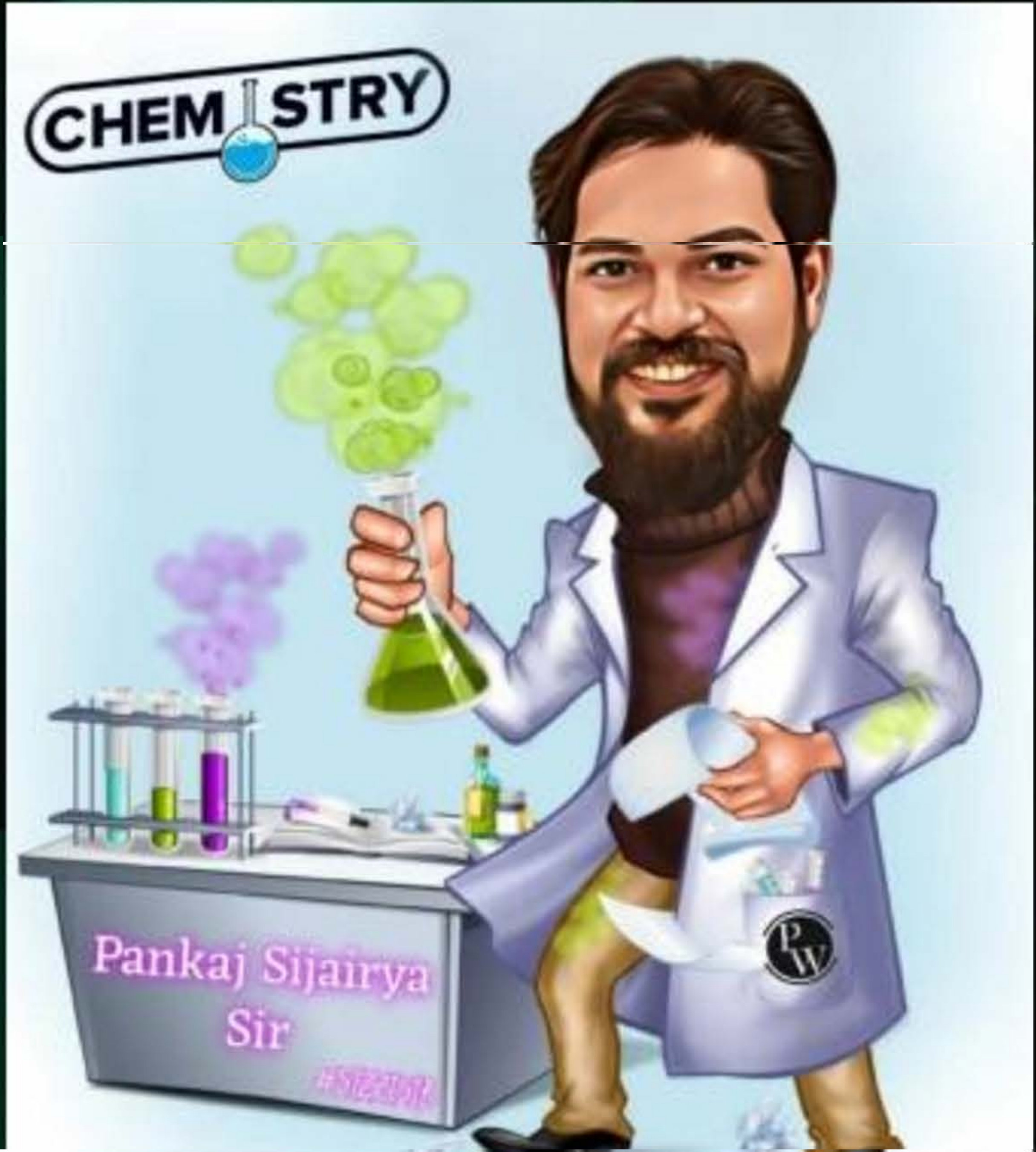
YAKEEN 2.0

FOR NEET 2025

Lecture- 01 | Organic Chemistry

Some Basic principles and Techniques (IUPAC Naming)

By- Pankaj Sir(POPU MAMA)


CHEMISTRY
Pankaj Sijairya Sir

Topics

to be covered

Mera selection Hoga

1. Basics ✓
2. Degree of C, H, X, OH and Amine ✓
3. Practice

Q. What is organic chemistry??

A. chemistry of 'C'

Q. 'C' ke compounds he kyun?

A. due to catenation prop. $C-C-C-C-C-C-C$

$\downarrow$

self linking prop.

due to tetravalence (4 Bond banata hai)

Compound

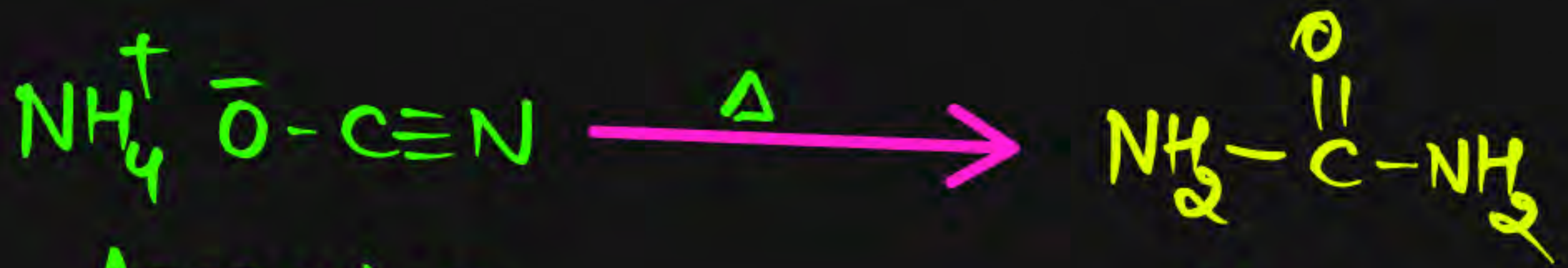
- organic
  - living organism
  - plants & Animals
- Inorganic
  - non living organism
  - mineral or gases

Berzelius: Theory of vitalism

It is impossible to prepare org comp from inorganic comp

Vital force zimmedar hote hai org comp ke liye.

Wohler



$$NH_4^+ \; \bar{O}-C\equiv N \xrightarrow{\Delta} NH_2-\overset{\overset{O}{\|}}{C}-NH_2$$

Ammonium cyanate

Inorganic

Urea

organic

Why o.c is tough??

1. Lack of Practice (class notes ✓ ques, DPP ✓, P.S ✓, H.W ✓, PYQs ✓ NEET ✓ JEE main ✓)
2. Lack of Revision (Daily, weekly, monthly)
3. Notes na hona (Khud ke notes)

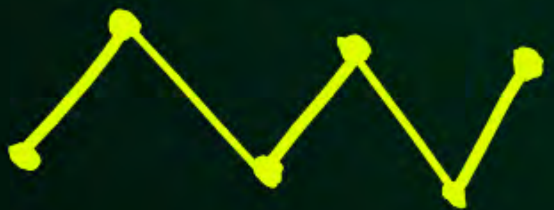
   Short notes (quick Revision)
4. Backlog

Representation of Organic Compounds

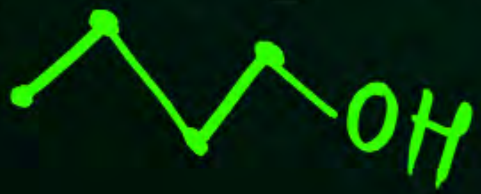
other than 'c' [N, O, S, X etc]

Definition Bond Line Structure:

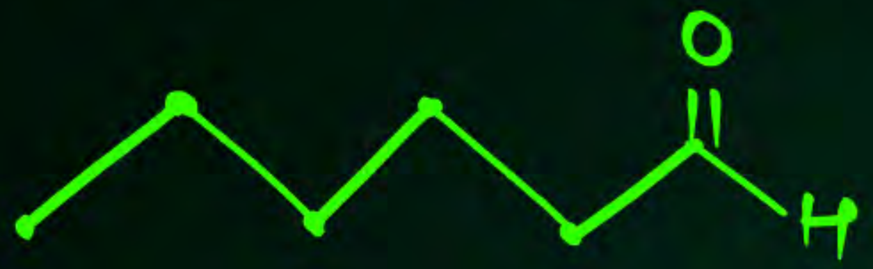
- One C – C bonds are represented. ✓
- Heteroatoms are always represented. ✓
- Longest C – C chain is represented in Zig-Zag pattern.
- Double bonds are shown with two lines and triple bonds three lines.
- **Example:** 1. $CH_3 - CH_2 - CH_2 - CH_2 - CH_2 - CH_3$



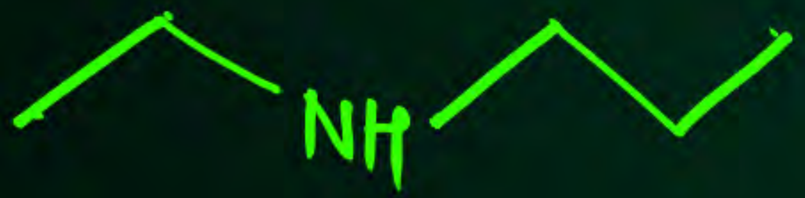
2. $CH_3 - CH_2 - CH_2 - CH_2 - OH$



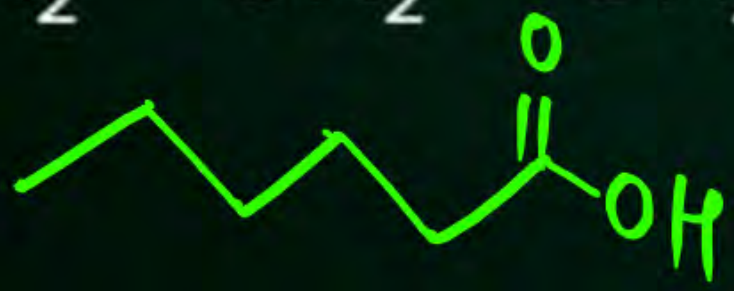
3. $CH_3-CH_2-CH_2-CH_2-CH_2-CHO$



4. $CH_3-CH_2-NH-CH_2-CH_2-CH_3$



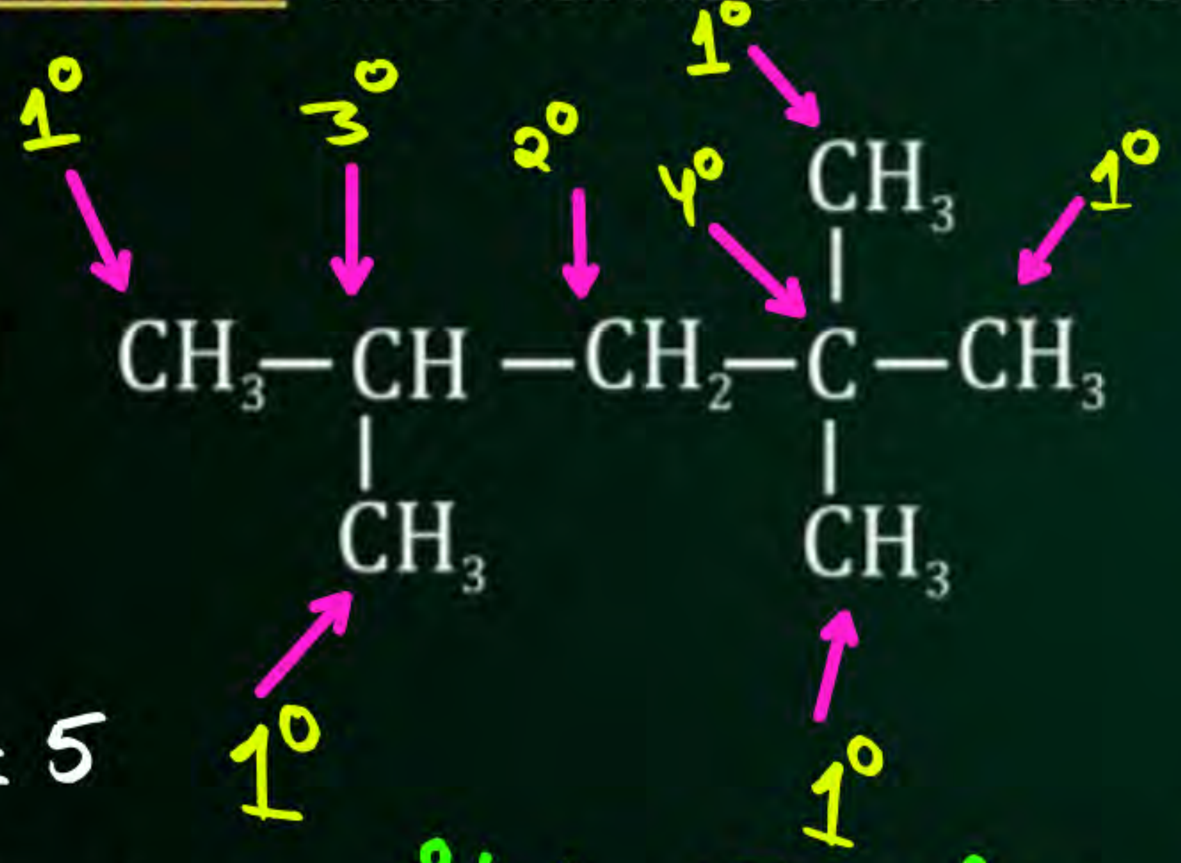
5. $CH_3-CH_2-CH_2-CH_2-CH_2-COOH$



Degree of Carbon

Definition: The number of C atoms directly attached with the carbon.

Ⓐ



1°
3°
2°
4°
1°
1°
1°
1°

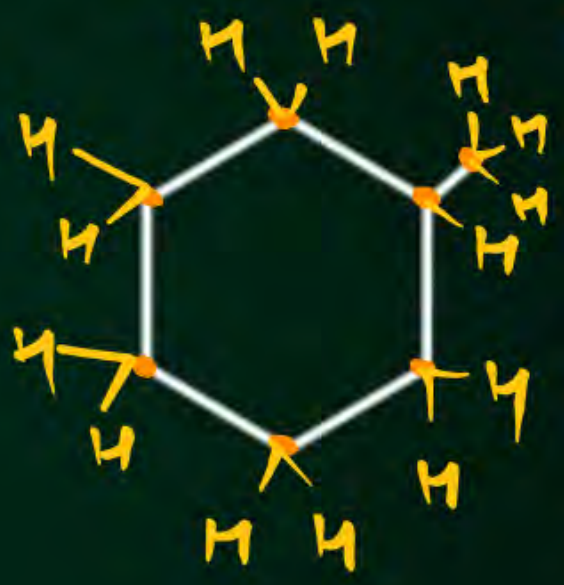
$$CH_3-\underset{\substack{|\\CH_3}}{CH}-CH_2-\overset{\substack{CH_3\\|}}{\underset{\substack{|\\CH_3}}{C}}-CH_3$$

1° 'C' = 5
2° 'C' = 1
3° 'C' = 1
4° 'C' = 1

1° 'H' = 15
2° 'H' = 2
3° 'H' = 1

4° 'H' = P.H.K (Pagal ho kya)
D.K.H.K (Dimag Kharab hai kya)

Ⓑ



H
H
H
H
H
H
H
H
H
H
H
H

1° 'C' = 1 1° 'H' = 3
2° 'C' = 5 2° 'H' = 10
3° 'C' = 1 3° 'H' = 1
4° 'C' = 0 4° 'H' = PHK
DKHK

OP Point: Super Primary Carbon (Jinki degree nahi hoti hai)

~~(zero degree)~~

(Akhang single Carbon)

$H-COOH$

super 1°

CH_3-O-CH_3

super 1° super 1°

CH_3-Cl

↓

super 1°

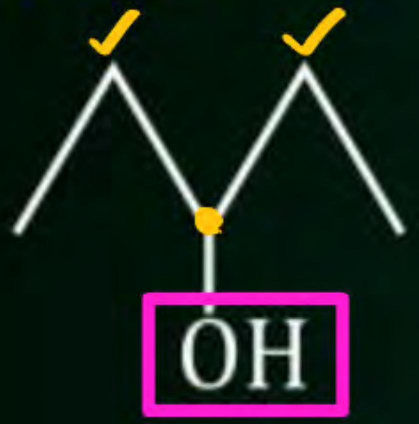
$\boxed{CH_4}$

super 1°

Degree of Alcohol

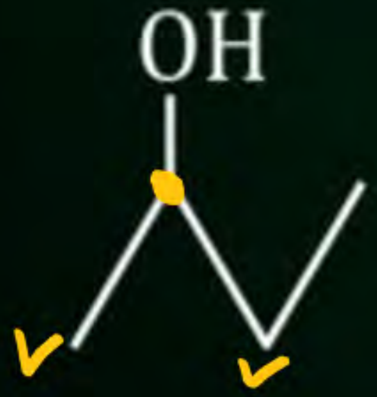
Definition: The degree of carbon at which the -OH group is present.

A



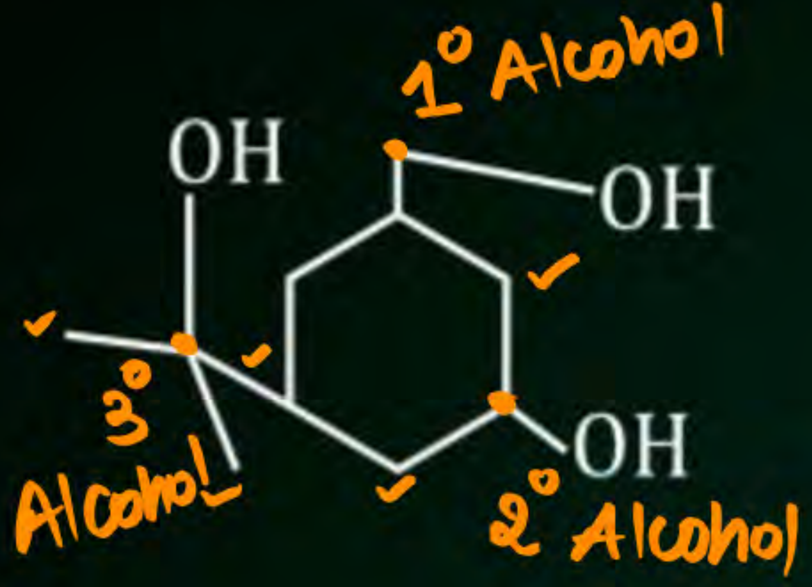
2° Alcohol

B

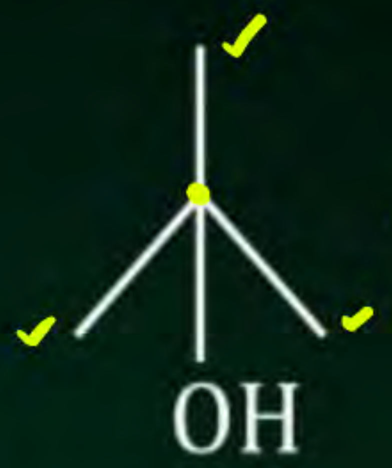


2° Alcohol

C

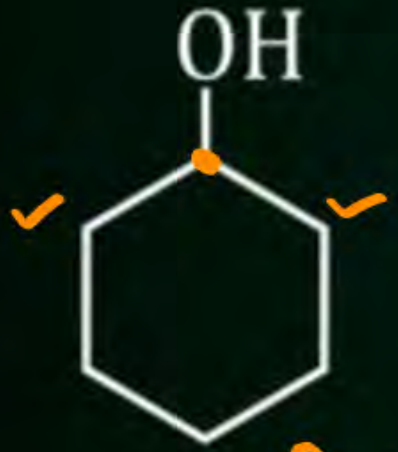

1° Alcohol
OH
OH
3° Alcohol
OH
2° Alcohol

D



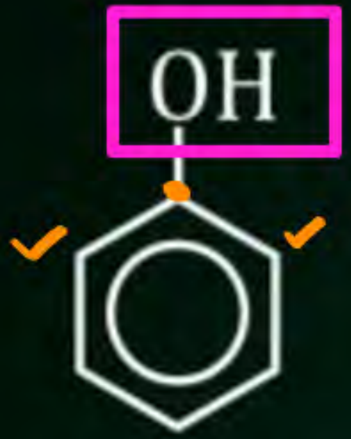
3° Alcohol

E



2° Alcohol

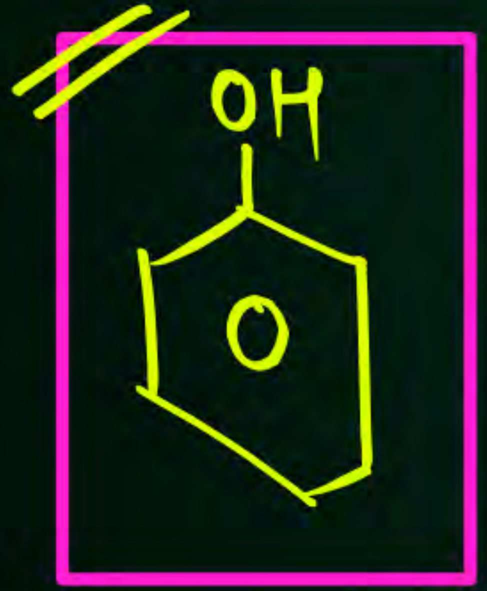
OP Point: Degree of Phenol



~~2° Alcohol~~

PHK

DKHK



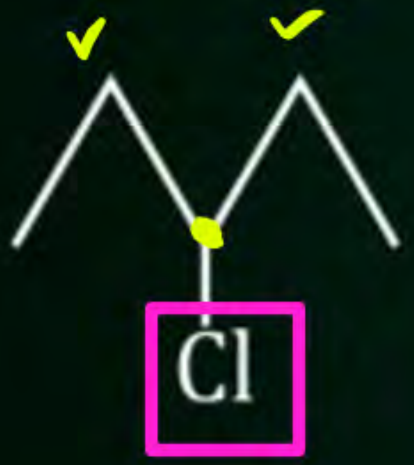
Phenol

Degree of Halogen

X
F
Cl
Br
I

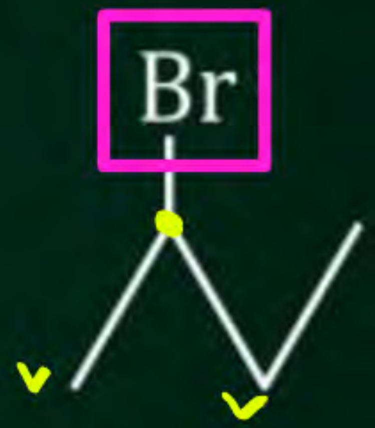
Definition: Degree of carbon at which X group is present.

A



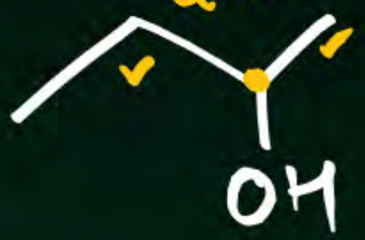
2° Chloride

B

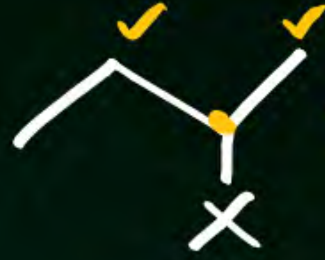


2° Bromide

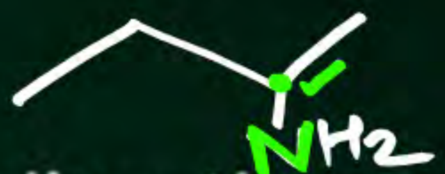
Degree of Amine



2° Alcohol



2° Halide

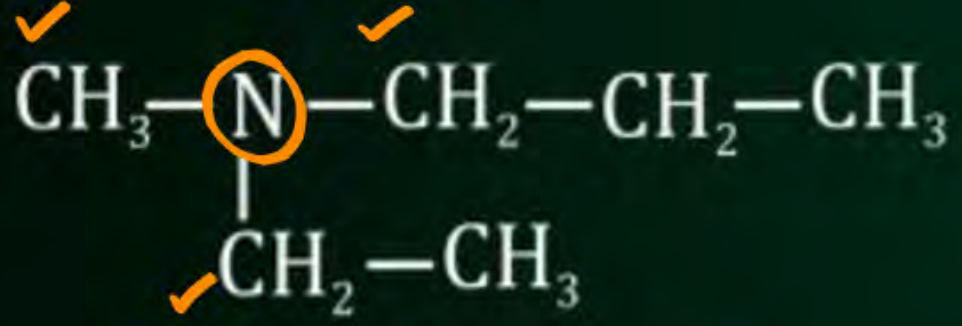


1° amine

Definition: The number of carbon atoms directly connected with the N.

3° Amine

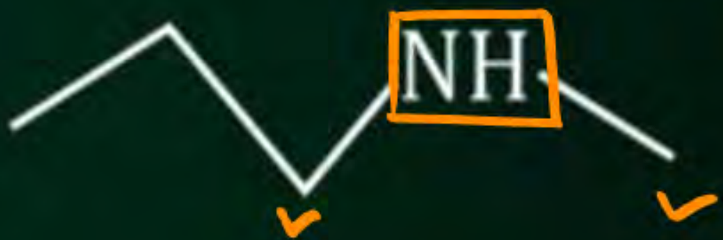
A



$$CH_3-\underset{\underset{CH_2-CH_3}{|}}{N}-CH_2-CH_2-CH_3$$

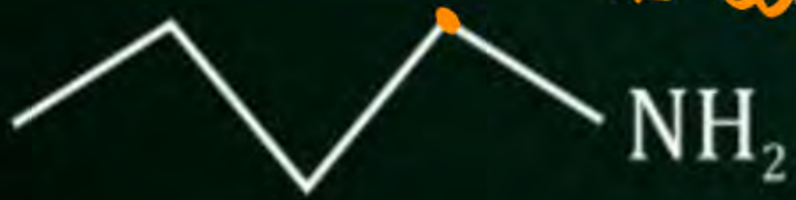
2° amine

B



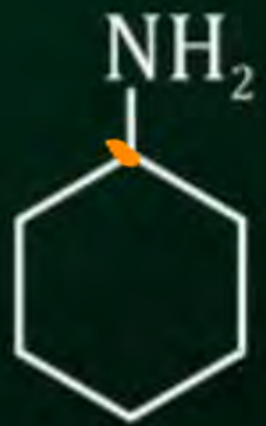
1° amine

C

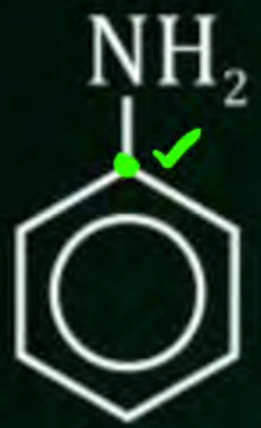


1° amine

D



OP Point: Degree of Aniline

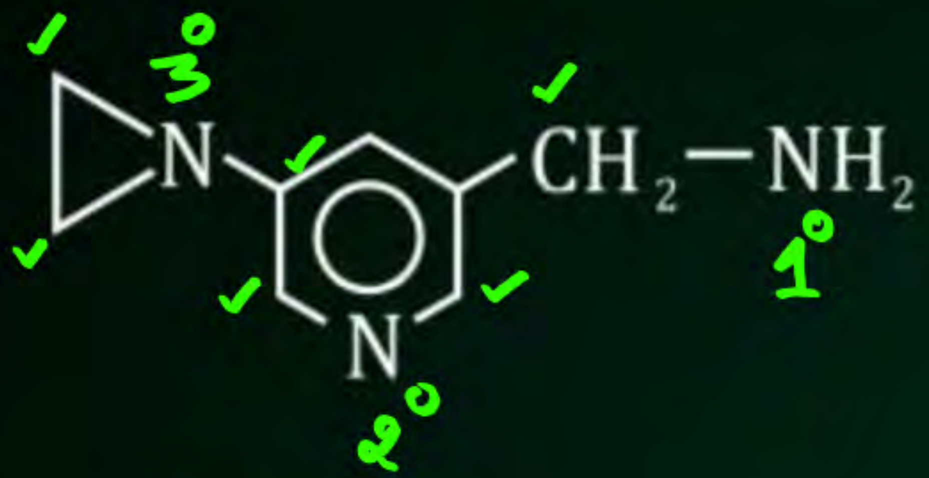


1° amine

ROH & $PhOH$ diff prop

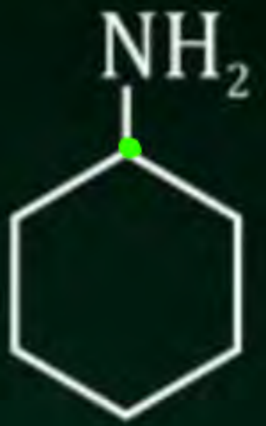
$R-NH_2$ & $PhNH_2$ same prop

E



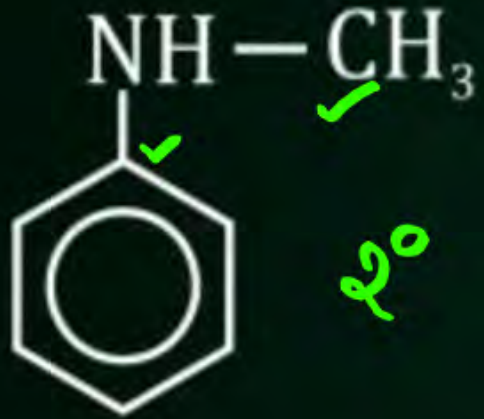
N
3°
CH$_2$—NH$_2$
1°
N
2°

F



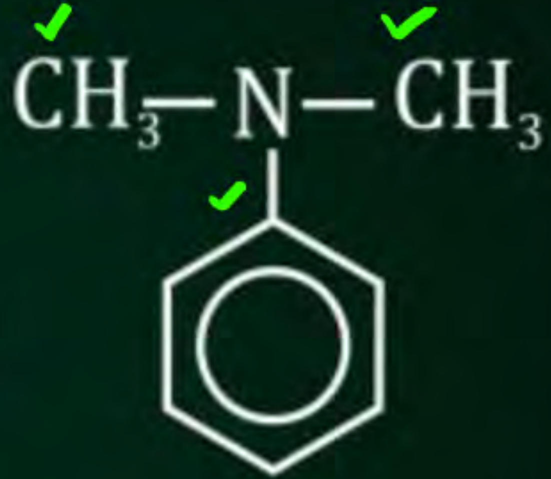
1°

G



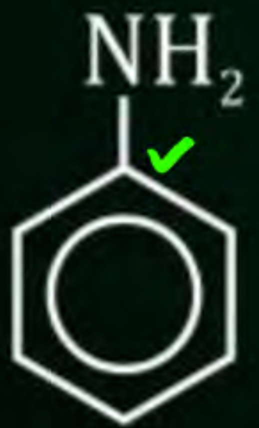
2°

H



3°

I



1°

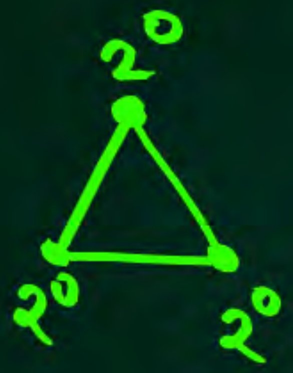
QUESTION

Find the simplest alkane having

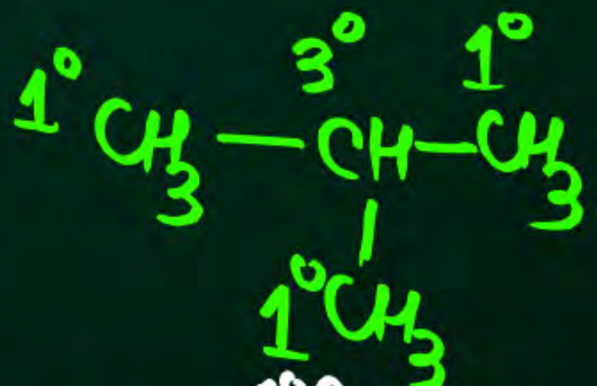
A Primary Carbon only

$\overset{1^\circ}{CH_3}-\overset{1^\circ}{CH_3}$

B Secondary Carbon only

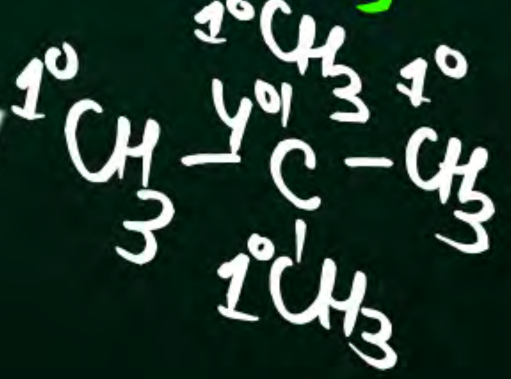


C Primary and tertiary Carbon only



$$1^\circ CH_3-\underset{\substack{|\\1^\circ CH_3}}{\overset{3^\circ}{CH}}-\overset{1^\circ}{CH_3}$$

D Primary and Quaternary Carbon only

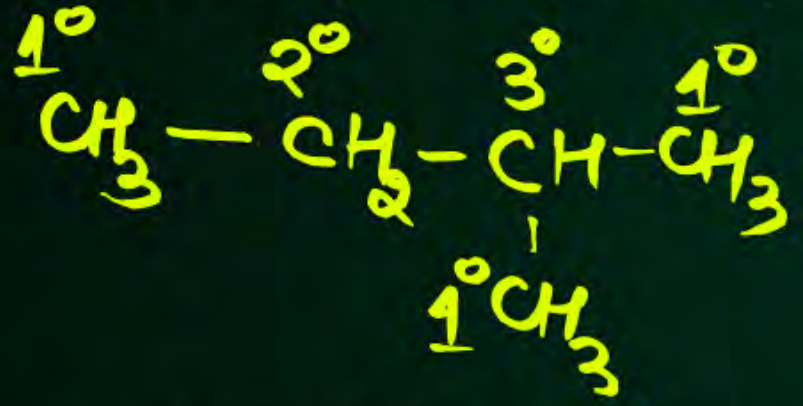


$$1^\circ CH_3-\underset{\substack{|\\1^\circ CH_3}}{\overset{\substack{1^\circ CH_3\\|}}{\overset{4^\circ}{C}}}-\overset{1^\circ}{CH_3}$$

E Primary and secondary carbon only

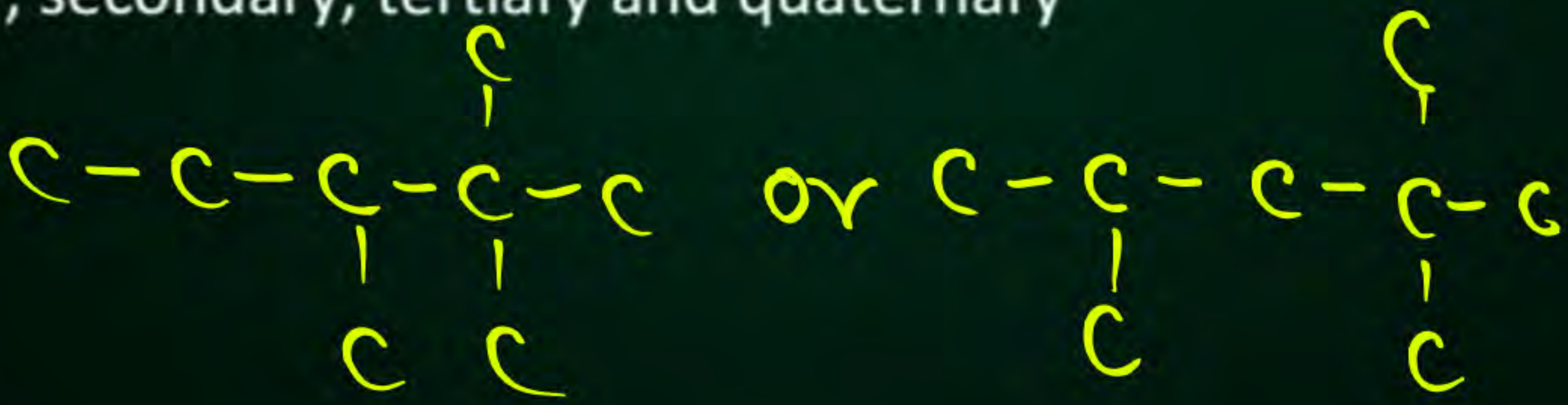
$CH_3-CH_2-CH_3$

F Primary, secondary and tertiary Carbon only



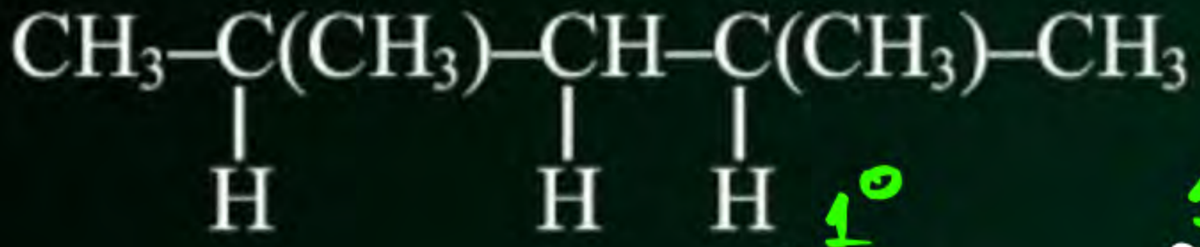
$$\overset{1^\circ}{CH_3}-\overset{2^\circ}{CH_2}-\overset{3^\circ}{C}H-\overset{1^\circ}{CH_3}$$
$$\qquad\qquad\qquad\;\; |$$
$$\qquad\qquad\qquad 1^\circ CH_3$$

G All primary, secondary, tertiary and quaternary

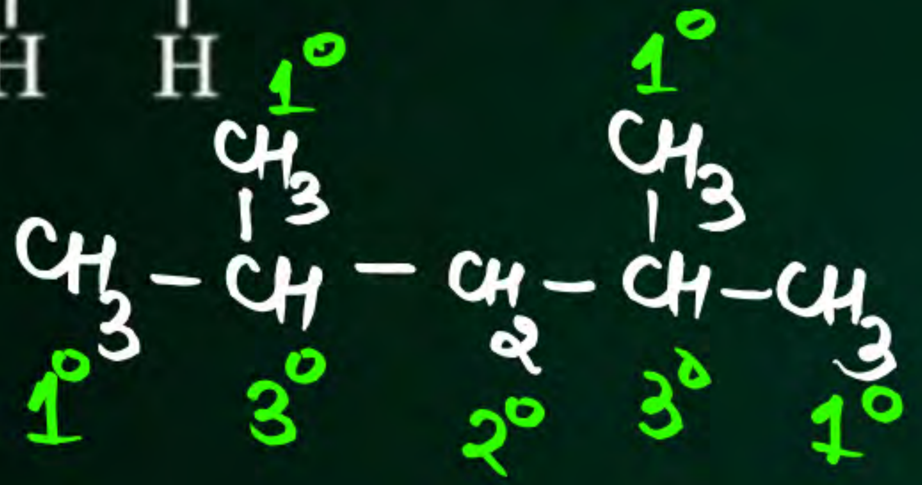


QUESTION (JEE Mains 8th April 2024, Morning Shift)

In the given compound, the number of 2° carbon atom/s is ____.



$CH_3-\underset{\underset{H}{|}}{C}(CH_3)-\underset{\underset{H}{|}}{C}H-\underset{\underset{H}{|}}{C}(CH_3)-CH_3$



$\overset{1°}{CH_3}-\overset{\overset{1°}{CH_3}}{\overset{|}{\underset{3°}{CH}}}-\underset{2°}{CH_2}-\overset{\overset{1°}{CH_3}}{\overset{|}{\underset{3°}{CH}}}-\underset{1°}{CH_3}$

- (A) Three
- [✓ (B) One]
- (C) Two
- (D) Four

QUESTION

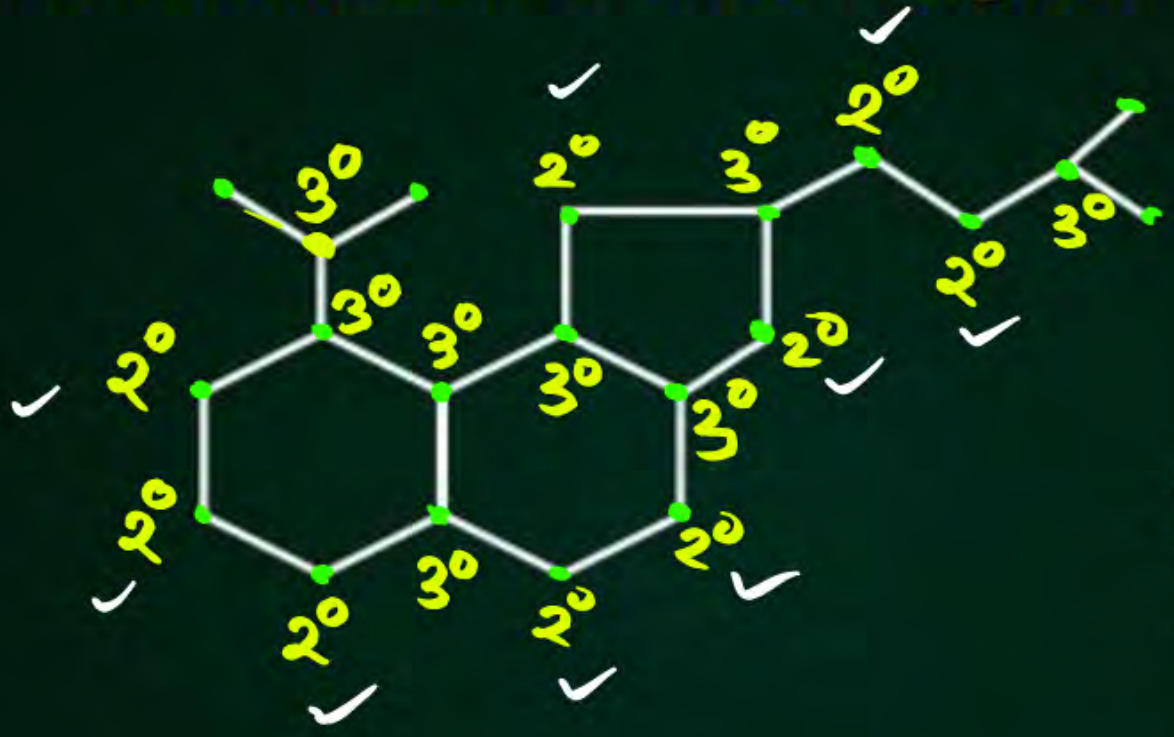
Number of 3° and 2° carbon atoms in the following compound are:

A 7, 8

B 6, 9

C 6, 8

D [✓ 8, 9]



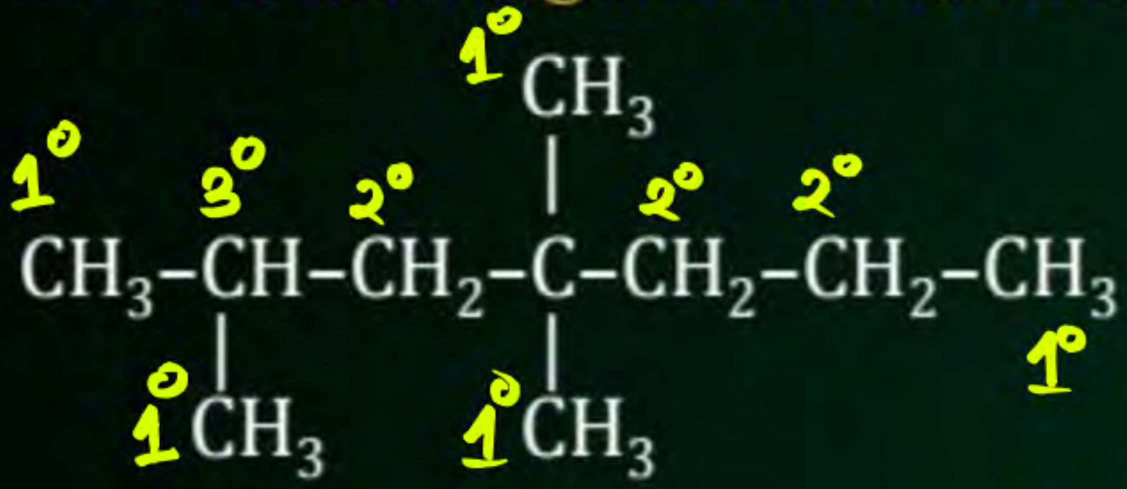
3°
2°
3°
2°
3°
3°
2°
3°
3°
2°
2°
2°
3°
3°
2°
2°
2°
2°
3°

$8 \rightarrow 3^\circ$ 'C'

$9 \rightarrow 2^\circ$ 'C'

QUESTION

In the following structure, Ratio of 1°, 2° and 3° H atoms is:



$CH_3-CH(CH_3)-CH_2-C(CH_3)_2-CH_2-CH_2-CH_3$

$15 : 6 : 1$

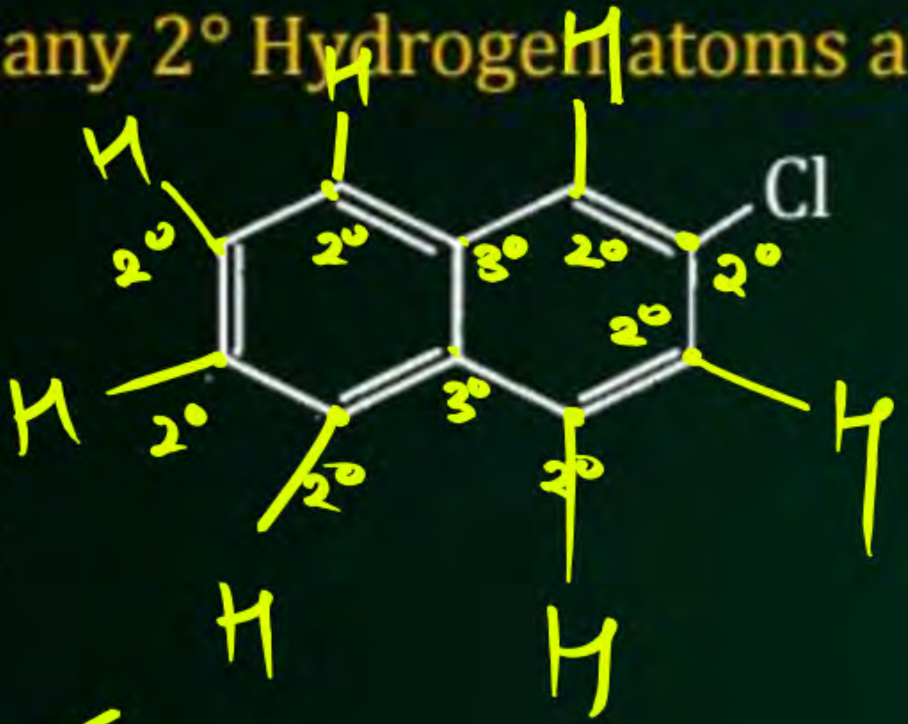
$\frac{15}{3} : \frac{6}{3} : \frac{1}{3}$

$5 : 2 : 0.3$

- A 5 : 2 : 0.557
- B 5 : 2 : 0.250
- [✓ C] 5 : 2 : 0.337
- D 5 : 2 : 0.153

QUESTION

How many 2° Hydrogen atoms are present in the given following compounds?


Cl
H
H
H
H
H
H
H
H
2°
2°
3°
2°
2°
2°
2°
3°
2°
2°
2°

A 2

B 5

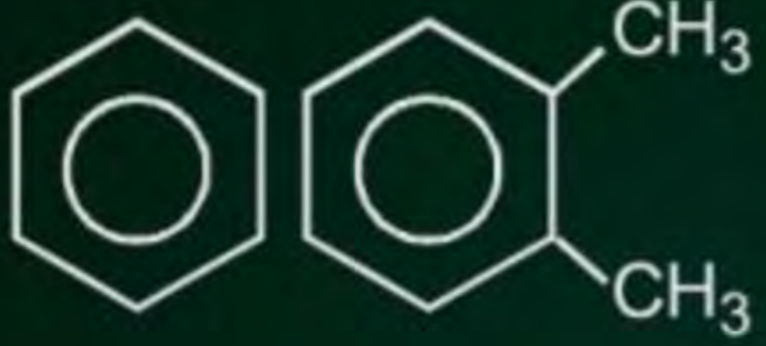
C 7

D 8

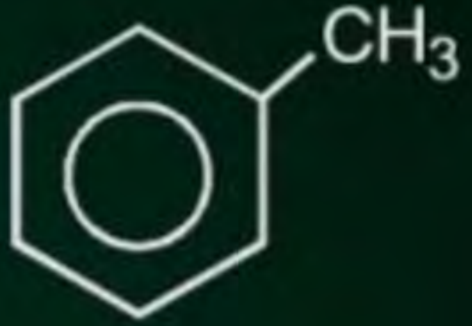
Home work

QUESTION

Number of 2° carbon atoms in the following compound are respectively:



and



(A) 6, 4, 5

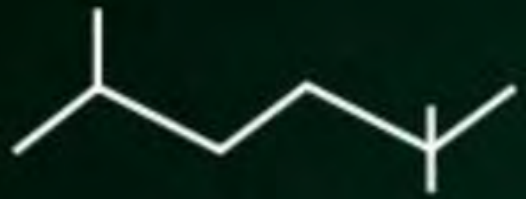
(B) 4, 5, 6

(C) 5, 4, 6

(D) 6, 2, 1

QUESTION

The number of 1° carbon atoms in given molecule is:



A 4

B 5

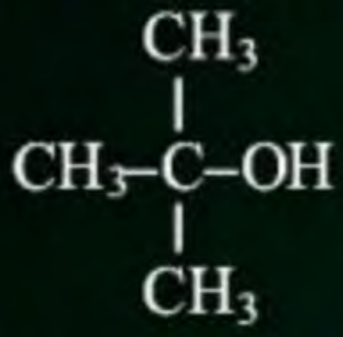
C 6

D 7

QUESTION

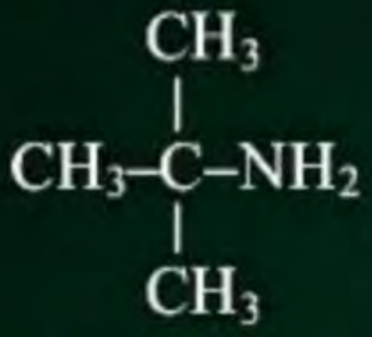
Examine the following structures:

(A)



$CH_3-\overset{\displaystyle CH_3}{\underset{\displaystyle CH_3}{C}}-OH$;

(B)



$CH_3-\overset{\displaystyle CH_3}{\underset{\displaystyle CH_3}{C}}-NH_2$

Which of the following statement is correct?

A A is tertiary alcohol while B is tertiary amine.

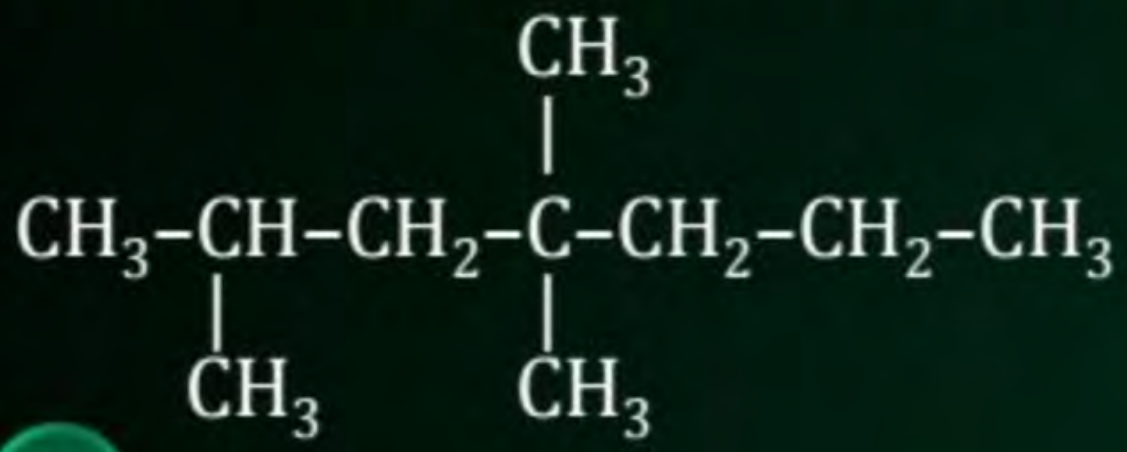
B A is primary alcohol while B is primary amine.

C A is tertiary alcohol while B is primary amine.

D A is primary alcohol while B is tertiary amine.

QUESTION

In the following structure, Ratio of 1° and 2° C atoms is:



$$CH_3-\underset{CH_3}{\underset{|}{CH}}-CH_2-\overset{CH_3}{\overset{|}{\underset{CH_3}{\underset{|}{C}}}}-CH_2-CH_2-CH_3$$

A 5 : 1

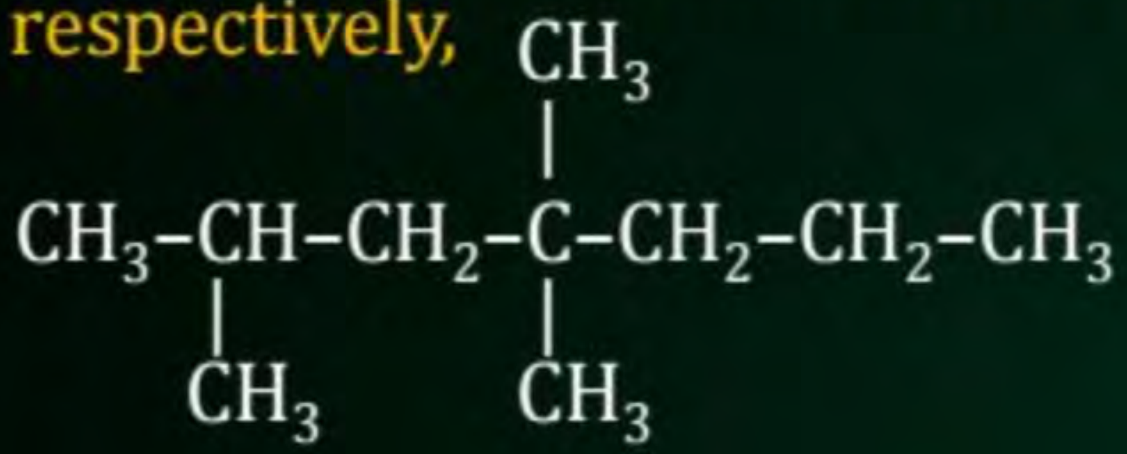
B 4 : 3

C 1 : 1

D 5 : 3

QUESTION

In the following structure, Number of 4° carbon atom and 3° hydrogen atom are respectively,



$$CH_3-\underset{\substack{|\\ CH_3}}{CH}-CH_2-\overset{\substack{CH_3\\ |}}{\underset{\substack{|\\ CH_3}}{C}}-CH_2-CH_2-CH_3$$

A 1, 1

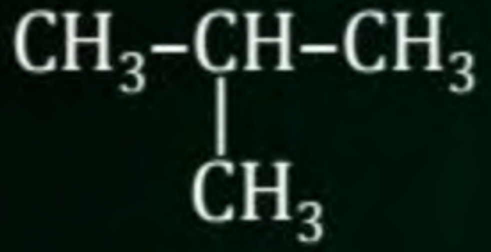
B 2, 1

C 2, 2

D None of these

QUESTION

Find the number of 1°, 2° & 3° hydrogen atoms in the following compounds:



$$\mathrm{CH_3{-}\underset{\displaystyle|\atop\displaystyle CH_3}{CH}{-}CH_3}$$

Ⓐ $1°\mathrm{H} \rightarrow 9,\ 3°\mathrm{H} \rightarrow 1$

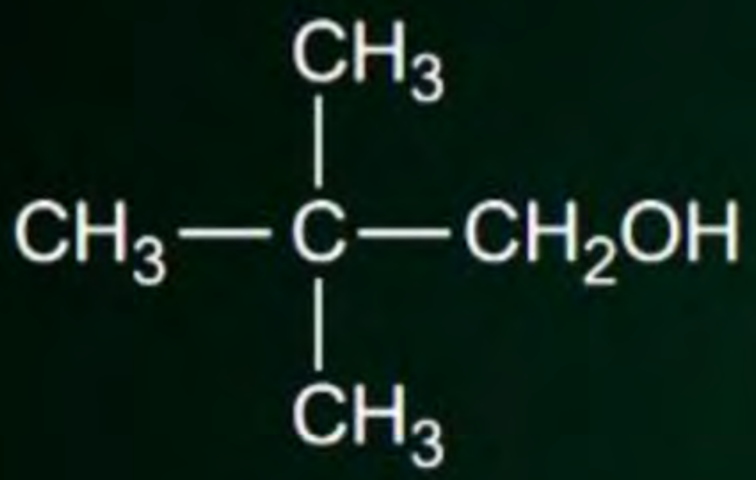
Ⓑ $1°\mathrm{H} \rightarrow 6,\ 2°\mathrm{H} \rightarrow 2,\ 3°\mathrm{H} \rightarrow 2$

Ⓒ $1°\mathrm{H} \rightarrow 6,\ 2°\mathrm{H} \rightarrow 4$

Ⓓ $1°\mathrm{H} \rightarrow 9,\ 2°\mathrm{H} \rightarrow 1$

QUESTION

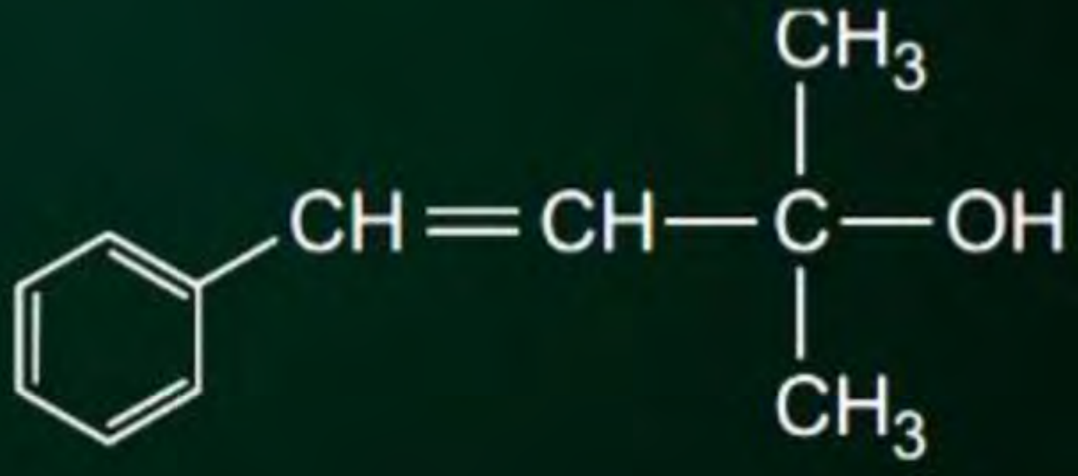
Classify the following as primary, secondary and tertiary alcohols:

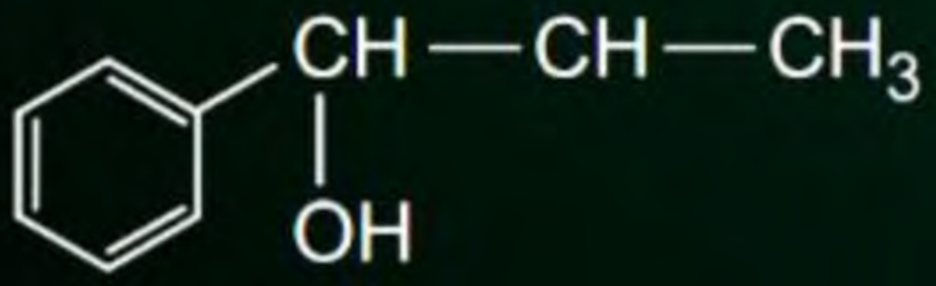
(i) 

$CH_3-\overset{\overset{CH_3}{|}}{\underset{\underset{CH_3}{|}}{C}}-CH_2OH$

(ii) $H_2C=CH-CH_2OH$

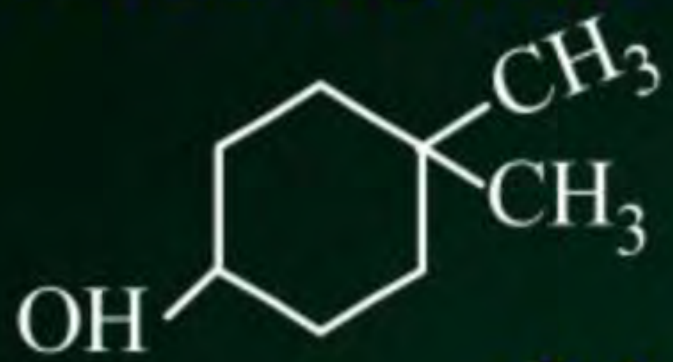
(iii) $CH_3-CH_2-CH_2-OH$

(iv) 

(v) 

QUESTION

On the basis of given compounds match the column.



Column-I	Column-II
(A) 1° Carbon	(P) 5
(B) 2° Carbon	(Q) 9
(C) 2° Hydrogen	(R) 2
(D) 1° Hydrogen	(S) 6

(1) A → P, B → R, C → Q, D → S

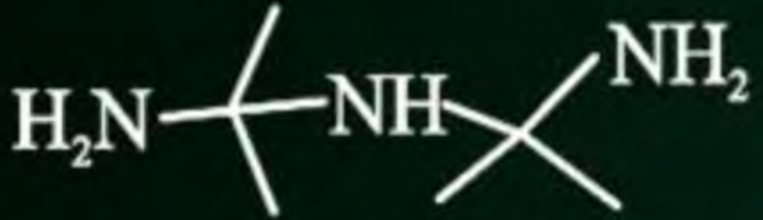
(2) A → R, B → P, C → Q, D → S

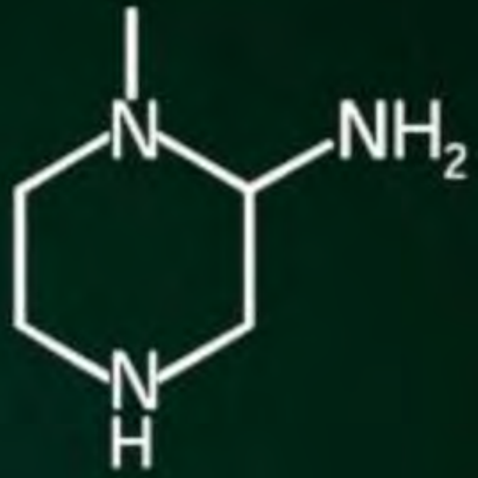
(3) A → R, B → P, C → S, D → Q

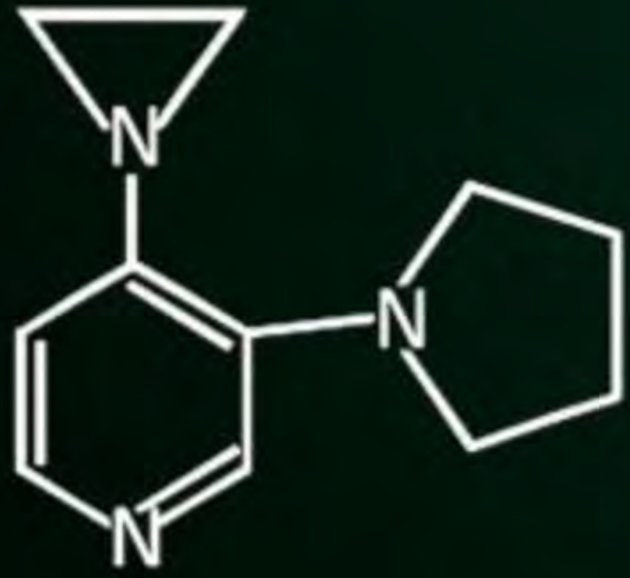
(4) A → P, B → R, C → S, D → Q

QUESTION

Which of the following compound contain all 1°, 2° & 3° amine?

(A) 

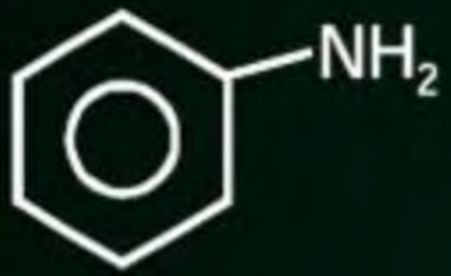
(B) 

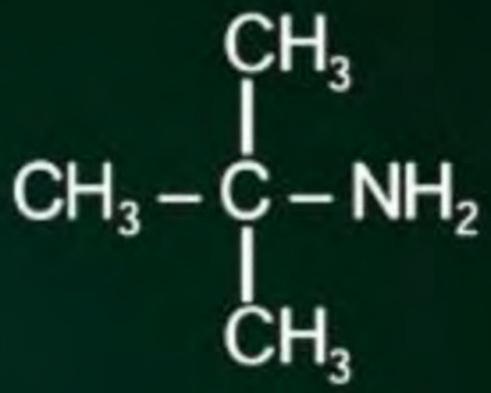
(C) 

(D) None of these

QUESTION

Which of the following is 1° amine?

(A) 

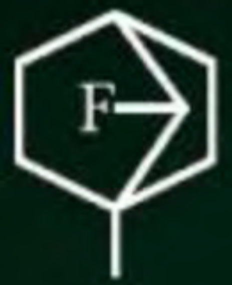
(B) 

$$CH_3-\overset{\overset{CH_3}{|}}{\underset{\underset{CH_3}{|}}{C}}-NH_2$$

(C) CH_3NH_2

(D) All of these

QUESTION

How many 3° H are present in 

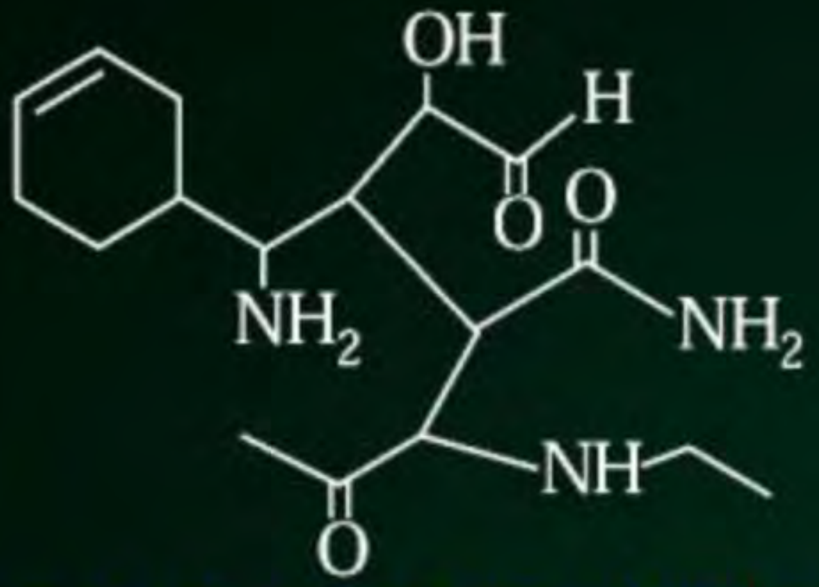
A 1

B 2

C 3

D 4

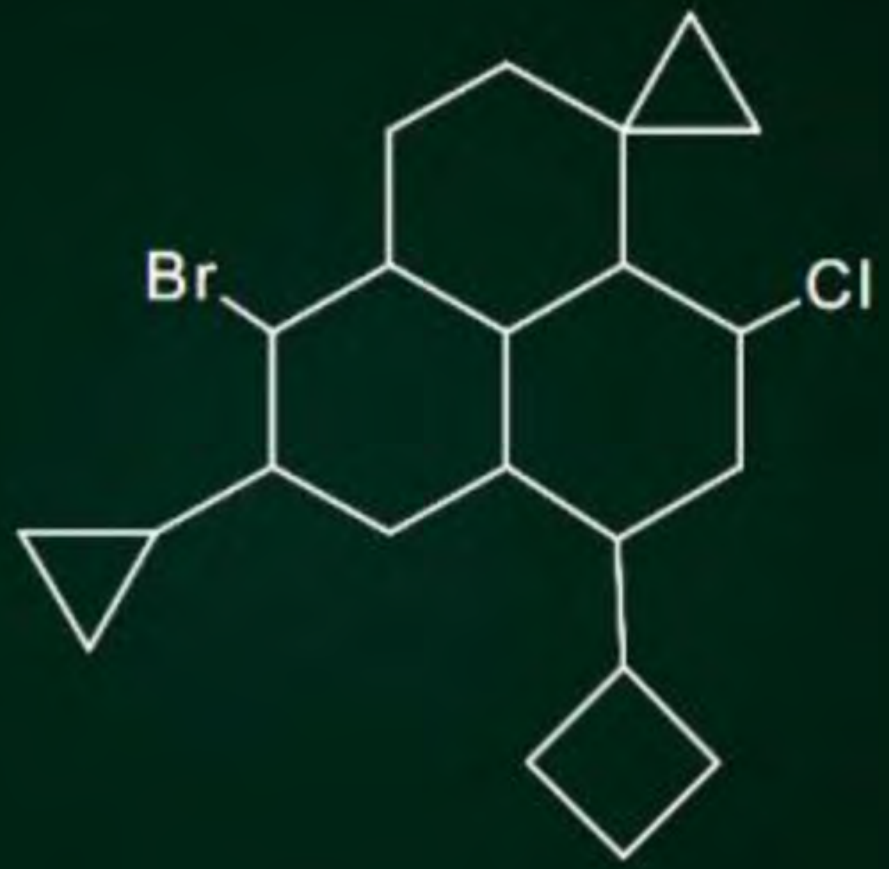
QUESTION



(a) Find out the total number of 1° hydrogen.
(b) Find out the total number of 2° hydrogen.
(c) Find out the total number of 3° hydrogen.
(d) Find out the total number of 1°carbon.
(e) Find out the total number of 2° carbon.
(f) Find out the total number of 3° carbon.
(g) Find out the total number of 4°carbon.

QUESTION

The total number of 2° carbon present in given compound is:



(A) 11

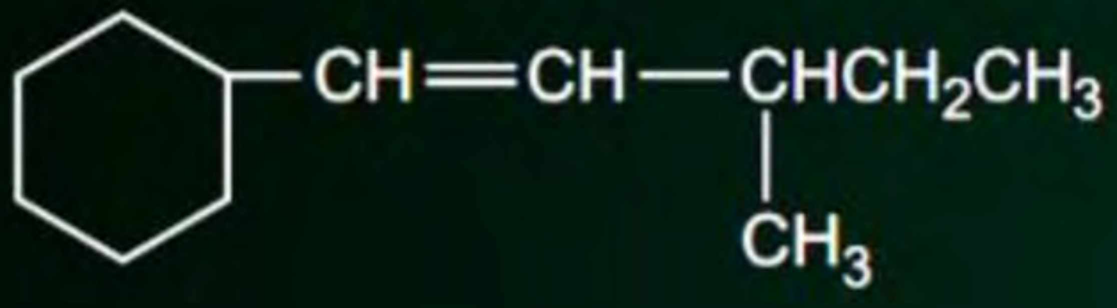
(B) 12

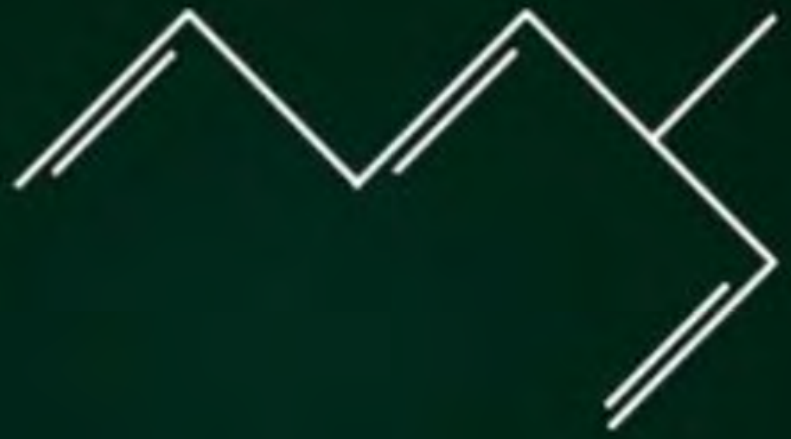
(C) 13

(D) 14

QUESTION

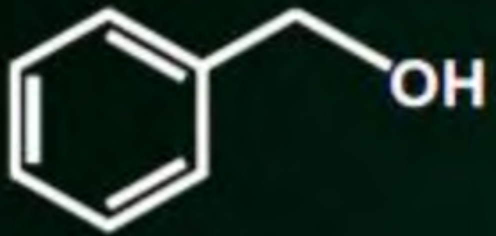
Count the number of primary, secondary, teritary, quarternary carbon as well as hydrogen in given compound:

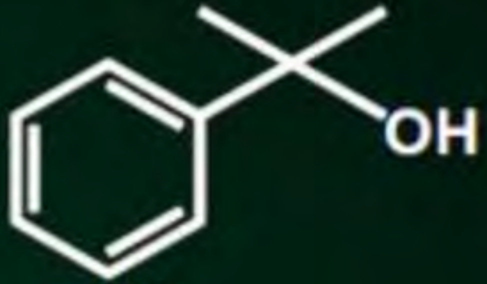

CH=CH—CHCH₂CH₃
CH₃

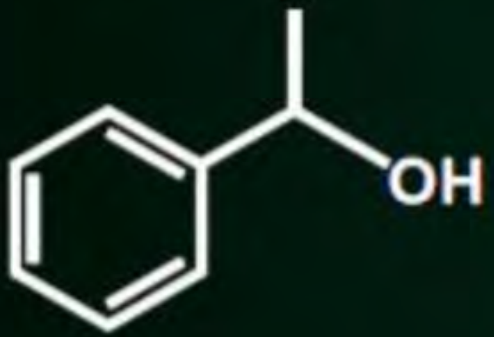


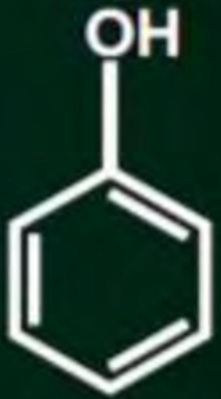
QUESTION

Which of the following compounds is a secondary alcohol?

A


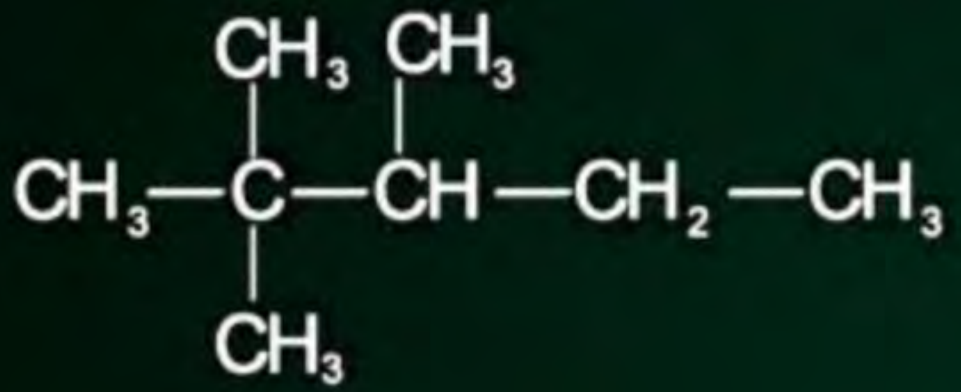
B


C


D


QUESTION

Number of 4° carbon atoms present in the compound are:



$$CH_3-\overset{\overset{CH_3}{|}}{\underset{\underset{CH_3}{|}}{C}}-\overset{\overset{CH_3}{|}}{C}H-CH_2-CH_3$$

A 4

B 2

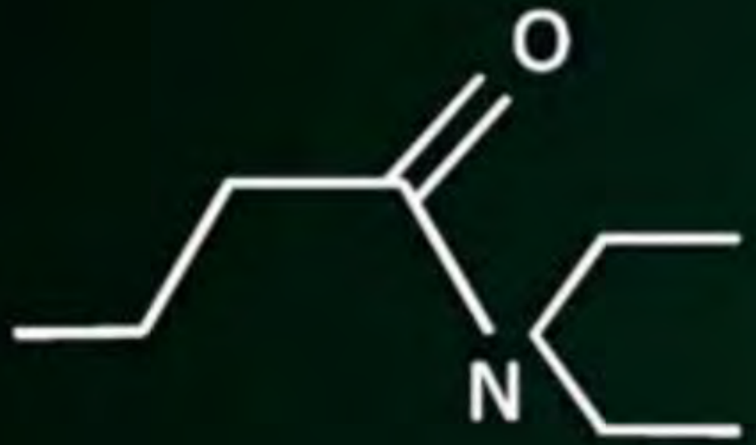
C 3

D 1

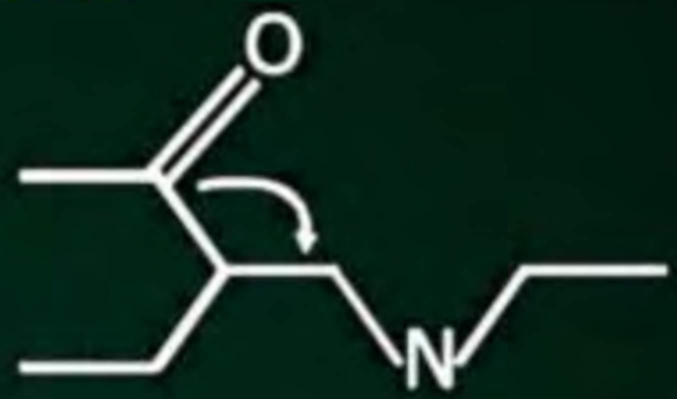
QUESTION

Which of the following is an example of 3° amide?

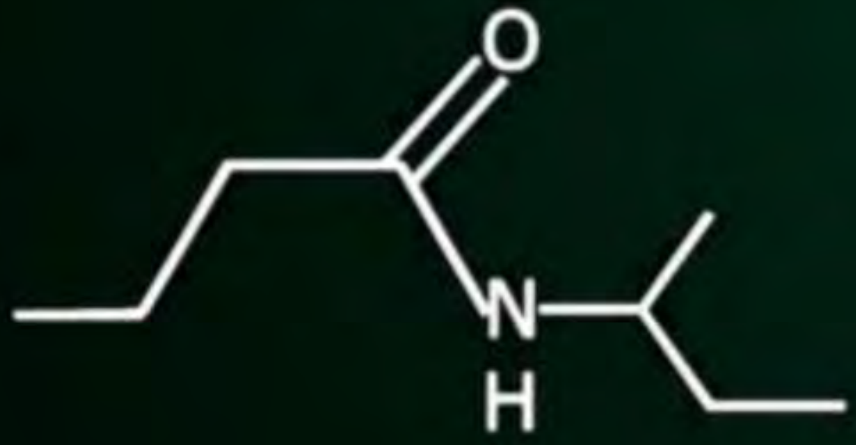
A



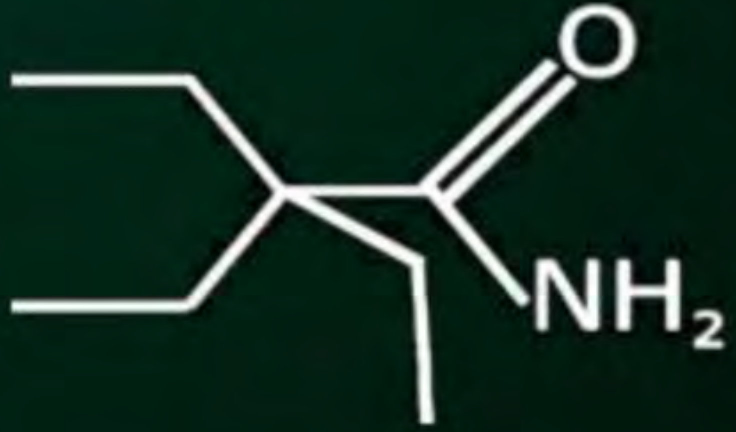
B



C



D



Home Work From PW Module (Yakeen NEET)

Prarambh: Q 34

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REAL TEST SERIES

Registration Closing Date for Test 01 – 10 Oct 2024

Exam Date - 13 Oct 2024 (online)

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NEET REAL TEST 01 SYLLABUS

11th NEET REAL TEST SERIES SYLLABUS

Cohort	Class	Name of the Test	Exam Date	Mode	Physics	Chemistry	Botany	Zoology
NEET	11	Test 1	13-Oct-2024	Online	Basic Maths & Calculus (Mathematical Tools) Vectors Units and Measurements Motion in a straight line	Structure of Atom Some Basic Concepts of Chemistry Classification of Elements and Periodicity in Properties	Cell - The Unit of Life Cell Cycle and Cell Division	Structural Organization in Animals Breathing and Exchange of Gases

12th NEET REAL TEST SERIES SYLLABUS

Cohort	Class	Name of the Test	Exam Date	Mode	Physics	Chemistry	Botany	Zoology
NEET	12	Test 1	13-Oct-2024	Online	Electric Charges and Fields Electrostatic Potential and Capacitance	Solution Electrochemistry	Sexual Reproduction in Flowering Plant	Human Reproduction

DROPPER NEET REAL TEST SERIES SYLLABUS

Cohort	Class	Name of the Test	Exam Date	Mode	Physics	Chemistry	Botany	Zoology
NEET	Dropper	Test 1	13-Oct-2024	Online	Basic Maths & Calculus (Mathematical Tools) Vectors Units and Measurements Motion in a straight line Motion in a plane Circular motion Laws of motion	Some Basic Concept of Chemistry Redox Reaction Solutions Thermodynamics Equilibrium Electrochemistry	Cell - The Unit of Life Cell Cycle and Cell Division The Living World Biological Classification Plant Kingdom Morphology of Flowering Plants	Structural Organization in Animals Breathing and Exchange of Gases Body Fluids and Circulation Excretory Products & their Elimination

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- **Exam Duration:** 60 Minutes

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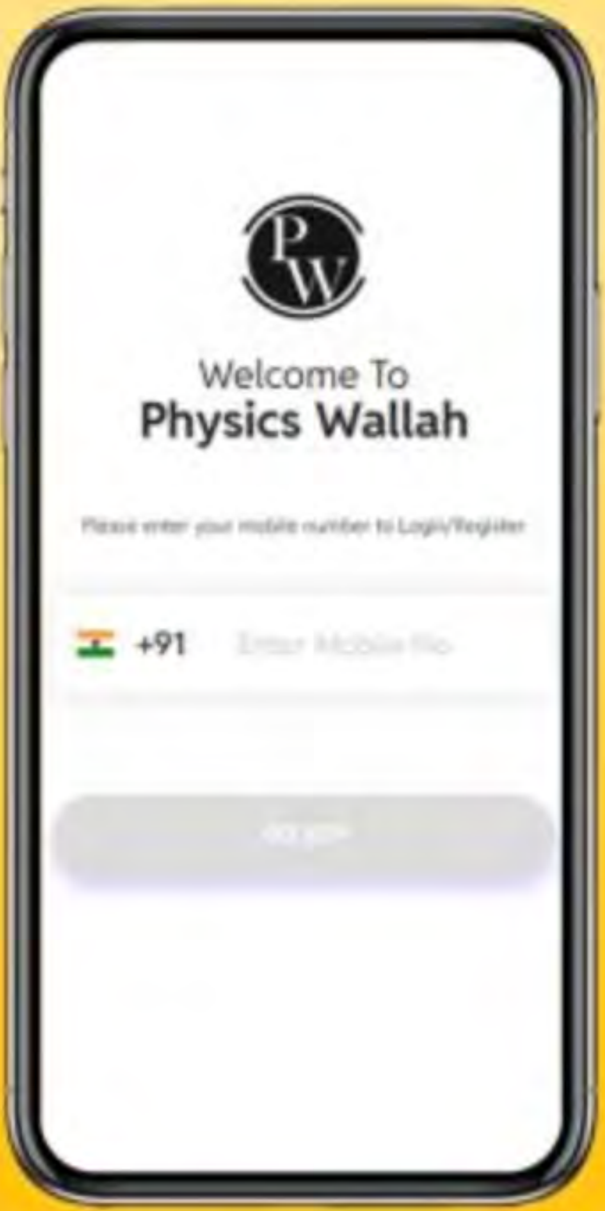

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Enter Mobile No.

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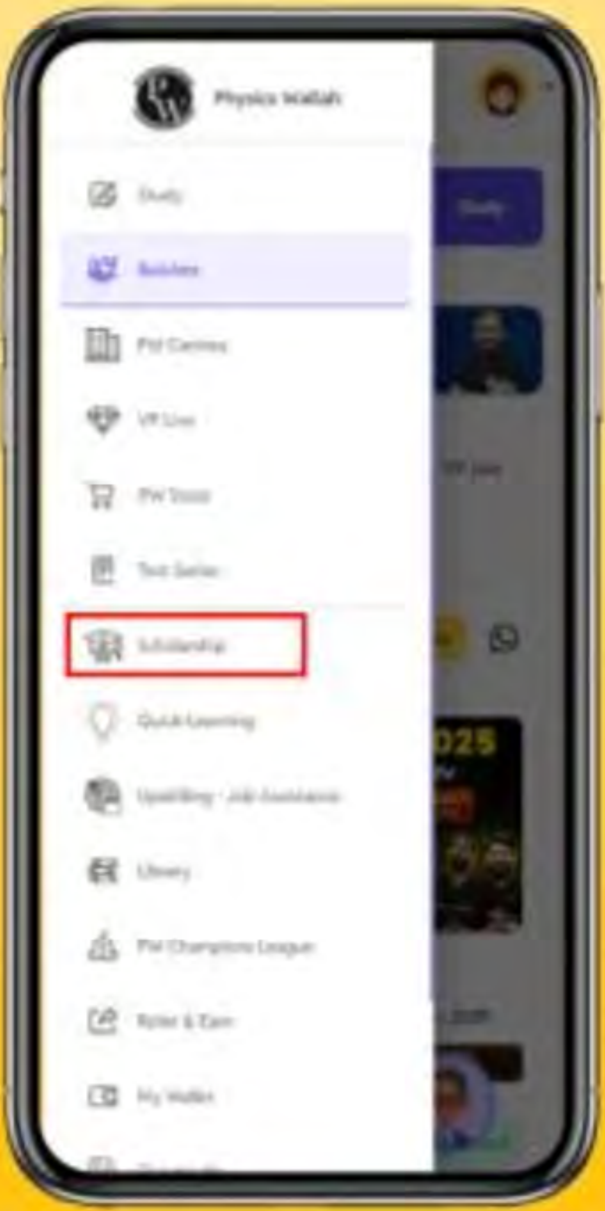

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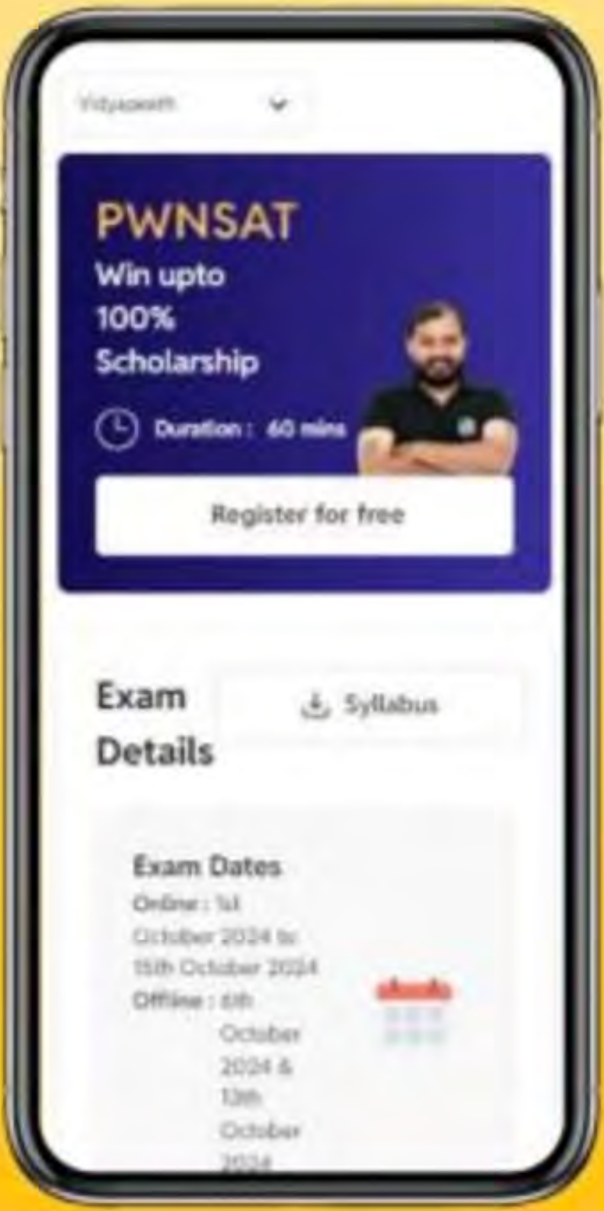

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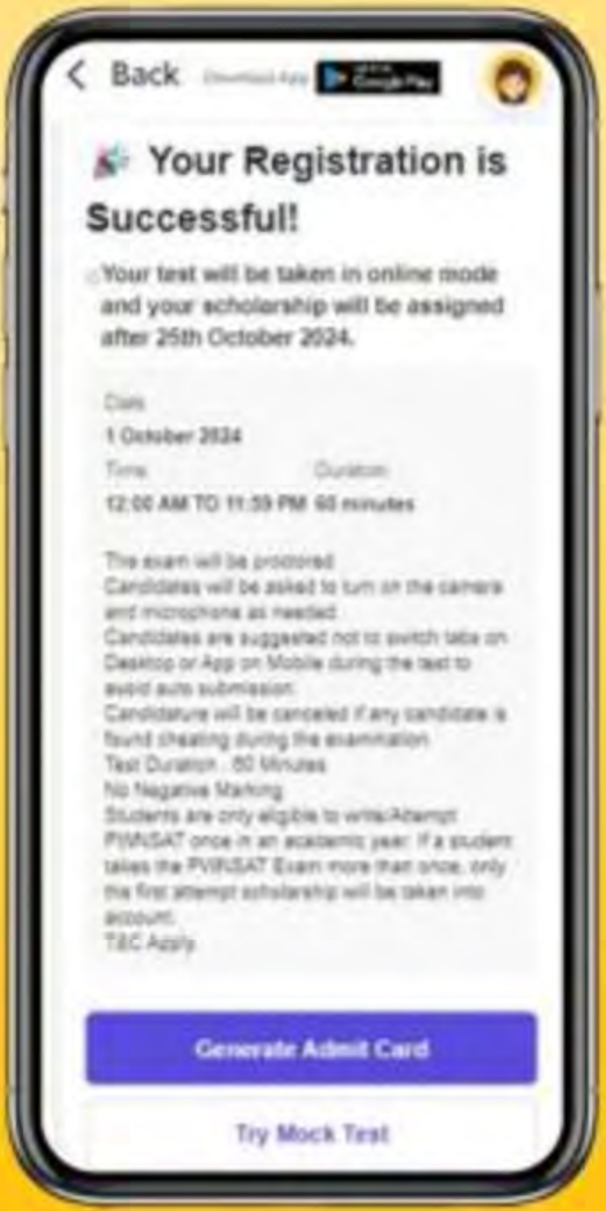

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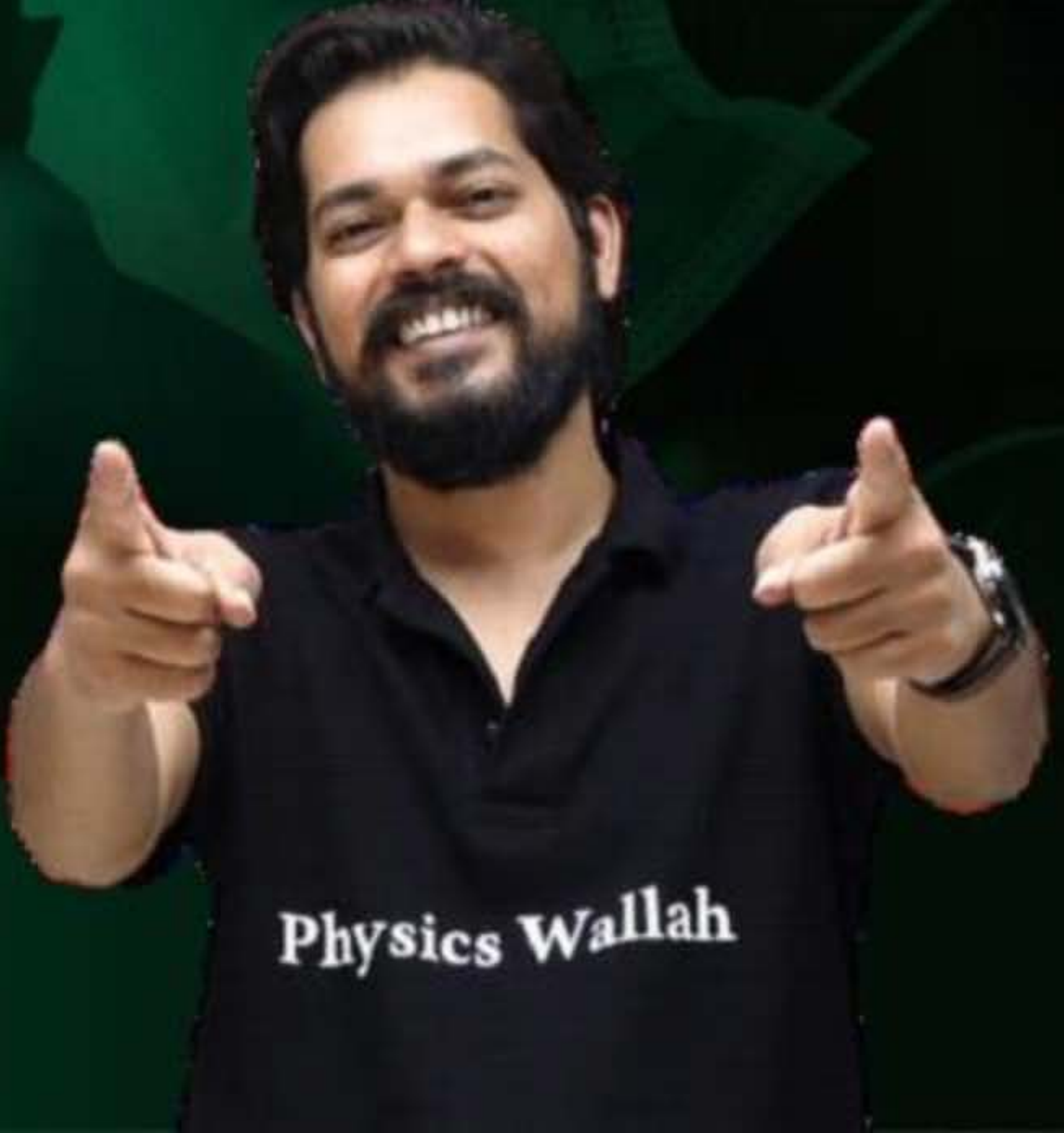
YAKEEN 2.0

FOR NEET 2025

Lecture- 02 | **Organic Chemistry**

Some Basic Principles and Techniques (IUPAC Naming)

By- Pankaj Sir (POPU MAMA)


Physics Wallah

Topics *to be covered*

1. D.U & Calculation of σ & π bonds ✓
2. Hybridization ✓
3. IUPAC Naming of Alkanes ✓
4. Practice

Degree of Unsaturation

- D.U. (Degree of Unsaturation) ✓

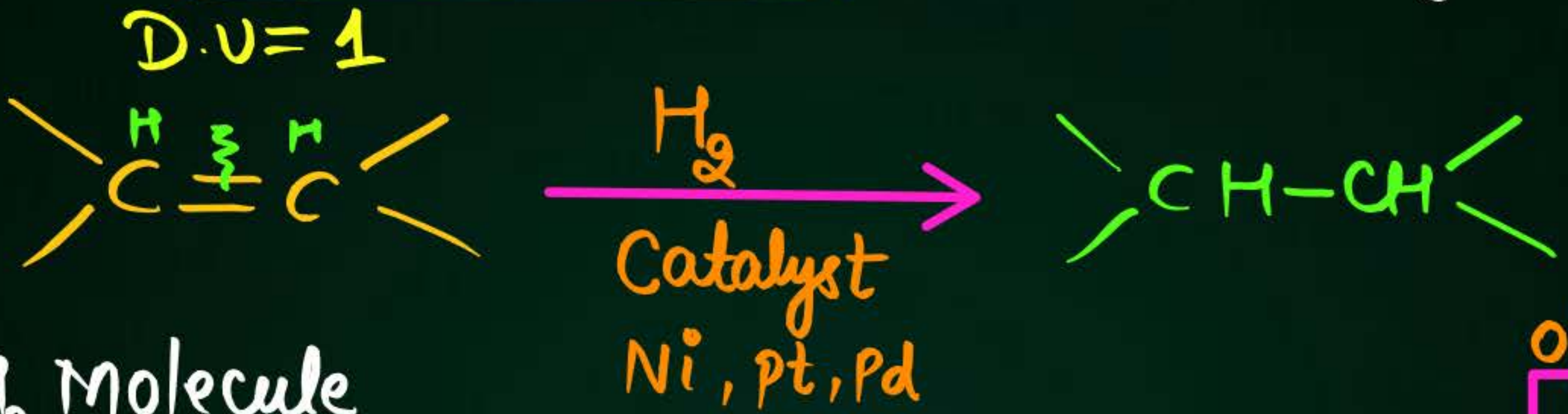
  OR
- I.H.D. (Index of Hydrogen deficiency) ✓

  OR
- U.I. (Unsaturation Index) ✓

  OR
- D.B.E. (Double bond equivalent) ✓

Case 01: Number of H_2 molecules are required to convert a molecule (multiple bond) into open chain compound.(Saare single)

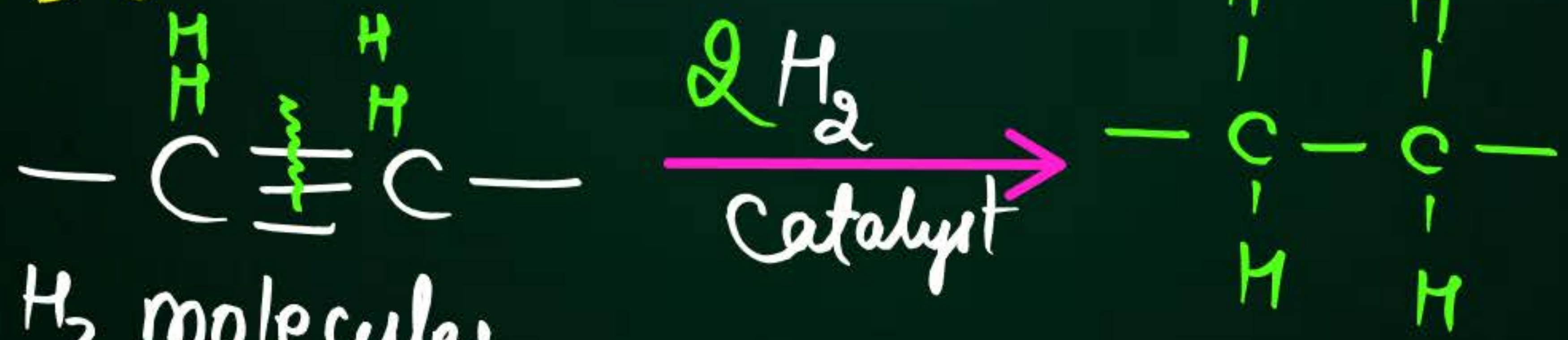
①


D.U= 1
H
H
C
C
H_2
Catalyst
Ni, pt, Pd
CH–CH

1 H_2 Molecule is required

1 D.U

②


H
H
H
H
C
C
$2 H_2$
Catalyst
H
H
C
C
H
H

2 H_2 molecules are req

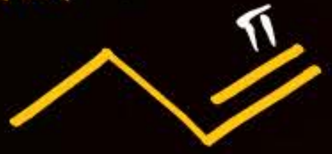
2 DU

op point

1 π Ki 1 D.U hoti hai

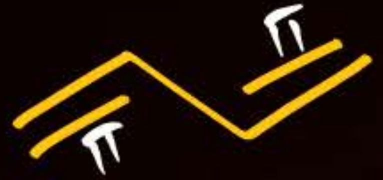
Q. find D.U

1)



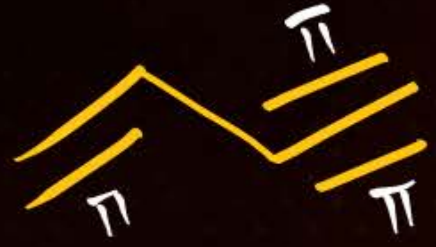
1

2)



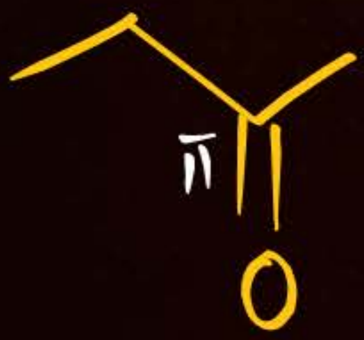
2

3)



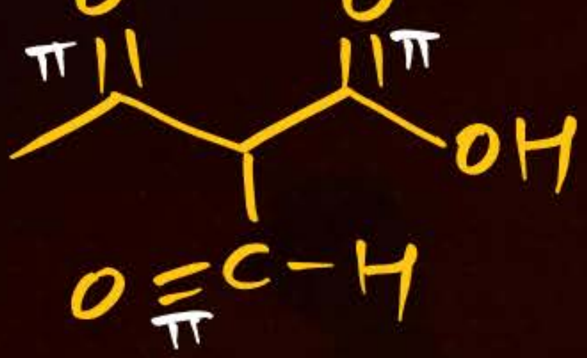
3

4)



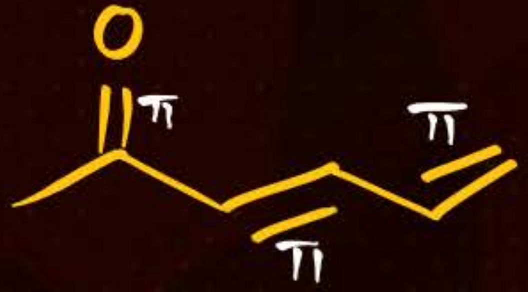
1

5)


O
O
π
π
OH
O
C
H
π

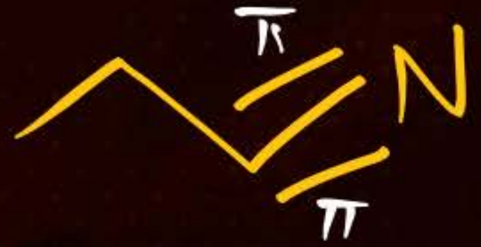
3

6)



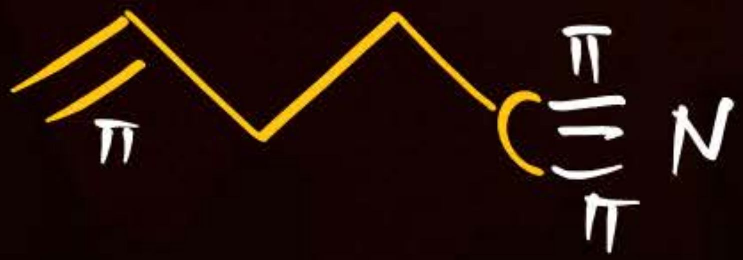
3

7)



2

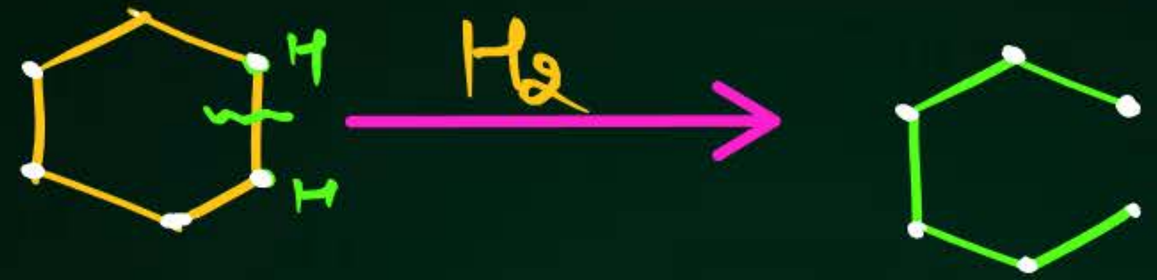
8)

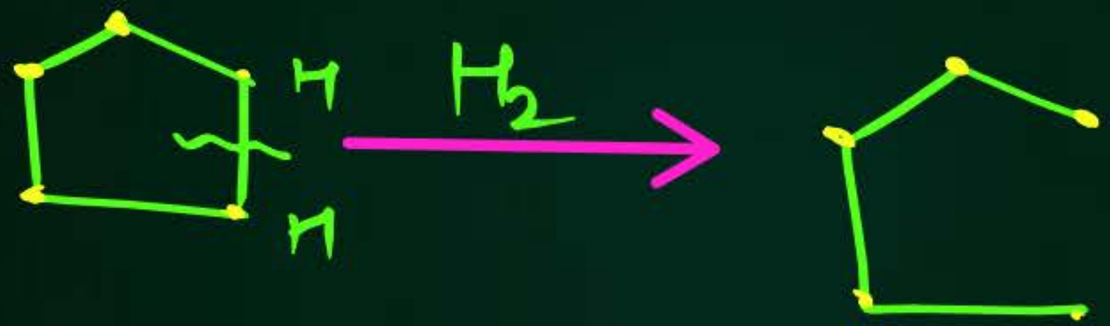


3

Case 02: How many bonds are cleaved to form an open chain saturated compounds.

DU=1 $C_6H_{12} \xrightarrow{+H_2} C_6H_{14}$





$C_5H_{10} \xrightarrow{+H_2} C_5H_{12}$

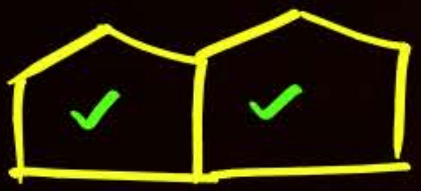
DU=1

op point

1 Ring ki 1 D.U hoti hai

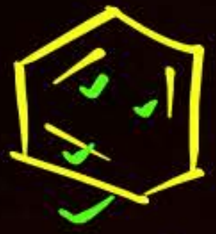
Q find DU

①



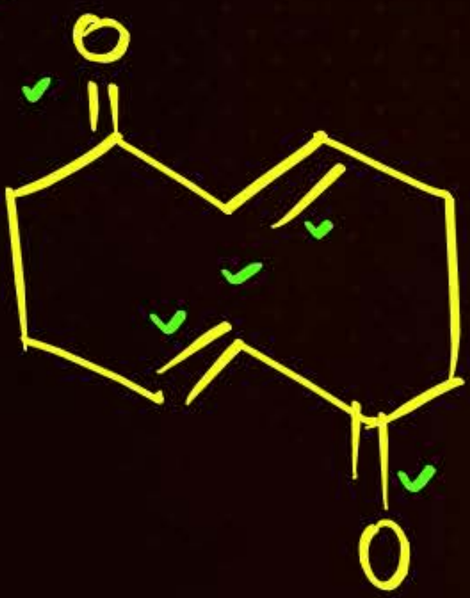
DU=2

②



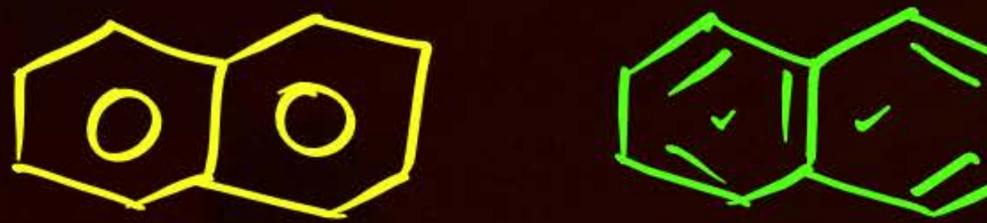
DU=4

③



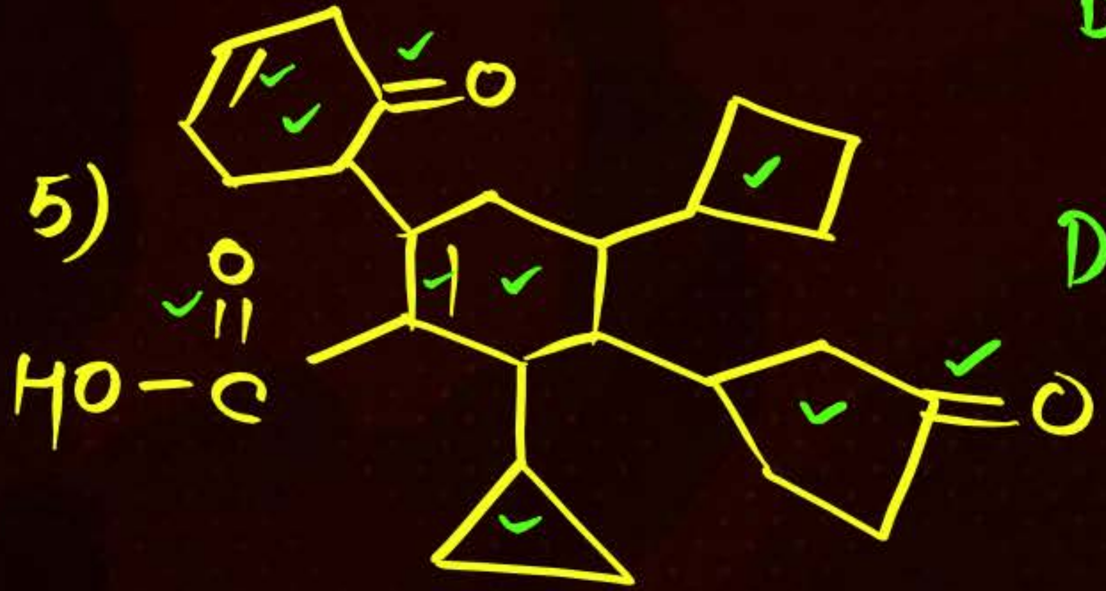
DU=5

4)



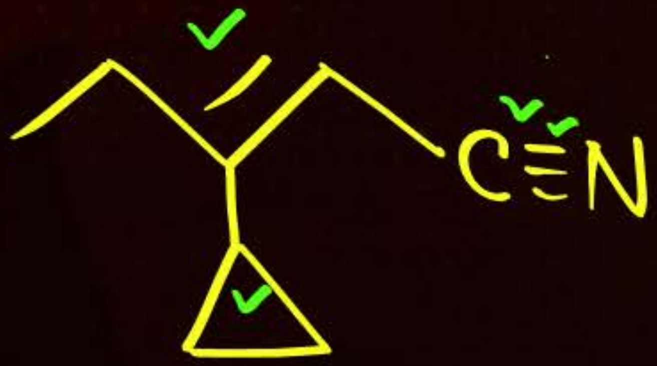
DU=7

5)



DU=10

6)



DU=4

If Molecular formula is given

$$DU = (C+1) - \left(\frac{H+X-N}{2}\right)$$

C = no. of 'C'
H = " " 'H'
X = " " halogens
N = " " 'N'

$C_4H_{10}O$

$$DU = (4+1) - \left(\frac{10+0-0}{2}\right)$$

$= 5-5 = 0$ (saare single)

C_5H_{10}

$$DU = (5+1) - \left(\frac{10+0-0}{2}\right)$$

$= 6-5 = 1 \rightarrow 1\pi$
or
$\rightarrow$ 1 Ring

QUESTION

Determine the double bond equivalent of each of the following compounds.

(a) $C_8H_8Cl_2$

$$DU = (8+1) - \left(\frac{8+2-0}{2}\right)$$
$$= 9 - 5$$
$$= 4$$

(b) $C_8H_{10}O_2$

$$DU = (8+1) - \left(\frac{10+0-0}{2}\right)$$
$$= 9 - 5$$
$$= 4$$

QUESTION

Calculate the double bond equivalent (DBE) of each of the following compounds:

(a) $C_{13}H_9BrS$

$$DU = (13+1) - \left(\frac{9+1-0}{2}\right)$$

$$= 14 - 5$$

$$= 9$$

(b) $C_{12}H_{16}N_2O_4$

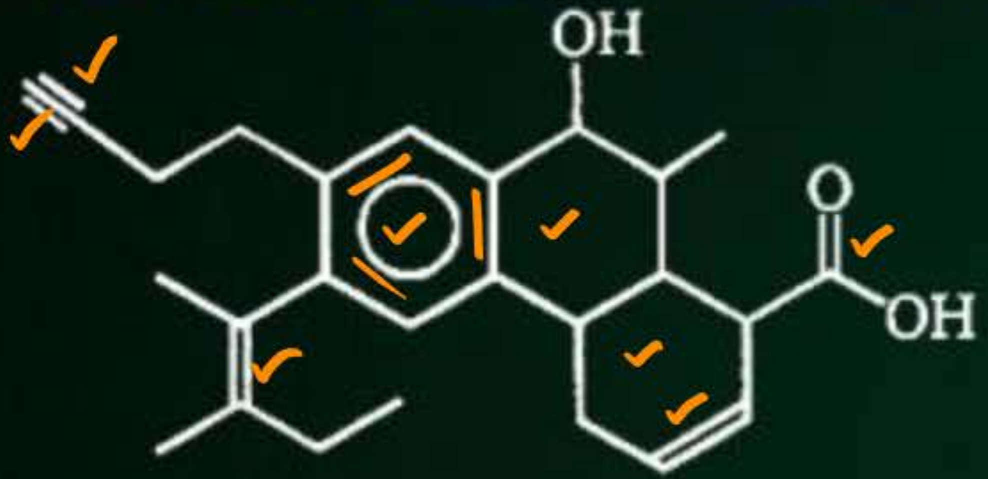
$$DU = (12+1) - \left(\frac{16+0-2}{2}\right)$$

$$= 13 - 7$$

$$= 6$$

QUESTION

How many degrees of unsaturation are there in the following compound ?



A 6

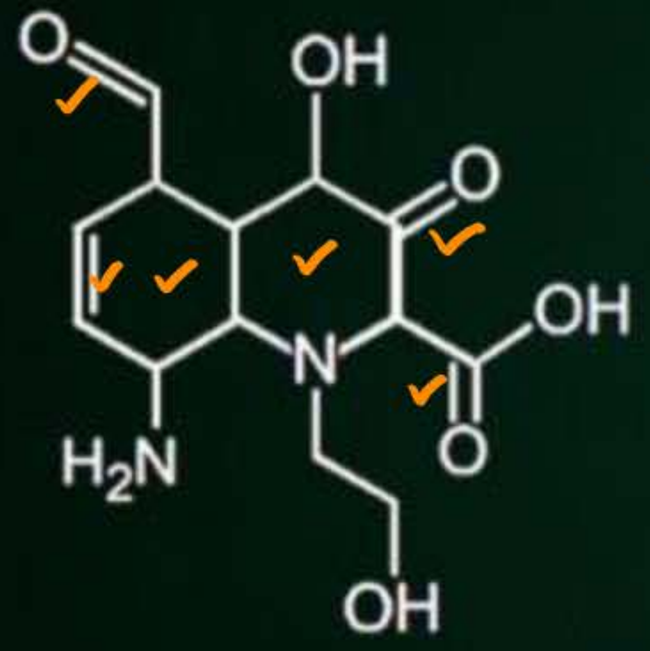
B 7

C 10

[✓ D] 11

QUESTION

Find the total number of Double bond equivalent (DBE) value.


O
OH
O
OH
N
H$_2$N
O
OH

Ans :- ⑥

Calculation of σ and π bonds

$A \overset{\sigma}{-} B$

$A \underset{\sigma}{\overset{\pi}{=}} B$

$A \underset{\sigma}{\overset{2\pi}{\equiv}} B$

A $CH_3\text{–}CH_2\text{–}CH{=}CH_2$

$11\sigma,\ 1\pi$

B $CH_2 = C = CH - CH_3$

$9\sigma,\ 2\pi$

QUESTION

Indicate the number of σ- and π-bonds in the following molecules.

A $HC \equiv C-CH=CH-CH_3$

$10\sigma , 3\pi$

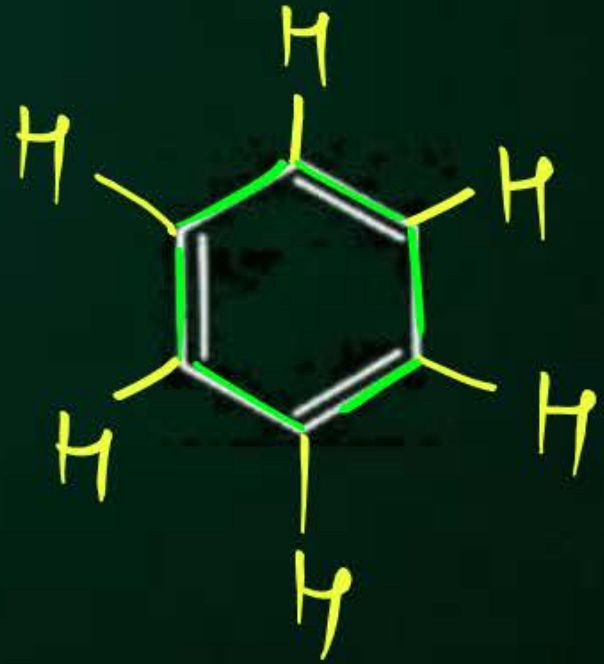
B $CH_3-CH_2-CH_2-CH_2-CH_3$

$16\sigma , 0\pi$

C $CH_3-C \equiv C-CH_3$

$9\sigma , 2\pi$

D



$12\sigma , 3\pi$

Hybridization

4σ sp^3
3σ sp^2
2σ sp

$3\sigma + 1\,L.P^* = 4$ sp^3
$2\sigma + 2\,L.P^* = 4$ sp^3
$2\sigma + 1\,L.P^* = 3$ sp^2

deloca L.P

$CH_2{=}CH{-}\overset{\times\times}{N}H_2$

$3\sigma \rightarrow sp^2$

Localised L.P

$CH_3{-}CH_2{-}\overset{\times\times}{N}H_2$

$3\sigma + 1\,L.P = 4$ sp^3

A $CH_3{-}CH{=}CH{-}CH_3$

sp^3 sp^2 sp^2 sp^3

B $CH_3{-}CH_2{-}CH_2{-}CH_3$

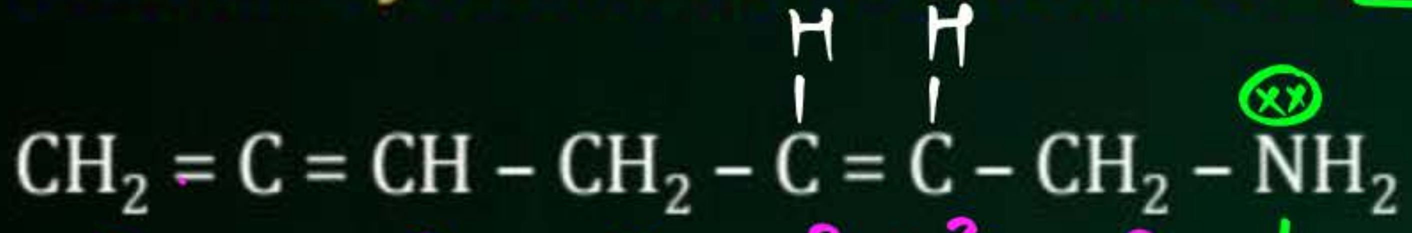
sp^3 sp^3 sp^3 sp^3

$A{=}B{-}\overset{\times\times}{Y}$ $Y \Rightarrow \ddot{N}$, $\ddot{O}$

QUESTION

$\underline{\underline{A=B}}-\overset{\times\times}{N}$

Find the hybridization state of each carbon atoms in following compound?



$$CH_2=C=CH-CH_2-\overset{\overset{H}{|}}{C}=\overset{\overset{H}{|}}{C}-CH_2-\overset{\times\times}{N}H_2$$

sp^2 sp sp^2 sp^3 sp^2 sp^2 sp^3 ↓

$3\sigma + 1$ LocaL.P

$= 4$ sp^3

QUESTION

$-\overset{sp}{C}\equiv\underset{sp}{N}\boxed{:}$

Sequence of hybridization in $CH_3-CH=CH-CN$

L to R

sp^3 sp^2 sp^2

A $sp^3, sp^2, sp, sp^2, sp^2$

B $sp^3, sp^2, sp^2, sp^2, sp^2$

[✓ **C**] sp^3, sp^2, sp^2, sp, sp

D $sp^3, sp^2, sp^2, sp, sp^2$

QUESTION

Find the hybridization of each carbon atom in following compound.

$$-\overset{\overset{\displaystyle O}{\|}}{C}-OH$$

$$\overset{8}{C}H_2 = \overset{7}{C} = \overset{6}{C}H - \overset{5}{C}H_2 - \overset{4}{C} \equiv \overset{3}{C} - \overset{2}{C}H_2 - \underbrace{\overset{1}{C}OOH}$$

sp^2 sp sp^2 sp^3 sp sp sp^3 sp^2

IUPAC Nomenclature

IUPAC Naming

Rule: Prefix-2 + Prefix-1 + Word Root + Suffix-1 + Suffix-2

Bonds b/w C & C

Prefix-2: Branch or Substituents

Prefix-1: cyclo

Word Root: No. of 'C' in main chain or Princi chain

Suffix-2: Princi Func^n groups

Prefix-2

① $-R$ alkyl

$-CH_3$ methyl

$-CH_2-CH_3$ Ethyl

$-CH_2-CH_2-CH_3$ Propyl

② $-OR$ alkoxy (F.G) → func^n grp

$-OCH_3$ methoxy

$-OC_2H_5$ ethoxy

$-OCH_2CH_2CH_3$ propoxy

③ $-X$ halo (F.G)

$-F$ fluoro

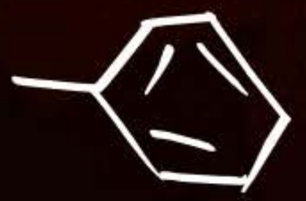
$-Cl$ chloro

$-Br$ bromo

$-I$ iodo

④ $-NO_2$ nitro (F.G)

⑤ $-NO$ nitroso (F.G)

⑥ 
phenyl

(-Ph)

Word root

No. of 'C' atom	Word root
1	meth
2	eth
3	prop
4	but
5	pent
6	hex
7	hept
8	oct
9	non
10	dec
11	undec
12	dodec
13	tridec
1	

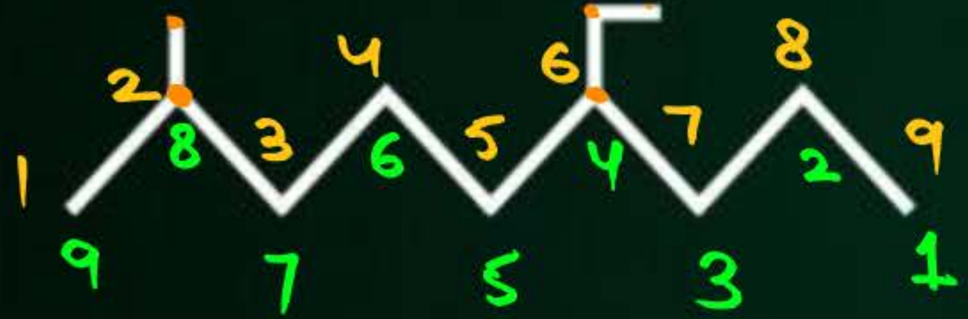
Suffix-1

Bond b/w C & C	Suffix-1
C—C (saare single)	ane
C=C	ene
C≡C	yne

Rules of IUPAC Nomenclature

Rule 1:

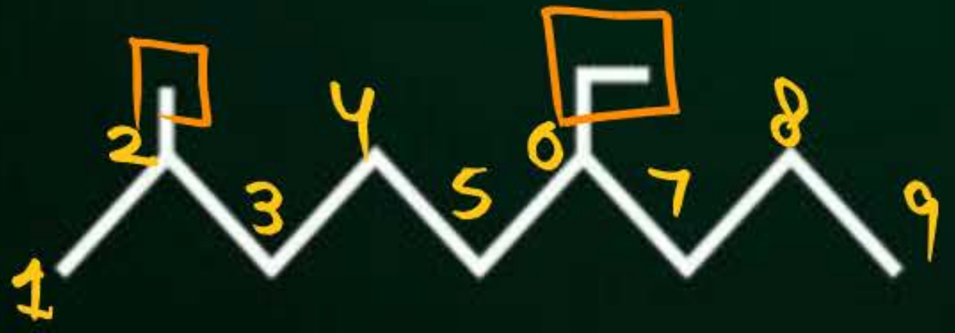
The longest carbon chain in the molecule is identified.



1
2
8
3
4
6
5
6
4
7
8
2
9
9
7
5
3
1

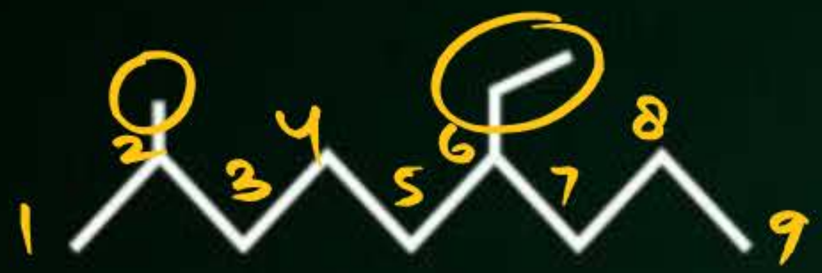
Rule 2:

The numbering is done in such a way that the branched carbon atoms get the lowest possible numbers.



Rule 3:

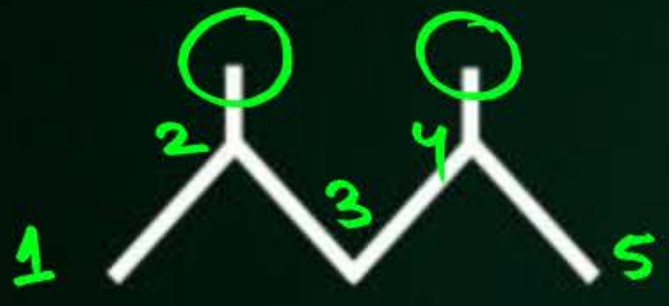
If different alkyl groups are present, they are listed in alphabetical order.



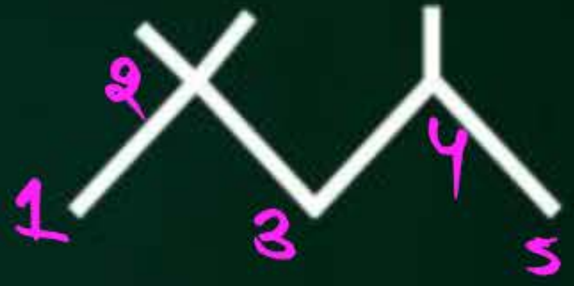
6-Ethyl-2-methyl nonane

Rule 4 :

If two or more identical substituent group are present then the numbers are separated by commas. The names of identical substituents are not repeated, instead prefixes such as di (for 2), tri (for 3), tetra (for 4), penta (for 5), hexa (for 6) etc are used.



2,4-Dimethyl pentane



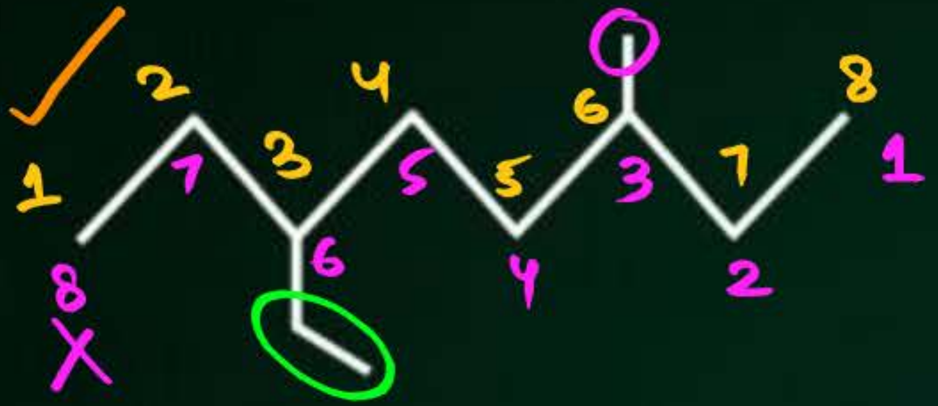
2,2,4-Trimethyl pentane

Rule 5:

The lower number is given to the one coming first in the alphabetical listing.

③- Ethyl

③- Methyl

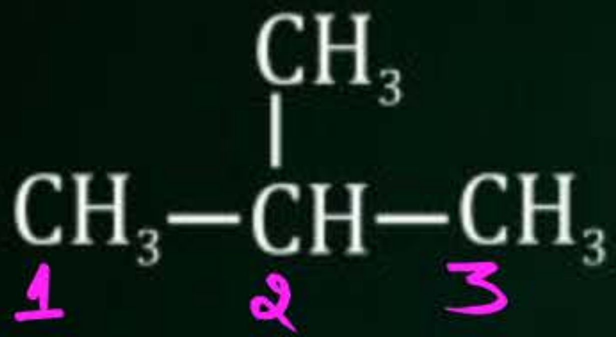

✓
1
2
3
4
5
6
7
8
①
8
7
6
5
4
3
2
1
✗

3-Ethyl-6-methyl octane

QUESTION

Write IUPAC name of the following compound.

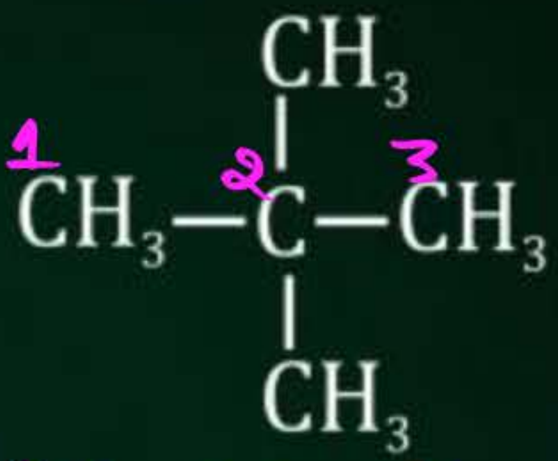
(A)



$CH_3-\overset{\overset{CH_3}{|}}{C}H-CH_3$

2-methyl propane

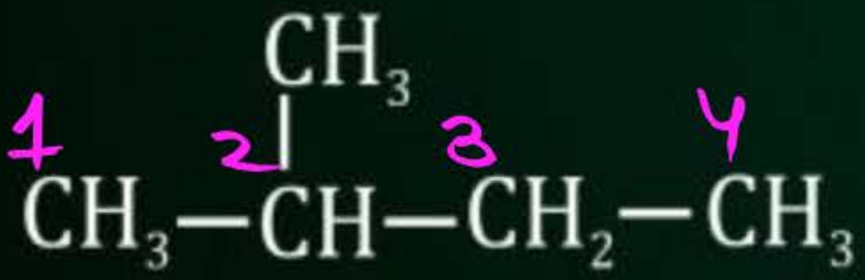
(B)



$CH_3-\overset{\overset{CH_3}{|}}{\underset{\underset{CH_3}{|}}{C}}-CH_3$

2,2-Dimethyl propane

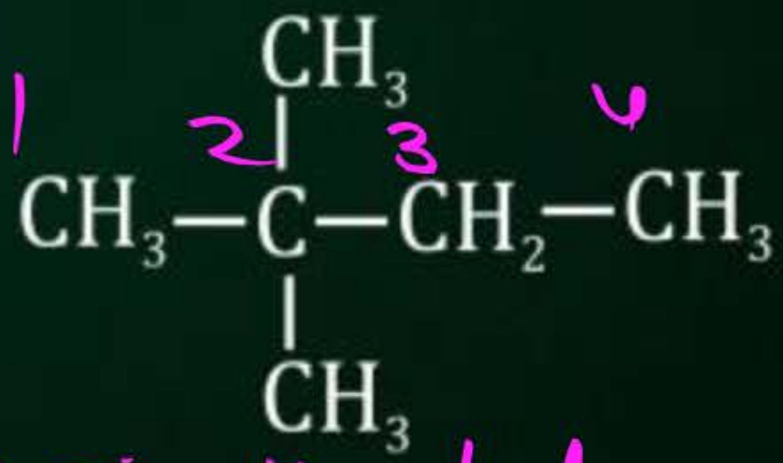
(C)



$CH_3-\overset{\overset{CH_3}{|}}{C}H-CH_2-CH_3$

2-methyl butane

(D)



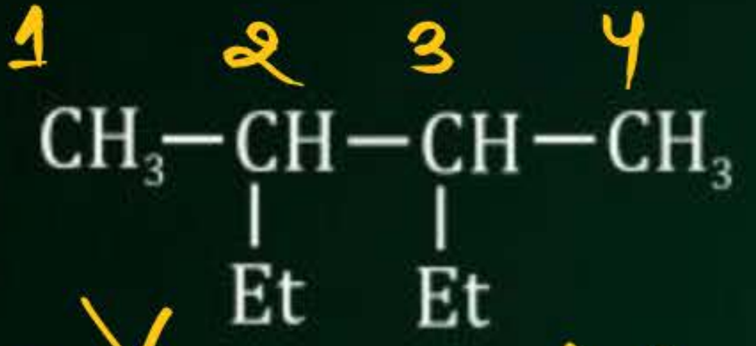
$CH_3-\overset{\overset{CH_3}{|}}{\underset{\underset{CH_3}{|}}{C}}-CH_2-CH_3$

2,2-Dimethyl butane

QUESTION

Write IUPAC name of the following compound.

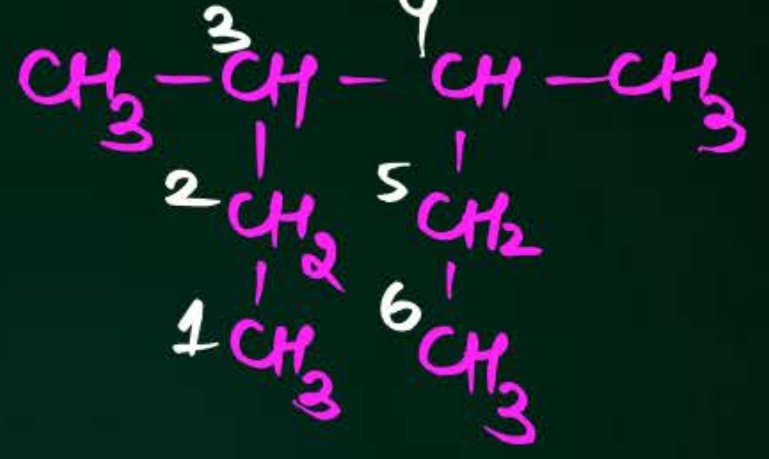
A *



$$\overset{1}{CH_3}-\underset{\underset{Et}{|}}{\overset{2}{CH}}-\underset{\underset{Et}{|}}{\overset{3}{CH}}-\overset{4}{CH_3}$$

PHK

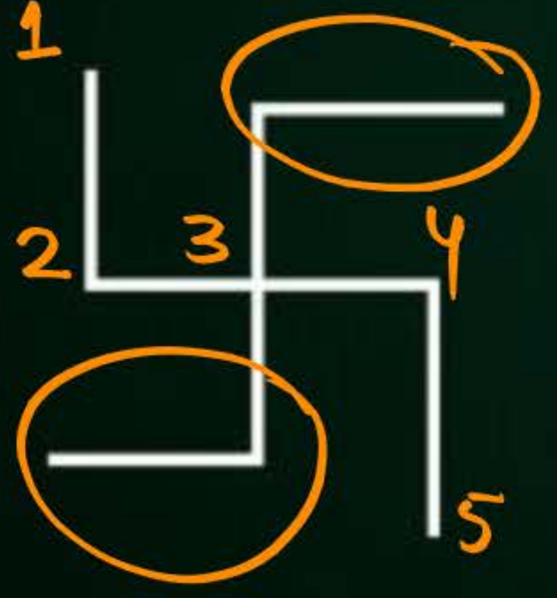
DKHK 2,~~3~~-Diethyl butane



$$CH_3-\underset{\underset{\underset{1\,CH_3}{|}}{2\,CH_2}}{\overset{3}{CH}}-\underset{\underset{\underset{6\,CH_3}{|}}{5\,CH_2}}{\overset{4}{CH}}-CH_3$$

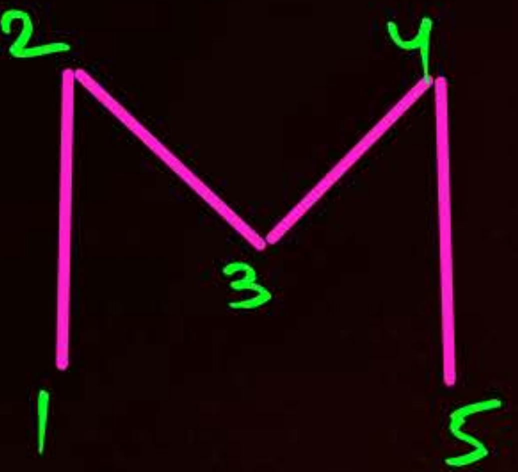
3,4-Dimethyl hexane

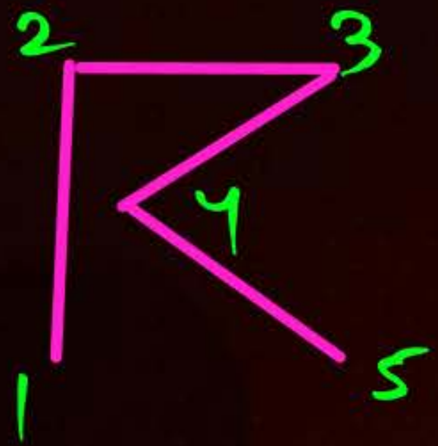
B



3,3- Diethyl pentane

Q



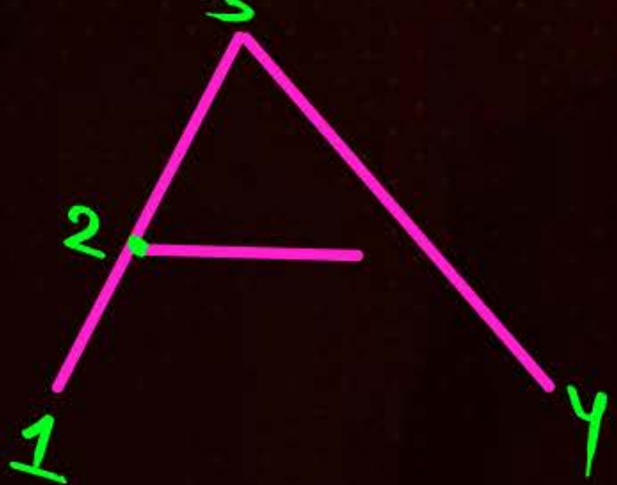


Same IUPAC name

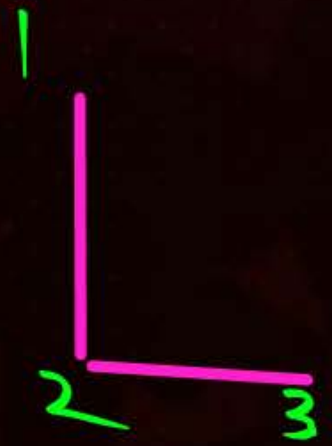
[✓ T]/ F

Pentane – Pentane

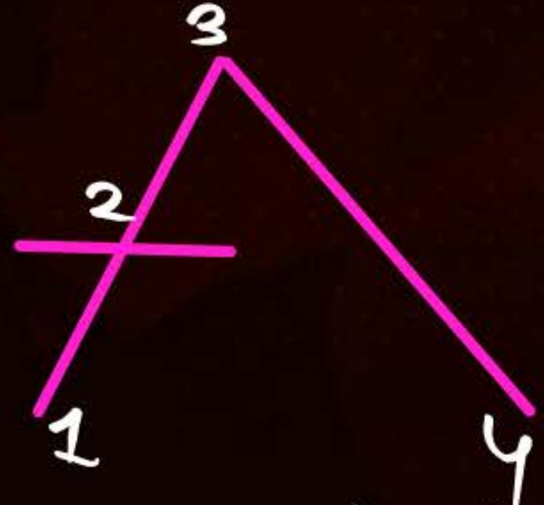
Q



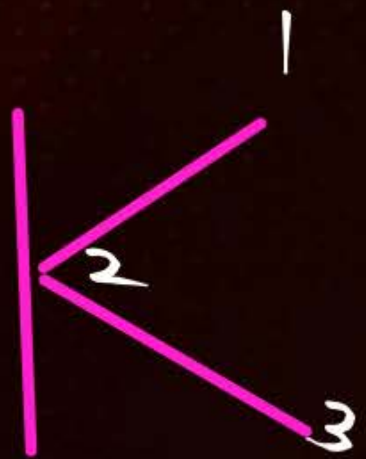
2-methyl butane



propane

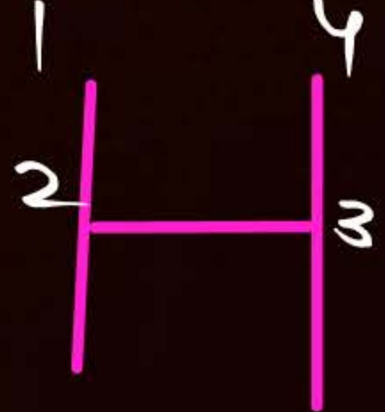


2,2-Dimethyl butane



2,2-Dimethyl propane

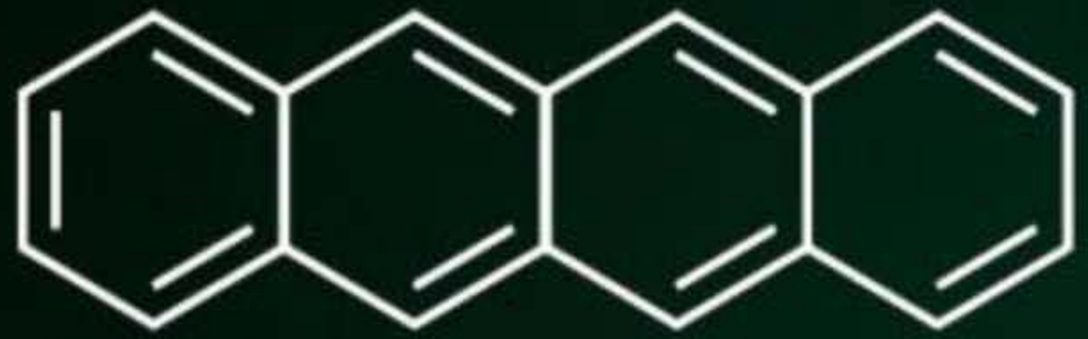
2,3-Dimethyl butane



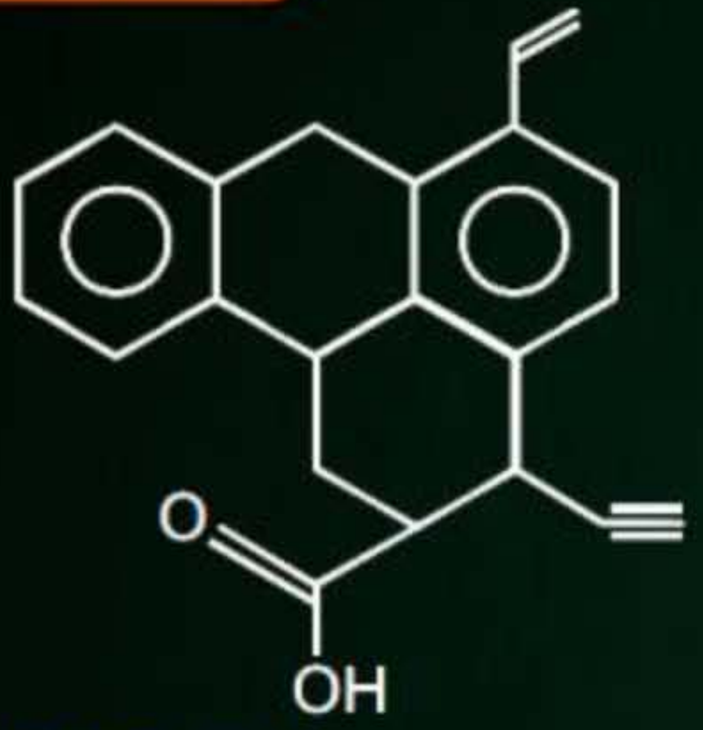
Homework

QUESTION

Number of pi-bond electrons present in given compound are:



QUESTION



D.B.E of above compound is:

(A) 12

(B) 13

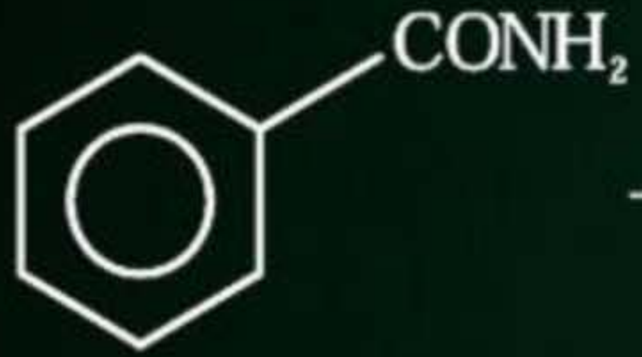
(C) 14

(D) 15

QUESTION

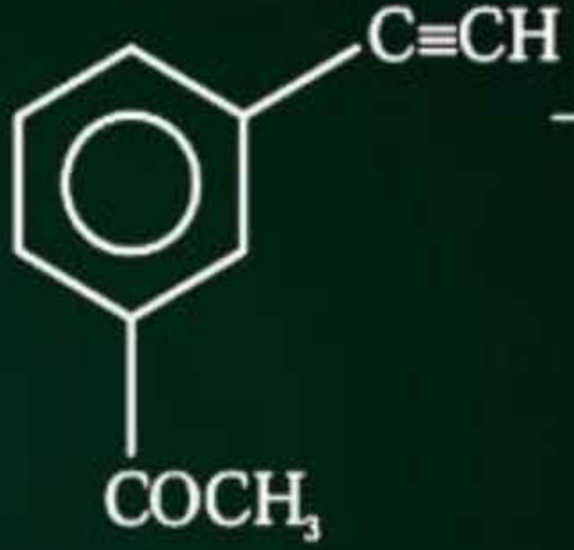
Which of the following is correctly matched with degree of unsaturation?

A



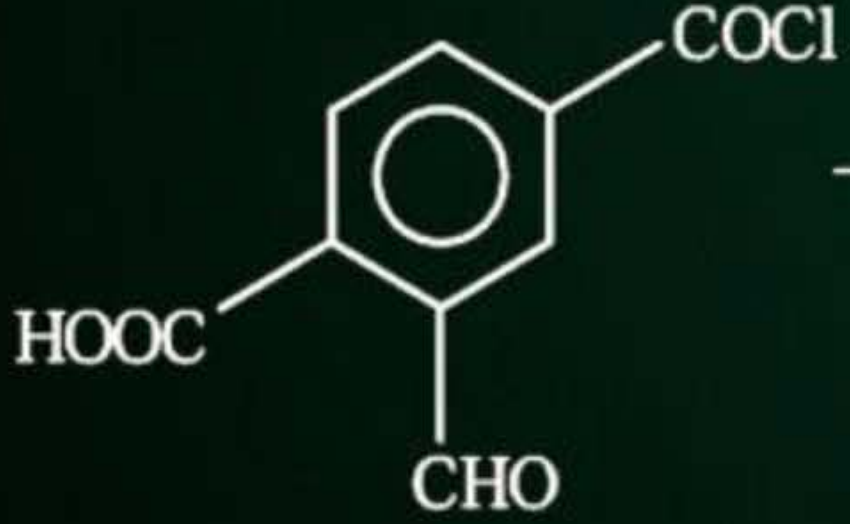
$\longrightarrow 4$

B



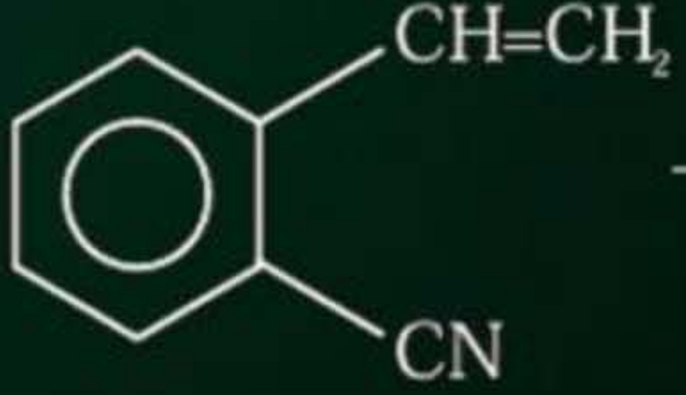
$\longrightarrow 7$

C


COCl
HOOC
CHO

$\longrightarrow 8$

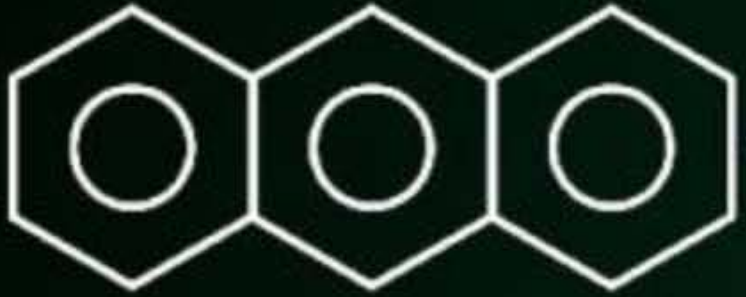
D



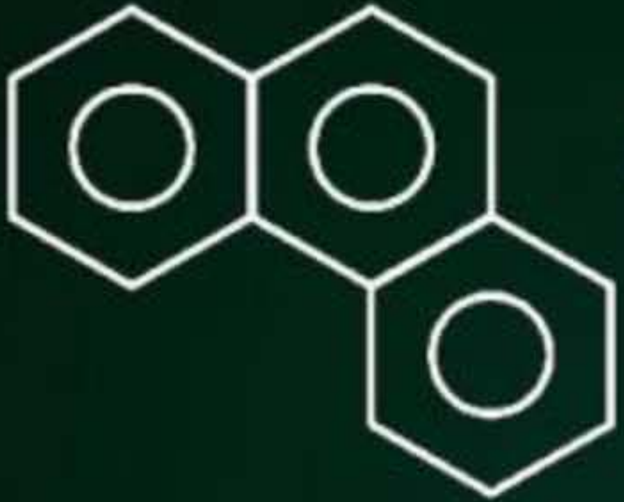
$\longrightarrow 5$

QUESTION

The difference in Double Bond Equivalent (DBE) value between



and



is :

A 0

B 1

C 2

D 3

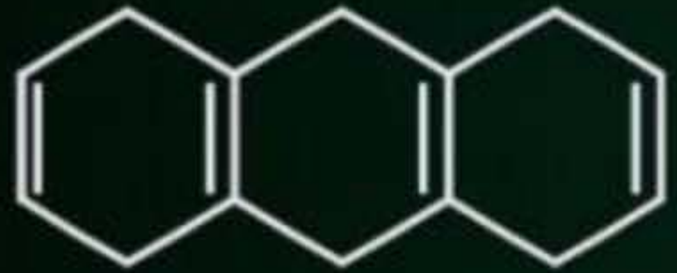
QUESTION

Find D.B.E of the following compounds.

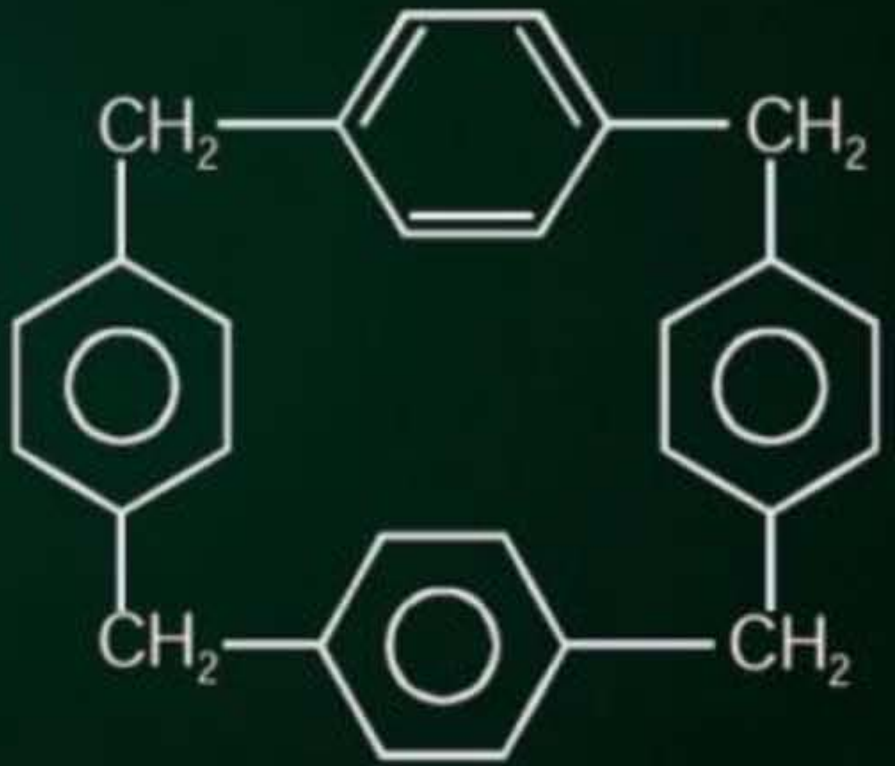
(i) $C_4H_8Br_2$

(ii) $C_4H_{10}O$

(iii)

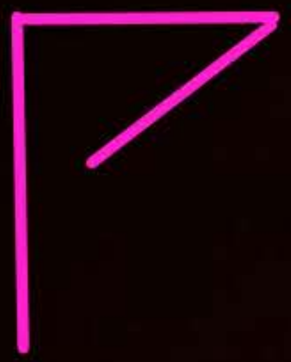


(iv)

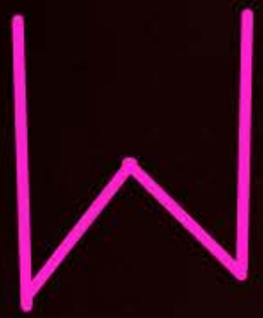

CH₂
CH₂
CH₂
CH₂

Q write IUPAC names

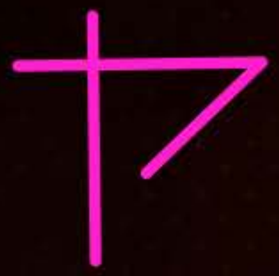
1)



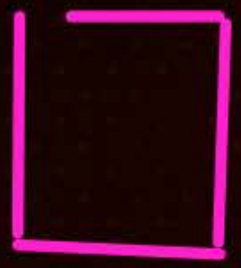
2)



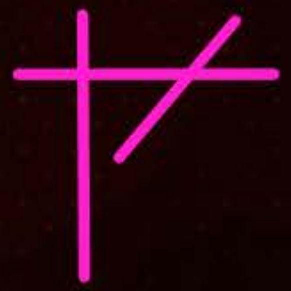
3)



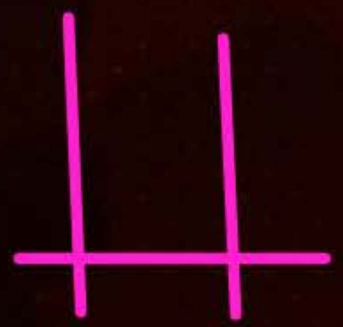
4)



5)



6)



QUESTION

What is the index of hydrogen deficiency in the molecule $C_{12}H_{17}NO$?

(A) 4

(B) 5

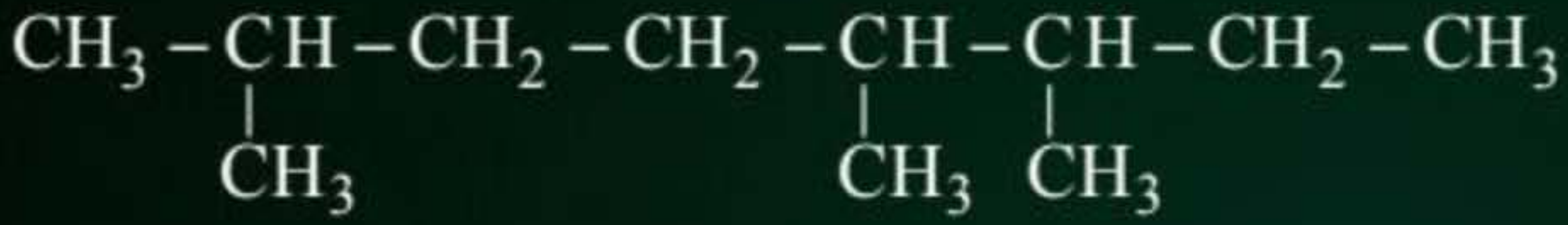
(C) 6

(D) 7

QUESTION (NCERT Example)

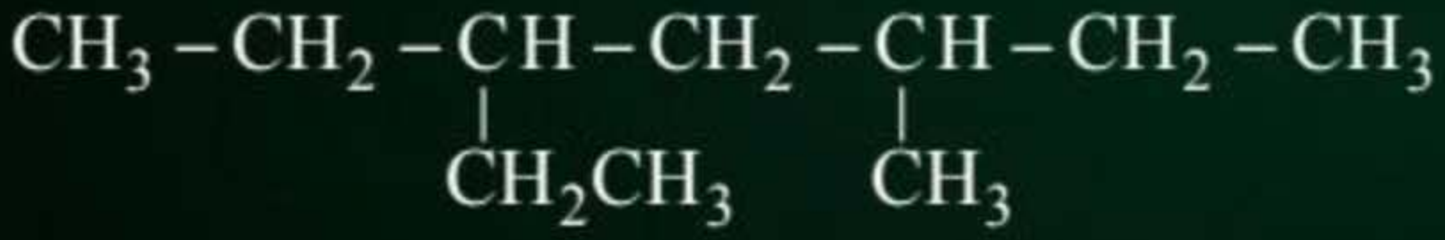
IUPAC Name of the following compounds.

(a)



$$CH_3-\underset{\underset{\displaystyle CH_3}{|}}{CH}-CH_2-CH_2-\underset{\underset{\displaystyle CH_3}{|}}{CH}-\underset{\underset{\displaystyle CH_3}{|}}{CH}-CH_2-CH_3$$

(b)



$$CH_3-CH_2-\underset{\underset{\displaystyle CH_2CH_3}{|}}{CH}-CH_2-\underset{\underset{\displaystyle CH_3}{|}}{CH}-CH_2-CH_3$$

QUESTION (NCERT Example)

How many σ and π bonds are present in each of the following molecules?

(a) $HC \equiv CCH = CHCH_3$

(b) $CH_2 = C = CHCH_3$

QUESTION (NCERT Example)

What is the type of hybridisation of each carbon in the following compounds?

(a) CH_3Cl,

(b) $(CH_3)_2CO$,

(c) CH_3CN

(d) $HCONH_2$,

(e) $CH_3CH=CHCN$

QUESTION (NCERT Example)

Write the state of hybridisation of carbon in the following compounds and shapes of each of the molecules.

(a) $H_2C{=}O$, (b) CH_3F, (c) $HC{\equiv}N$

QUESTION

Calculate the no. of σ, π bonds and lone pairs in the given compound.

$C_2(CN)_4$

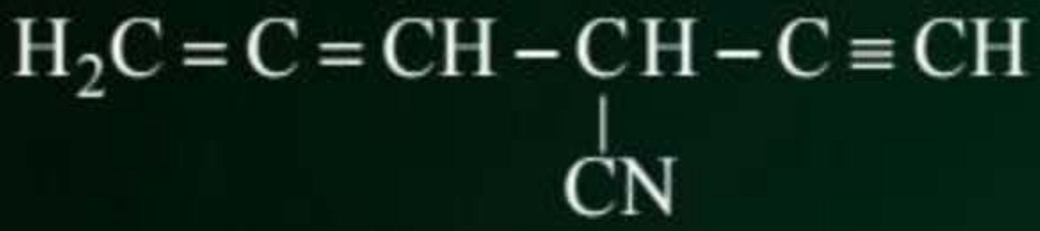
QUESTION

What are hybridisation states of each carbon atom in the following compound?

$CH_2 = C = O$, $CH_3CH{=}CH_2$, $(CH_3)_2CO$, $CH_2 = CHCN$, C_6H_6

QUESTION

In the following compound, the number of '*sp*' hybridised carbon is:



$$H_2C=C=CH-\underset{\underset{CN}{|}}{C}H-C\equiv CH$$

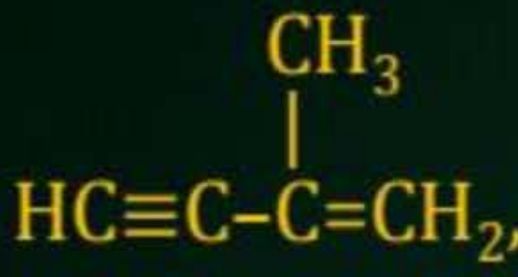
A 2

B 3

C 4

D 5

QUESTION



In the compound $HC\equiv C-\overset{\overset{CH_3}{|}}{C}=CH_2$, the hybridization of C_2 and C_3 carbons are respectively:

(A) sp^3 and sp^2

(B) sp^2 and sp^3

(C) sp^3 and sp

(D) sp^2 and sp

QUESTION

The number of sigma and pi bonds in but-1-ene-3-yne are:

(A) 5 sigma and 5 pi

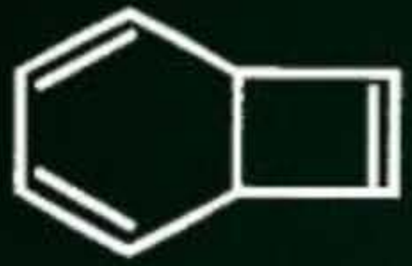
(B) 7 sigma and 3 pi

(C) 8 sigma and 2 pi

(D) 6 sigma and 4 pi

QUESTION

The number of $sp^2 - sp^2$ sigma bond in the compound given below is:



(A) 1

(B) 3

(C) 4

(D) 5

QUESTION

A straight chain hydrocarbon has the molecular formula C_8H_{10}. The hybridization for the carbon atoms from one end of the chain to the other are respectively sp^3, sp^2, sp^2, sp^3, sp^2, sp^2, sp and sp. The structural formula of the hydrocarbon would be:

Ⓐ $CH_3-C\equiv C-CH_2=CH-CH=CH_2$

Ⓑ $CH_3-CH_2-CH=CH-CH_2-C\equiv C-CH=CH_2$

Ⓒ $CH_3-CH=CH-CH_2-C\equiv C-CH=CH_2$

Ⓓ $CH_3-CH=CH-CH_2-CH=CH-C\equiv CH$

QUESTION

Underlined carbon is sp^2 hybridised in:

A $CH_3\underline{C}H_2CH_3$

B $CH_3\underline{C}H_2NH_2$

C $CH_3\underline{C}ONH_2$

D $CH_3CH_2\underline{C}N$

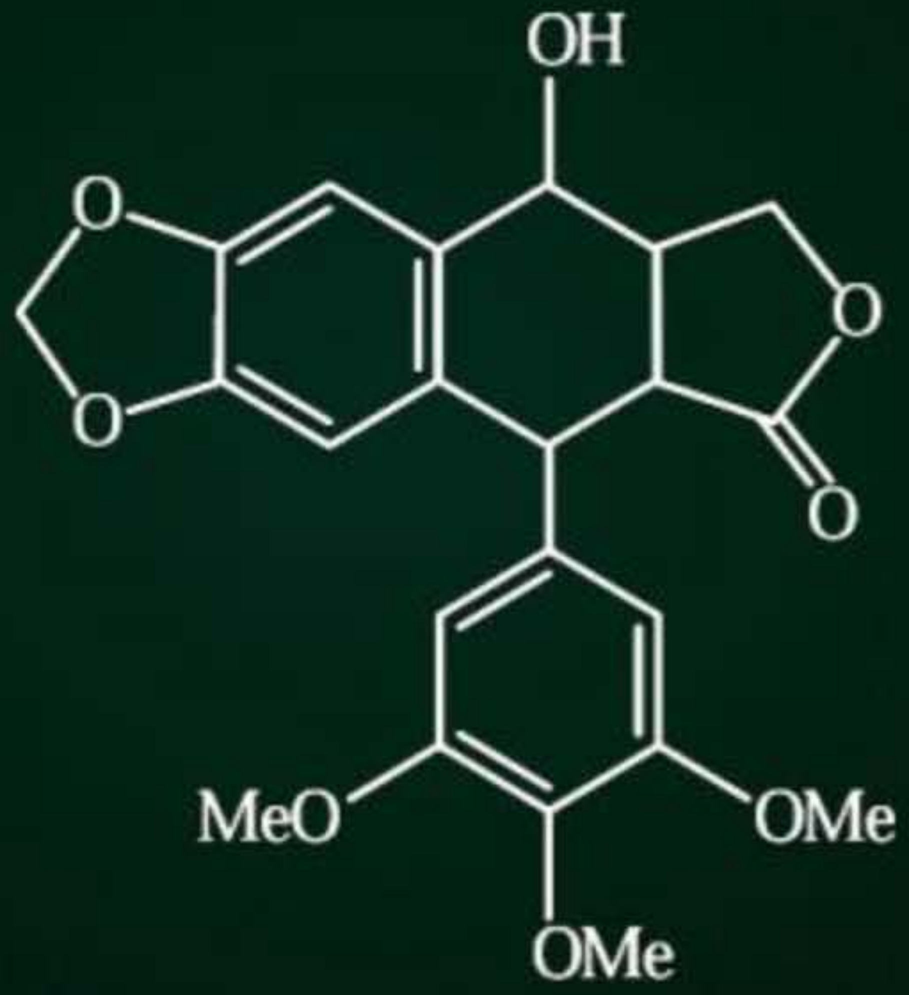
QUESTION

In the compound
$HC \equiv C–CH_2–CH=CH–CH_3$, total sigma bond and pie bonds respectively are

- **A** 5, 3
- **B** 13, 3
- **C** 13, 5
- **D** None of these

QUESTION

How many sp^3 hybridised carbon atoms are there in the given anti-cancer compound (podophyllotoxin)?


OH
O
O
O
O
MeO
OMe
OMe

A 7

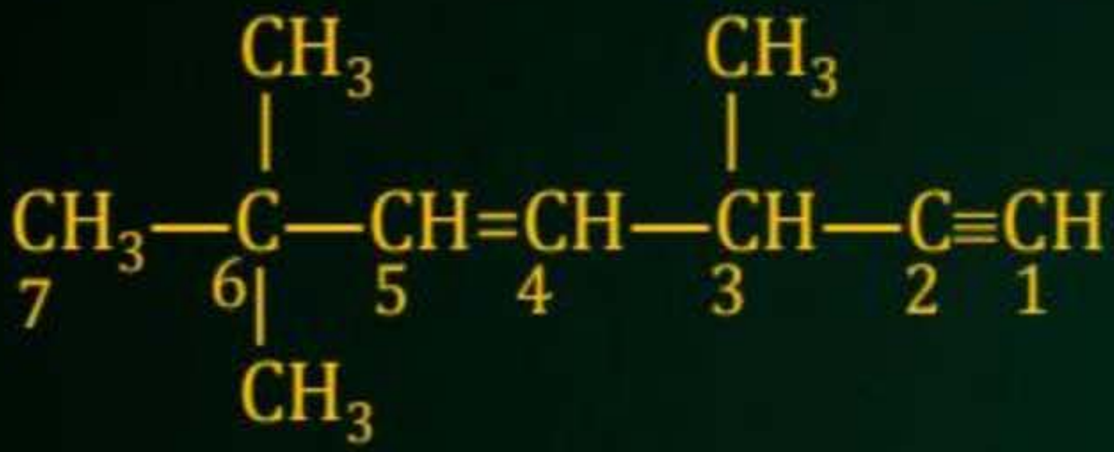
B 8

C 9

D 10

QUESTION

The state of hybridization of C_2, C_3, C_5 and C_6 of the hydrocarbon,



$$\underset{7}{CH_3}-\overset{CH_3}{\underset{6\ CH_3}{C}}-\underset{5}{CH}=\underset{4}{CH}-\overset{CH_3}{\underset{3}{CH}}-\underset{2}{C}\equiv\underset{1}{CH}$$

is in the following sequence:

(A) sp, sp^3, sp^2 and sp^3

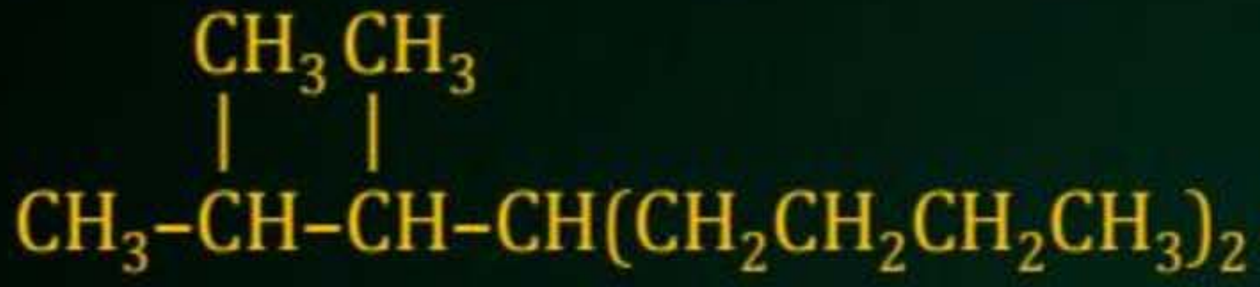
(B) sp, sp^2, sp^2 and sp^3

(C) sp, sp^2, sp^3 and sp^2

(D) sp^3, sp^2, sp^2 and sp

QUESTION

The IUPAC name of the compound,



$CH_3-\overset{\overset{CH_3}{|}}{CH}-\overset{\overset{CH_3}{|}}{CH}-CH(CH_2CH_2CH_2CH_3)_2$ is:

A 2, 4, 4-Dibutyl-3, 3-dimethylbutane

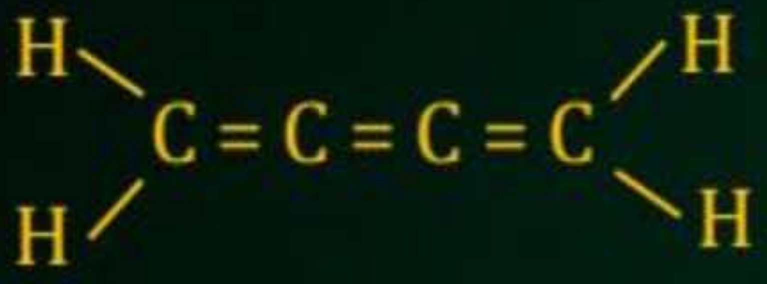
B 5-(1, 2-Dimethylpropyl) nonane

C 4-Butyl-2, 3-dimethyloctane

D 1, 1-Dibutyl-2, 3-dimethylbutane

QUESTION

Number of sp^2–sp sigma bonds in the given compound is:



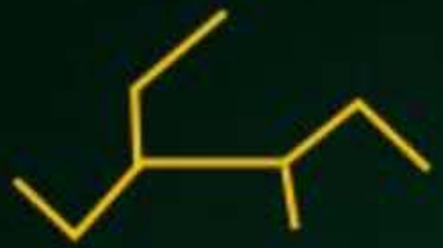
(A) 1

(B) 2

(C) 3

(D) 4

QUESTION

The IUPAC name of  is:

A 4-ethyl-3-methyl hexane

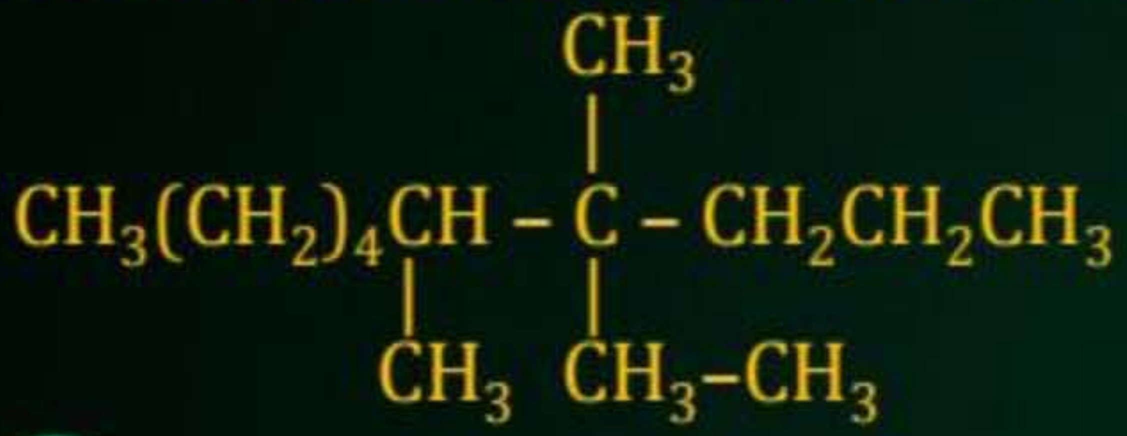
B 3-ethyl-4-ethyl hexane

C 3-methyl-4-ethyl hexane

D None of these

QUESTION

What is the correct IUPAC name for the following compound?



$$CH_3(CH_2)_4\underset{\underset{CH_3}{|}}{CH}-\overset{\overset{CH_3}{|}}{\underset{\underset{CH_3-CH_3}{|}}{C}}-CH_2CH_2CH_3$$

A 3, 4-Dimethyl-3-n-propyl nonane

B 6, 7-Dimethyl-2-n-propyl nonane

C 6, 7-Dmethyl-7-ethyl decane

D 4-Ethyl-4, 5-dimethyl decane

Home Work From PW Module (Yakeen NEET)

Prarambh: Q 03, 31, 32, 33, 35, 36, 39, 41

#TayyariSelectionKi!

HURRY UP!

REGISTRATION CLOSING SOON FOR NEET REAL TEST 01!

REAL TEST SERIES

Registration Closing Date for Test 01 – 10 Oct 2024

Exam Date - 13 Oct 2024 (online)

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NEET REAL TEST 01 SYLLABUS

11th NEET REAL TEST SERIES SYLLABUS

Cohort	Class	Name of the Test	Exam Date	Mode	Physics	Chemistry	Botany	Zoology
NEET	11	Test 1	13-Oct-2024	Online	Basic Maths & Calculus (Mathematical Tools) Vectors Units and Measurements Motion in a straight line	Structure of Atom Some Basic Concepts of Chemistry Classification of Elements and Periodicity in Properties	Cell - The Unit of Life Cell Cycle and Cell Division	Structural Organization in Animals Breathing and Exchange of Gases

12th NEET REAL TEST SERIES SYLLABUS

Cohort	Class	Name of the Test	Exam Date	Mode	Physics	Chemistry	Botany	Zoology
NEET	12	Test 1	13-Oct-2024	Online	Electric Charges and Fields Electrostatic Potential and Capacitance	Solution Electrochemistry	Sexual Reproduction in Flowering Plant	Human Reproduction

DROPPER NEET REAL TEST SERIES SYLLABUS

Cohort	Class	Name of the Test	Exam Date	Mode	Physics	Chemistry	Botany	Zoology
NEET	Dropper	Test 1	13-Oct-2024	Online	Basic Maths & Calculus (Mathematical Tools) Vectors Units and Measurements Motion in a straight line Motion in a plane Circular motion Laws of motion	Some Basic Concept of Chemistry Redox Reaction Solutions Thermodynamics Equilibrium Electrochemistry	Cell - The Unit of Life Cell Cycle and Cell Division The Living World Biological Classification Plant Kingdom Morphology of Flowering Plants	Structural Organization in Animals Breathing and Exchange of Gases Body Fluids and Circulation Excretory Products & their Elimination

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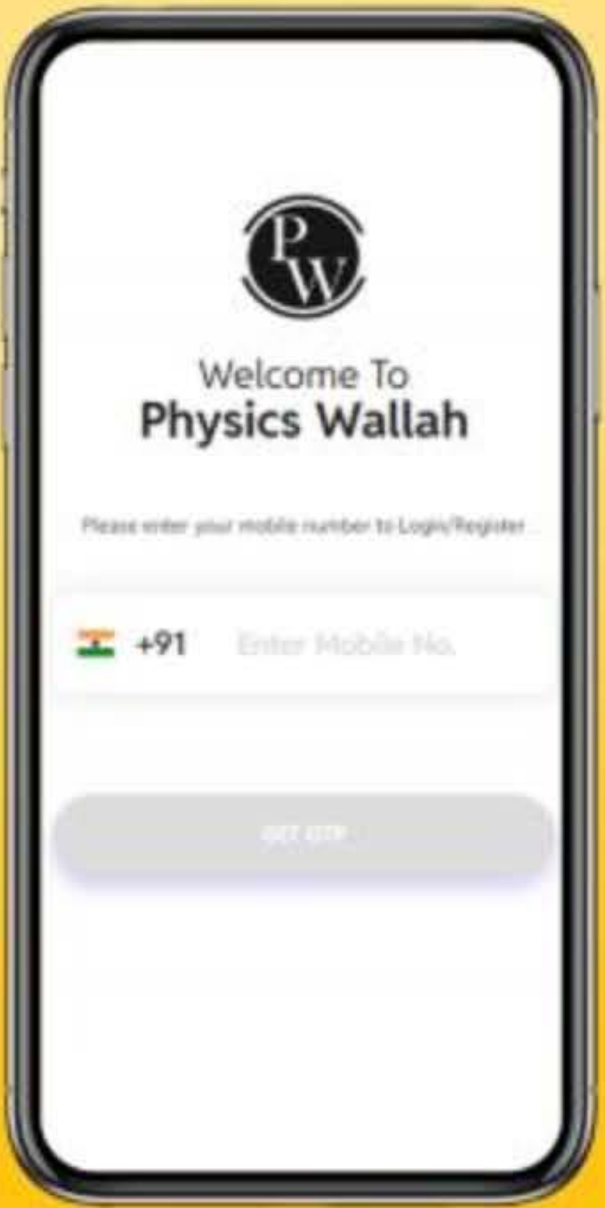
- **Exam Time:** Online 1st to 15th Oct (Daily)
  Offline 6th & 13th Oct
- **Exam Timing:** Online Any time on Exam Day (24 Hr. Window)
  Offline (10:00 to 11:00 AM & 04:00 to 05:00 PM)
- **Exam Duration:** 60 Minutes

HOW TO REGISTER IN PWNSAT?



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Physics Wallah

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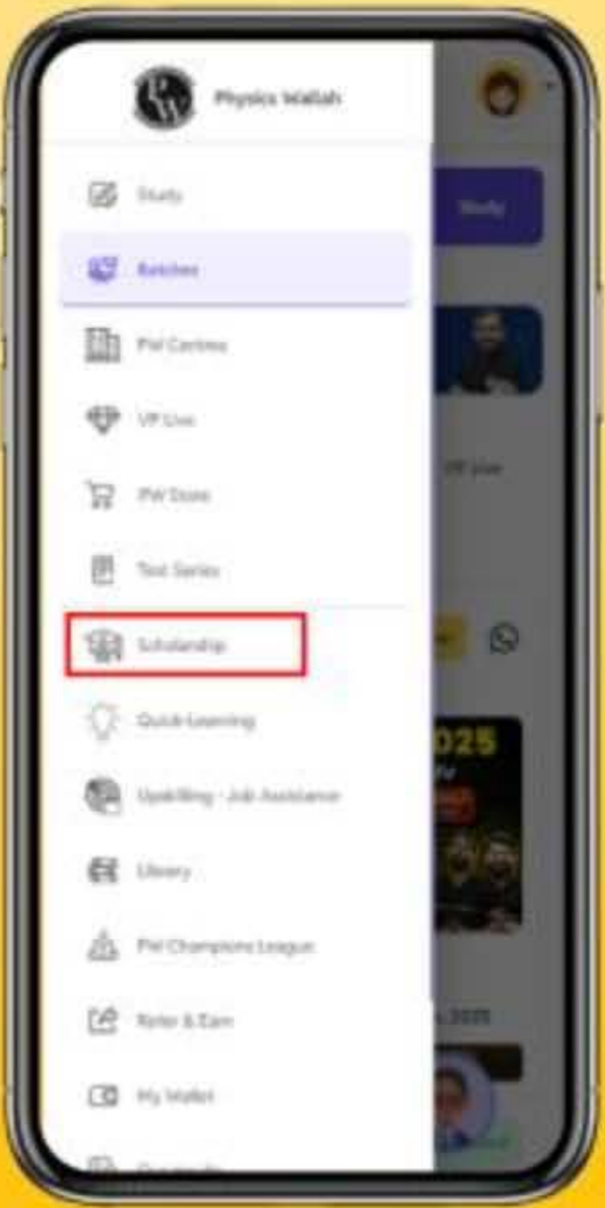
GET OTP

LOG INTO THE APP


Physics Wallah
Study
Batches
PW Centres
VP Live
PW Store
Test Series
Scholarship
Quick Learning
Upskilling - Job Assistance
Library
PW Champions League
Refer & Earn
My Wallet
Study
025

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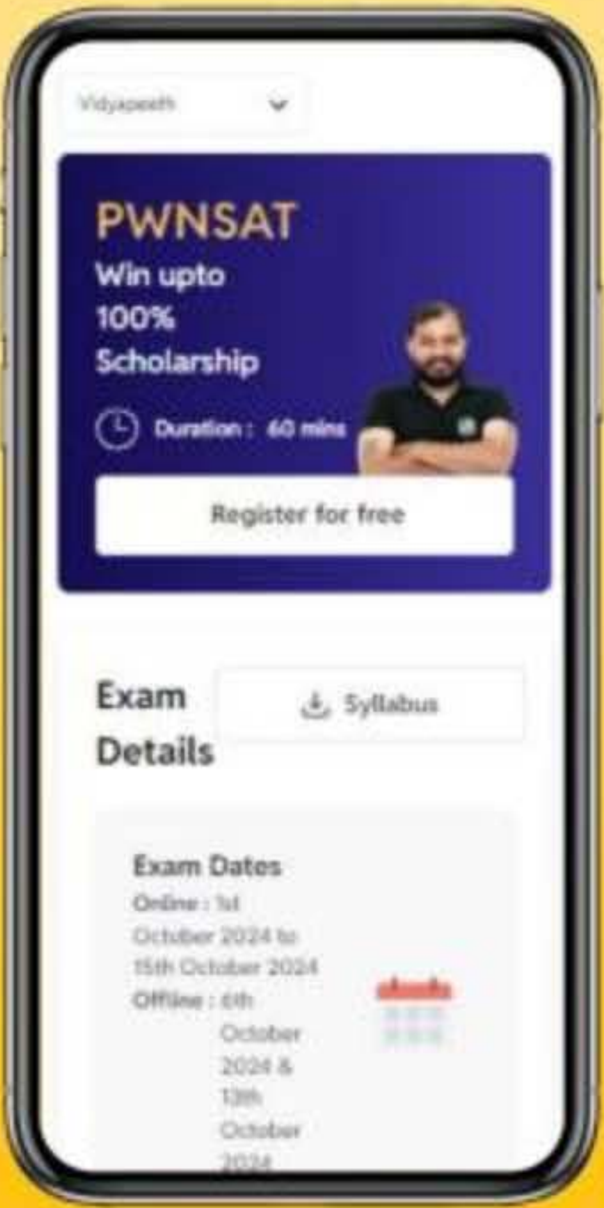
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Exam Dates

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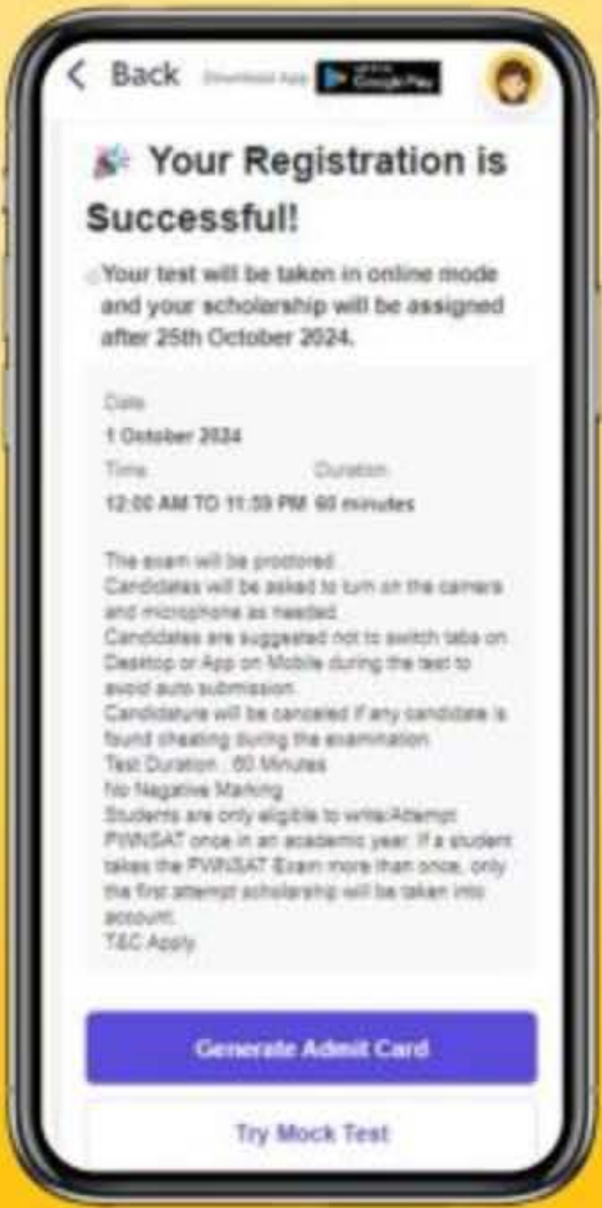
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1 October 2024

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Candidates will be asked to turn on the camera and microphone as needed
Candidates are suggested not to switch tabs on Desktop or App on Mobile during the test to avoid auto submission.
Candidature will be canceled if any candidate is found cheating during the examination
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No Negative Marking
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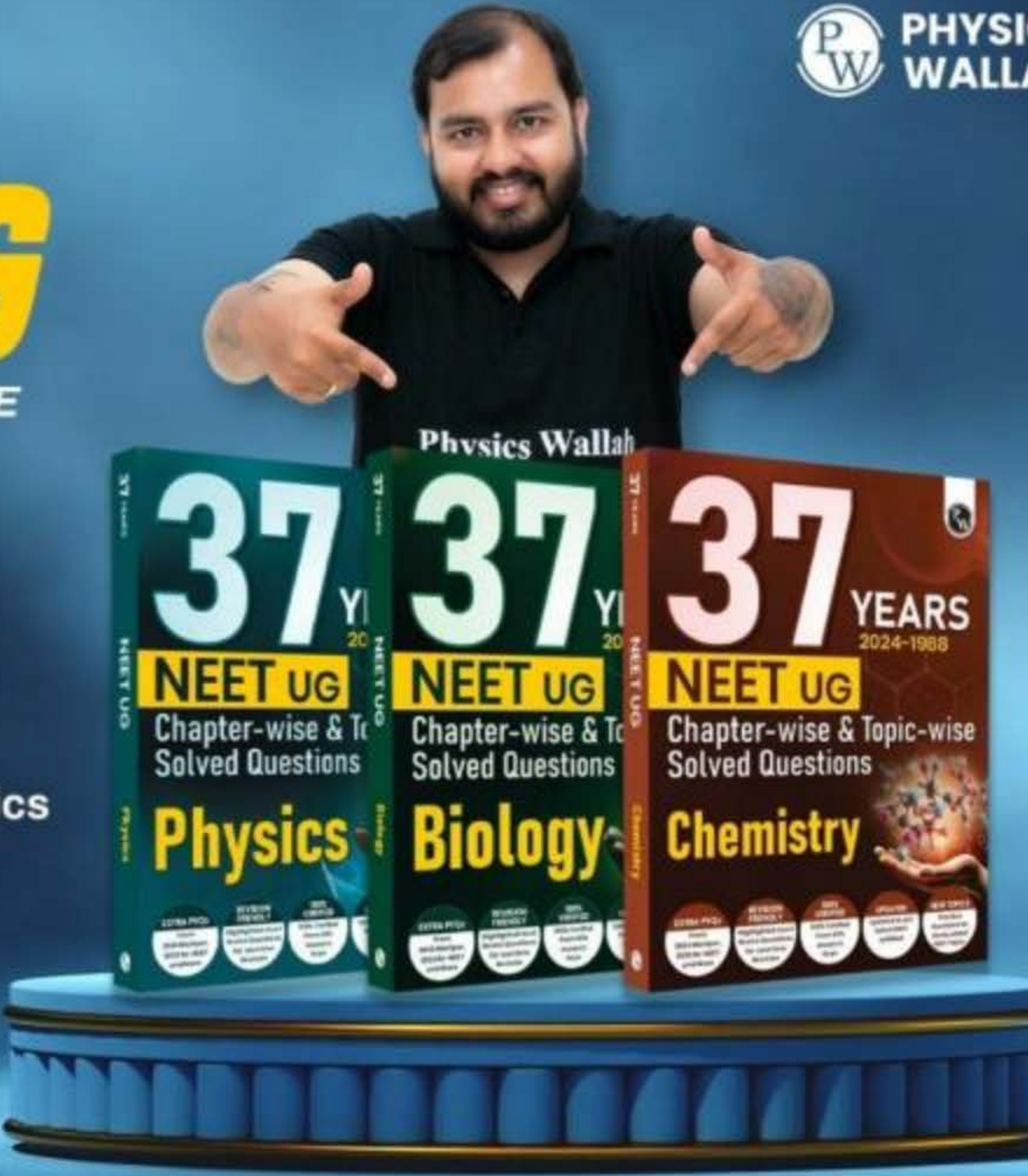

Physics Wallah
37 YEARS 2024-1988
NEET UG
Chapter-wise & Topic-wise Solved Questions
Physics
Biology
Chemistry

Thank you!

YAKEEN 2.0

FOR NEET 2025

Lecture- 03 **Organic Chemistry**

Some Basic Principles and Techniques (IUPAC Naming)

By- Pankaj Sir(POPU MAMA)

Physics Wallah

Topics *to be covered*

1. IUPAC Naming of Alkenes & Alkynes ✓ ✓
2. Practice

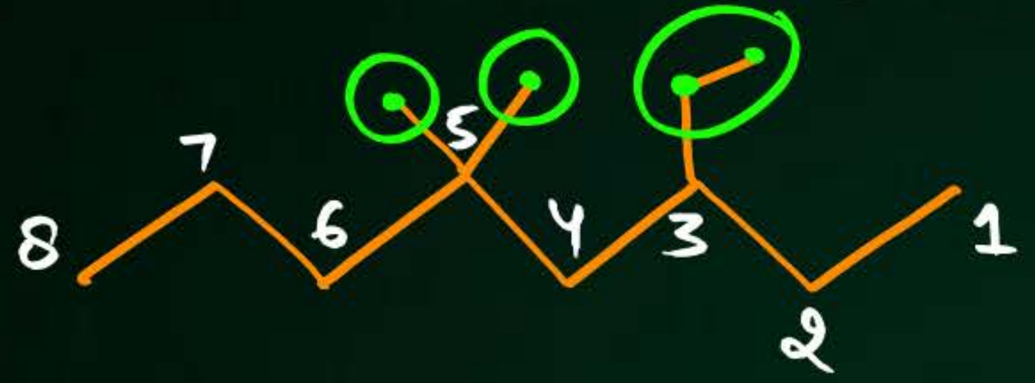
Recap

IUPAC Naming

Rule: Prefix-2 + Prefix-1 + Word Root + Suffix-1 + Suffix-2

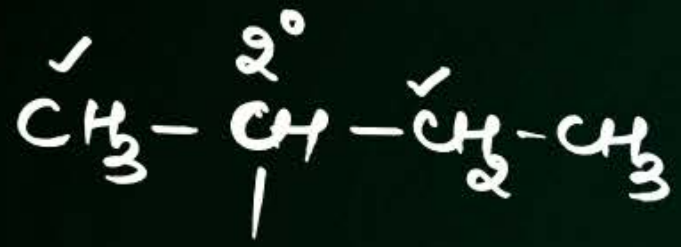
OP point

(i) Di tri tetra etc are not considered in priority in simple branch

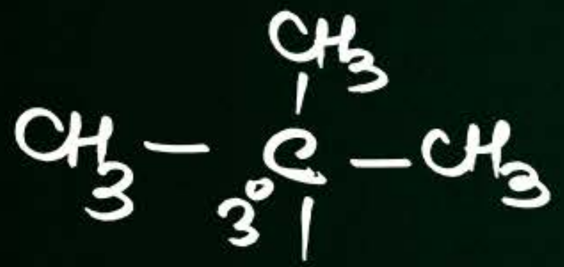


3-Ethyl-5,5-dimethyl octane

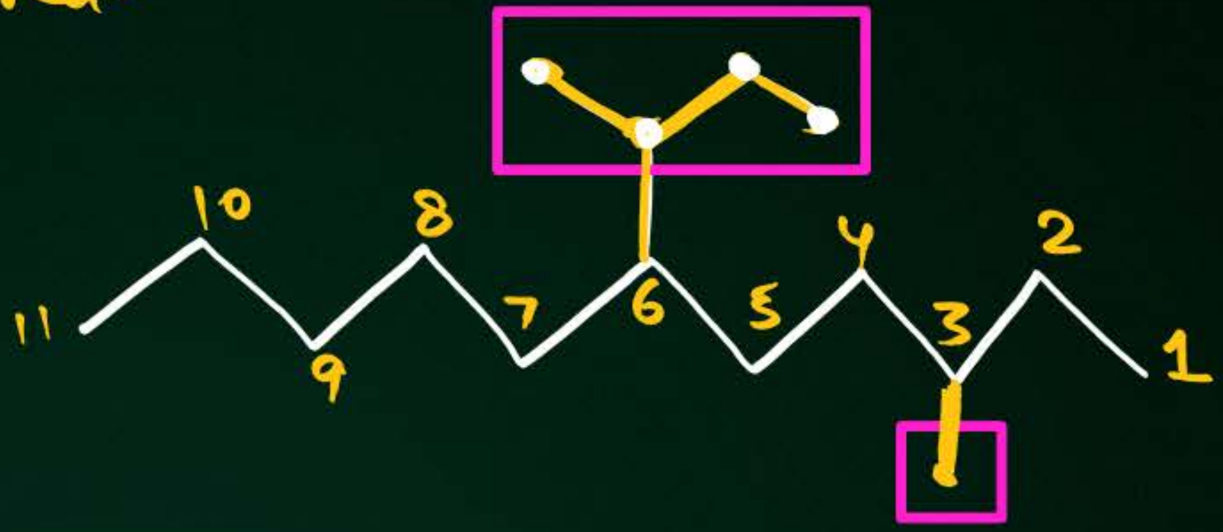
② Sec & tert are not considered.



$\overset{\checkmark}{C}H_3-\underset{|}{\overset{2^\circ}{C}H}-\overset{\checkmark}{C}H_2-CH_3$ sec-Butyl

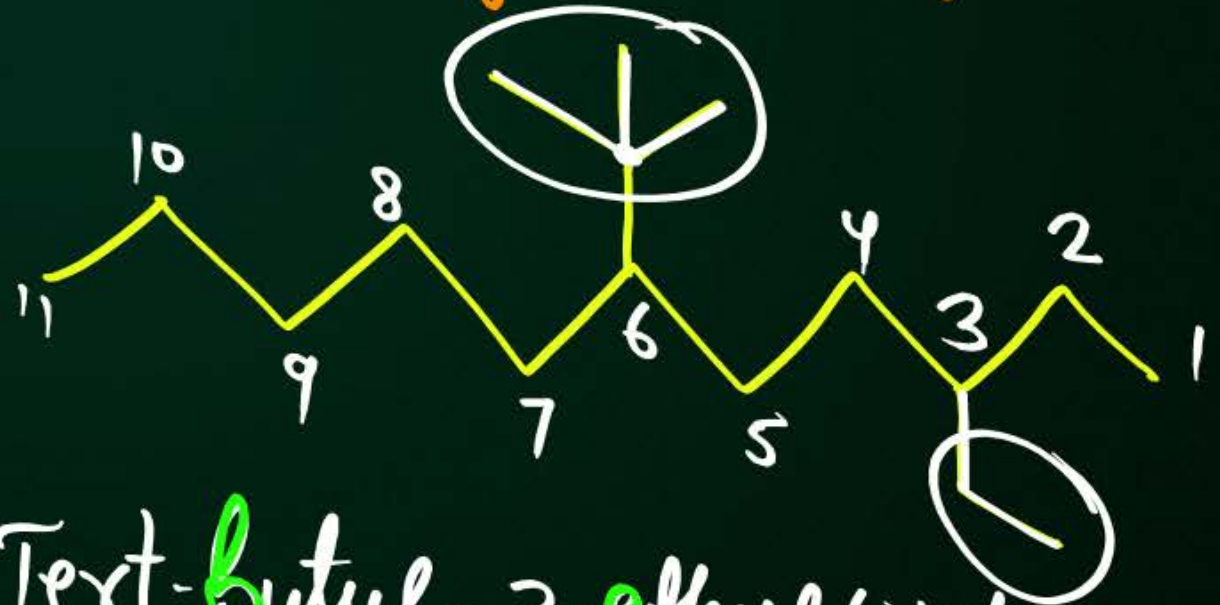


$CH_3-\overset{CH_3}{\underset{3^\circ\ |}{\overset{|}{C}}}-CH_3$ tert-Butyl



10
8
4
2
11
7
6
5
3
1
9

6-Sec-Butyl-3-methyl undecane



10
8
4
2
11
6
3
1
9
7
5

6-Tert-Butyl-3-ethyl Undecane

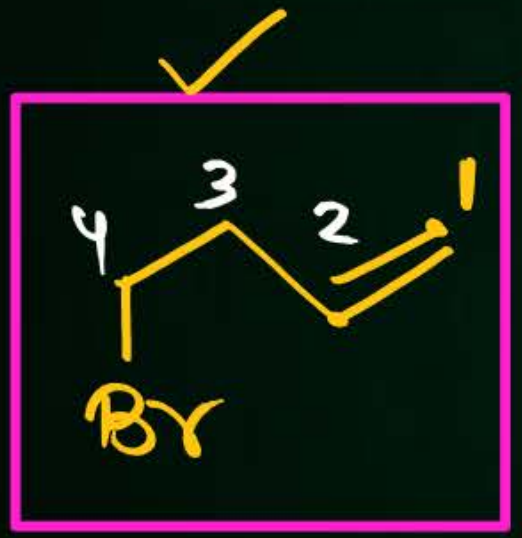
IUPAC Naming of alkenes and alkynes

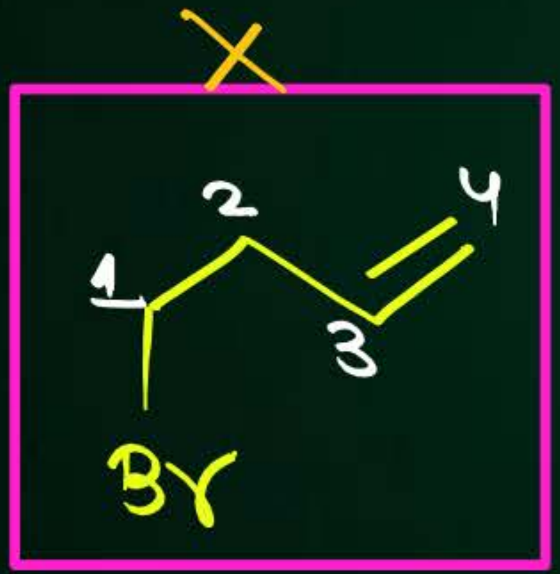
IUPAC Naming

Rule: Prefix-2 + Word Root + Suffix-1

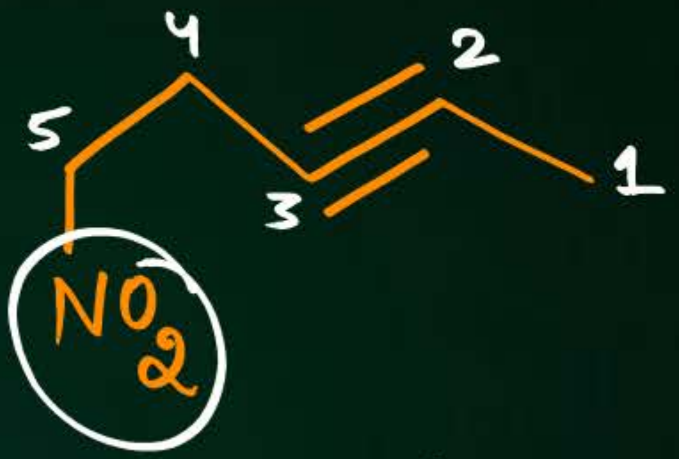
ene

yne





4-Bromo But-1-ene



5-Nitro pent-2-yne

①

1 2 3 4 ✓

$CH_2=CH-C\equiv CH$

4 3 2 1 ✗

Agar same no. mile

$\boxed{= \; > \; \equiv}$

But-1-en~~e~~-3-yne

Suffix-1 & suffix-2 main a, e, i, o, u, y main se two consecutive (Lagatar) nahi ayenge

1 2 3 4 5 ✓

$CH_2=CH-C\equiv C-CH_3$

5 4 3 2 1 ✗

Pent-1-en~~e~~-3-yne

1 2 3 4 5 ✗

$CH_3-CH=CH-C\equiv CH$

5 4 3 2 1 ✓

Pent-3-en~~e~~-1-yne

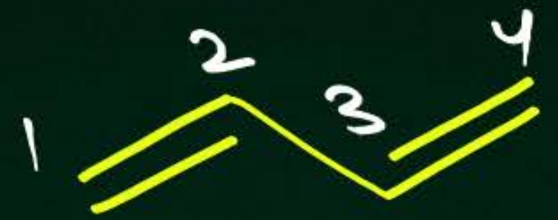
op point ÷ If two or more than two double or triple bonds are present

word root + a

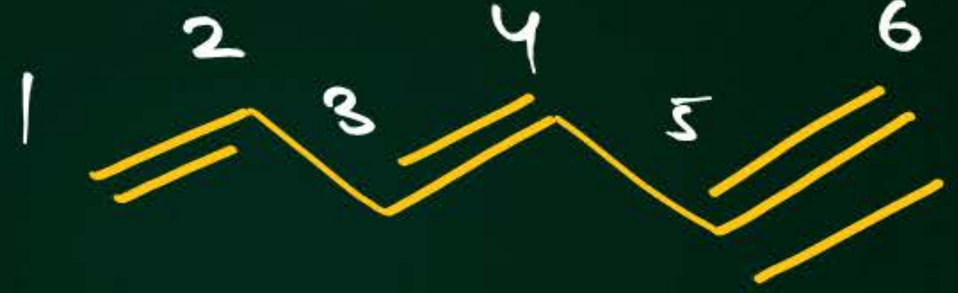
Pent + a = Penta

hex + a = hexa

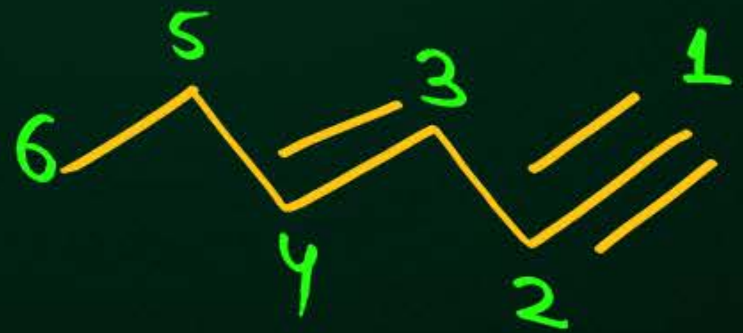
hep + a = hepta



Buta-1,3-diene

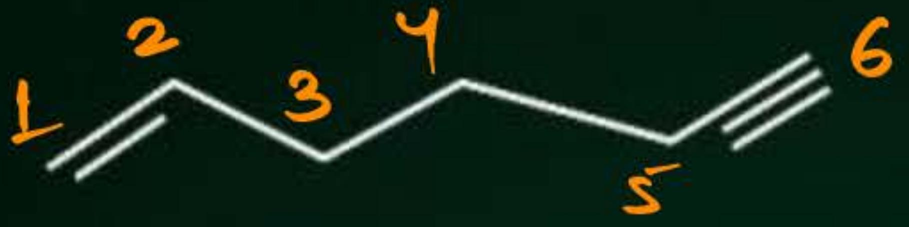


Hexa-1,3-dien~~e~~-5-yne



Hex-3-en~~e~~-1-yne

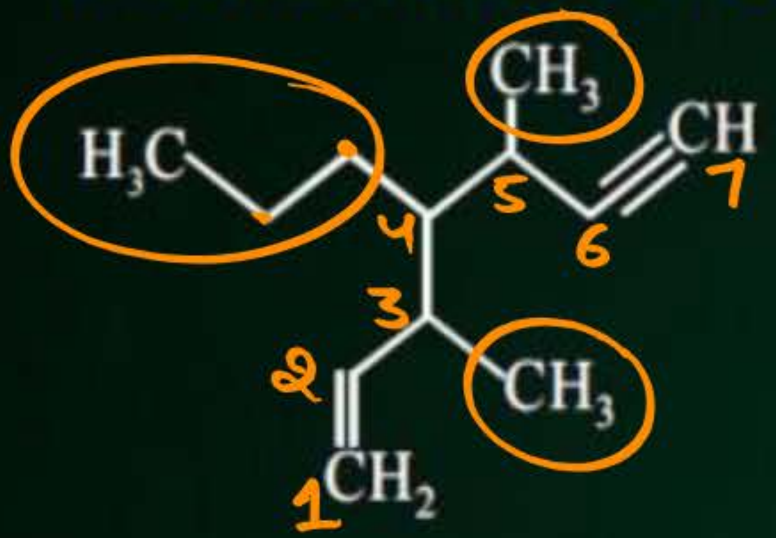
QUESTION

I.U.P.A.C name of 

- (A) Hex-5-ene-1-yne
- (B) Hex-1-yne-5-ene
- [✓ (C)] Hex-1-en-5 yne
- (D) Hex-5 yne-1-ene

QUESTION

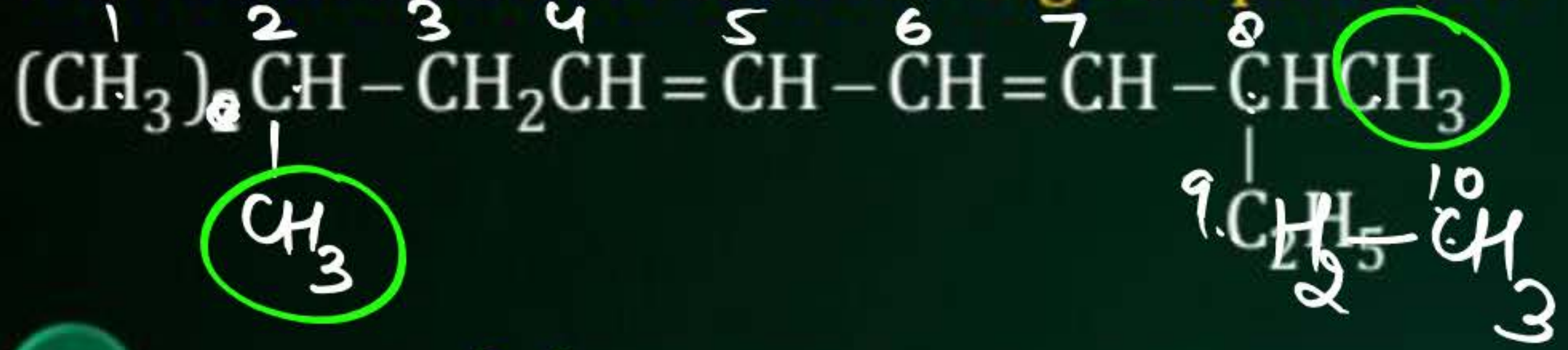
The IUPAC name of the following compound is:


H₃C
CH₃
CH
CH₃
CH₂
1
2
3
4
5
6
7

- **A** 3, 5-dimethyl-4-propylhept-6-en-1-yne
- **B** 3-methyl-4-(3-methylprop-1-enyl)-1-heptyne
- **C** 3-methyl-4-(1-methylprop-2-ynyl)-1-heptane
- [✓ **D**] 3, 5-dimethyl-4-propylhept-1-en-6-yne

QUESTION (AIIMS 2016)

The IUPAC name of the following compound is:



$$\overset{1}{(CH_3)_2}\underset{\underset{CH_3}{|}}{\overset{2}{C}}H-\overset{3}{C}H_2\overset{4}{C}H=\overset{5}{C}H-\overset{6}{C}H=\overset{7}{C}H-\underset{\underset{9.\,CH_2-\overset{10}{C}H_3}{|}}{\overset{8}{C}}HCH_3$$

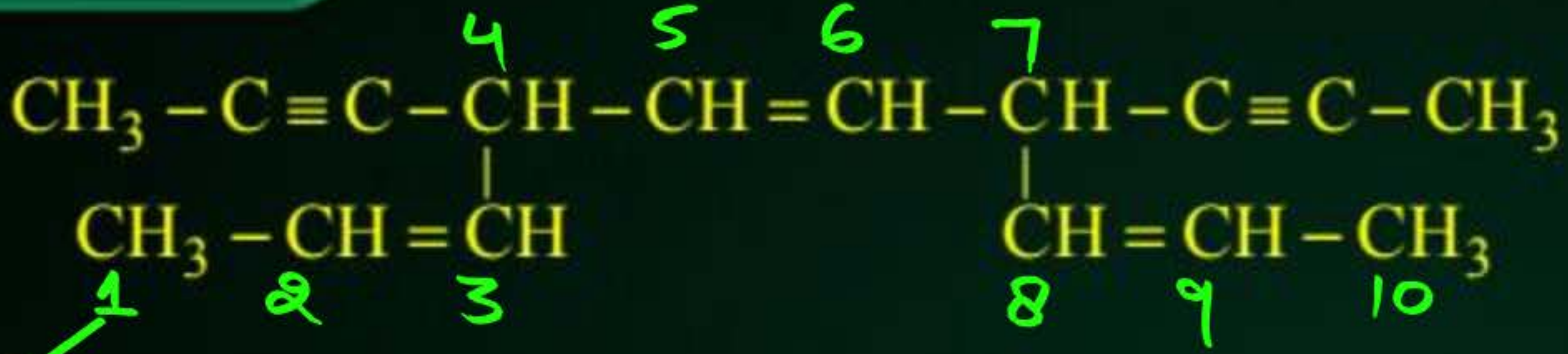
A 1, 1, 7, 7-tetramethyl-2, 5-octadiene

B 2, 8-dimethyl-3, 6-decadiene

C 1, 5-di-iso-propyl-1, 4-hexadiene

[✓ D] 2, 8-dimethyl-4, 6-decadiene

QUESTION



$$CH_3-C\equiv C-\underset{\underset{CH_3-CH=CH}{|}}{CH}-CH=CH-\underset{\underset{CH=CH-CH_3}{|}}{CH}-C\equiv C-CH_3$$

[✓ A] Parent Carbon Chain contains three double bonds.

B Parent Carbon Chain contains one double bond and two triple bonds.

C Parent Carbon Chain contains two double bonds and one triple bond.

D Parent Carbon Chain contains two double bonds and two triple bonds.

Priority:

Prici F.G
(suffix-2)

(= & ≡)

PFG > Multiple bonds > Number of C atoms > Maximum number of Substituents > Lowest locant > alphabetical order

Pagla batch
yakeen 2.0

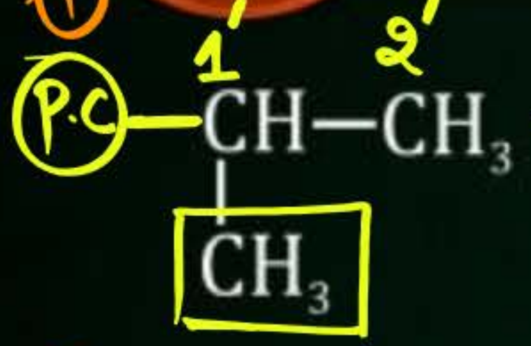
Maalik complex wala bata do Usmain dikkat hoti hai

popu mama

Wah bahut badiya
Aao phir

Complex Substituents

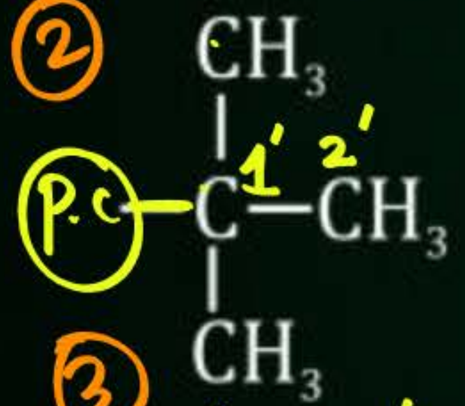
①



$$\mathrm{P.C}-\underset{\boxed{\mathrm{CH_3}}}{\overset{1'}{\mathrm{CH}}}-\overset{2'}{\mathrm{CH_3}}$$

–(1'-methyl ethyl)

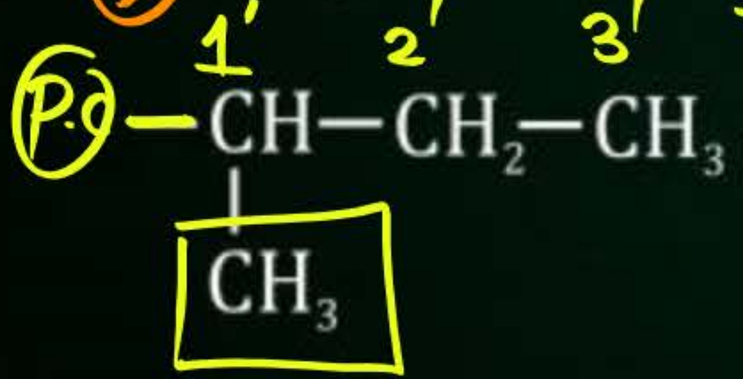
②



$$\mathrm{P.C}-\underset{\mathrm{CH_3}}{\overset{\mathrm{CH_3}}{\overset{1'}{\mathrm{C}}}}-\overset{2'}{\mathrm{CH_3}}$$

–(1',1'-Dimethyl ethyl)

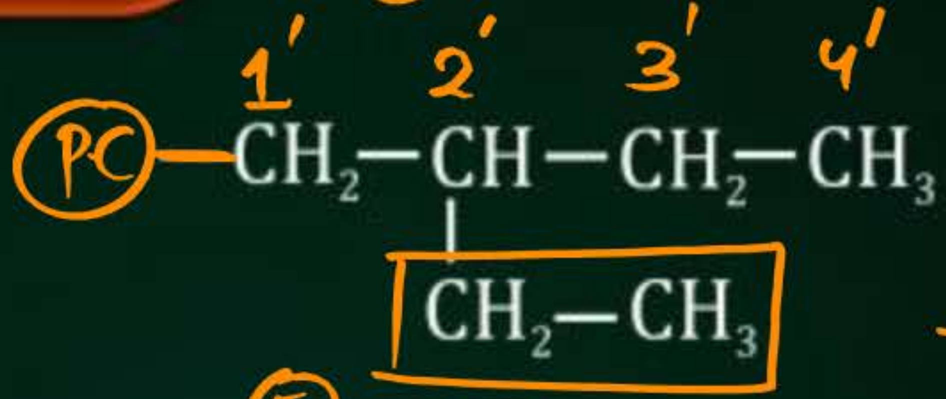
③



$$\mathrm{P.C}-\underset{\boxed{\mathrm{CH_3}}}{\overset{1'}{\mathrm{CH}}}-\overset{2'}{\mathrm{CH_2}}-\overset{3'}{\mathrm{CH_3}}$$

–(1'-methyl propyl)

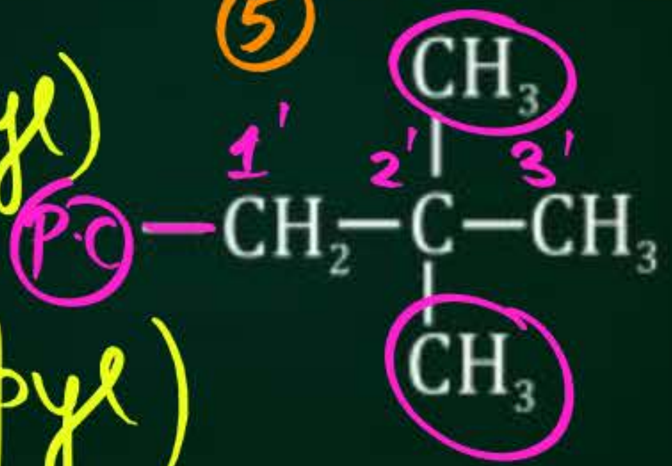
④



$$\mathrm{PC}-\overset{1'}{\mathrm{CH_2}}-\underset{\boxed{\mathrm{CH_2-CH_3}}}{\overset{2'}{\mathrm{CH}}}-\overset{3'}{\mathrm{CH_2}}-\overset{4'}{\mathrm{CH_3}}$$

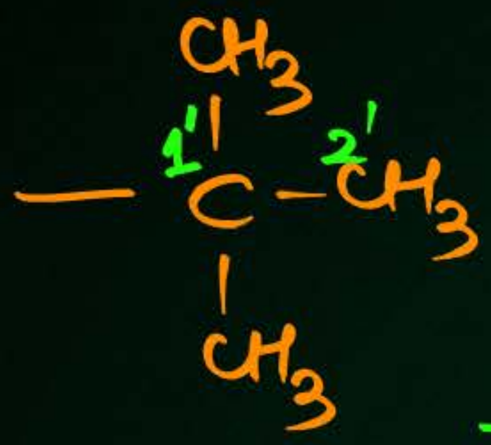
–(2'-Ethyl butyl)

⑤



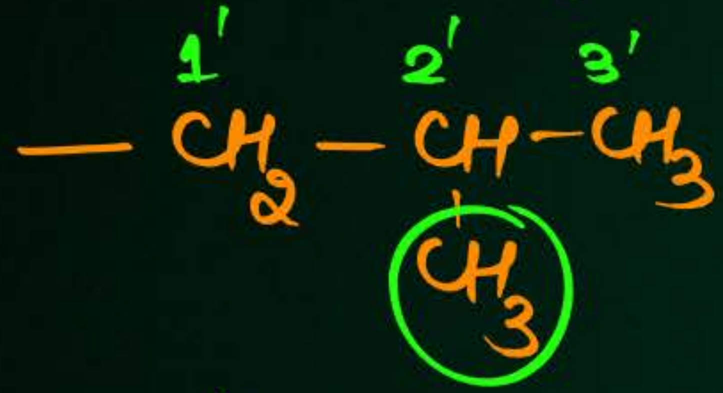
$$\mathrm{P.C}-\overset{1'}{\mathrm{CH_2}}-\underset{\mathrm{CH_3}}{\overset{\mathrm{CH_3}}{\overset{2'}{\mathrm{C}}}}-\overset{3'}{\mathrm{CH_3}}$$

–(2',2'-Dimethyl propyl)

⑥ 

$$-\overset{CH_3}{\underset{CH_3}{\overset{1'}{C}}}-\overset{2'}{C}H_3$$

— (1',1'-Dimethyl ethyl)

⑦ 

$$-\overset{1'}{C}H_2-\overset{2'}{\underset{CH_3}{C}H}-\overset{3'}{C}H_3$$

— (2'-methyl propyl)

⑧ $-\overset{1'}{C}H_2-Br$ or (Bromomethyl)

— (1'-Bromo methyl)

⑨ $-\underset{1'}{CH_2}-\underset{2'}{CH_2}-NO_2$

— (2'-nitro ethyl)

⑩ (P.C)—$\overset{1'}{C}H_2-\overset{2'}{C}H=\overset{3'}{C}H_2$

— (Prop-2'-enyl)

⑪ (P.C)—$\overset{1'}{C}H_2-\overset{2'}{C}\equiv\overset{3'}{C}H$

— (Prop-2'-ynyl)

⑫ $-\overset{1'}{C}H=\overset{2'}{C}H_2$

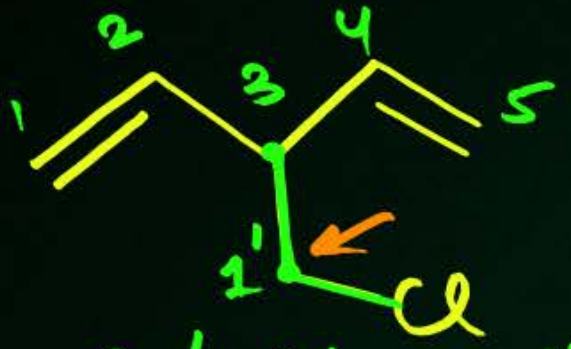
— (eth-1'-enyl) or (ethenyl)

⑬ $-\overset{1'}{C}\equiv\overset{2'}{C}H$

— (eth-1'-ynyl) or (ethynyl)

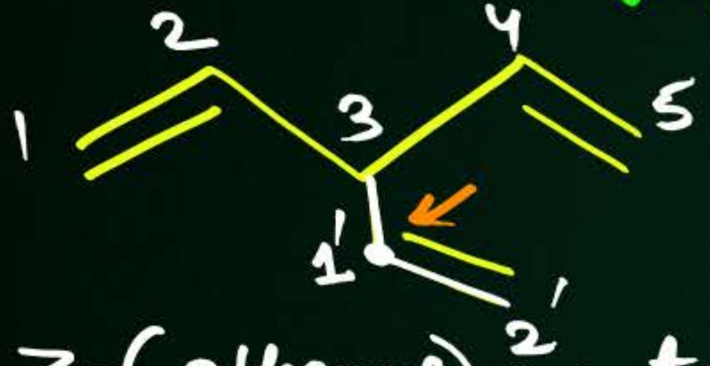
Q

①



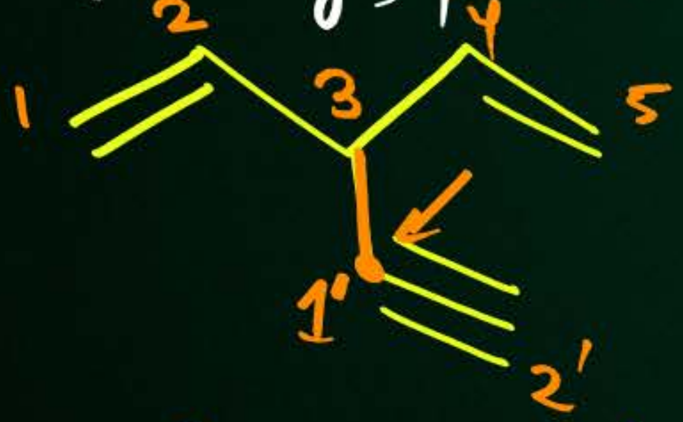
3-(1'-chloromethyl)penta-1,4-diene

②



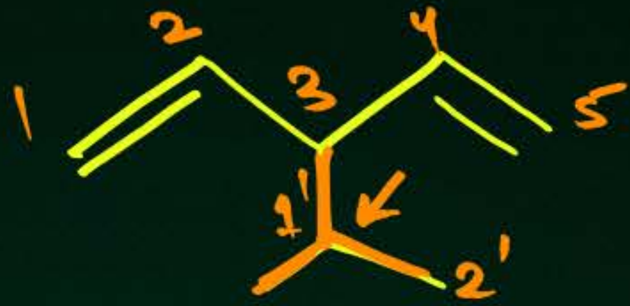
3-(ethenyl)penta-1,4-diene

③



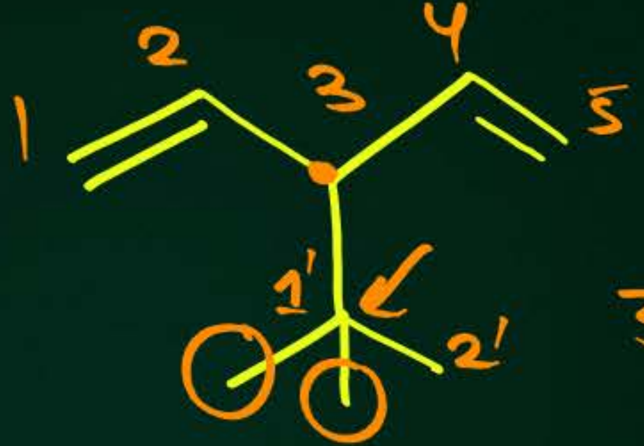
3-(Ethynyl)penta-1,4-diene

④



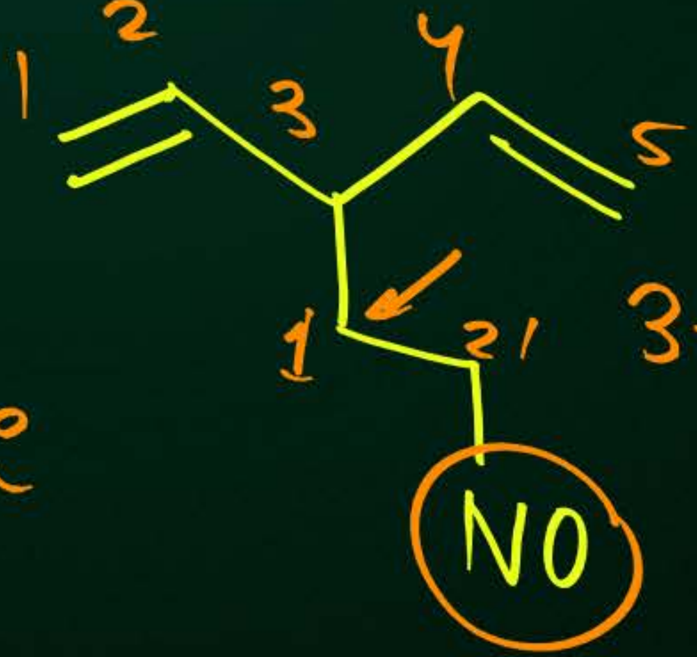
3-(1'-methyl ethyl)penta-1,4-diene

⑤



3-(1',1'-Dimethylethyl) penta-1,4-diene

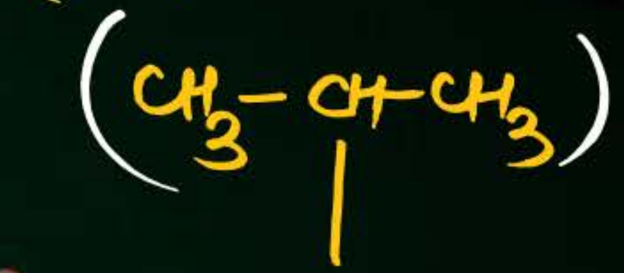
⑥



3-(2'-Nitrosoethyl) penta-1,4-diene

OP Points for complex branch

(isopropyl)

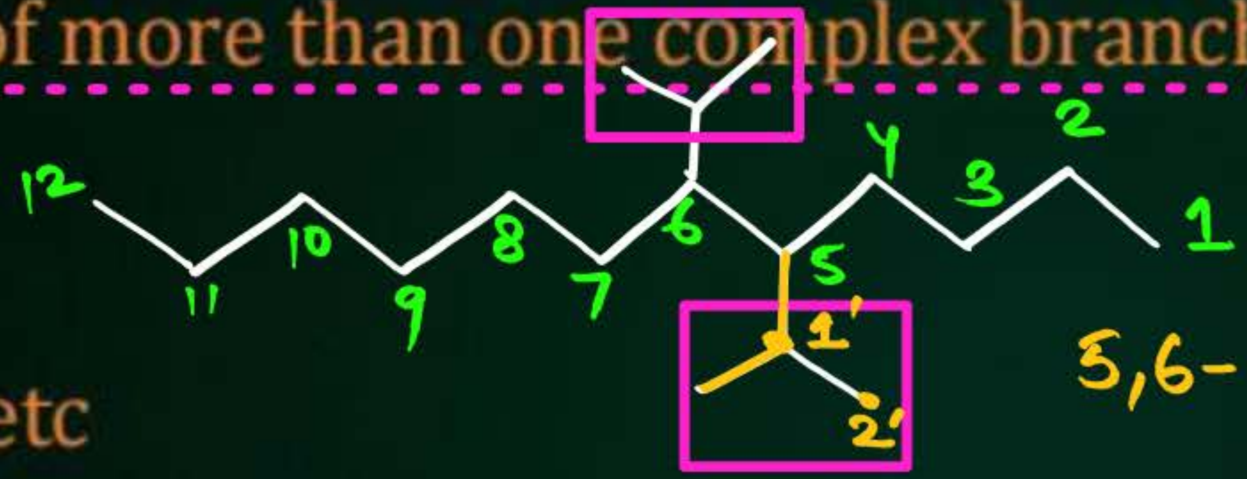

$$(CH_3-\underset{|}{C}H-CH_3)$$

1. In the case of more than one complex branches we have to use

Bis for 2

Tris for 3

Tetrakis for 4 etc

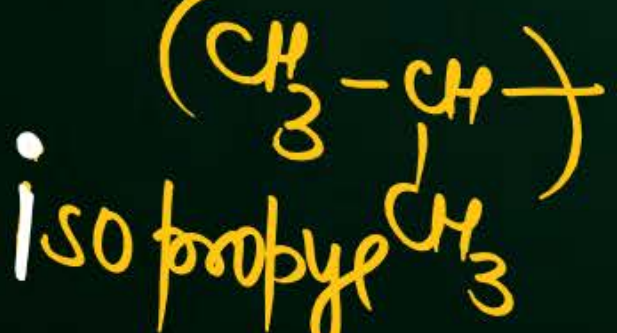


5,6- Bis-(1'-methylethyl) dodecane

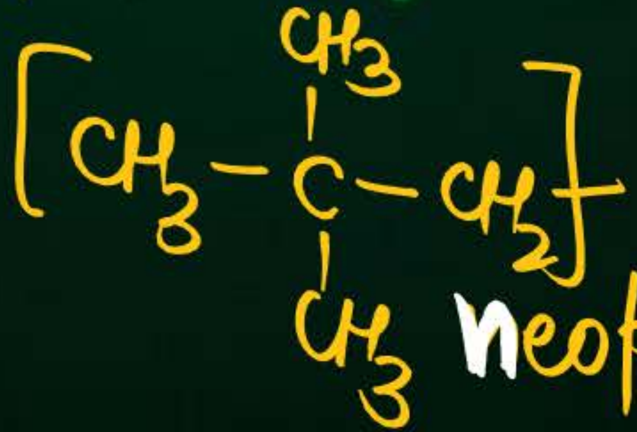
2. First alphabet(di ,tri ,tetra etc) written in small bracket is always considered to decide priority in case of Complex branch

5,6- Di isopropyl dodecane

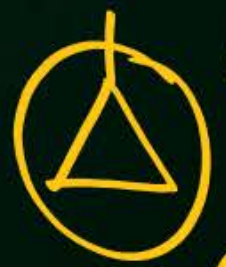
3. First alphabet of only three prefix iso, neo, cyclo are considered to decide priority

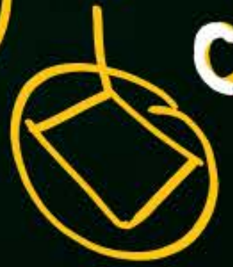

$$(CH_3-\underset{CH_3}{\underset{|}{C}H}-)$$

isopropyl

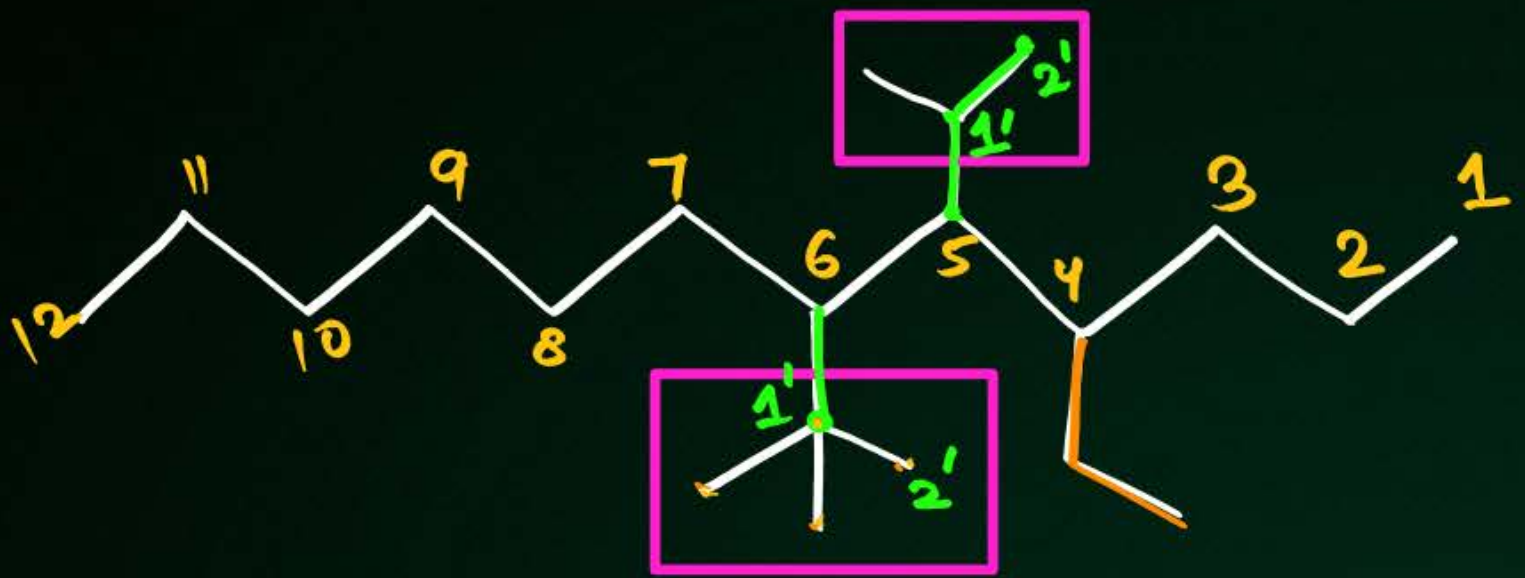

$$[CH_3-\overset{CH_3}{\overset{|}{\underset{CH_3}{\underset{|}{C}}}}-CH_2-]$$

neopentyl


cyclopropyl


cyclobutyl

Q

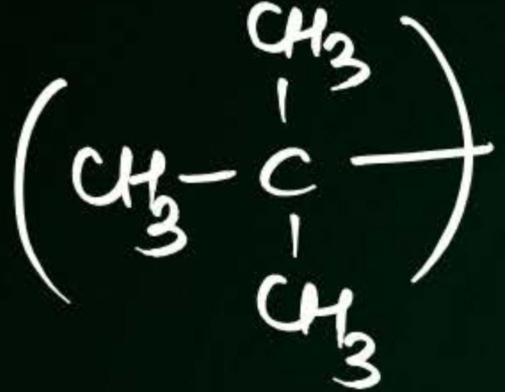


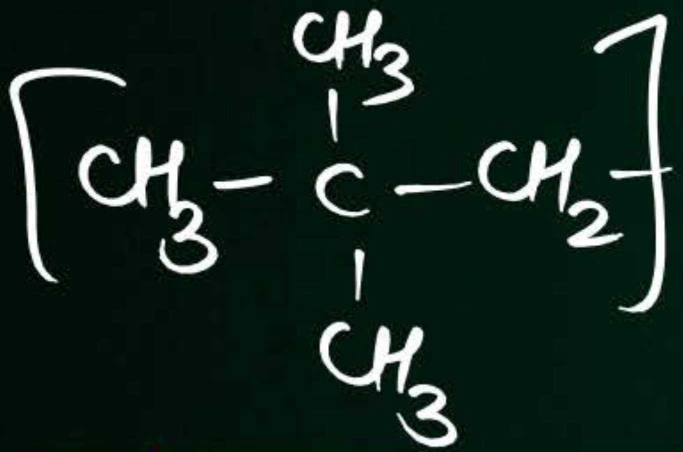
11
9
7
3
1
12
10
8
6
5
4
2
1′
2′
1′
2′

6 – (1′, 1′- Dimethylethyl)-4-Ethyl-5-(1′-methylethyl) dodecane

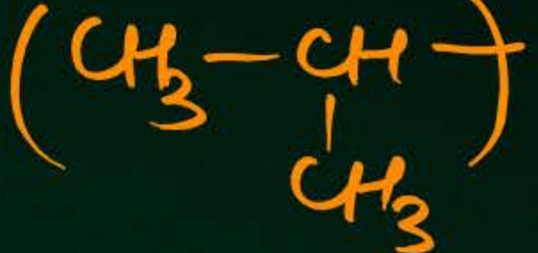
or

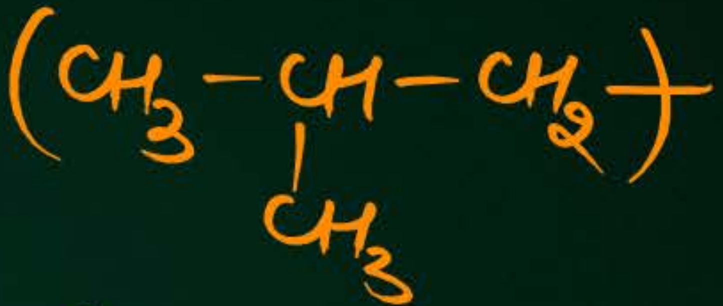
6- tert butyl 4-Ethyl 5- isopropyl dodecane tert vs neo

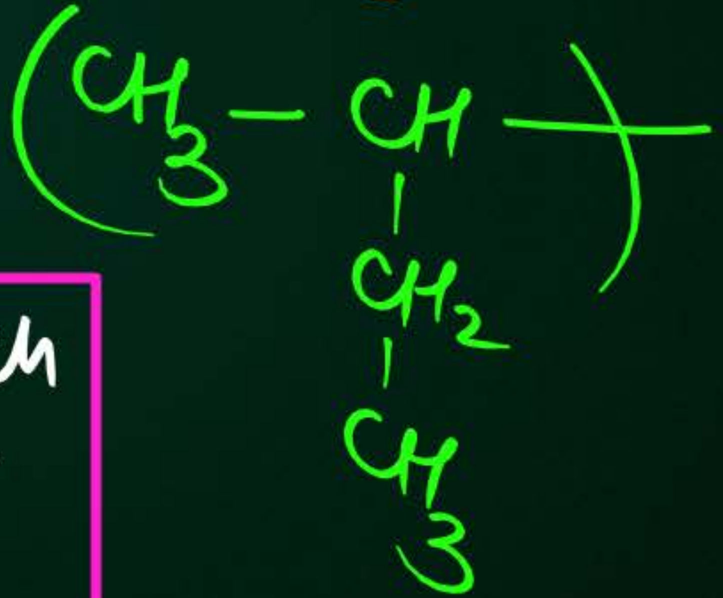

$\left(CH_3-\overset{\displaystyle CH_3}{\underset{\displaystyle CH_3}{\overset{|}{\underset{|}{C}}}}-\right)$ tert butyl


$\left[CH_3-\overset{\displaystyle CH_3}{\underset{\displaystyle CH_3}{\overset{|}{\underset{|}{C}}}}-CH_2-\right]$ neo pentyl

iso vs sec


$\left(CH_3-\underset{\displaystyle CH_3}{\underset{|}{CH}}-\right)$ isopropyl


$\left(CH_3-\underset{\displaystyle CH_3}{\underset{|}{CH}}-CH_2-\right)$ isobutyl


$\left(CH_3-\underset{\displaystyle CH_3}{\underset{|}{\underset{\displaystyle CH_2}{\underset{|}{CH}}}}-\right)$ sec butyl

✓iso, ✓neo, ✓cyclo

×sec, ×tert

complex branch
main ✓di ✓Tri
✓tetra

✓iso ✓neo ✓cyclo ✓

×sec ×tert

Homework

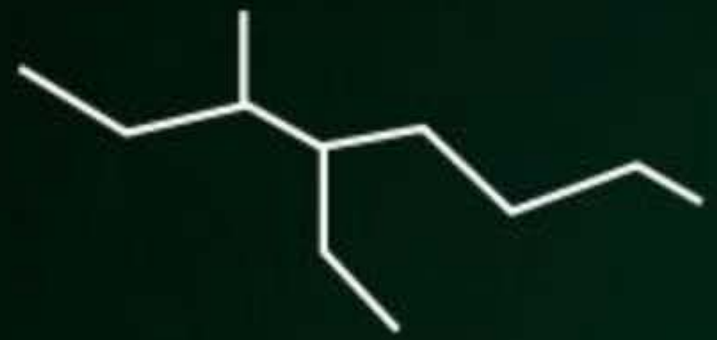
QUESTION (NCERT Exemplar)

Which of the following is the correct IUPAC name?

- (A) 3-Ethyl-4, 4-dimethylheptane
- (B) 4, 4-Dimethyl-3-ethylheptane
- (C) 5-Ethyl-4, 4-dimethylheptane
- (D) 4, 4-Bis(methyl)-3-ethylheptane

QUESTION (AIIMS 2013, 2015)

Name of the compound given below is:



Ⓐ 3-methyl-4-ethyloctane

Ⓑ 2, 3-dimethylpentane

Ⓒ 5-ethyl-6-methyloctane

Ⓓ 4-ethyl-3-methylocatane

QUESTION

Statement-1: IUPAC name of
$H_2C = CH - CH_2 - C \equiv CH$ is Pent-4-en-1-yne.
Statement-2: Alkene is preferred over alkyne when they are placed at same position.

A Statement-1 is true, statement-2 is true and statement-2 is correct explanation for Statement-1.

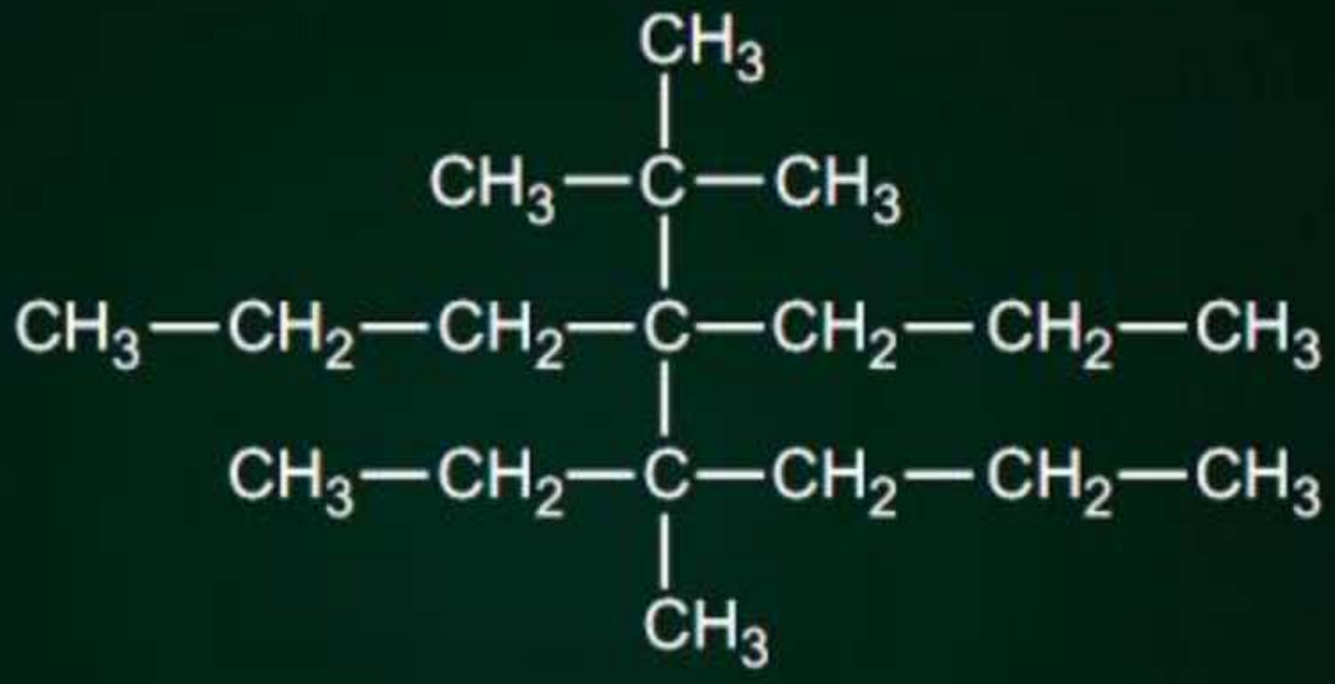
B Statement-1 is true, statement-2 is true and statement-2 is NOT the correct explanation for statement-1.

C Statement-1 is true, statement-2 is false.

D Statement-1 is false, statement-2 is true.

QUESTION

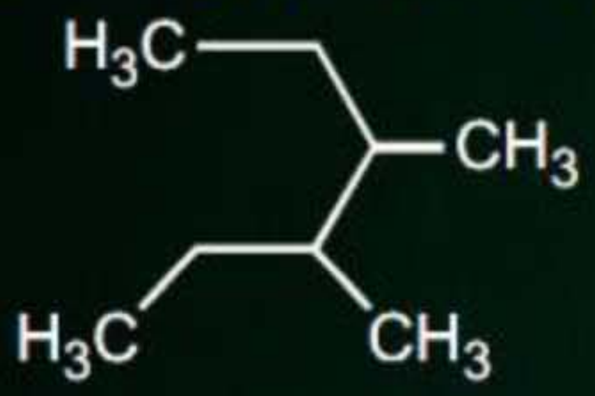
Total number of carbon atoms present in parent chain is:



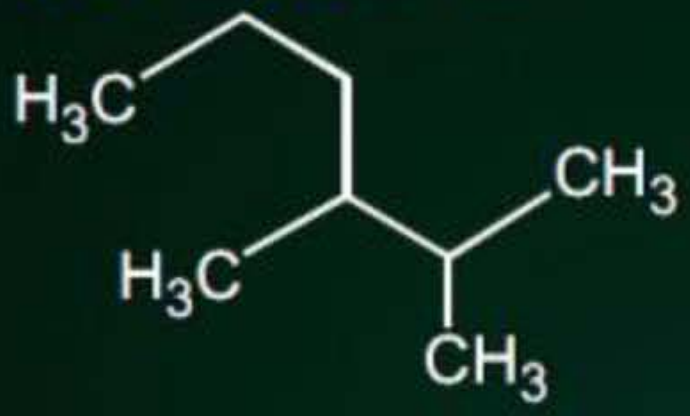
- **A** 5
- **B** 6
- **C** 7
- **D** None of these

QUESTION

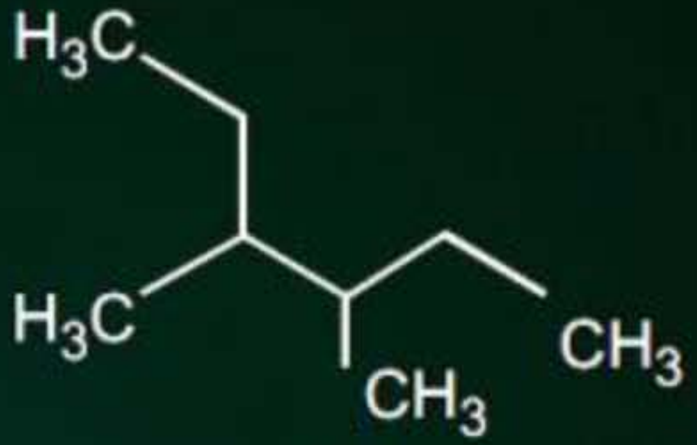
Among the following compounds


H3C
CH3
H3C
CH3

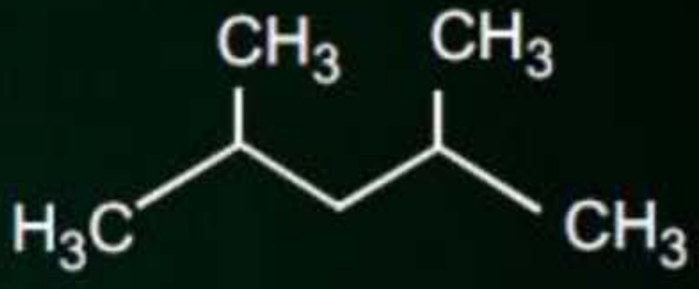
(i)


H3C
H3C
CH3
CH3

(ii)


H3C
H3C
CH3
CH3

(iii)


CH3
CH3
H3C
CH3

(iv)

2, 3-dimethylhexane is:

- **A** (i)
- **B** (ii)
- **C** (iii)
- **D** (iv)

QUESTION

The correct IUPAC name of $CH_3CH_2CH(CH_3)CH(C_2H_5)_2$ is:

(A) 4-ethyl-3-methyl hexane

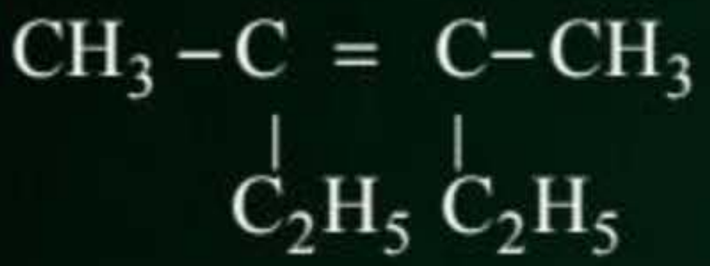
(B) 3-ethyl-4 methyl hexane

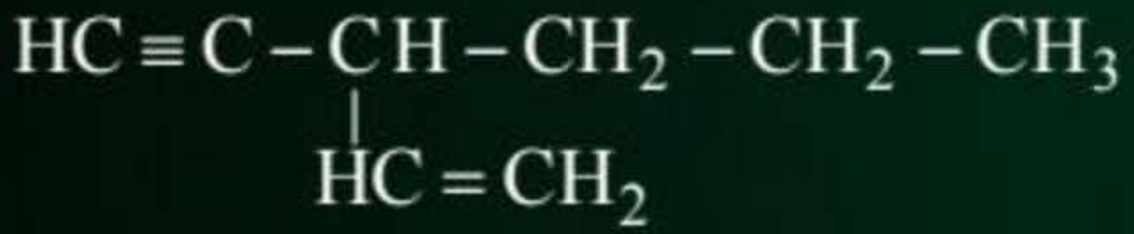
(C) 4-methyl-3-ethyl hexane

(D) 2, 4-diethylpentane

QUESTION

Which IUPAC name is correct:

A 
$CH_3-\underset{\underset{C_2H_5}{|}}{C}=\underset{\underset{C_2H_5}{|}}{C}-CH_3$ → 2,3-Diethylbutene

B 
$HC\equiv C-\underset{\underset{HC=CH_2}{|}}{C}H-CH_2-CH_2-CH_3$ →3-Ethynylpenta-1,4-diene

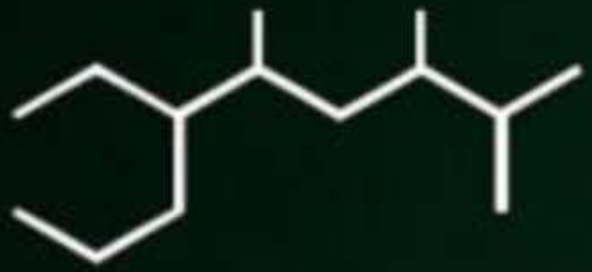
C $HC\equiv C-CH=CH_2$ → But-1-en-3-yne

D $CH_3-CH=CH-C\equiv CH$ → Pent-1-yne-3-ene

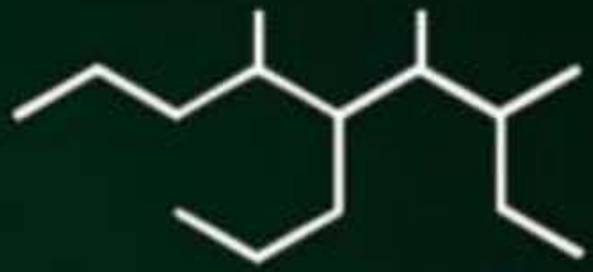
QUESTION

The correct structure of 6-Ethyl-2, 3, 5-trimethylnonane is:

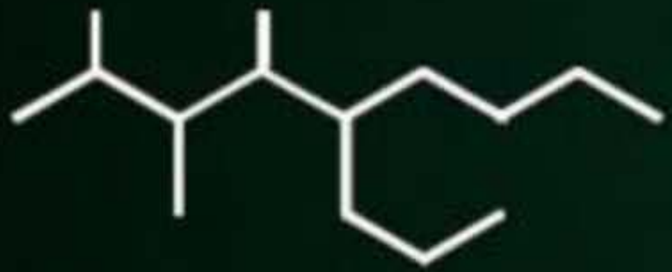
(A)



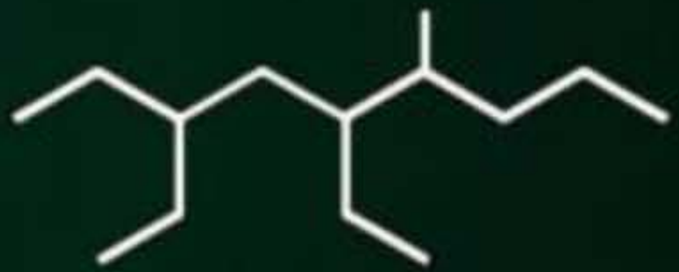
(B)



(C)

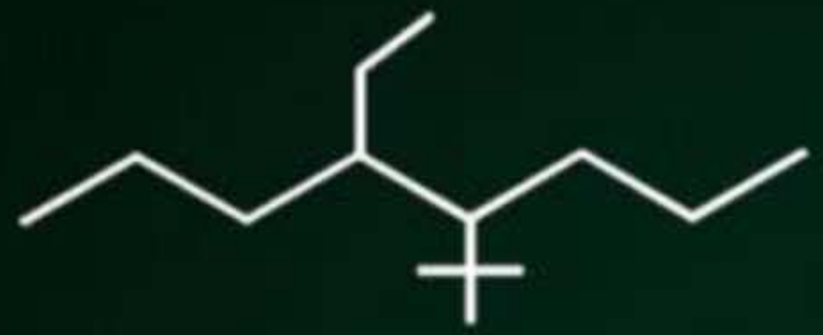


(D)



QUESTION

Correct IUPAC name of the following compound is:



(A) 4-(1,1-dimethylethyl)-5-ethyloctane

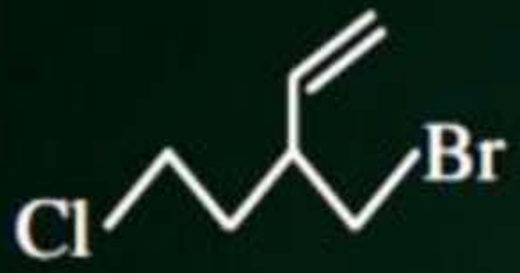
(B) 5-ethyl-4-(1,1-dimethylethyl)octane

(C) 5-(1,1-dimethylethyl)-4-ethyloctane

(D) 5-ethyl-5-(1,1-dimethylethyl)octane

QUESTION

The IUPAC name of the compound is:



(A) 1-Bromo-4-chloro-3-ethenyl butane

(B) 4-Bromo-1-Chloro-3-ethenyl butane

(C) 3-(Bromomethyl)-5-chloropent-1-ene

(D) 3-(Bromomethyl)-1-chloropent-4-ene

QUESTION

The IUPAC name of the compound $CH_3CH = CHCH{=}CHC \equiv CCH_3$ is:

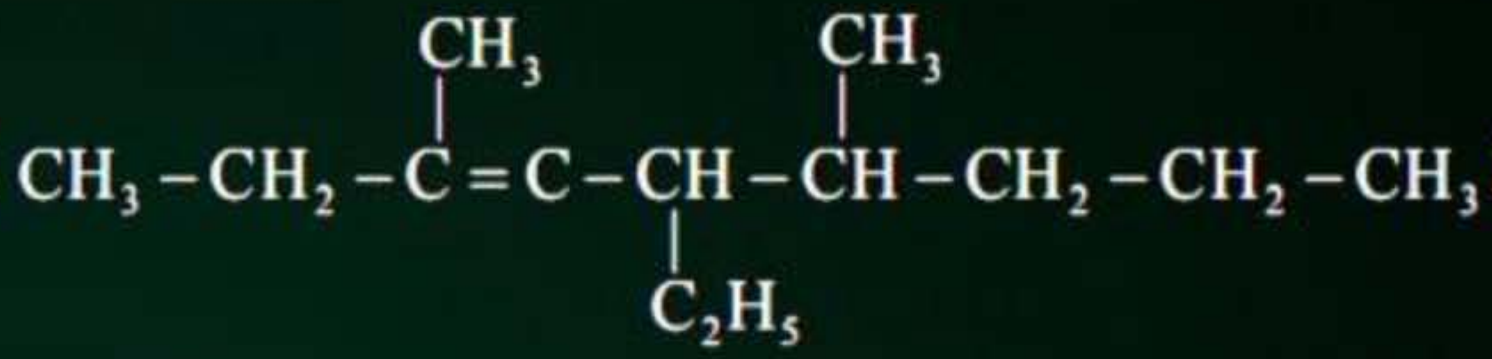
Ⓐ Octa-4,6-diene-2-yne

Ⓑ Octa-2,4-diene-6-yne

Ⓒ Oct-2-yne-4,6-diene

Ⓓ Oct-6-yne-2,4-diene

QUESTION

The correct IUPAC name of the compound  $CH_3-CH_2-\overset{CH_3}{\overset{|}{C}}=C-\underset{C_2H_5}{\underset{|}{CH}}-\overset{CH_3}{\overset{|}{CH}}-CH_2-CH_2-CH_3$ is:

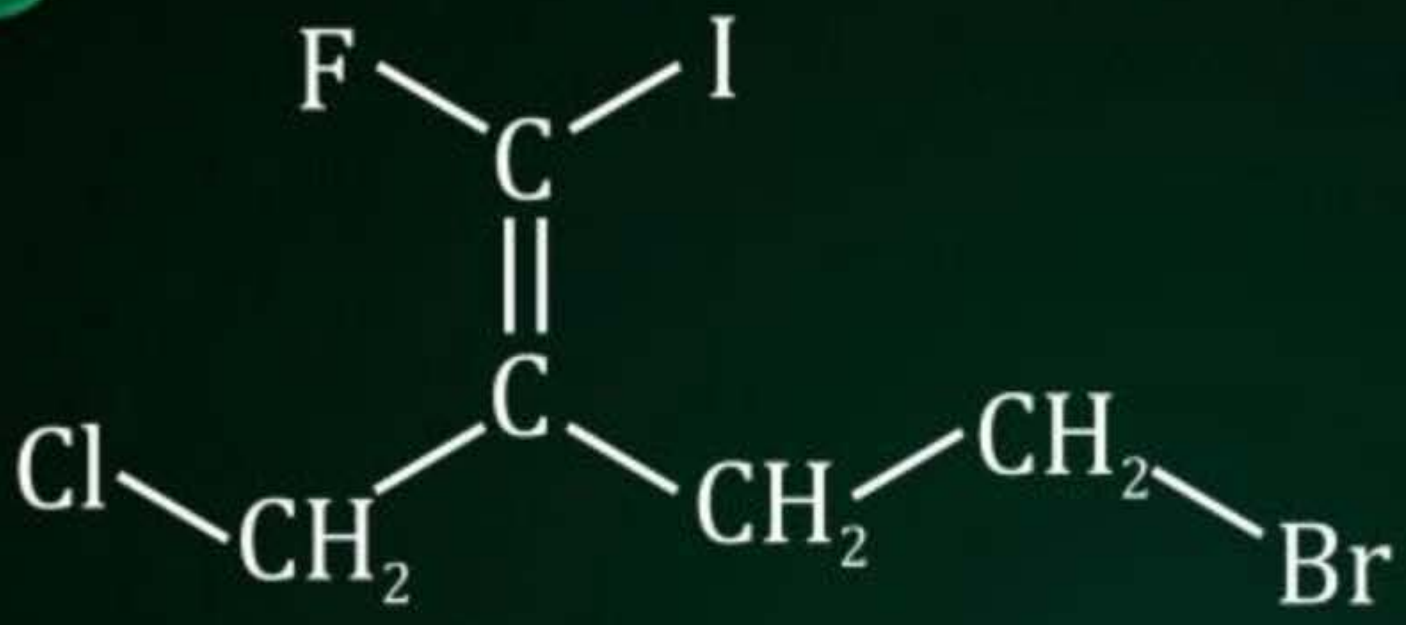
(A) 5-Ethyl-3,6-dimethytnon-3-ene

(B) 5-Ethyl-4,7-dimethylnon-3-ene

(C) 4-Methyl-5,7-diethyloct-2-ene

(D) 2,4-Dimethyl-5-ethyloct-2-ene

QUESTION The correct IUPAC name of the compound is:



(A) 4-Bromo-1-chloro-2-fluoroiodomethylbutene

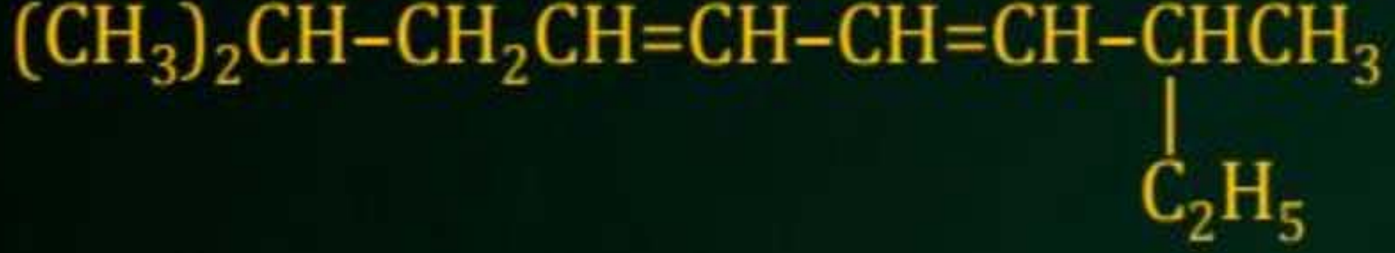
(B) 4-Bromo-2-chloromethyl-1-fluoro-1-iodobut-1-ene

(C) 2-(2-Bromoethyl)-3-chloro-1-fluoro-1-iodoprop-1-ene

(D) 1-Bromo-3-chloromethyl-4-fluoro-4-iodobut-1-ene

QUESTION

The IUPAC name of the following compounds is:



$$(CH_3)_2CH-CH_2CH=CH-CH=CH-\underset{\underset{\displaystyle C_2H_5}{|}}{C}HCH_3$$

(A) 1, 1, 7, 7-tetramethyl-2, 5-octadiene

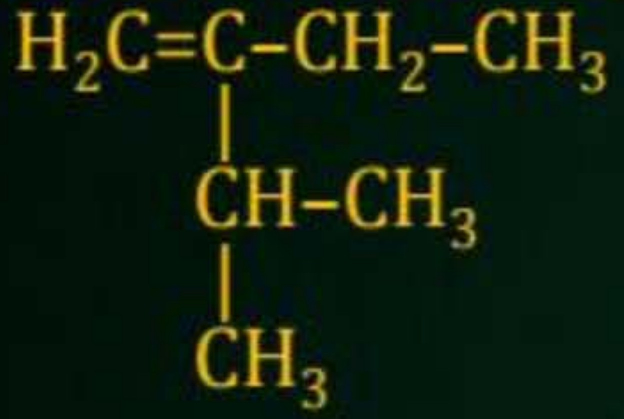
(B) 2, 8-dimethyl-3, 6-decadiene

(C) 1, 5-di-isopropyl-1, 4-hexadiene

(D) 2, 8-dimethyl-4, 4-decadiene

QUESTION

The IUPAC name of the following compound is:



$$\begin{array}{l} H_2C{=}C{-}CH_2{-}CH_3 \\ \qquad\;\, | \\ \qquad\;\, CH{-}CH_3 \\ \qquad\;\, | \\ \qquad\;\, CH_3 \end{array}$$

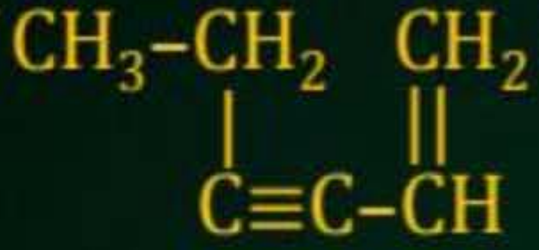
A 2-ethyl-3-methylbut-1-ene

B 2-isopropylbut-1-ene

C 2-methyl-3-ethylbut-3-ene

D ethyl isopropyl ethene

QUESTION

The correct name of  is:

$$\begin{array}{lcl} CH_3-CH_2 & & CH_2 \\ \qquad\;\; | & & \;\;\| \\ \qquad\; C\equiv C & - & CH \end{array}$$

(A) hex-3-yn-5-ene

(B) hex-5-en-3-yne

(C) hex-3-yn-1-ene

(D) hex-1-en-3-yne

QUESTION

The IUPAC name of $(CH_3)_3C{-}CH{=}CH_2$ is:

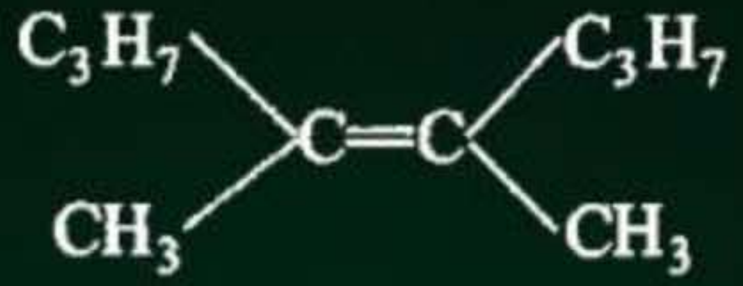
A 2, 2-dimethylbut-3-ene

B 2, 2-dimethylpent-4-ene

C 3, 3-dimethylbut-1-ene

D hex-1-ene

QUESTION

The IUPAC name of the compound  is:

C_3H_7
C_3H_7
C=C
CH_3
CH_3

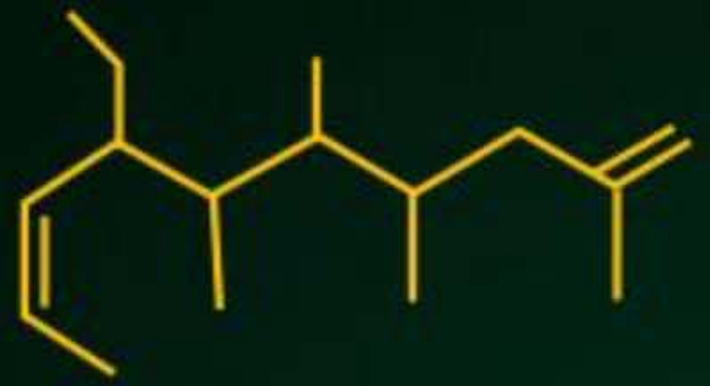
(A) 4, 5-dimethyloct-4-ene

(B) 2, 3-dipropylbut-2-ene

(C) 4-methyl-5-propylhex-4-ene

(D) none of the above

QUESTION

The IUPAC name of  is:

(A) 7-Ethyl-2, 4, 5, 6-tetramethyldeca-1, 8-diene

(B) 7-Ethyl-2, 4, 5, 6-tetramethyldeca-1, 7-diene

(C) 7-(1-Propenyl)-2, 3, 4, 5-tetramethyl-non-1-ene

(D) 4-Ethyl-5, 6, 7, 9-tetramethyldeca-2, 9-diene

Home Work From PW Module (Yakeen NEET)

Prarambh: Q 02, 04, 13, 25, 36

Prabal: Q 08, 09

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11th NEET REAL TEST SERIES SYLLABUS

Cohort	Class	Name of the Test	Exam Date	Mode	Physics	Chemistry	Botany	Zoology
NEET	11	Test 1	13-Oct-2024	Online	Basic Maths & Calculus (Mathematical Tools) Vectors Units and Measurements Motion in a straight line	Structure of Atom Some Basic Concepts of Chemistry Classification of Elements and Periodicity in Properties	Cell - The Unit of Life Cell Cycle and Cell Division	Structural Organization in Animals Breathing and Exchange of Gases

12th NEET REAL TEST SERIES SYLLABUS

Cohort	Class	Name of the Test	Exam Date	Mode	Physics	Chemistry	Botany	Zoology
NEET	12	Test 1	13-Oct-2024	Online	Electric Charges and Fields Electrostatic Potential and Capacitance	Solution Electrochemistry	Sexual Reproduction in Flowering Plant	Human Reproduction

DROPPER NEET REAL TEST SERIES SYLLABUS

Cohort	Class	Name of the Test	Exam Date	Mode	Physics	Chemistry	Botany	Zoology
NEET	Dropper	Test 1	13-Oct-2024	Online	Basic Maths & Calculus (Mathematical Tools) Vectors Units and Measurements Motion in a straight line Motion in a plane Circular motion Laws of motion	Some Basic Concept of Chemistry Redox Reaction Solutions Thermodynamics Equilibrium Electrochemistry	Cell - The Unit of Life Cell Cycle and Cell Division The Living World Biological Classification Plant Kingdom Morphology of Flowering Plants	Structural Organization in Animals Breathing and Exchange of Gases Body Fluids and Circulation Excretory Products & their Elimination

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  Offline (10:00 to 11:00 AM & 04:00 to 05:00 PM)
- **Exam Duration:** 60 Minutes

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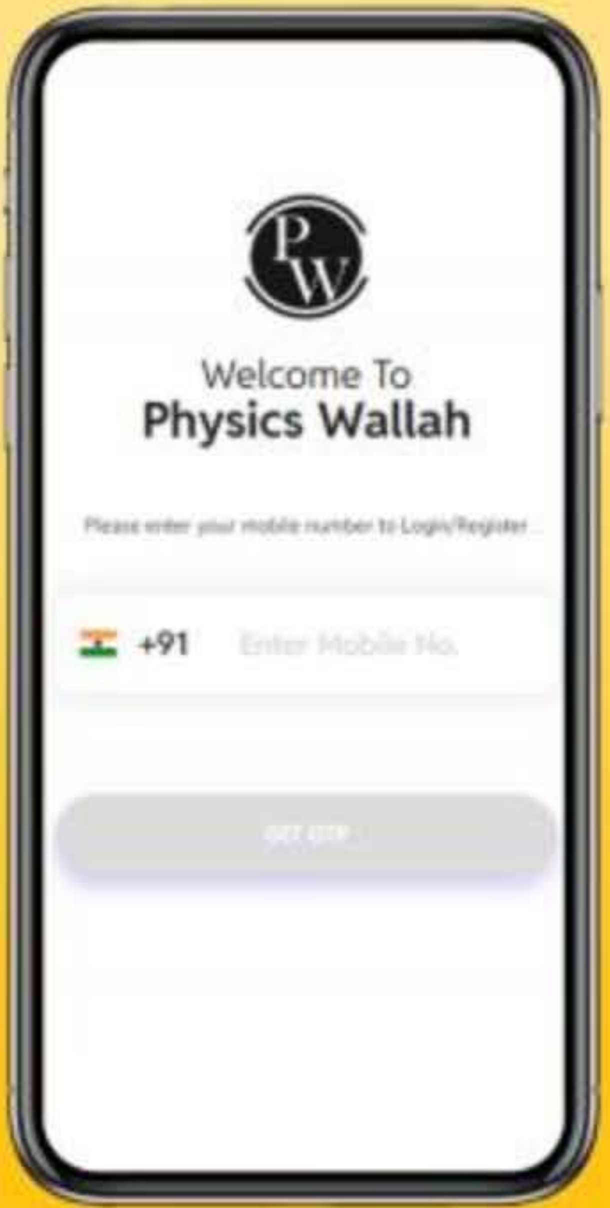

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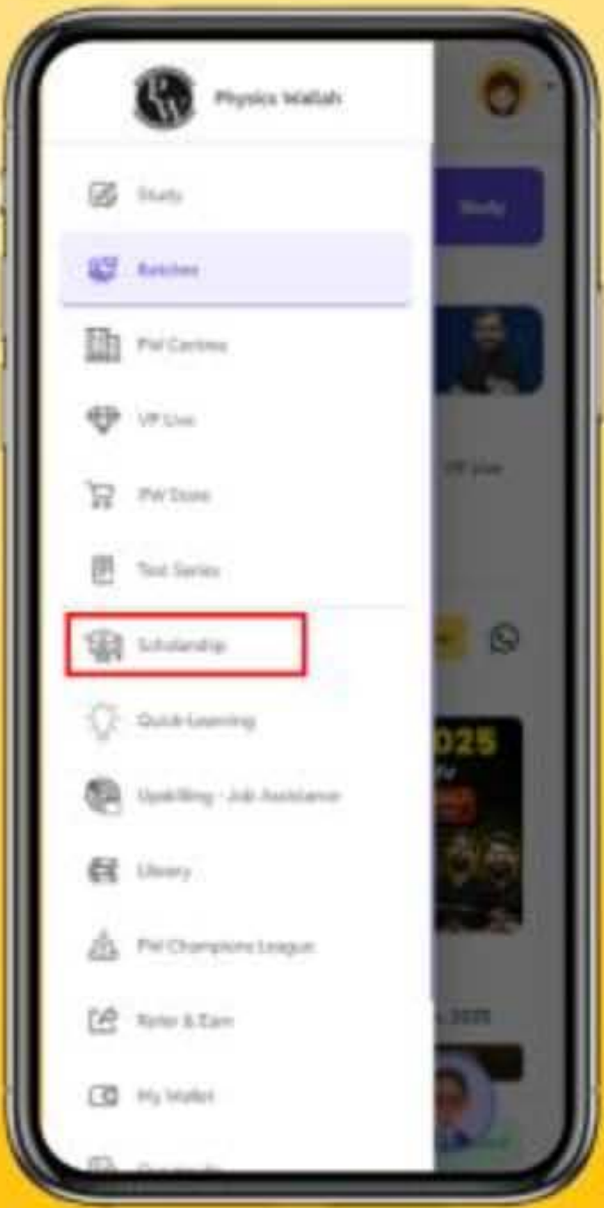

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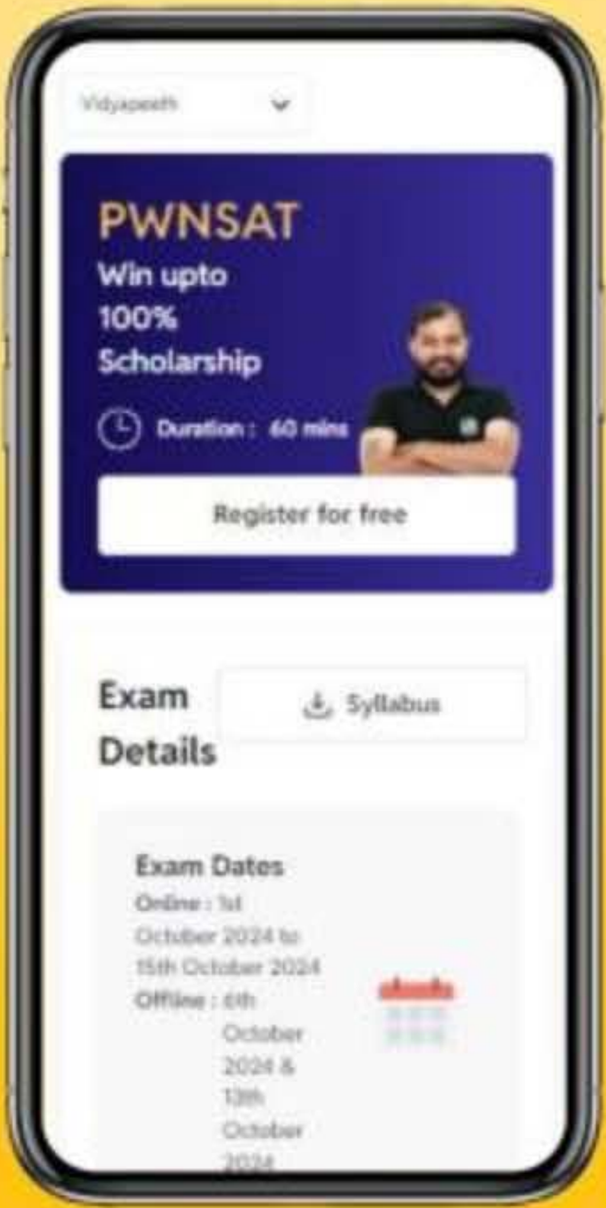

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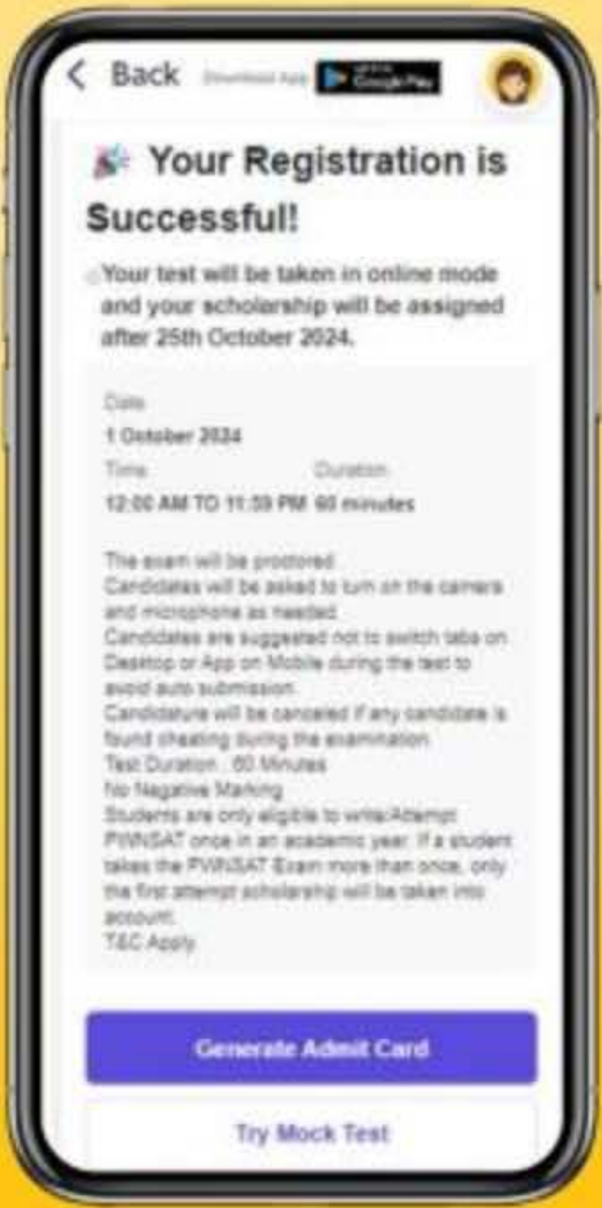

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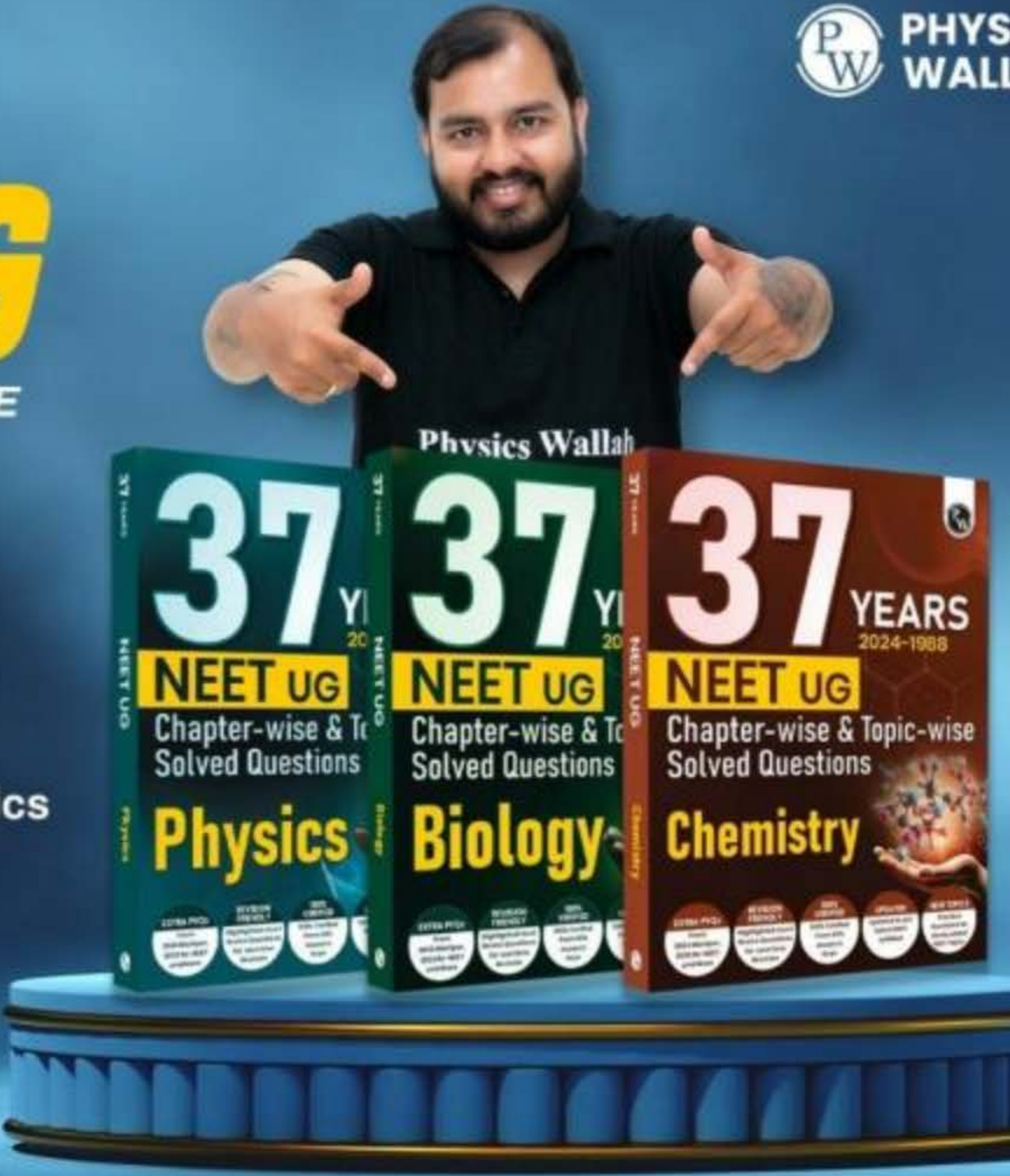

Physics Wallah
37 YEARS 2024-1988
NEET UG
Chapter-wise & Topic-wise Solved Questions
Physics
Biology
Chemistry

Thank you!!

YAKEEN 2.0

FOR NEET 2025

Lecture- 04 | **Organic Chemistry**

Some Basic Principles and Techniques (IUPAC Naming)

By- Pankaj Sir(POPU MAMA)

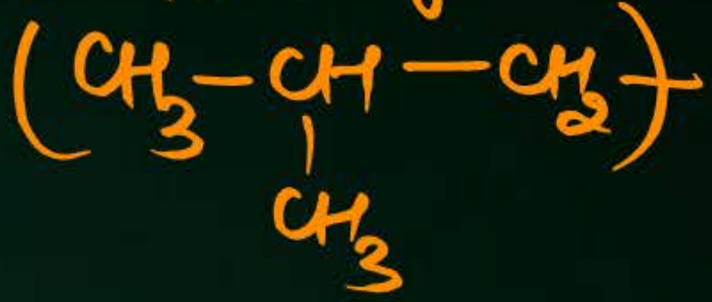
Physics Wallah

Topics *to be covered*

1. IUPAC Naming of Compounds having Functional Groups ✓
2. Practice

IUPAC Nomenclature

isobutyl



$$(CH_3-\underset{\underset{CH_3}{|}}{CH}-CH_2-)$$

IUPAC Naming

✓

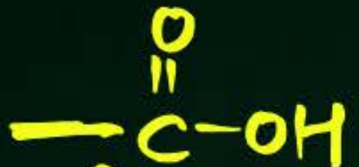
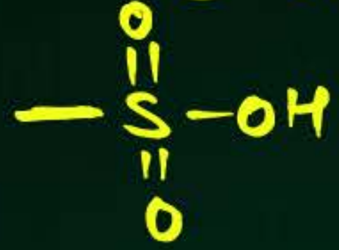
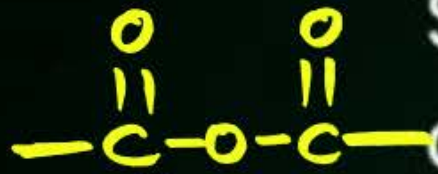
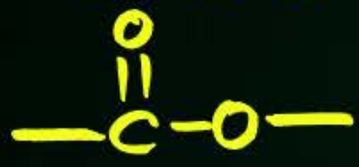
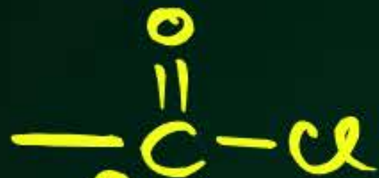
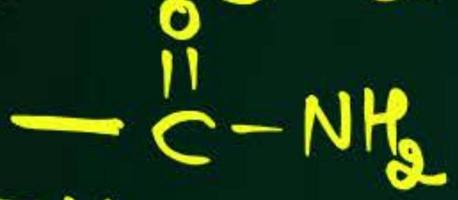
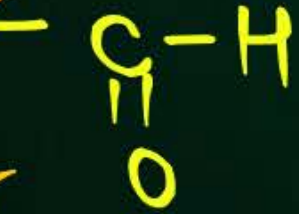
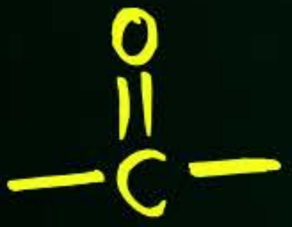
Rule: Prefix-2 + Prefix-1 + Word Root + Suffix-1 + Suffix-2

×

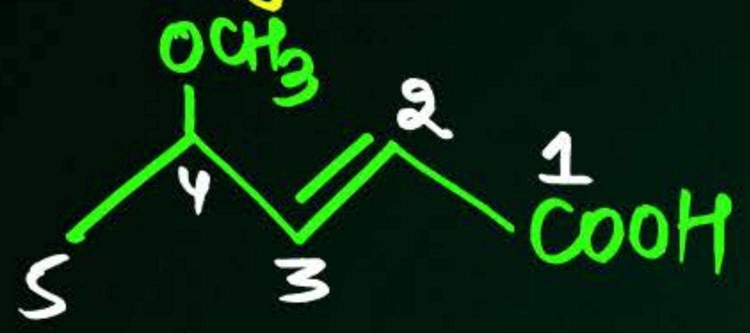
P.F.G

(Princi func^n groups)

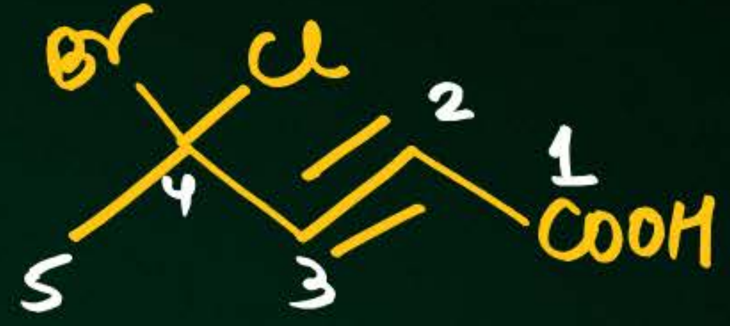
$\boxed{\text{Suffix-2} > \text{suffix-1} > \text{prefix-2}}$

P.F.G		Suffix-2
Carboxylic acid	 $-\overset{O}{\overset{\|}{C}}-OH$	oic acid ✓
Sulphonic acid	 $-\overset{O}{\overset{\|}{\underset{\underset{O}{\|}}{S}}}-OH$	Sulphonic acid ✓
anhydride	 $-\overset{O}{\overset{\|}{C}}-O-\overset{O}{\overset{\|}{C}}-$	oic anhydride ✓
Ester	 $-\overset{O}{\overset{\|}{C}}-O-$	oate ✓
acid chloride	 $-\overset{O}{\overset{\|}{C}}-Cl$	oyl chloride ✓
acid amide	 $-\overset{O}{\overset{\|}{C}}-NH_2$	amide ✓
cyanide	$-C\equiv N$	nitrile ✓
isocyanide	$-\overset{+}{N}\equiv\overset{-}{C}$	isonitrile ✓
aldehyde	 $-\underset{\underset{O}{\|}}{C}-H$	al ✓
ketone	 $-\overset{O}{\overset{\|}{C}}-$	one ✓
alcohol	$-OH$	ol ✓
thiol	$-SH$	thiol ✓
amine	$-NH_2$	amine ✓

① Carboxylic acid (–COOH)   oic acid

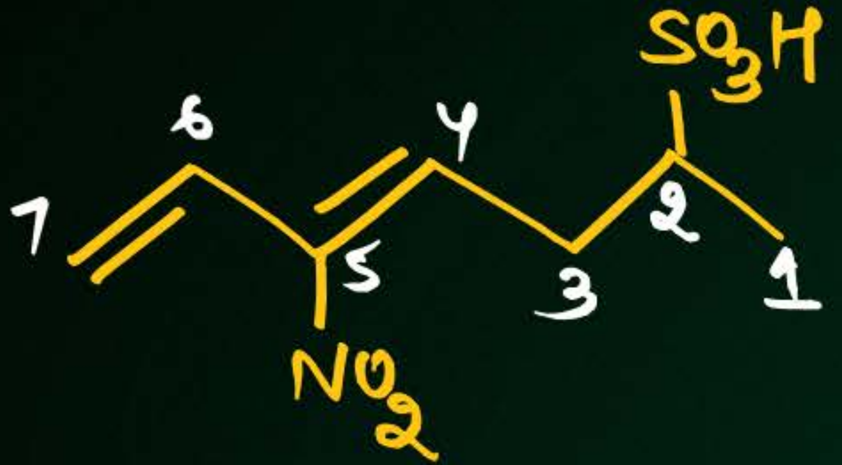

OCH3
2
1
COOH
4
5
3

4-Methoxy pent-2-en~~e~~-1-oic acid


Br
Cl
2
1
COOH
4
5
3

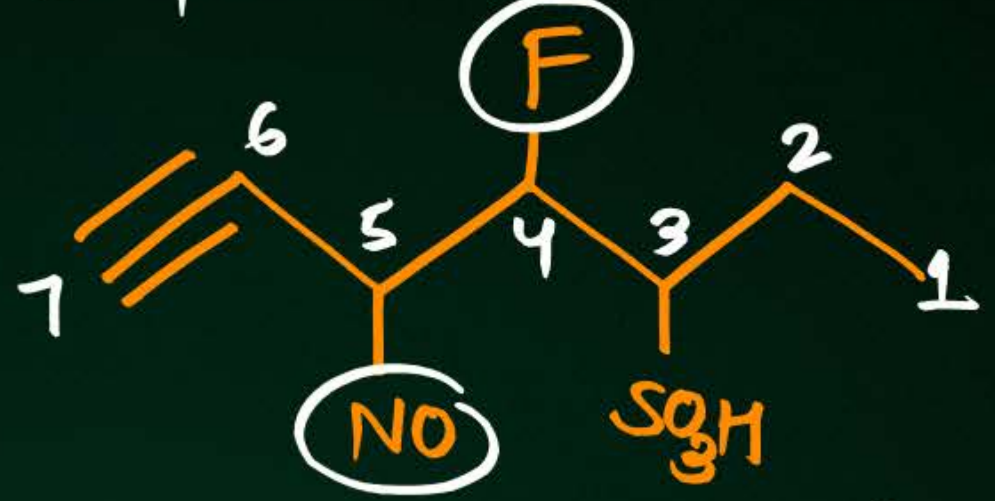
4-Bromo-4-chloro pent-2-yn~~e~~-1-oic acid

② sulphonic acid ($-SO_3H$)


SO_3H
7
6
4
2
5
3
1
NO_2

5-Nitro hepta-4,6-diene -2-sulphonic acid

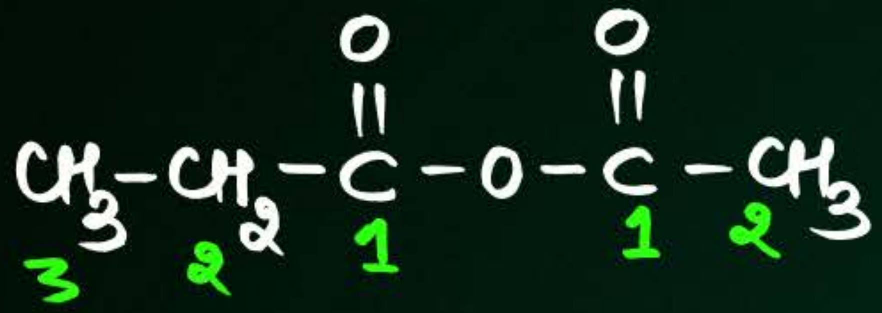
sulphonic acid


F
6
2
5
4
3
7
1
NO
SO_3H

4-fluoro-5-nitroso hept-6-yne-3-sulphonic acid.

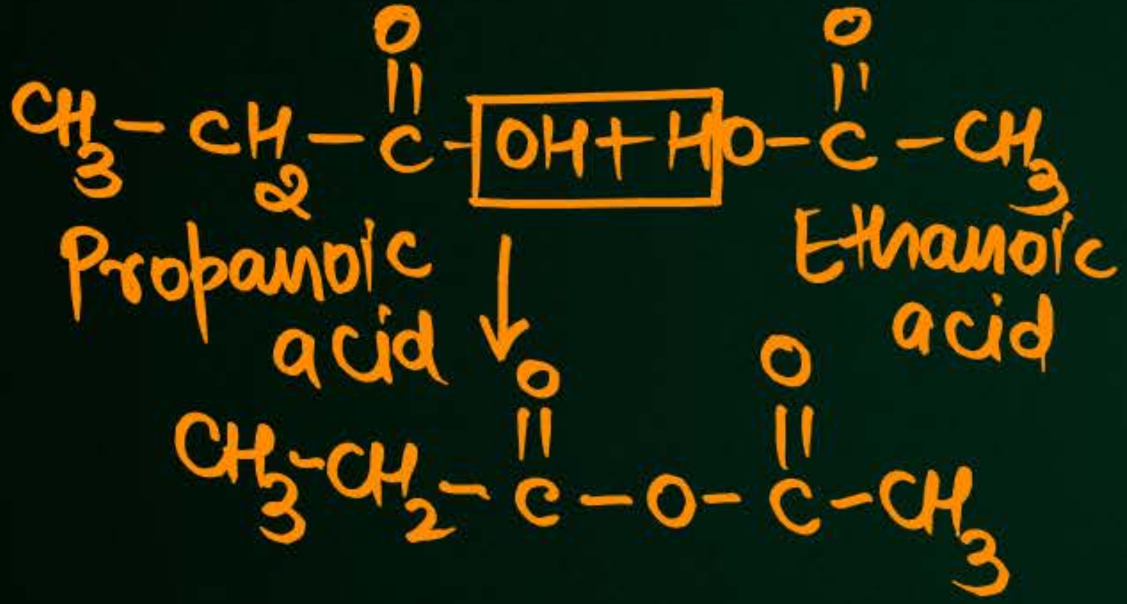
③ Anhydride ($-\overset{O}{\overset{\|}{C}}-O-\overset{O}{\overset{\|}{C}}-$)

oic anhydride



$CH_3-CH_2-\overset{O}{\overset{\|}{C}}-O-\overset{O}{\overset{\|}{C}}-CH_3$

Ethanoic propanoic anhydride



$CH_3-CH_2-\overset{O}{\overset{\|}{C}}-\boxed{OH+H}O-\overset{O}{\overset{\|}{C}}-CH_3$

Propanoic acid

Ethanoic acid

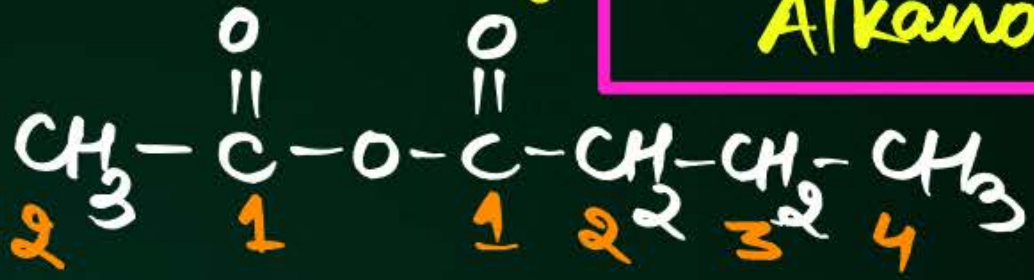
$\downarrow$

$CH_3-CH_2-\overset{O}{\overset{\|}{C}}-O-\overset{O}{\overset{\|}{C}}-CH_3$

unsymm $\Rightarrow$ IUPAC ÷ Alphabeti order

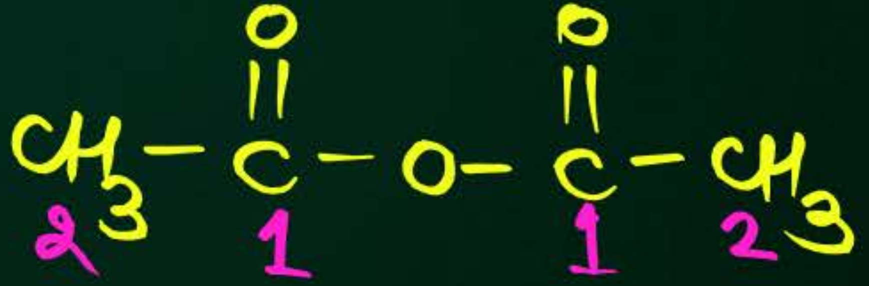
Alkanoic alkanoic anhydride

symm IUPAC ÷ Alkanoic anhydride



$CH_3-\overset{O}{\overset{\|}{C}}-O-\overset{O}{\overset{\|}{C}}-CH_2-CH_2-CH_3$

Butanoic ethanoic anhydride

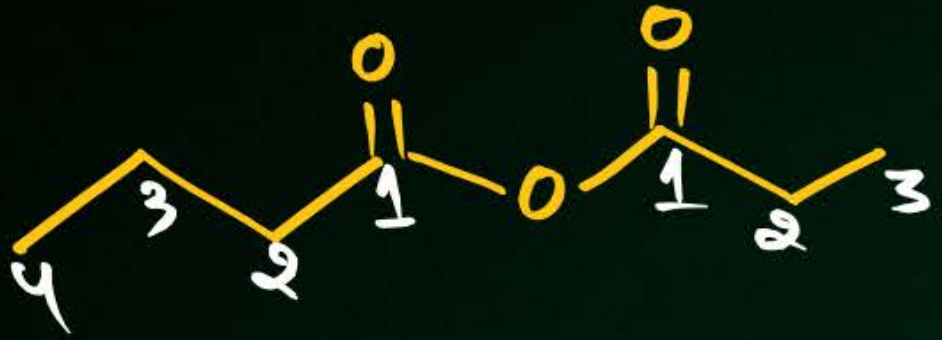


$CH_3-\overset{O}{\overset{\|}{C}}-O-\overset{O}{\overset{\|}{C}}-CH_3$

Ethanoic ethanoic anhydrid ✗

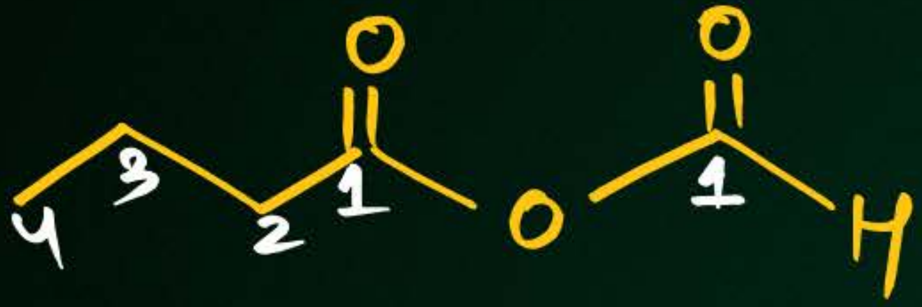
Ethanoic anhydride ✓

①


O
O
4
3
2
1
O
1
2
3

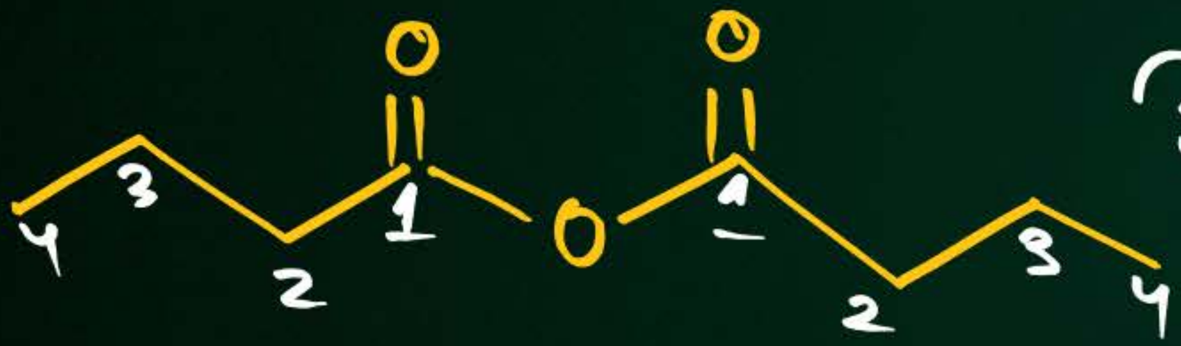
Butanoic propanoic anhydride

②

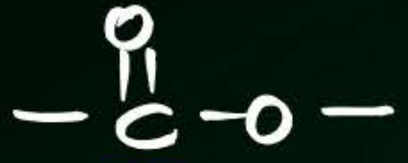


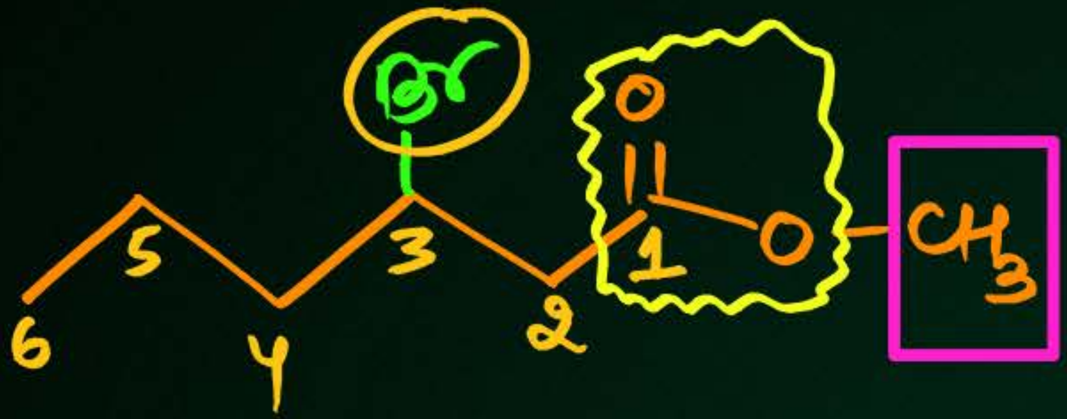
Butanoic methanoic anhydride

③

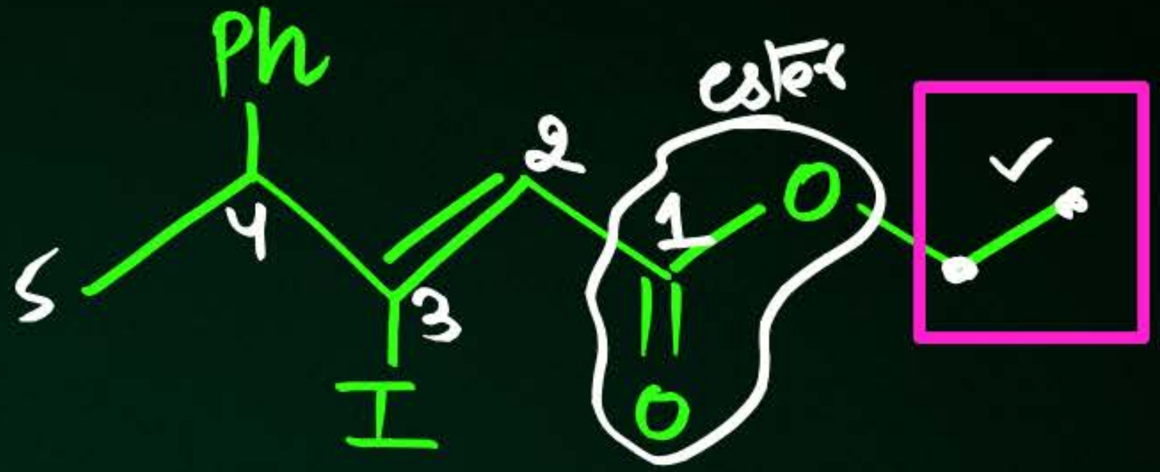

O
O
4
3
2
1
O
1
2
3
4

Butanoic anhydride

④ Ester  $-\overset{O}{\overset{\|}{C}}-O-$ oate

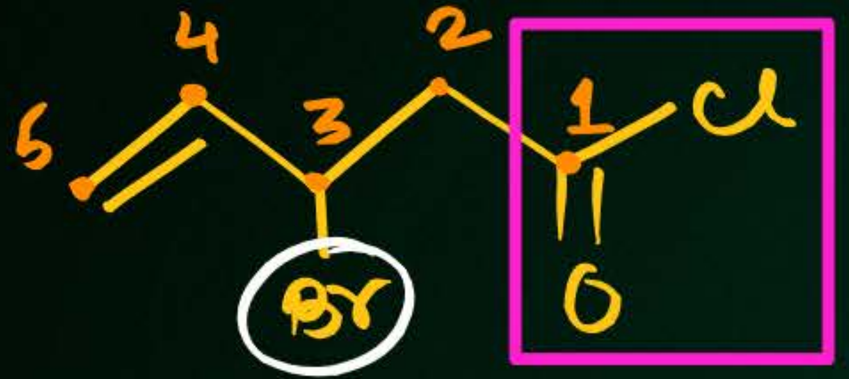

Br
O
1
O
CH$_3$
6
5
4
3
2

Methyl-3-bromohexan~~e~~-1-oate

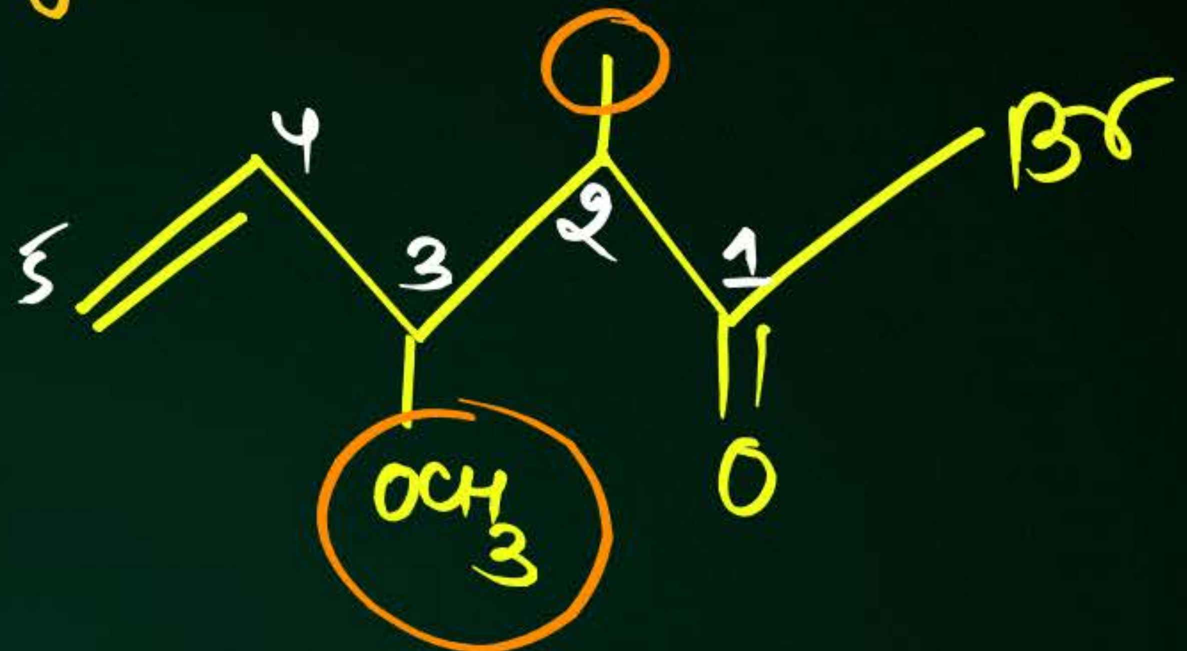

Ph
ester
5
4
3
2
1
O
O
I
✓

Ethyl-3-iodo-4-phenyl pent-2-en~~e~~-1-oate

③ Acid chloride $-\overset{O}{\overset{\|}{C}}-Cl$ (oyl chloride)


4
2
5
3
1
Cl
Br
O

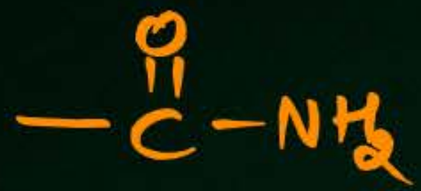
3-Bromo pent-4-en~~e~~-1-oylchloride


4
5
3
2
1
Br
OCH3
O

~~meth~~oxy
~~meth~~yl

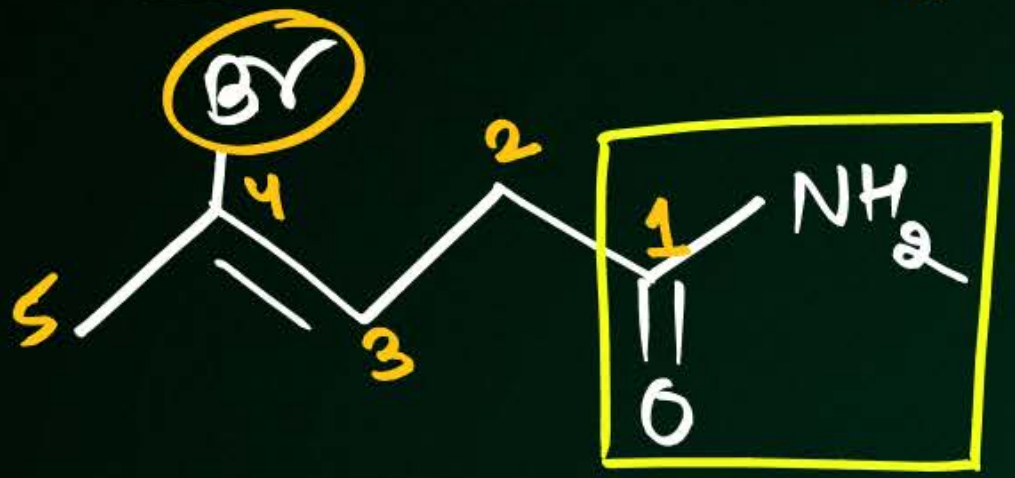
3-methoxy-2-methyl
pent-4-en~~e~~-1-oylbromide

⑥ Acid amide

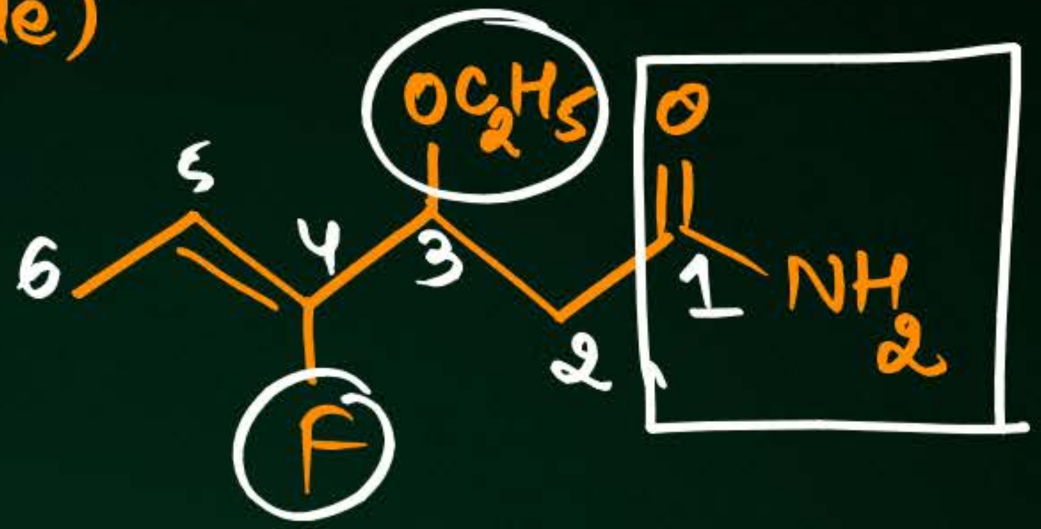


$-\overset{O}{\overset{||}{C}}-NH_2$

(amide)

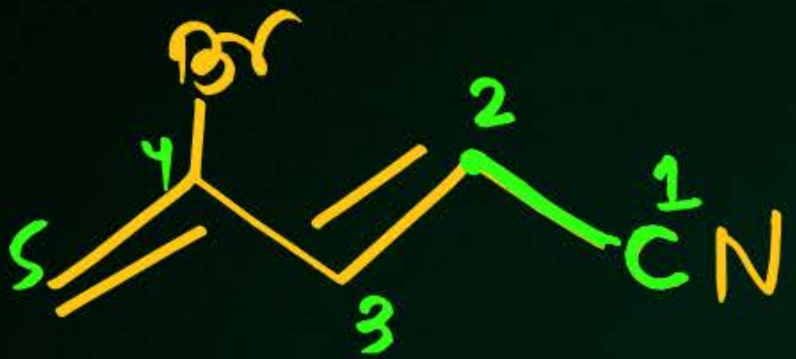

Br
4
5
3
2
1
NH_2
O

4-Bromo pent-3-en~~e~~-1-amide

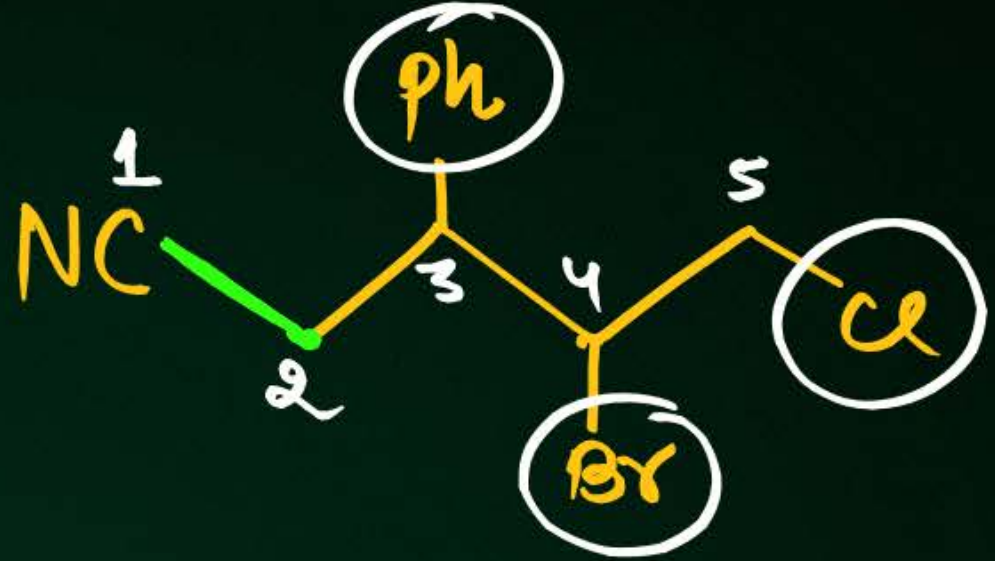

6
5
4
3
OC_2H_5
O
1
NH_2
2
F

3-Ethoxy-4-fluoro hex-4-en~~e~~
-1-amide

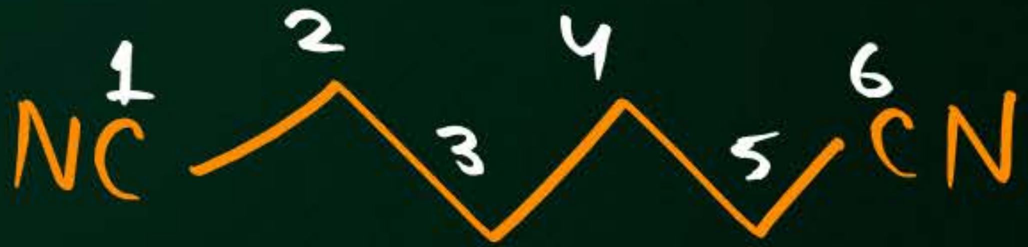
① cyanide —C≡N (nitrile)



4-Bromo penta-2,4-diene
-1- nitrile

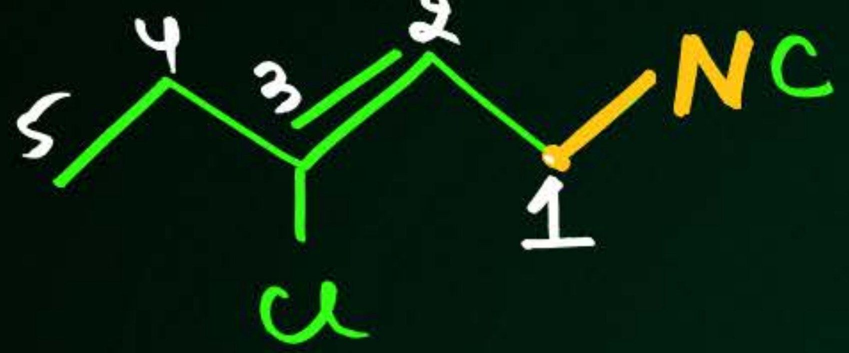

Ph
1
NC
5
3
4
Cl
2
Br

4-Bromo-5-Chloro-3-phenyl
pentane-1-nitrile

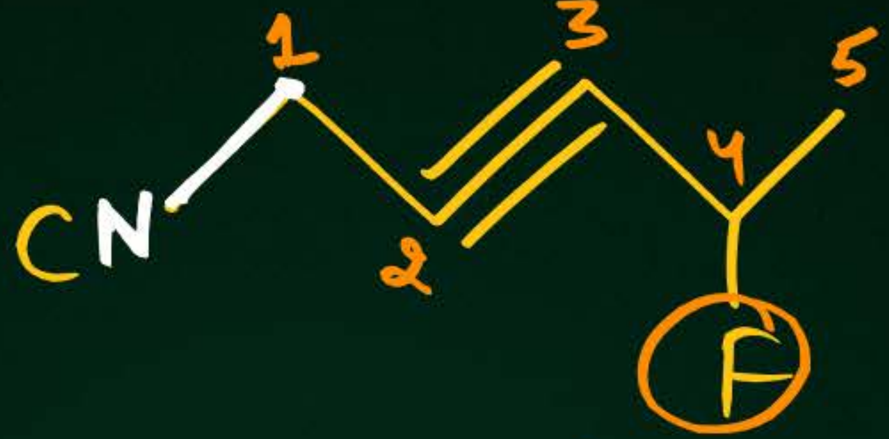

1
2
4
6
NC
3
5
CN

Hexane-1,6-dinitrile

⑧ Isocyanide (NC)   isonitrile

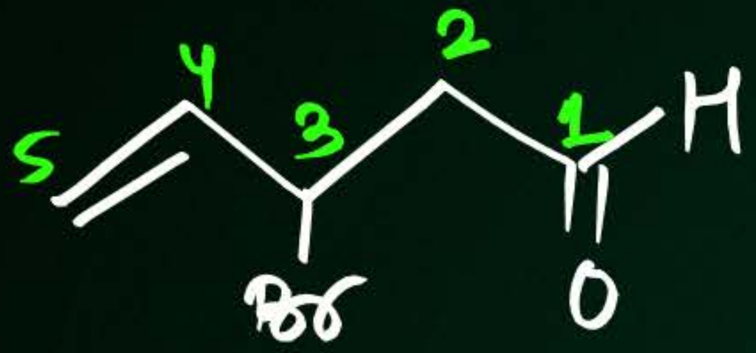


3-chloro pent-2-en~~e~~
-1-isonitrile

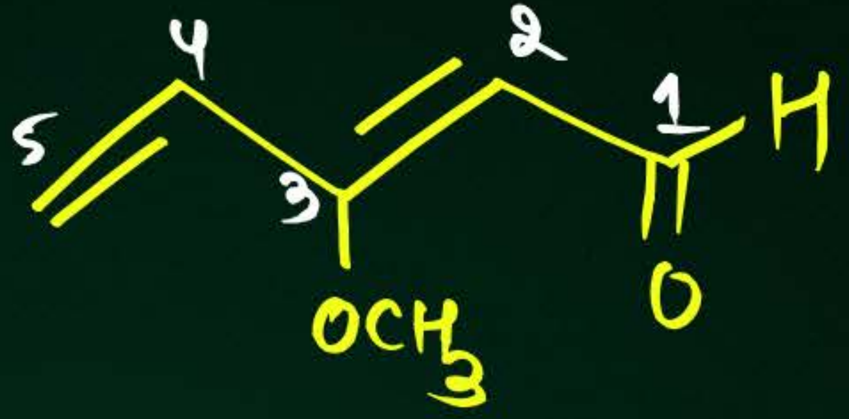


4-Fluoro pent-2-yn~~e~~-1-isonitrile

⑨ Aldehyde ($-CHO$) al



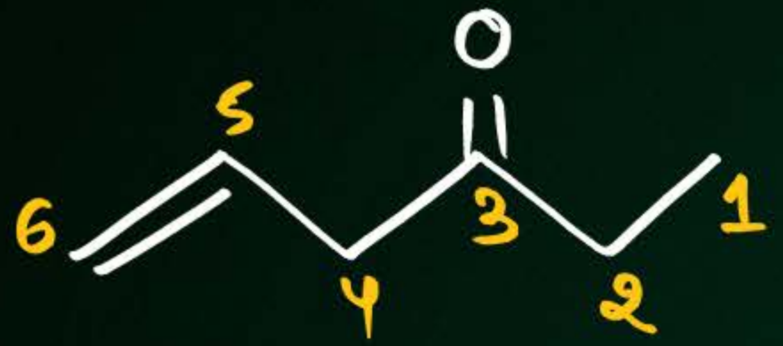
3-Bromo pent-4-en~~e~~-1-al


5
4
3
2
1
H
OCH3
O

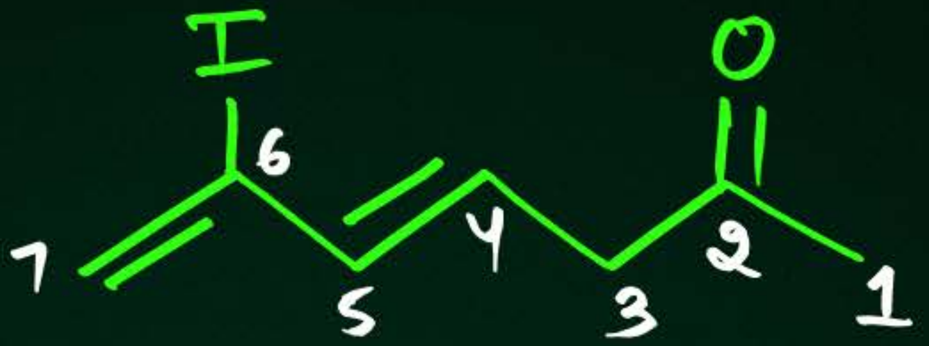
3-methoxy penta-2,4-dien~~e~~-1-al

⑩ Ketone (
$\left(-\overset{O}{\overset{\|}{C}}-\right)$)

One

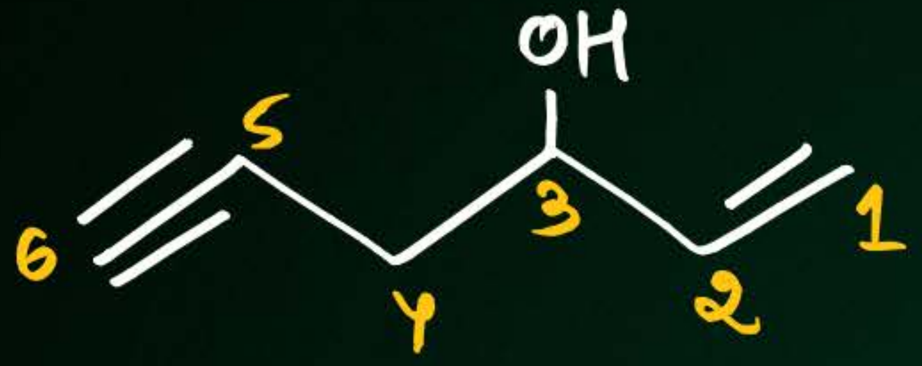


Hex-5-en~~e~~-3-one

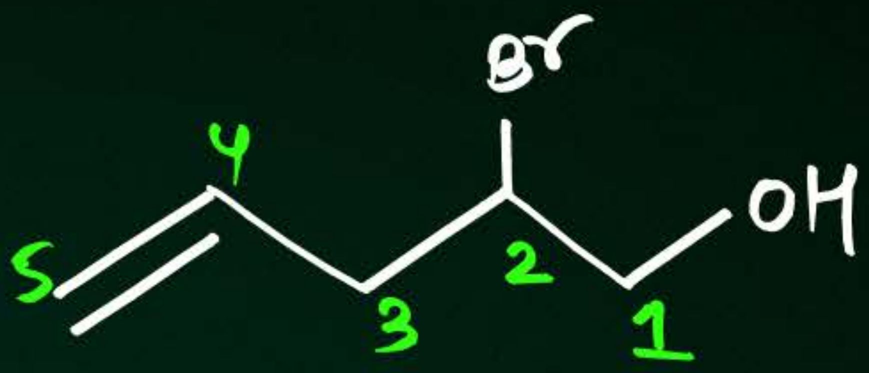


6-Iodo hepta-4,6-dien~~e~~-2-one

⑪ Alcohol (-OH) ol

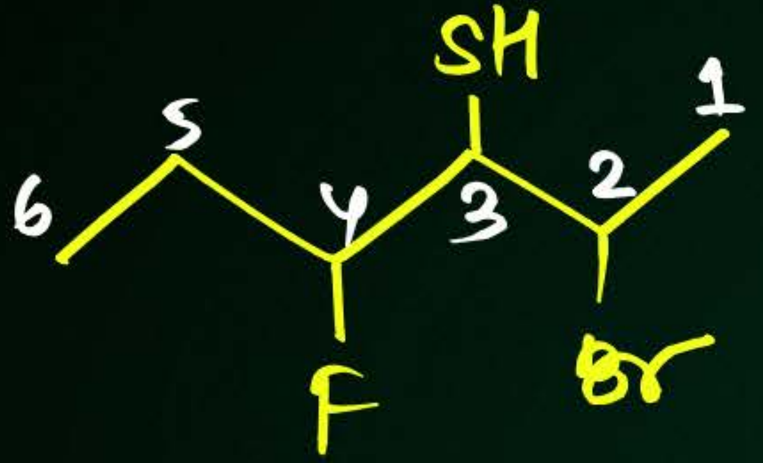


Hex-1-en~~e~~-5-yn~~e~~-3-ol

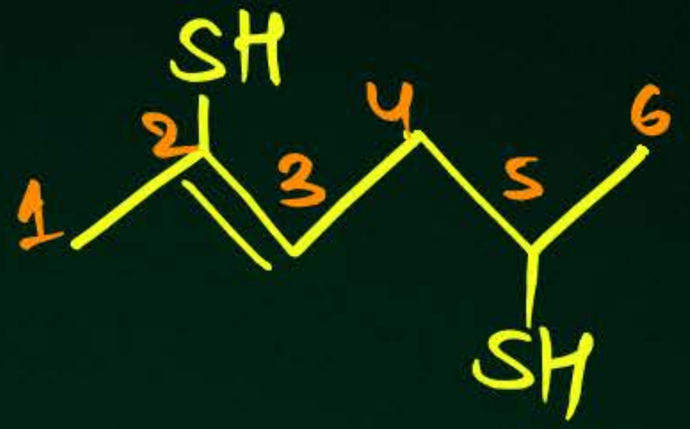


2-Bromopent-4-en~~e~~-1-ol

⑫ thiol (–SH) thiol

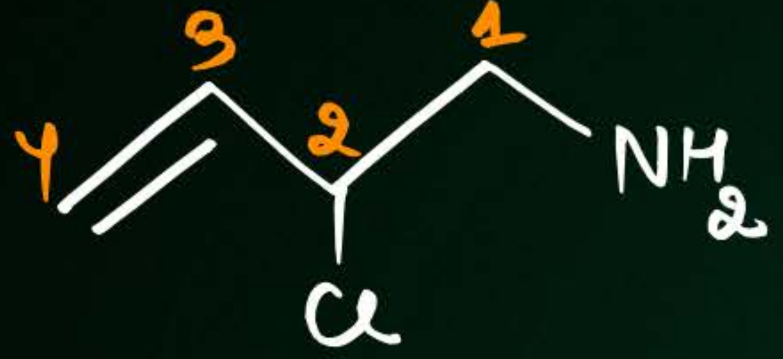

SH
1
2
3
4
5
6
F
Br

2-Bromo-4-fluorohexane-3-thiol

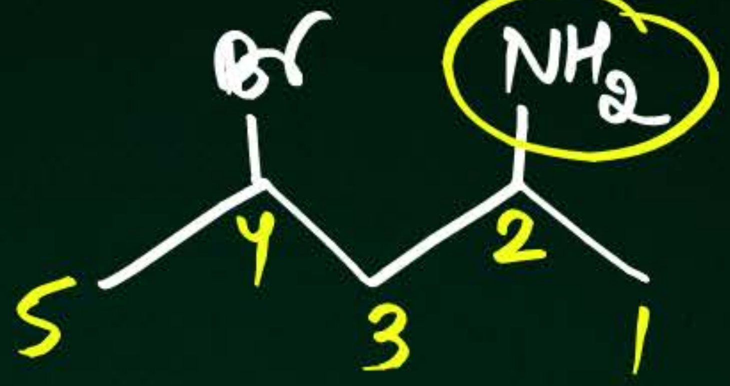

SH
1
2
3
4
5
6
SH

Hex-2-ene-2,5-dithiol

⑬ Amine $(-NH_2)$ amine



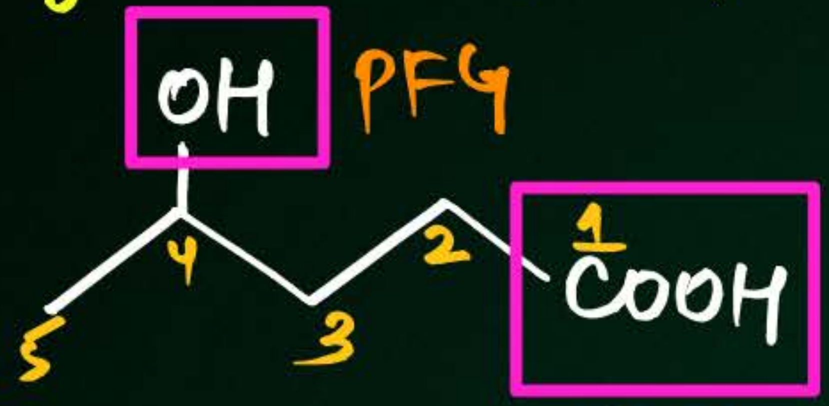
2-chloro but-3-en~~e~~-1-amine



Br
NH_2
5
4
3
2
1

4-Bromo pentan~~e~~-2-amine

IUPAC of mixed P.F.G


OH
PFG
5
4
3
2
1
COOH
PFG

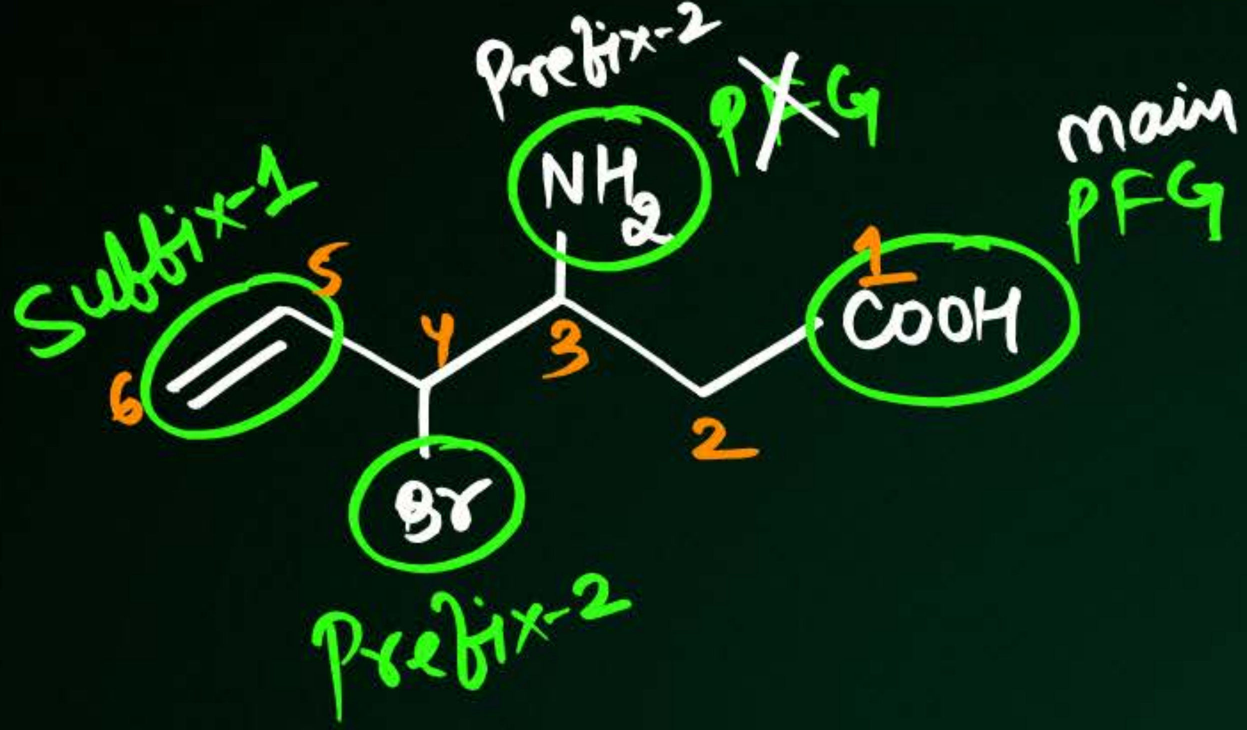
4-Hydroxy pentan~~e~~-1-oic acid

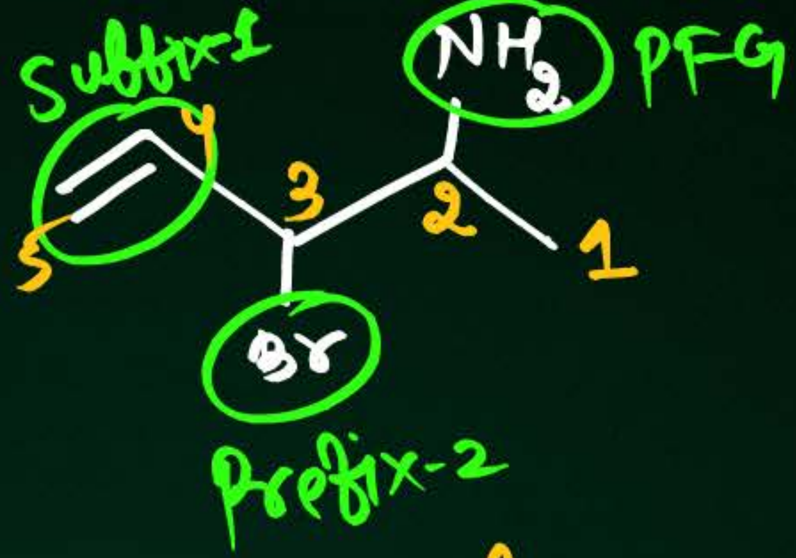
Priority

COOH > OH

COOH ↓ main PFG Suffix-2

OH → Prefix-2 → Hydroxy


Prefix-2
P~~F~~G
NH2
main
PFG
Suffix-1
5
6
4
3
2
1
COOH
Br
Prefix-2


Suffix-1
NH2
PFG
4
3
2
1
5
Br
Prefix-2

3-Bromo pent-4-en~~e~~-2-amine

3-Amino-4-bromo hex-5-en~~e~~-1-oic acid

Priority:

PFG > Multiple bonds > Number of C atoms > Maximum number of Substituents > Lowest locant > alphabetical order

IUPAC Naming of Principal Functional groups

Suffixes-2

Carboxylic acid > Sulphonic acid > anhydride > Ester > acid chloride > acid amide > cyanide > isocyanide > aldehyde > ketone > alcohol > thiol > amine

P.F.G	Prefix-2
Carboxylic acid	carboxy ✓
Sulphonic acid	Sulpho
anhydride	-
Ester	Alkoxycarbonyl
acid chloride	chlorocarbonyl
acid amide	carbamoyl
cyanide	cyano
isocyanide	isocyano
aldehyde **	aldo and formyl
ketone	keto or oxo
alcohol	hydroxy
thiol	mercapto
amine	amino

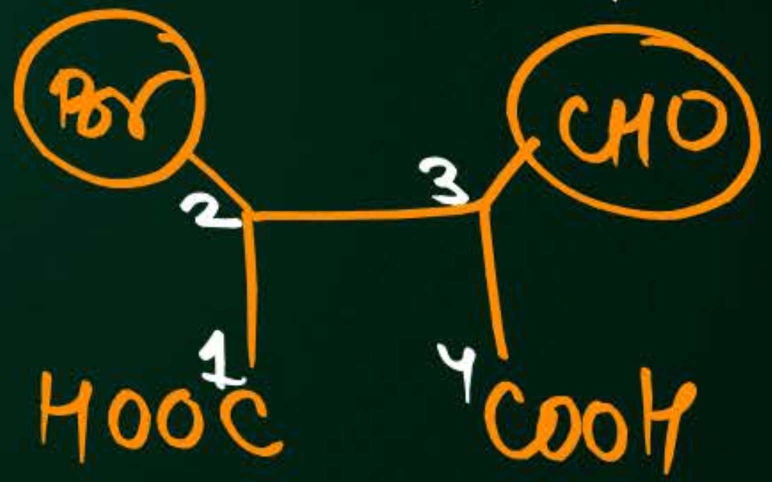
Kab formyl Kab Aldo ?

$\overset{4}{OHC}-\overset{3}{CH_2}-\overset{2}{CH_2}-\overset{1}{COOH}$

4-Aldo Butanoic acid

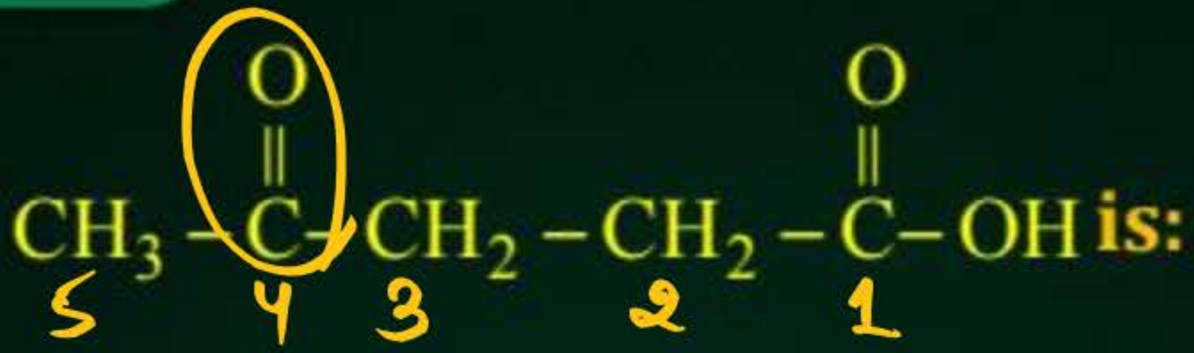
$\boxed{OHC}-\overset{3}{CH_2}-\overset{2}{CH_2}-\overset{1}{COOH}$

3-formyl propanoic acid



2-Bromo-3-formyl butane-1,4-dioic acid

QUESTION (NCERT Exemplar)

The IUPAC name for 

$\underset{5}{CH_3}-\underset{4}{\overset{\overset{\displaystyle O}{\|}}{C}}-\underset{3}{CH_2}-\underset{2}{CH_2}-\underset{1}{\overset{\overset{\displaystyle O}{\|}}{C}}-OH$ **is:**

A 1-hydroxypentane-1,4-dione ✗

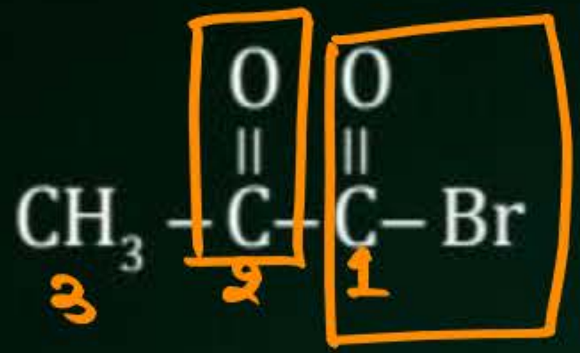
B 1,4-dioxopentanol ✗

C 1-carboxybutan-3-one ✗

D 4-oxopentanoic acid ✓

QUESTION

IUPAC name of



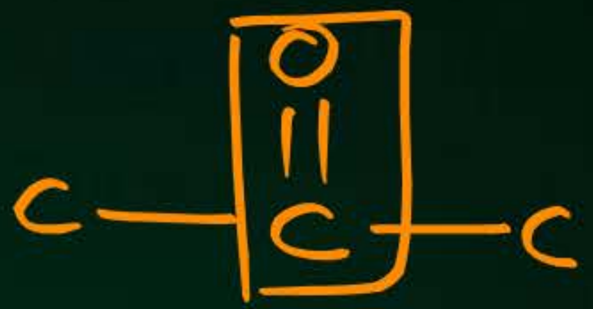
$CH_3-\overset{\overset{O}{\|}}{C}-\overset{\overset{O}{\|}}{C}-Br$

A 1-Bromo propan-1, 2-dione

B 3-Bromo propan -2, 3-dione

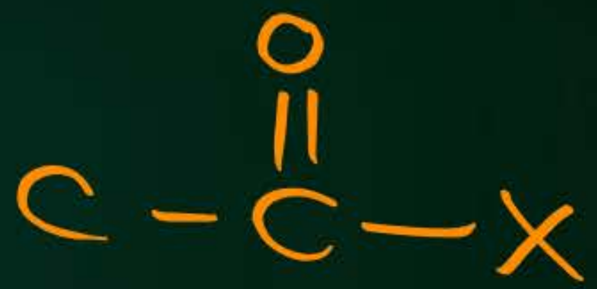
C 2-Oxo-3-propanoyl bromide

[✓ **D**] 2-Oxo propanoyl bromide



$C-\overset{\overset{O}{\|}}{C}-C$

Ketone

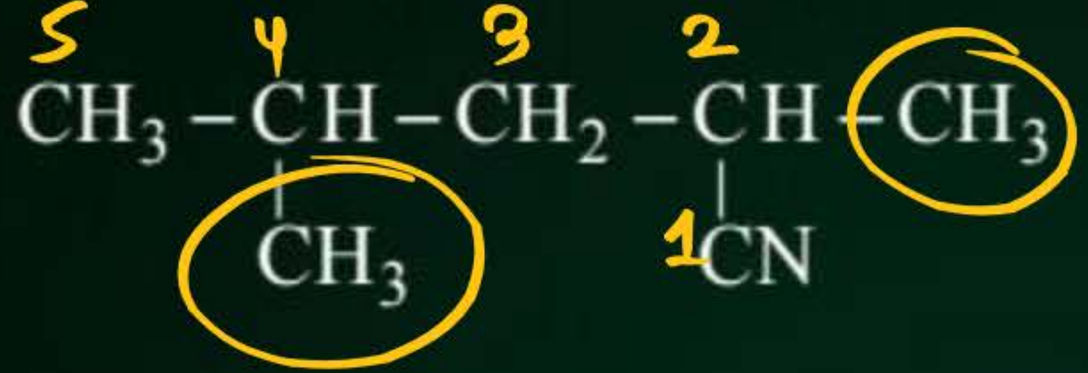


$C-\overset{\overset{O}{\|}}{C}-X$

acid halide

QUESTION (AIIMS 2002)

IUPAC name of

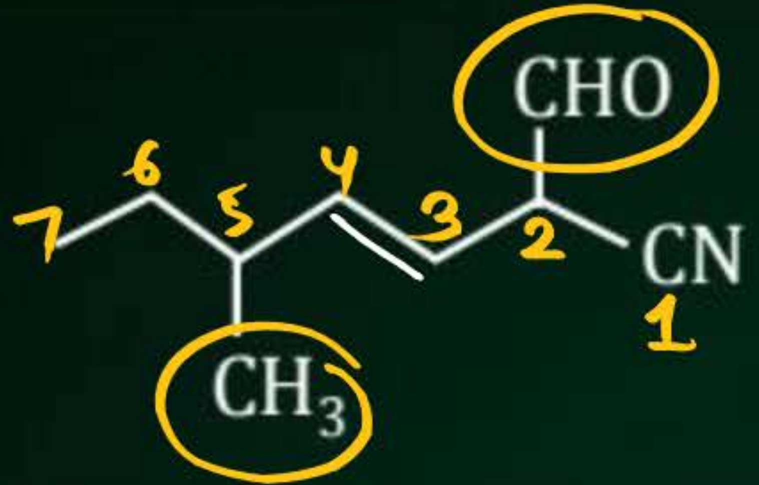


$$\overset{5}{CH_3}-\underset{CH_3}{\overset{4}{C}H}-\overset{3}{C}H_2-\underset{{}^{1}CN}{\overset{2}{C}H}-CH_3$$

- **A** 2-cyano-3-methylhexane
- **B** ✓ 2, 4-dimethyl[illegible]pentane -1-nitrile
- **C** 3-methyl-5-cyanohexane
- **D** 2-cyano-3-methylhexane

QUESTION (AIIMS 27 May, 2018)

Give IUPAC name of:



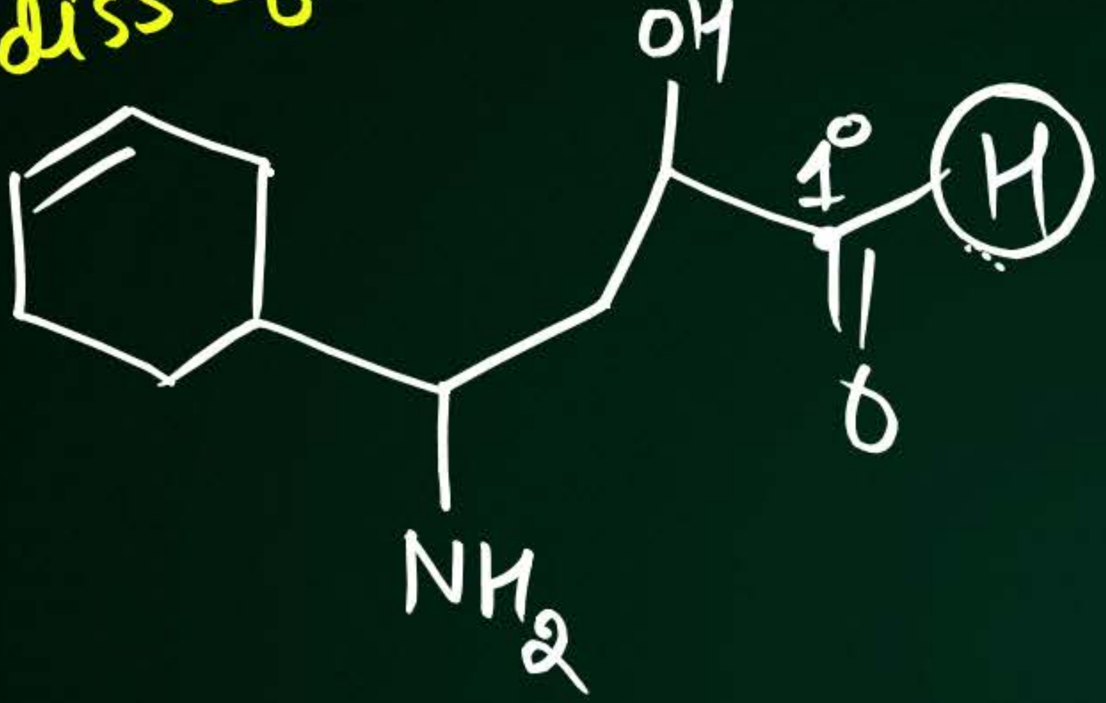
A 2-cyano-5-methyl hept-3-enal

[✓ B] 2-formyl-5-methyl hept-3-enenitrile

C 2-oxo-5-methyl hept-3-ene-1-nitrile

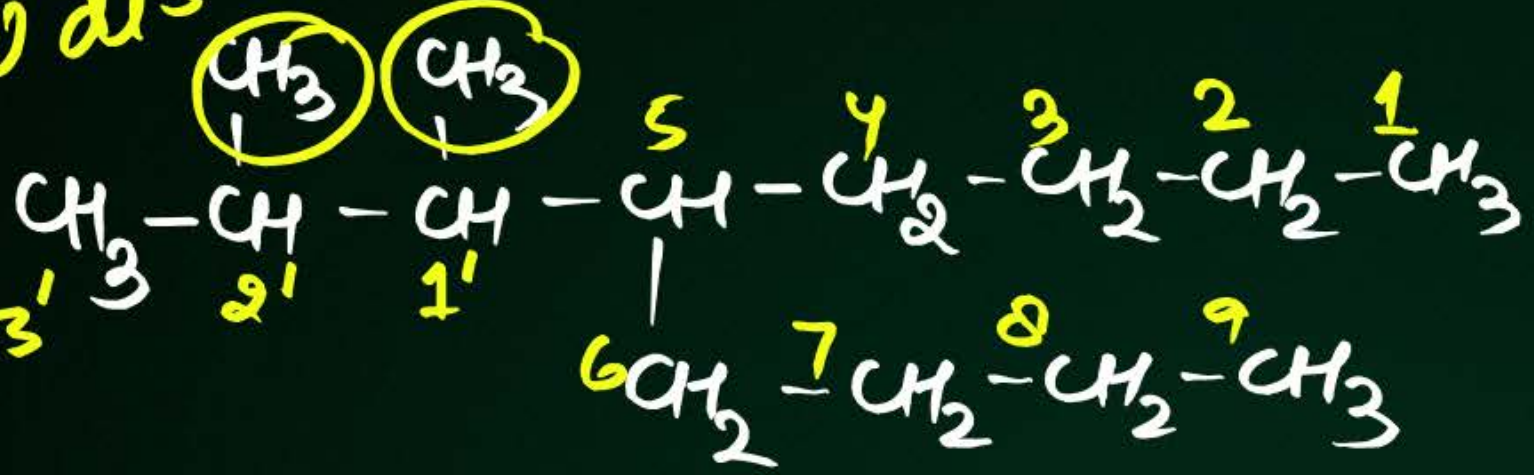
D 1-cyano-1-formyl-4-methyl hex-2-ene

Corrections
in H.w diss of L-1



1°H = ⑨

Correction
in H.W dis L-2



CH_3
CH_3
5
4
3
2
1
$CH_3-CH-CH-CH-CH_2-CH_2-CH_2-CH_3$
3'
2'
1'
6
7
8
9
$CH_2-CH_2-CH_2-CH_3$

5-(1',2'-Dimethyl propyl) Nonane

Ans (B)

Home Work

QUESTION 01

The IUPAC name of $CH_3CH(OH)CH_2CH_2COOH$ is:

(A) 4-hydroxy pentanoic acid

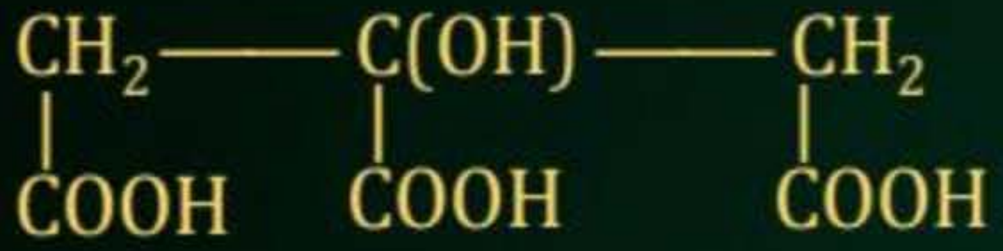
(B) 1-carboxybutan-3-ol

(C) 1-carboxybutan-4-ol

(D) 4-carboxybutan-2-ol

QUESTION 02

The name of the following compound is:



$$\underset{\mathrm{COOH}}{\underset{|}{\mathrm{CH_2}}} - \underset{\mathrm{COOH}}{\underset{|}{\mathrm{C(OH)}}} - \underset{\mathrm{COOH}}{\underset{|}{\mathrm{CH_2}}}$$

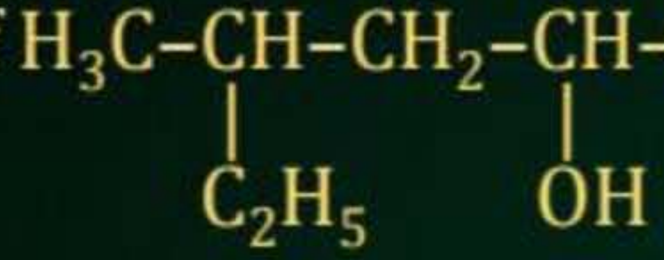
A 2-hydroxypropane-1, 2, 3-tricarboxylic acid

B 3-carboxy-3-hydroxy-1, 5-pentanedioic acid

C citric acid

D all of the above

QUESTION 03



The IUPAC name of $H_3C-\underset{C_2H_5}{\underset{|}{C}}H-CH_2-\underset{OH}{\underset{|}{C}}H-CH_2Cl$ is:

A 1-chloro-4-methylhexan-2-ol

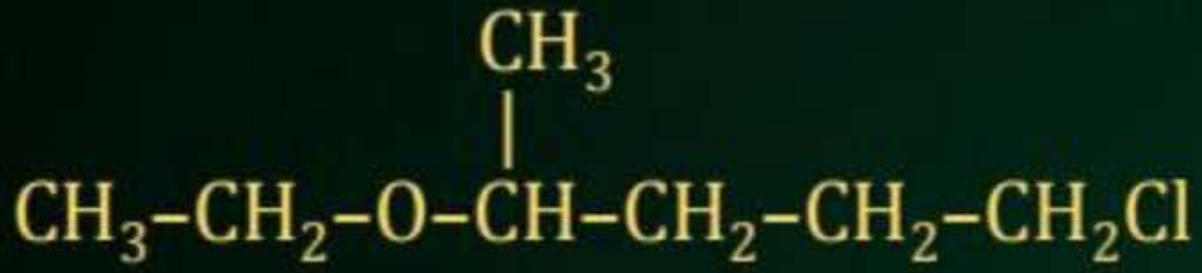
B 1-chloro-4-methylhexan-2-al

C 1-chloro-4-ethylpentan-2-ol

D 1-chloro-2-hydroxy-4-methylhexane

QUESTION 04

The correct IUPAC name for



$$CH_3-CH_2-O-\overset{\overset{\displaystyle CH_3}{|}}{C}H-CH_2-CH_2-CH_2Cl$$

is:

(A) 2-ethoxy-5-chloropentane

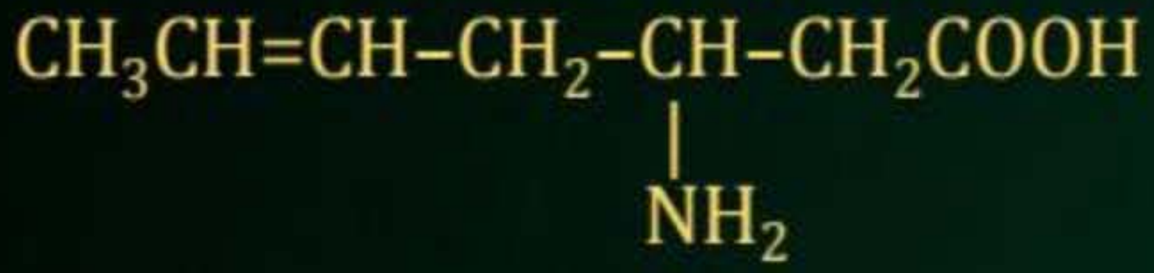
(B) 1-chloro-4-ethoxy-4-methyl butane

(C) 1-chloro-4-ethoxy pentane

(D) ethyl-1-chloropentyl ether

QUESTION 05

The IUPAC name of the following is:



$$CH_3CH{=}CH{-}CH_2{-}\underset{\substack{|\\ NH_2}}{CH}{-}CH_2COOH$$

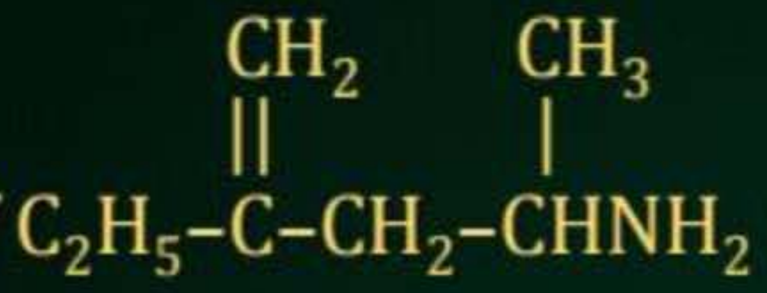
Ⓐ 3-aminohept-5-enoic acid

Ⓑ 5-aminohex-2-ene-carboxylic acid

Ⓒ 3-amino-δ-heptanoic acid

Ⓓ 5-aminohept-2-enoic acid

QUESTION 06



The IUPAC name of $C_2H_5-\overset{\overset{\displaystyle CH_2}{\|}}{C}-CH_2-\overset{\overset{\displaystyle CH_3}{|}}{C}HNH_2$ is:

A 4-amino-2-ethylpent-1-ene

B 2-ethylpentan-4-amine

C aminopent-4-ene

D 4-ethylpent-4-en-2-amine

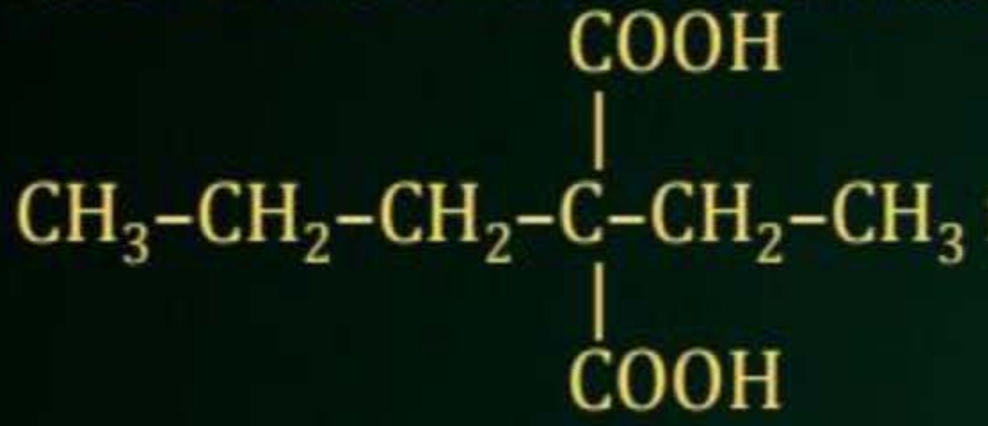
QUESTION 07

The IUPAC name of the compound $BrCH_2\text{–}(CONH_2)CH\text{–}CO\text{–}CH_2\text{–}CH_3$ is:

- A 2-(bromoethyl)-3-oxopentanamide
- B 2-(bromoethyl)-3keto pentanamide
- C 2-(bromomethyl)-3-oxopentanamide
- D 3-(bromoethyl)-3-oxopentanamide

QUESTION 08

The IUPAC name of the compound



$CH_3-CH_2-CH_2-\underset{\displaystyle COOH}{\overset{\displaystyle COOH}{\overset{|}{\underset{|}{C}}}}-CH_2-CH_3$ is:

Ⓐ 2-propyl-2-ethyl propanedioic acid

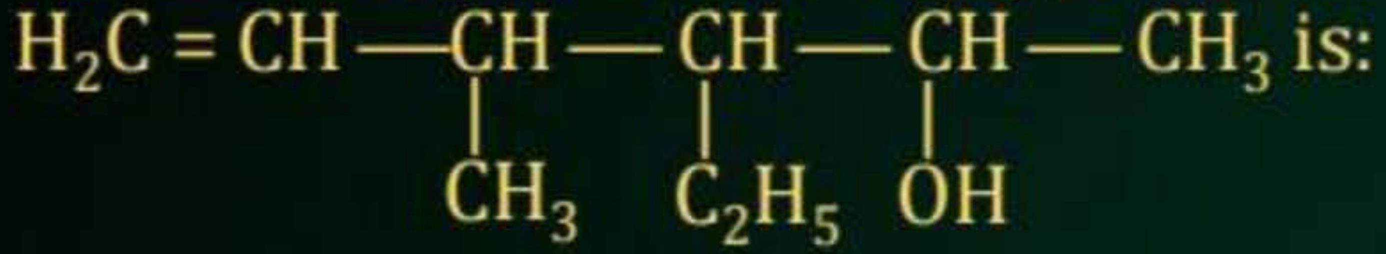
Ⓑ 2-ethyl-2-propyl propanedioic acid

Ⓒ 2-ethyl-2-carboxy pentanoic acid

Ⓓ 2-carboxy-2-ethyl pentanoid acid

QUESTION 09

The IUPAC name of the compound



$$H_2C=CH-\underset{CH_3}{\underset{|}{CH}}-\underset{C_2H_5}{\underset{|}{CH}}-\underset{OH}{\underset{|}{CH}}-CH_3 \text{ is:}$$

Ⓐ 3-ethyl-4-methylhex-5-en-2-ol

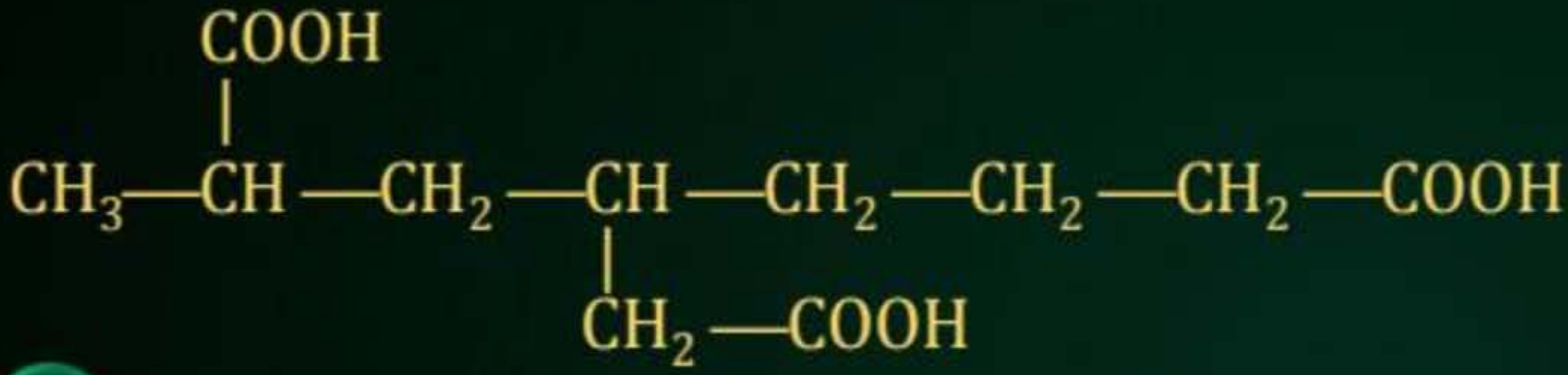
Ⓑ 3-methyl-4-ethylhex-1-en-5-ol

Ⓒ 3-ethy-2-hydroxy-4-methylhex-5-ene

Ⓓ none of the above

QUESTION 10

IUPAC name of the compound



$$CH_3-\overset{\displaystyle COOH}{\overset{|}{CH}}-CH_2-\underset{\underset{\displaystyle CH_2-COOH}{|}}{CH}-CH_2-CH_2-CH_2-COOH$$ is:

- **A** 2-methyl-4-ethanoic octane-1, 8-octanedioic acid
- **B** 2-methyl-4-(carboxy methyl) octane-1, 8-dioic acid
- **C** 2-methyl-1, 1, 6-heptane tricarboxylic acid
- **D** none of these

ANSWER KEY

1. A
2. D
3. A
4. A
5. A
6. D
7. C
8. B
9. A
10. B

Home Work From PW Module (Yakeen NEET)

Prarambh: Q 01, 05, 06, 08, 09, 10, 11, 12, 14, 23, 24, 26, 27, 44, 45, 59

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REAL TEST SERIES

Registration Closing Date for Test 01 – 10 Oct 2024

Exam Date - 13 Oct 2024 (online)

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NEET REAL TEST 01 SYLLABUS

11th NEET REAL TEST SERIES SYLLABUS

Cohort	Class	Name of the Test	Exam Date	Mode	Physics	Chemistry	Botany	Zoology
NEET	11	Test 1	13-Oct-2024	Online	Basic Maths & Calculus (Mathematical Tools) Vectors Units and Measurements Motion in a straight line	Structure of Atom Some Basic Concepts of Chemistry Classification of Elements and Periodicity in Properties	Cell - The Unit of Life Cell Cycle and Cell Division	Structural Organization in Animals Breathing and Exchange of Gases

12th NEET REAL TEST SERIES SYLLABUS

Cohort	Class	Name of the Test	Exam Date	Mode	Physics	Chemistry	Botany	Zoology
NEET	12	Test 1	13-Oct-2024	Online	Electric Charges and Fields Electrostatic Potential and Capacitance	Solution Electrochemistry	Sexual Reproduction in Flowering Plant	Human Reproduction

DROPPER NEET REAL TEST SERIES SYLLABUS

Cohort	Class	Name of the Test	Exam Date	Mode	Physics	Chemistry	Botany	Zoology
NEET	Dropper	Test 1	13-Oct-2024	Online	Basic Maths & Calculus (Mathematical Tools) Vectors Units and Measurements Motion in a straight line Motion in a plane Circular motion Laws of motion	Some Basic Concept of Chemistry Redox Reaction Solutions Thermodynamics Equilibrium Electrochemistry	Cell - The Unit of Life Cell Cycle and Cell Division The Living World Biological Classification Plant Kingdom Morphology of Flowering Plants	Structural Organization in Animals Breathing and Exchange of Gases Body Fluids and Circulation Excretory Products & their Elimination

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  Offline (10:00 to 11:00 AM & 04:00 to 05:00 PM)
- **Exam Duration:** 60 Minutes

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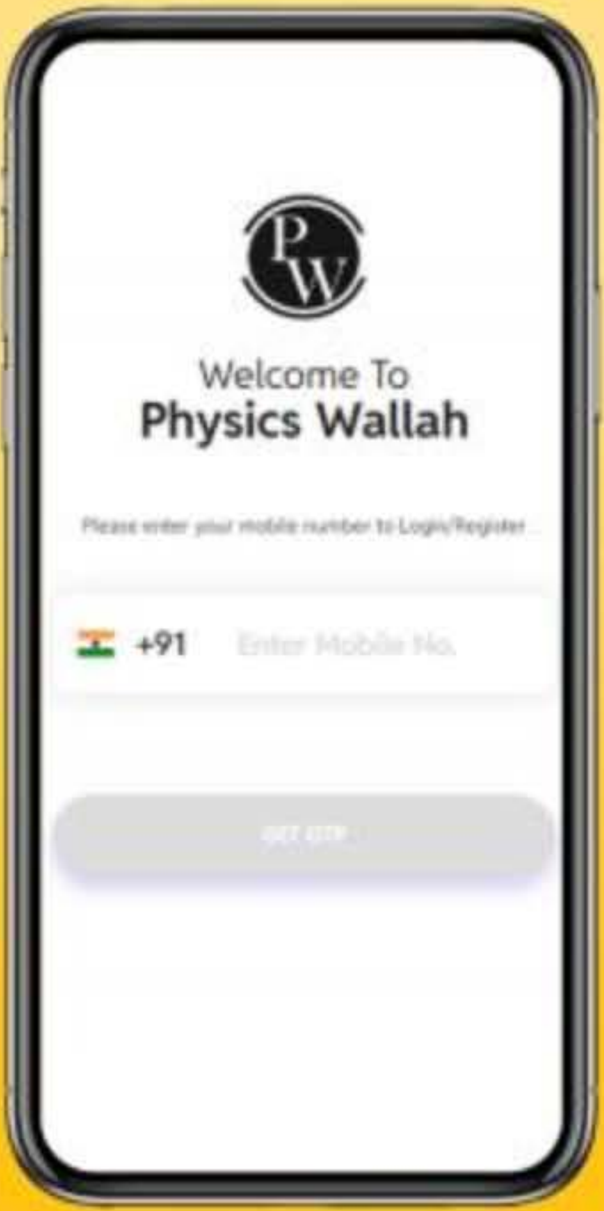
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Enter Mobile No.
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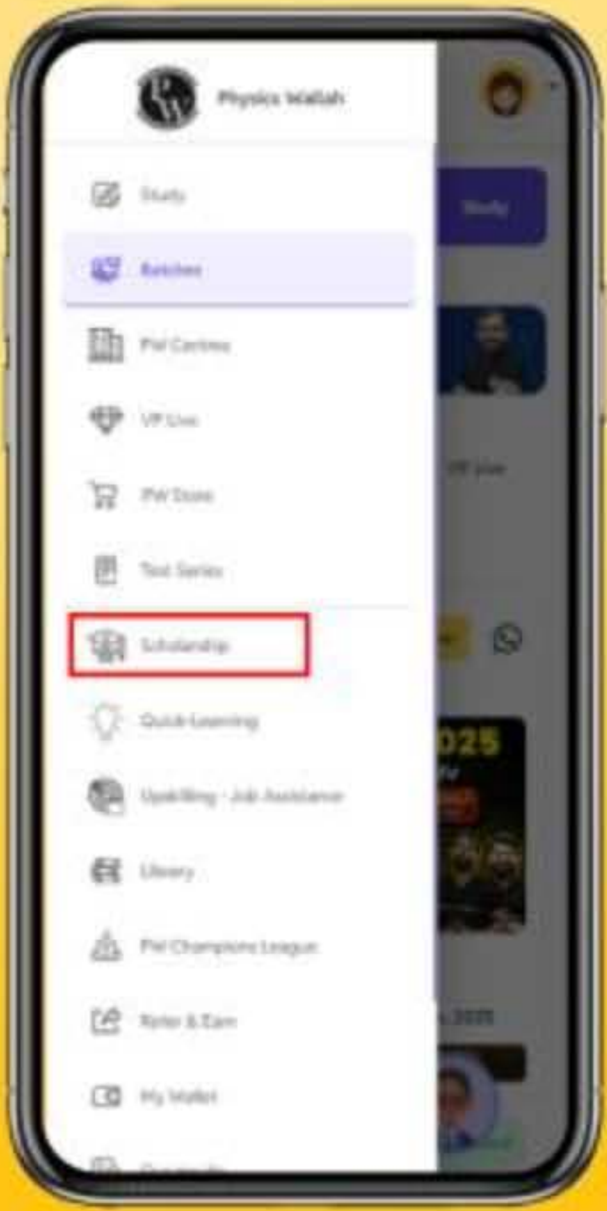
LOG INTO THE APP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Upskilling - Job Assistance
Library
PW Champions League
Refer & Earn
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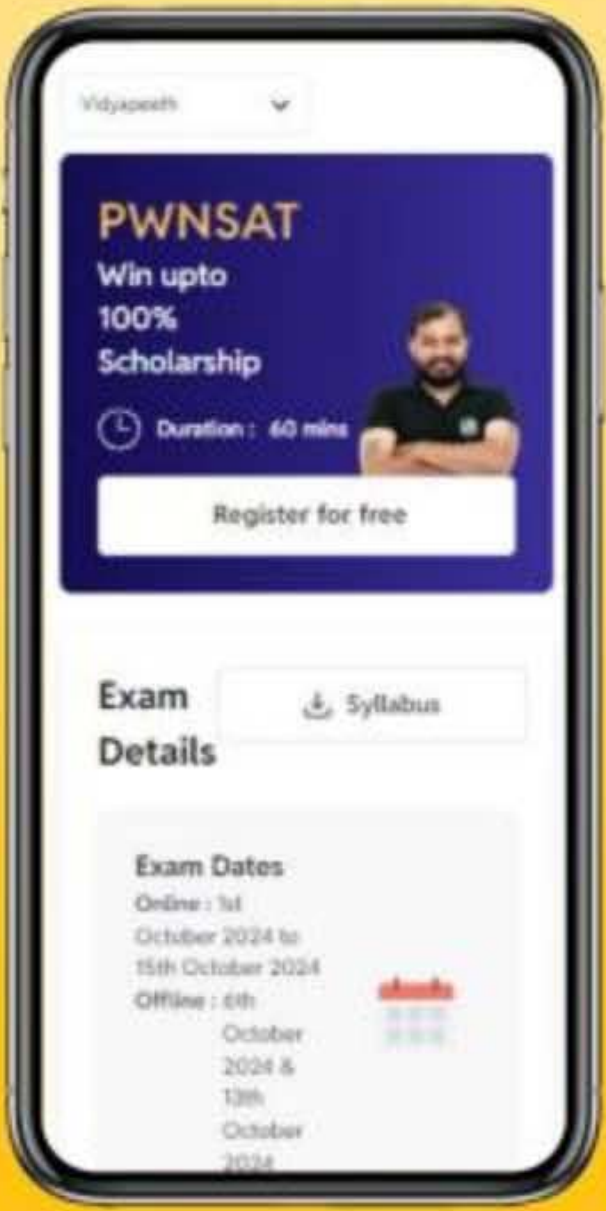
Study

SELECT SCHOLARSHIP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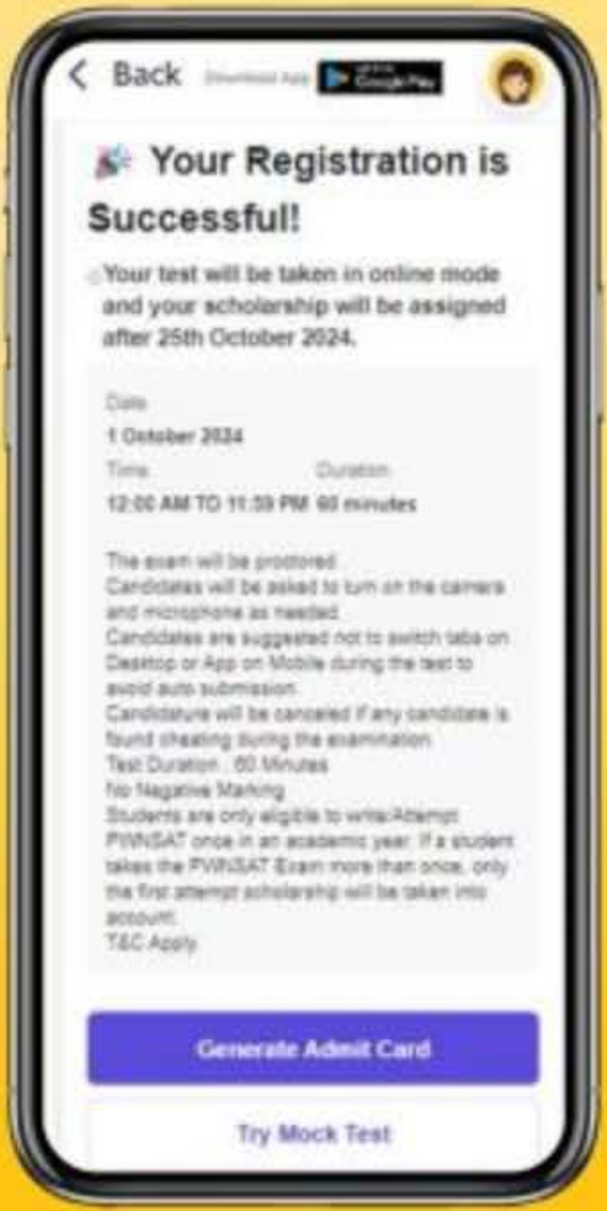
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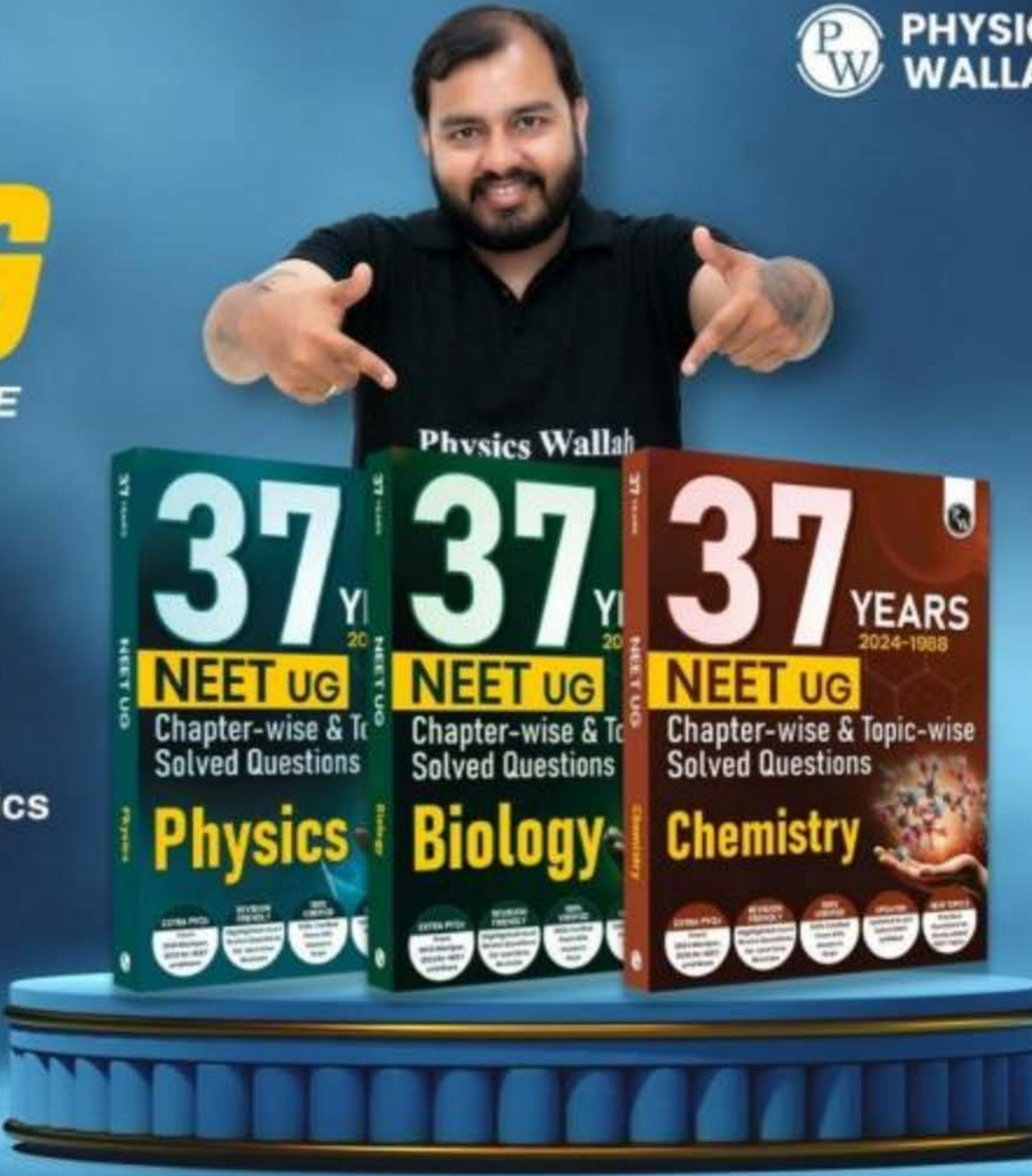
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Physics
Biology
Chemistry

Thankyou!!

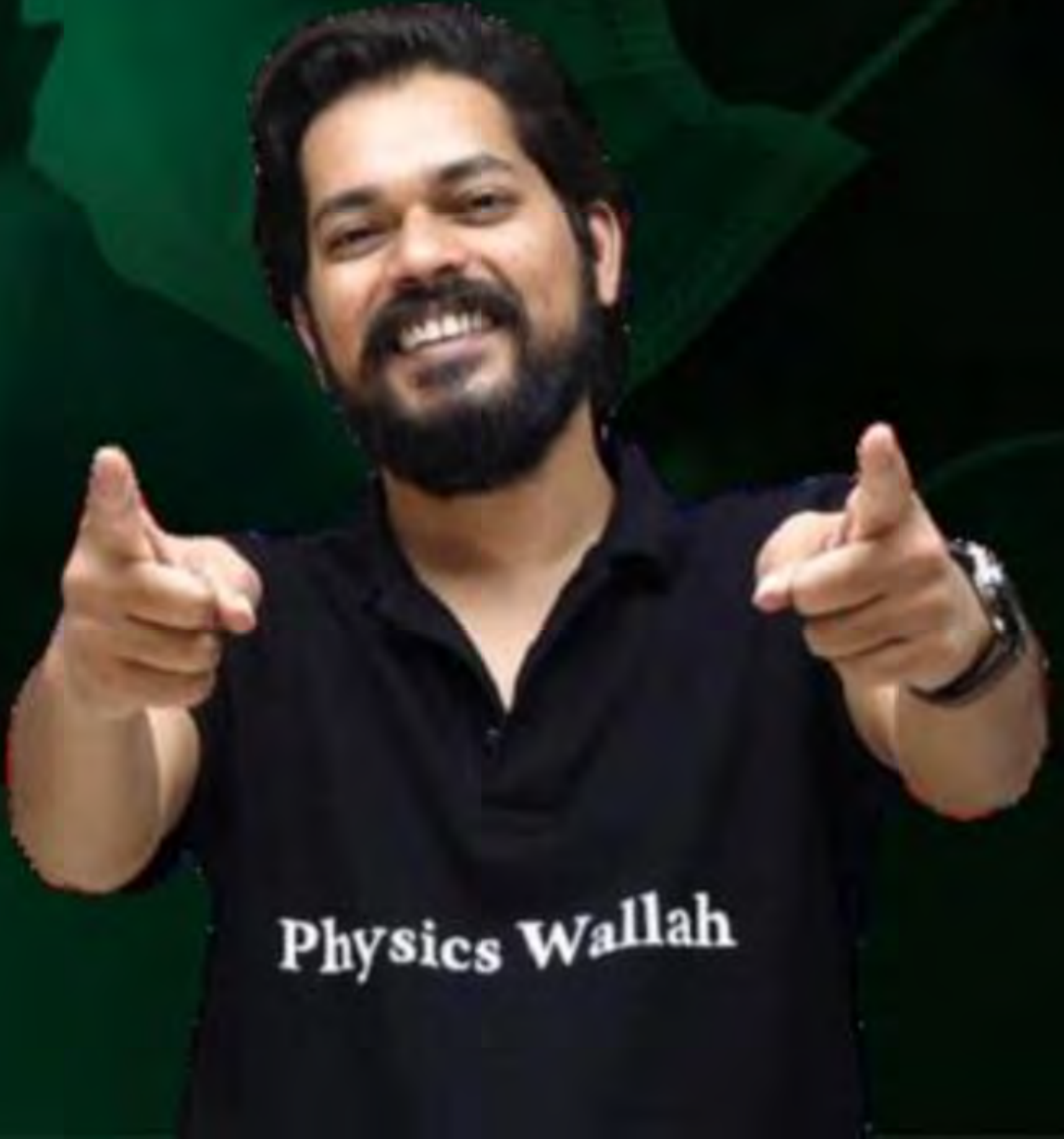
YAKEEN 2.0

FOR NEET 2025

Lecture- 05 Organic Chemistry

Some Basic Principles and Techniques
(IUPAC Naming)

By- Pankaj Sir(POPU MAMA)


Physics Wallah

Topics *to be covered*

1. IUPAC Naming of Cyclo Compounds
2. HW discussions

IUPAC Naming of Cyclo Compounds

cyclo

Rule: Prefix-2 + Prefix 1 + Word Root + Suffix-1 + Suffix-2

Priority:

PFG > Multiple bonds > Number of C atoms (Jismain Jyada ho)

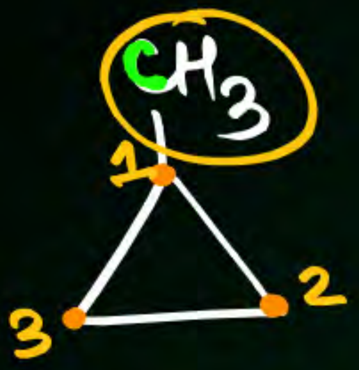
If no. of carbon atoms are same then priority Ring > Chain

If carbon containing F.G is directly attached with the ring then they are taken as part of the ring & (Special suffix-2) must be used

(Ring Ki numbering Hogi)

F.G		Special Suffix-2
Carboxylic acid ✓	$-COOH$	carboxylic acid ✓
Sulphonic acid ×		sulphonic acid ×
Ester $-\overset{O}{\overset{\|}{C}}-O-\overset{O}{\overset{\|}{C}}-$	$-\overset{O}{\overset{\|}{C}}-O-$	carboxylate ✓
acid chloride	$-\overset{O}{\overset{\|}{C}}-Cl$	carbonyl chloride ✓
acid amide	$-\overset{O}{\overset{\|}{C}}-NH_2$	carboxamide ✓
cyanide $-NC$	$-C\equiv N$	carbonitrile ✓
aldehyde	$-\underset{O}{\underset{\|}{C}}-H$	carbaldehyde ✓
ketone	$-\underset{O}{\underset{\|}{C}}-$	one
alcohol × $-OH$		ol ×
thiol	$-SH$ ×	thiol ×
amine	$-NH_2$ ×	amine ×

①



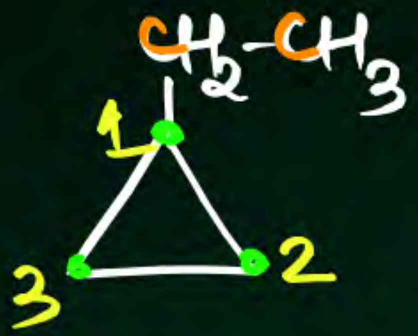
PFG ×

M.B ×

No. of 'C'

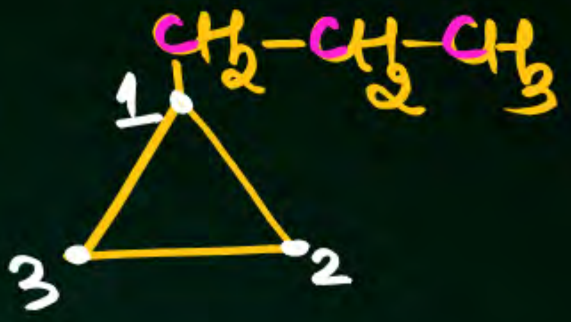
1-methyl cyclopropane

②



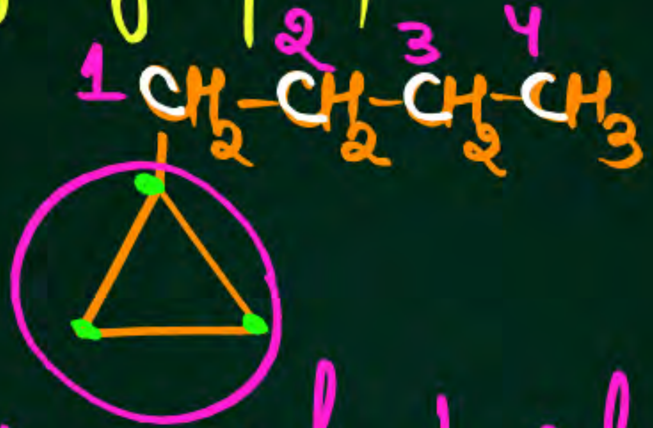
1-Ethyl cyclopropane

③


CH2-CH2-CH3
1
2
3

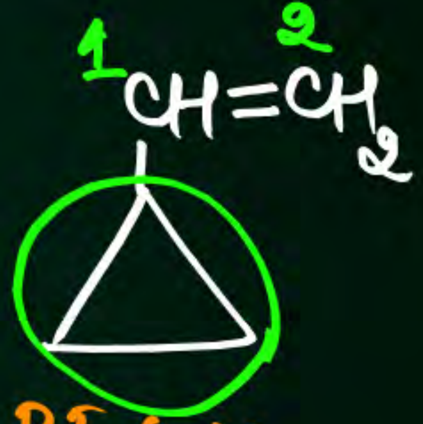
1-Propyl cyclopropane

④


1 CH2-CH2-CH2-CH3
2
3
4

1-cyclopropyl butane

⑤

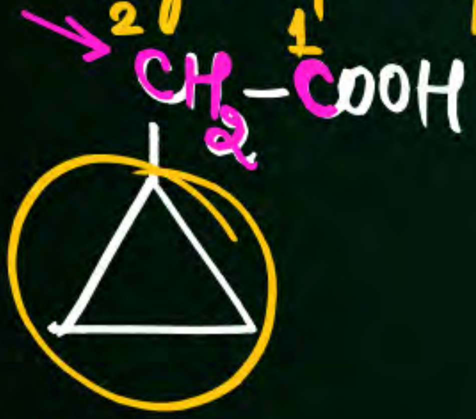


PFG ×

M.B ✓

1-cyclopropyl ethene

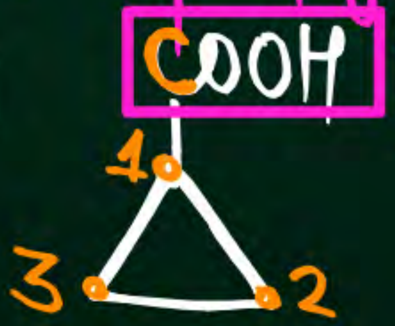
⑥



PFG ✓

2-cyclopropyl ethan~~e~~-1-oic acid

⑦



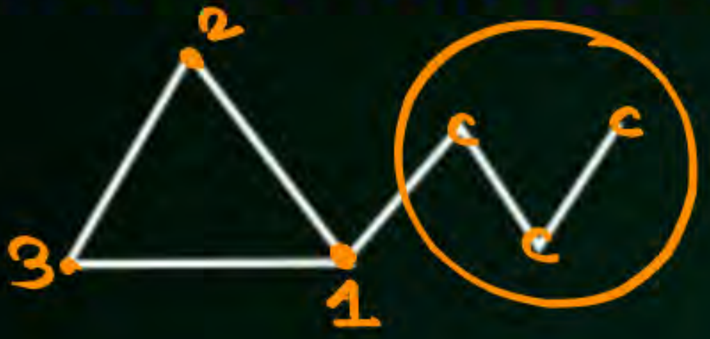
foofa Ji

cyclopropane-1-carboxylic acid

QUESTION

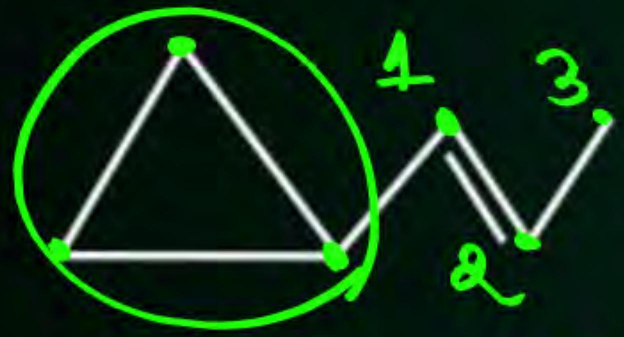
Write IUPAC Name of the following Compounds.

(1)



1-Propyl cyclopropane

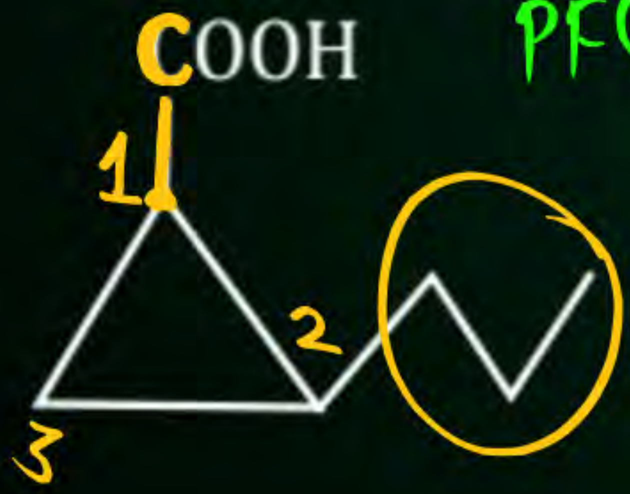
(2)



PFG ×
M.B ✓

1-cyclopropyl propene

(3)



PFG(✓)

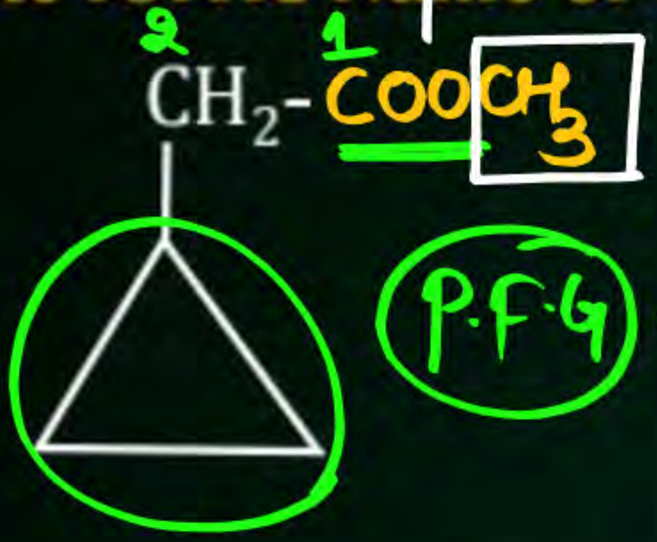
2-propylcyclopropane-1-carboxylic acid

QUESTION

Ester

Write IUPAC Name of the following Compounds.

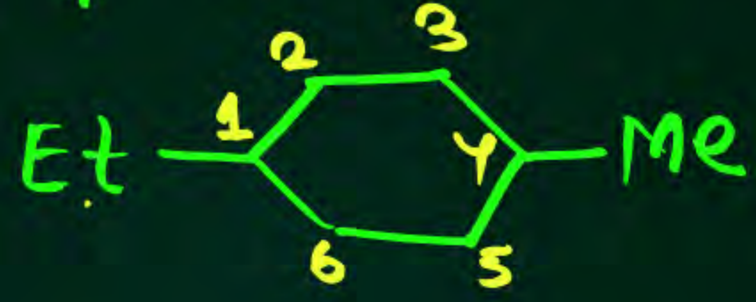
(4)



2
1
CH_2-$COOCH_3$
P.F.G ✓

Methyl-2-cyclopropyl ethan~~e~~-1-oate

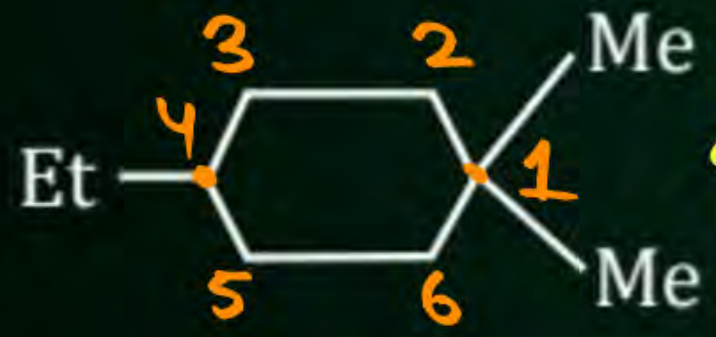
7)



Et
Me
1
2
3
4
5
6

1-Ethyl-4-methyl cyclohexane

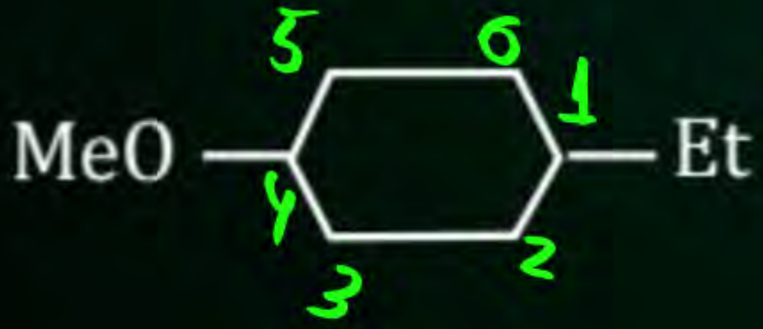
(5)



Et
Me
Me
1
2
3
4
5
6

4-Ethyl-1,1-dimethyl cyclohexane

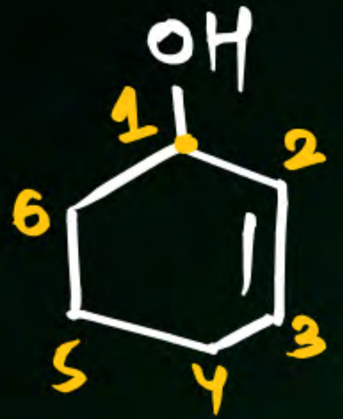
(6)



MeO
Et
1
2
3
4
5
6

1-Ethyl-4-methoxycyclohexane

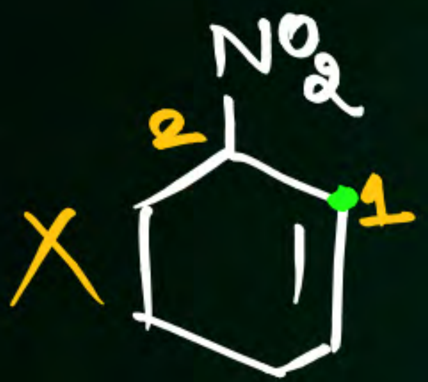
⑧



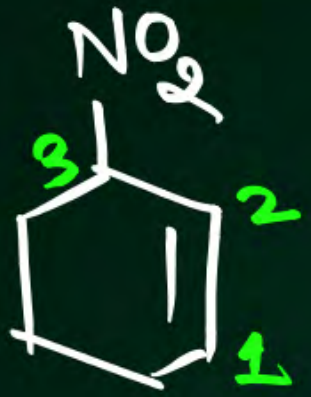
PFG ✓

cyclohex-2-en~~e~~-1-ol

⑨

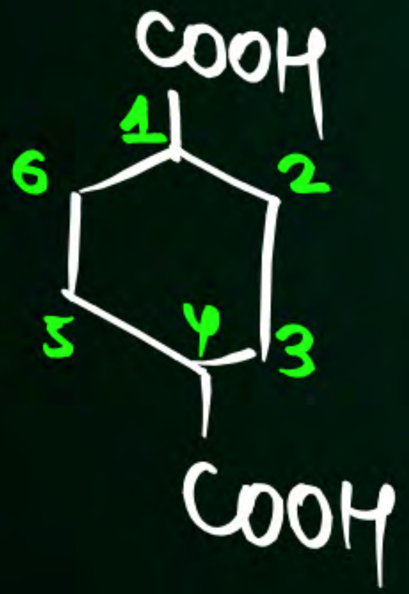


PFG X
M.B ✓



3-Nitrocyclohexene

⑩

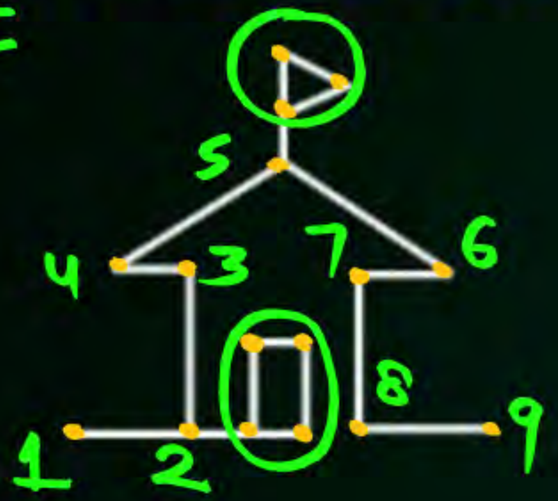

COOH
1
2
3
4
5
6
COOH

cyclohexane-1,4-dicarboxylic acid

QUESTION

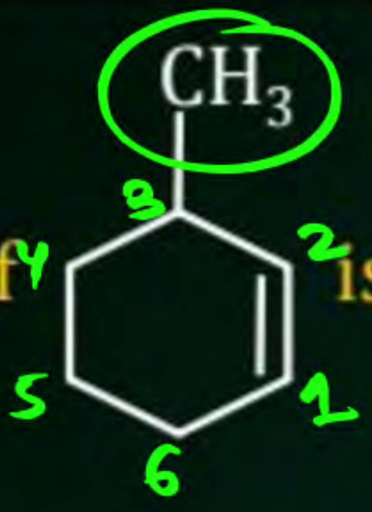
Write the IUPAC names of following figure.

UMC



2-cyclobutyl -5-cyclopropyl nonane

QUESTION (AIIMS 2003)

IUPAC name of  is:

[✓ A] 3-methylcyclohexene

B 1-methylcyclohex-2-ene

C 6-methylcyclohexene

D 1-methylcyclohex-5-ene

QUESTION

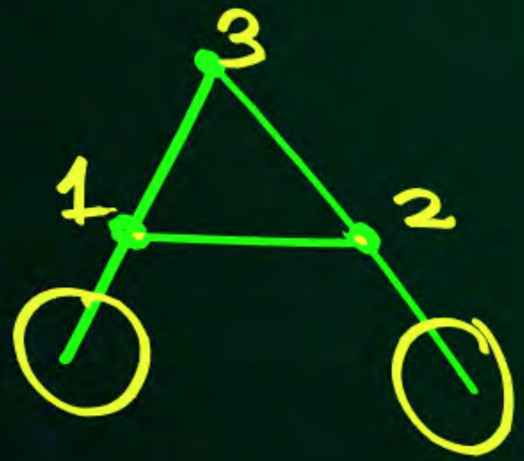
The IUPAC name of the given structure A is:

[✓ A] 1,2-dimethylcyclopropane

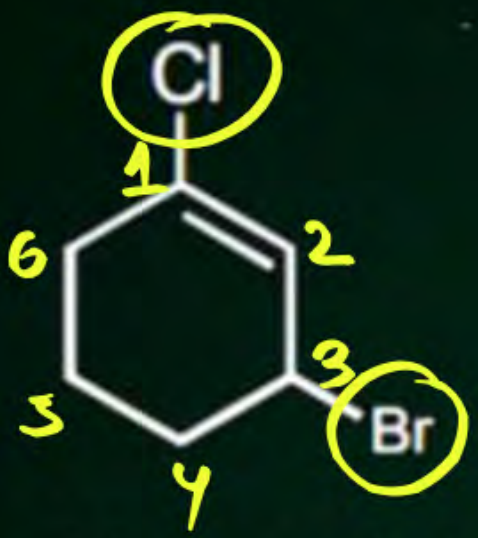
B cyclopropane-1,2-dimethyl

C 1-methyl-1-methylcyclopropane

D cyclopentane



QUESTION The IUPAC name of the compound shown below is:



A 2-Bromo-6-chlorocyclohex-1-ene

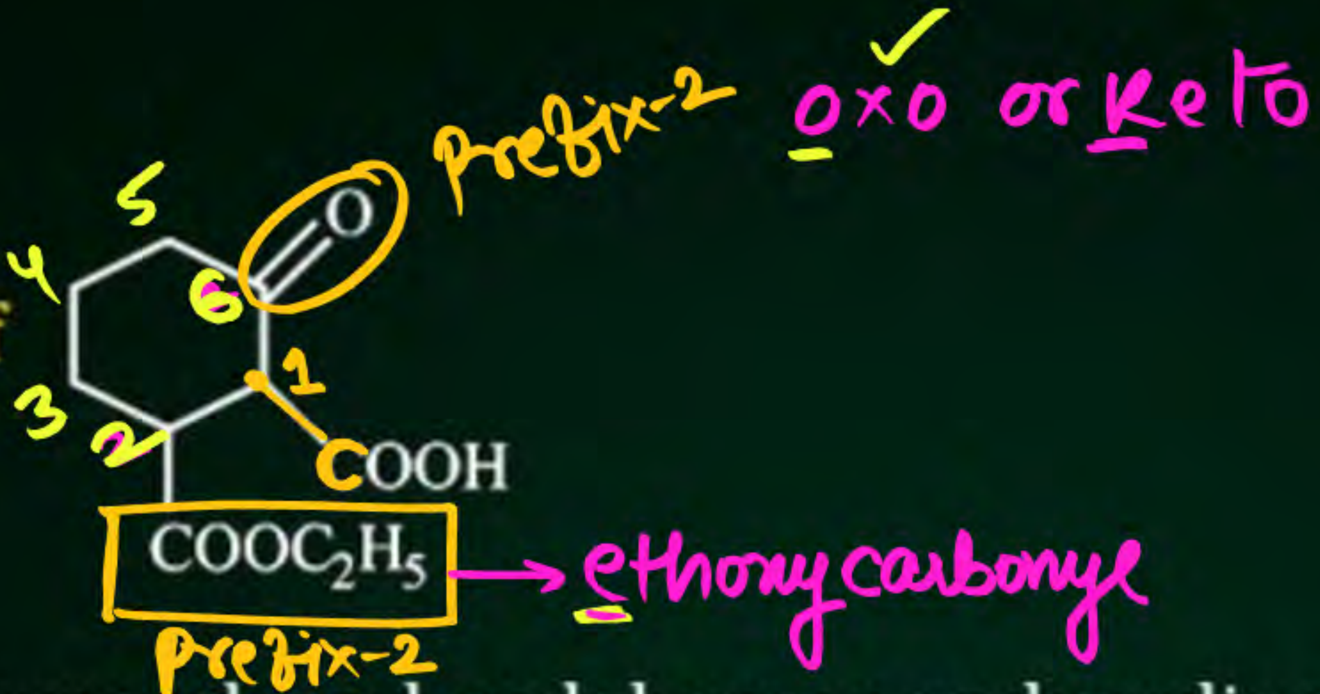
B 6-Bromo-2-chlorocyclohexene

[✓ C] 3-Bromo-1-chlorocyclohex-1-ene

D 1-Bromo-3-chlorocyclohexene

QUESTION

IUPAC name of


Prefix-2
oxo or keto
O
5
4
6
1
3
2
COOH
COOC$_2$H$_5$
ethoxy carbonyl
Prefix-2

Ⓐ 2–oxo–5 ethoxy carbonyl cyclohexane carboxylic acid

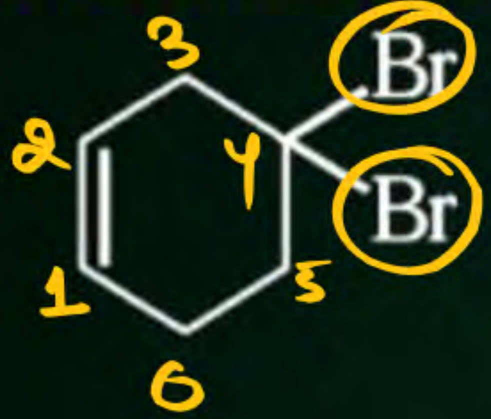
Ⓑ 2-Ethoxy carbonyl-6-keto cyclohexane carboxylic acid

Ⓒ Ethyl–2-carboxy–3–oxo-cyclohexyl methanoate

Ⓓ 3–Ethoxy carbonyl–2-carboxy cyclohexanone

QUESTION

Correct IUPAC name of compound is:



[✓ A] 4, 4-Dibromo cyclohexene

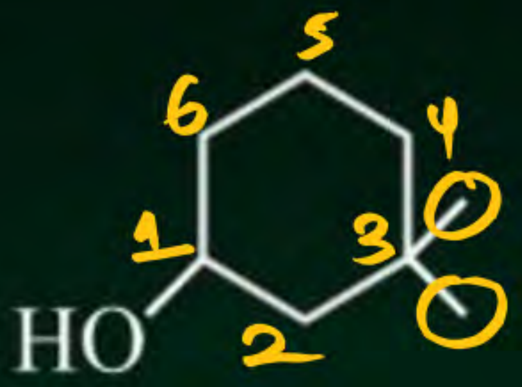
B 5,5-Dibromo cyclohexene

C 1,1-Dibromo cyclohex-3-ene

D 1,1-Dibromo cyclohex-4-ene

QUESTION

The IUPAC name of the compound



is

(A) 3, 3-dimethyl-1-hydroxy cyclohexane

(B) 1, 1-dimethyl-3-hydroxy cyclohexane

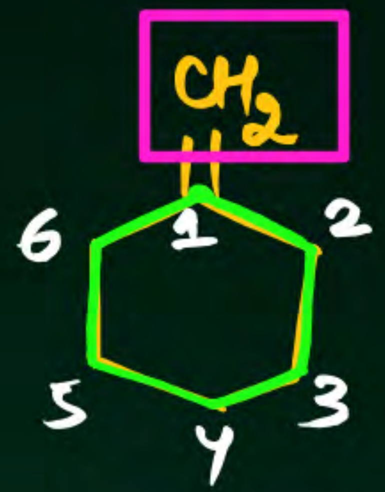
[✓ (C)] 3, 3-dimethyl-1-cyclohexanol

(D) 1, 1-dimethyl-3-cyclohexanol

op points Ⓐ

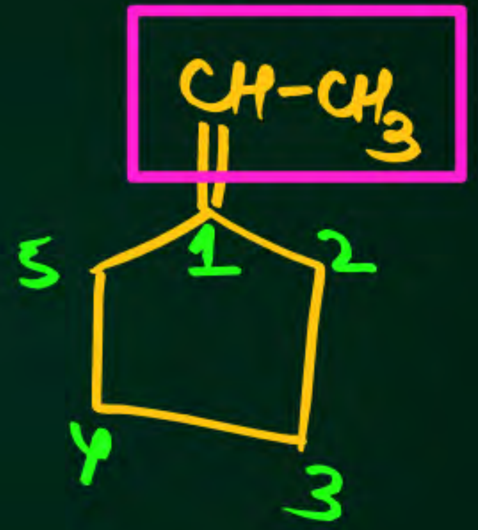
Prefix-2

① methylidene ($=CH_2$)



1-methylidene cyclohexane

② ethylidene ($=CH-CH_3$)



$CH-CH_3$
1
2
3
4
5

1-Ethylidene cyclopentane

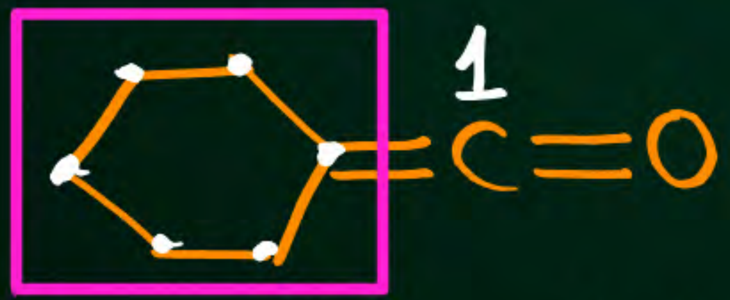
$=G$ (idene)

$=CH_2$

$=CH-CH_3$

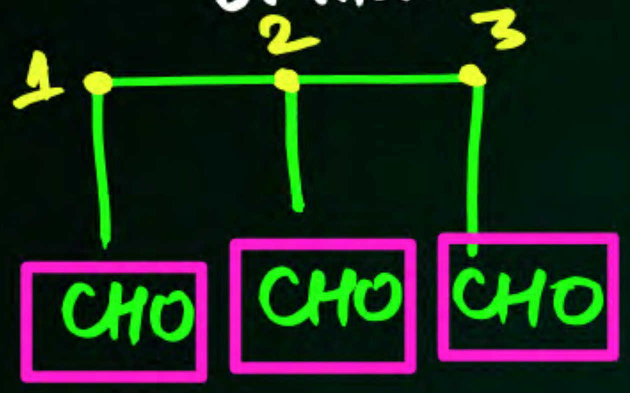
$=CH-CH_2-CH_3$

Q

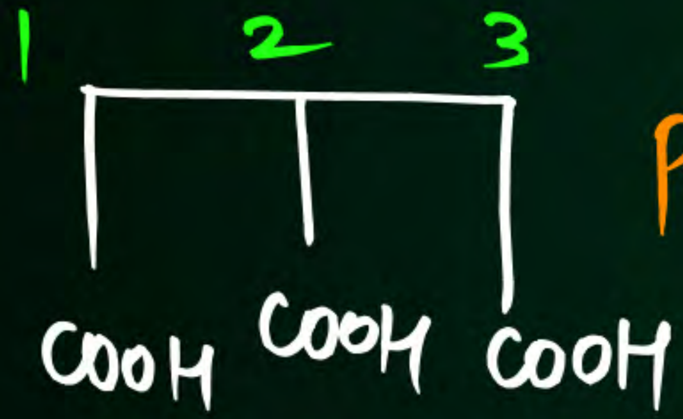


Cyclohexylidene methanone

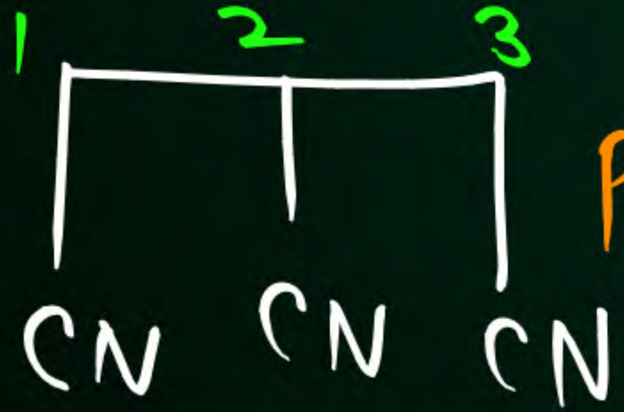
③ If three or more same carbon containing P.F.G are present


1
2
3
CHO
CHO
CHO

Propane-1,2,3-tricarbaldehyde


1
2
3
COOH
COOH
COOH

Propane-1,2,3-tricarboxylic acid

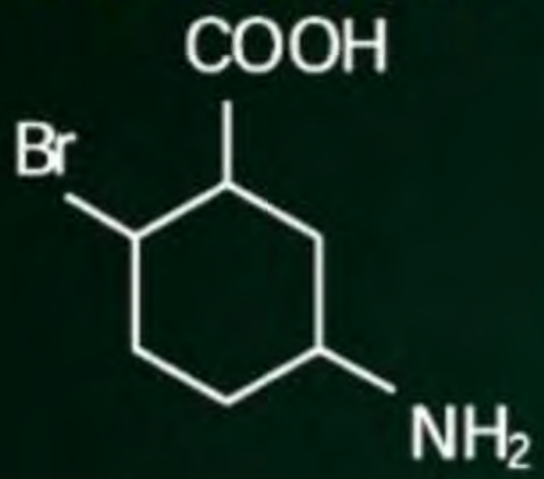


Propane-1,2,3-tricarbonitrile

Home Work

QUESTION 01

The correct IUPAC name of compound is:



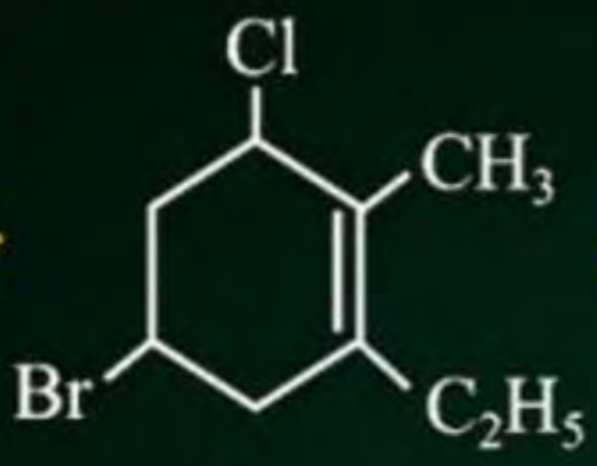
(A) 3-Amino-6-bromocyclohexane-1-carboxylic acid

(B) 2-Bromo-5-aminocyclohexane-1-carboxylic acid

(C) 5-Amino-2-bromocyclohexane-1-carboxylic acid

(D) 4-Bromo-5-carboxycyclohexanamine

QUESTION 02

IUPAC name of  is:

A 4-Bromo-6-chloro-2-ethyl-1-methylcyclohex-1-ene

B 5-Bromo-1-chloro-3-ethyl-2-methylcyclohex-2-ene

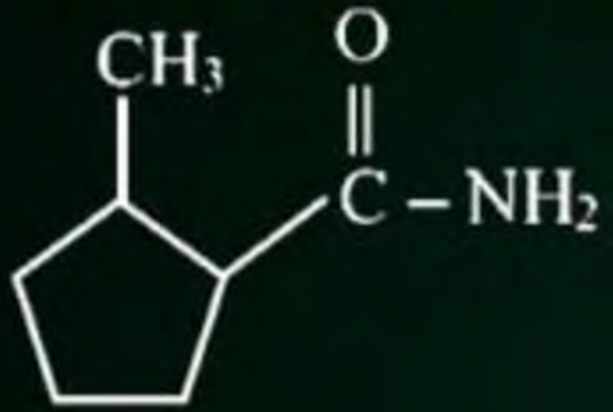
C 5-Bromo-3-chloro-1-ethyl-2-methylcyclohex-1-ene

D 1-Bromo-5-chloro-3-ethyl-4-methylcyclohex-3-ene

QUESTION 03

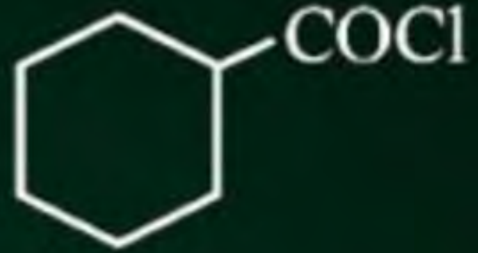
Which of the following IUPAC names is incorrect?

A



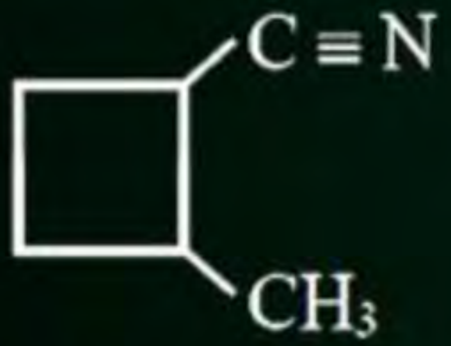
2-Methylcyclopentanecarboxamide

B



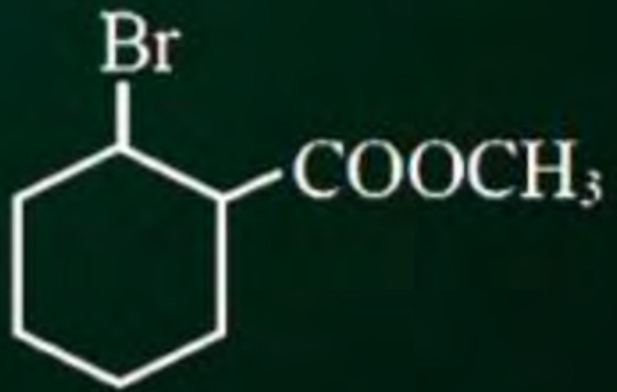
Cyclohexanoyl chloride

C



2-Methylcyclobutanecarbonitrile

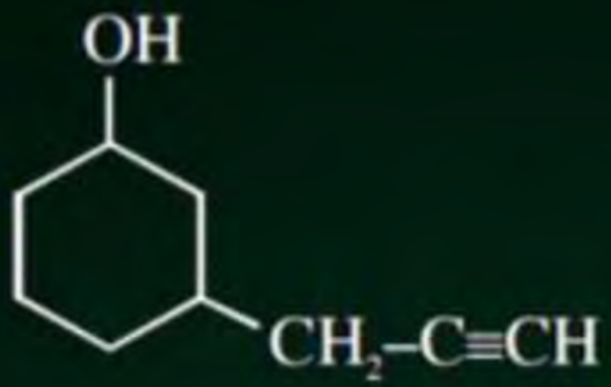
D



Methyl 2-bromocyclohexanecarboxylate

QUESTION 04

The correct IUPAC name of



(A) 3-Cyclohexanolpropyne

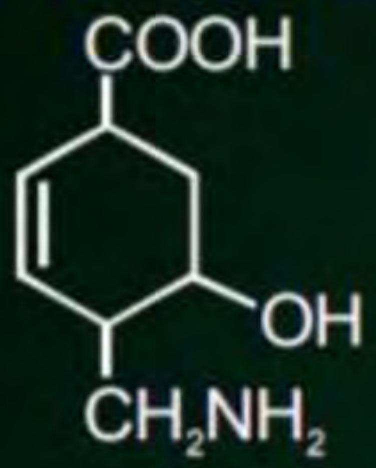
(B) 3-[3-Hydroxycyclohexyl]propyne

(C) 3-Propynylcyclohexanol

(D) 3-(2-Propynyl)cyclohexanol

QUESTION 05

The correct IUPAC name of following compound is:



A 4-Aminomethyl-3-hydroxycyclohex-5-ene-1-carboxylic acid

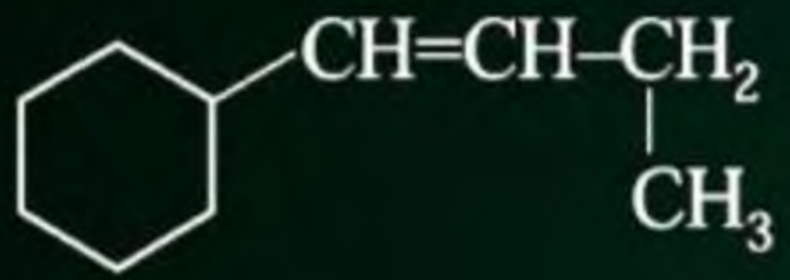
B 2-Aminomethyl-5-carboxycyclohex-3-en-1-ol

C 4-Aminomethyl-5-hydroxycyclohex-2-ene-1-carboxylic acid

D 3-Hydroxy-4-aminomethylcyclohex-5-en-1-oic acid

QUESTION 06

What will be correct IUPAC name for the following compound.



A 1-(But-1-enyl) cyclohexane

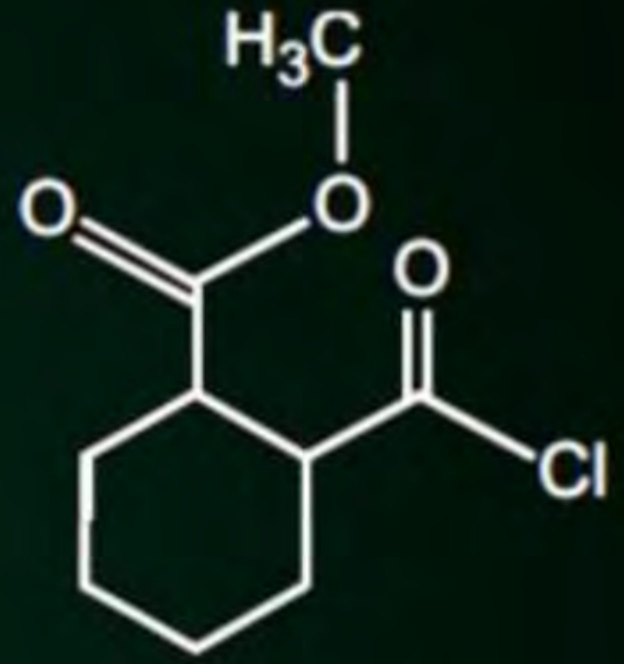
B 1-Cyclohexyl-2-ethyl ethene

C 1-Cyclohexyl but-1-ene

D 1-Cyclohexyl-3-methyl prop-1-ene

QUESTION 07

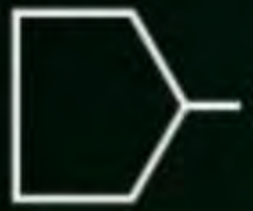
IUPAC name of the given compound is:



- **A** Methyl 2-chloroformyl-1-cyclohexanecarboxylate
- **B** 2-Methoxy carbonyl Cyclohexanecarbonyl chloride
- **C** Methyl 2-chloroformyl-1-cyclohexanoate
- **D** 2-Methoxy carbonyl Cyclohexanonyl chloride

QUESTION 08

Assertion(A): The correct IUPAC name for the compound



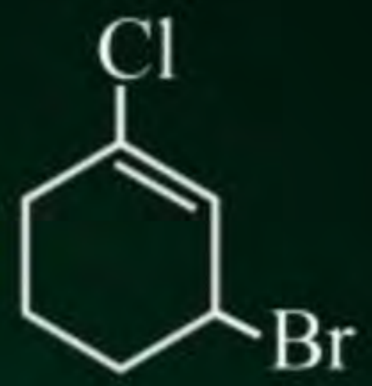
$CH(CH_3)_2$ is 1-methyl ethyl cyclopentane.

Reason(R): It is named as derivative of cyclopentane because the number of carbon atoms in the ring is more than the side chain.

- (A) If both assertion and reason are correct and reason is the correct explanation of the assertion.
- (B) If both assertion and reason are correct but reason is not correct explanation of the assertion.
- (C) If assertion is correct but reason is incorrect.
- (D) If assertion is incorrect but reason is correct.

QUESTION 09

The IUPAC name of the compound shown below is:



(A) 2-bromo-6-chlorocyclohex-1-ene

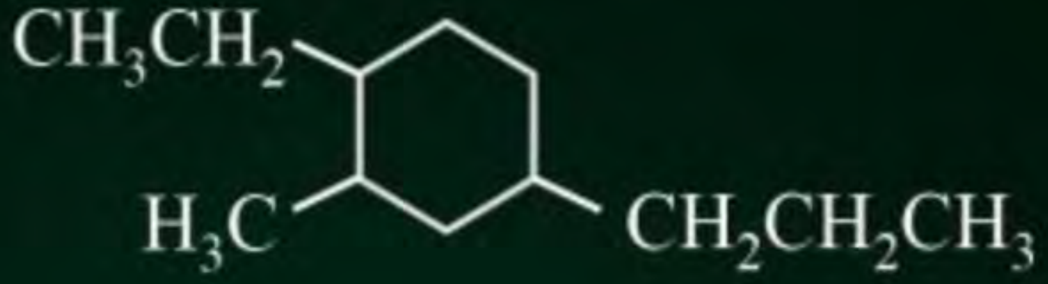
(B) 6-bromo-2-chlorocyclohexene

(C) 3-bromo-1-chlorocyclohexene

(D) 1-bromo-3-chlorocyclohexene

QUESTION 10

The IUPAC name of the compound


CH_3CH_2
H_3C
$CH_2CH_2CH_3$

A 1-Ethyl-2-methyl-4-propylcyclohexane

B 2-Ethyl-1-methyl-5-propylcyclohexane

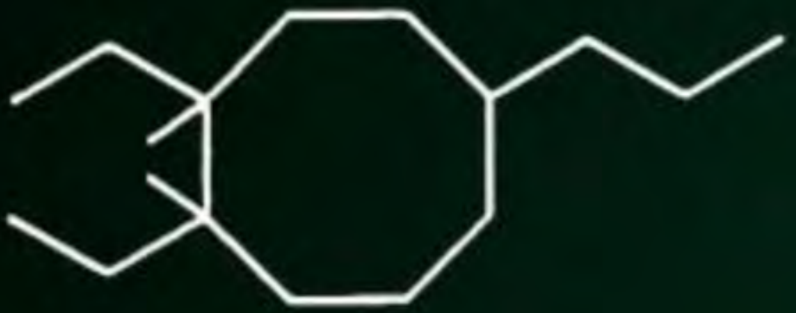
C 4-Ethyl-3-methyl-1-propylcyclohexane

D All the three

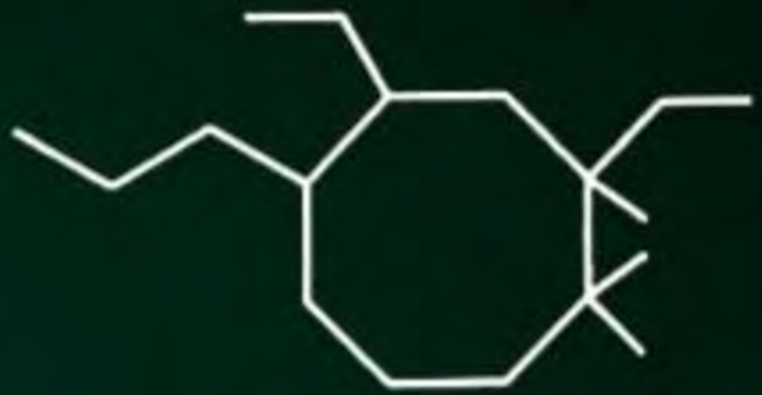
QUESTION 11

The correct structural formula of 1, 2-Diethyl-1,8-dimethyl-5-propyl cyclooctane is:

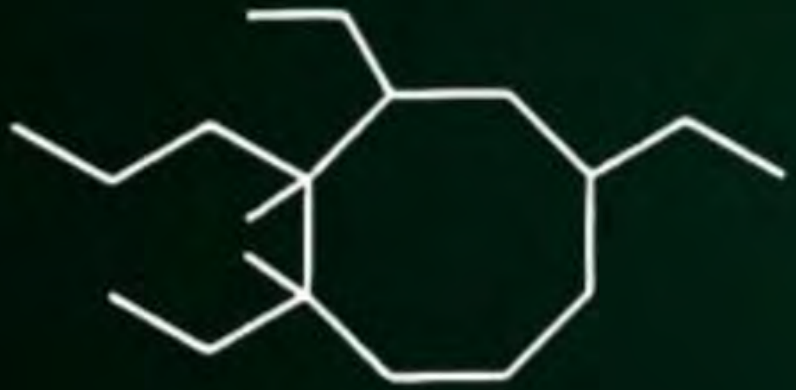
A



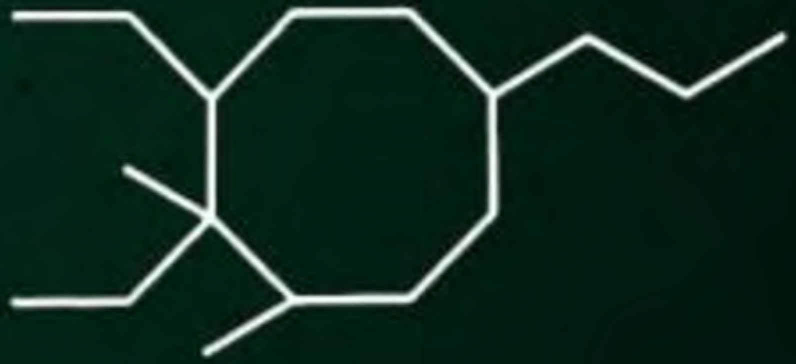
B



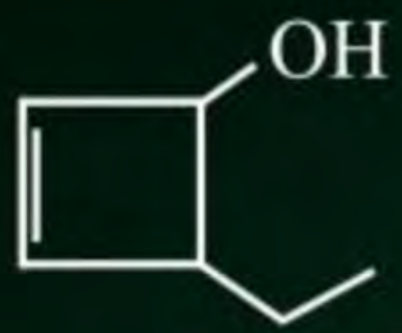
C



D



QUESTION 12

The IUPAC name of  is:

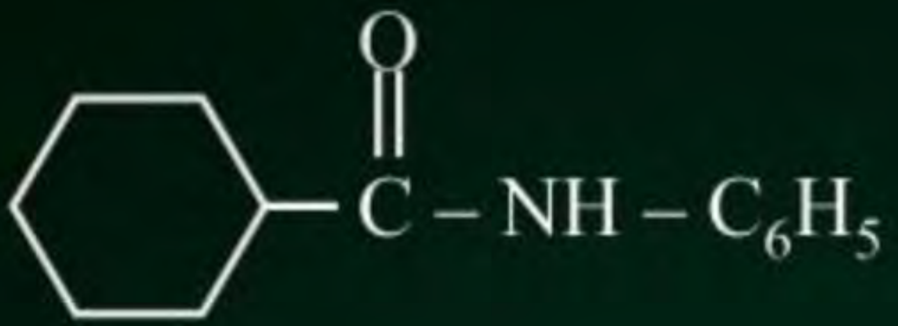
A 4-ethyl cyclobut-2-en-1-ol

B 4-ethyl cyclobut-1-en-3-ol

C 3-ethyl cyclobut-1-en-2-ol

D 2-ethyl cyclobut-3-en-1-ol

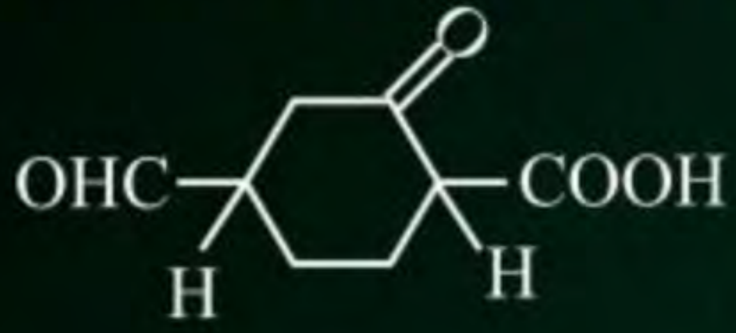
QUESTION 13

The IUPAC name of  is:

- **A** N-cyclohexyl benzamide
- **B** N-cyclohexyl-N-phenyl methyl amide
- **C** N-phenyl-N-cyclohexyl methanamide
- **D** N-phenyl cyclohexane carboxamide

QUESTION 14

Write the IUPAC name of the following compound?



A 2, 4-Dioxocycloheptanoic acid

B 4-Formyl-2-oxocyclohexane-1-carboxylic acid

C 2, 4-Dioxocyclohexanecarboxylic acid

D 2, 4-Dioxocyclohexane-1-carboxylic acid

ANSWER KEY

1. C
2. C
3. B
4. D
5. C
6. C
7. A
8. A
9. C
10.A
11.D
12.A
13.D
14.B

Home Work From PW Module (Yakeen NEET)

Prarambh: Q 57, 58

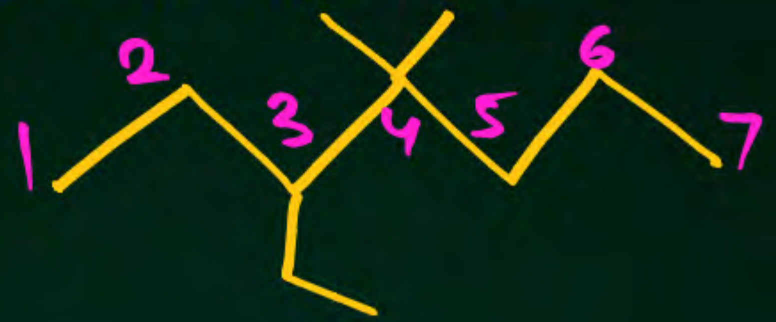
Prabal: Q 02, 08

Homework

Discuss L-03

QUESTION (NCERT Exemplar)

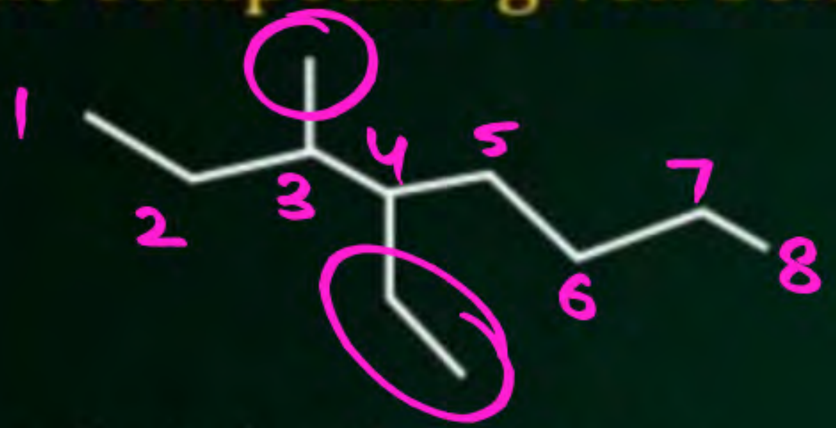
Which of the following is the correct IUPAC name?



- [✓ A] 3-Ethyl-4, 4-dimethylheptane
- B 4, 4-Dimethyl-3-ethylheptane
- C 5-Ethyl-4, 4-dimethylheptane
- D 4, 4-Bis(methyl)-3-ethylheptane

QUESTION (AIIMS 2013, 2015)

Name of the compound given below is:



- A 3-methyl-4-ethyloctane
- B 2, 3-dimethylpentane
- C 5-ethyl-6-methyloctane
- [✓ D] 4-ethyl-3-methyloctane

QUESTION

Statement-1: ✗ IUPAC name of 1-en-4-yne ✓

$\overset{1}{H_2C} = \overset{2}{CH} - \overset{3}{CH_2} - \overset{4}{C} \equiv \overset{5}{CH}$ **is Pent-4-en-1-yne.** ✗

Statement-2: ✓ Alkene is preferred over alkyne when they are placed at same position.

A Statement-1 is true, statement-2 is true and statement-2 is correct explanation for Statement-1.

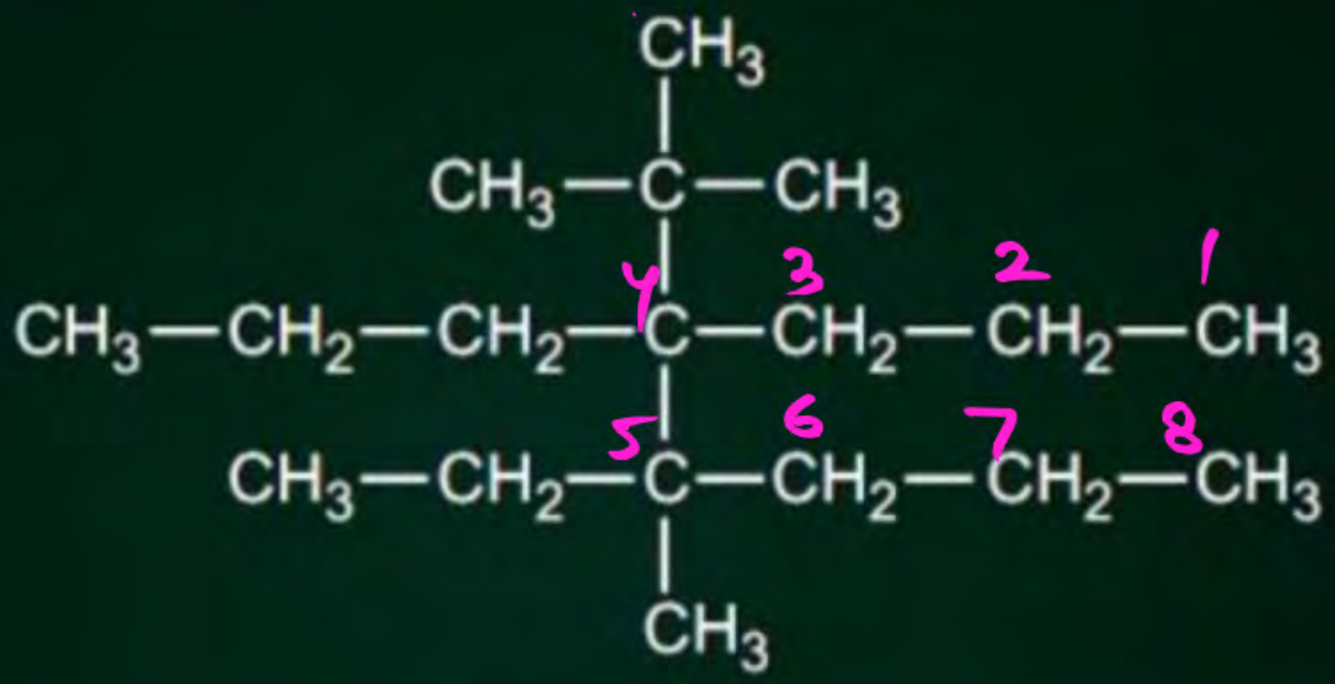
B Statement-1 is true, statement-2 is true and statement-2 is NOT the correct explanation for statement-1.

C Statement-1 is true, statement-2 is false.

[✓ D] Statement-1 is false, statement-2 is true.

QUESTION

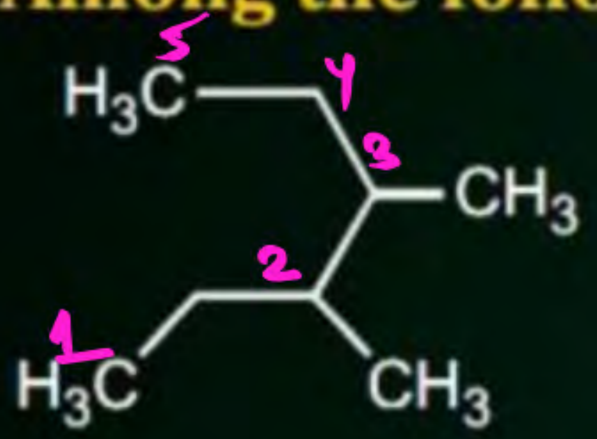
Total number of carbon atoms present in parent chain is:


CH3
CH3—C—CH3
CH3—CH2—CH2—C—CH2—CH2—CH3
CH3—CH2—C—CH2—CH2—CH3
CH3
1
2
3
4
5
6
7
8

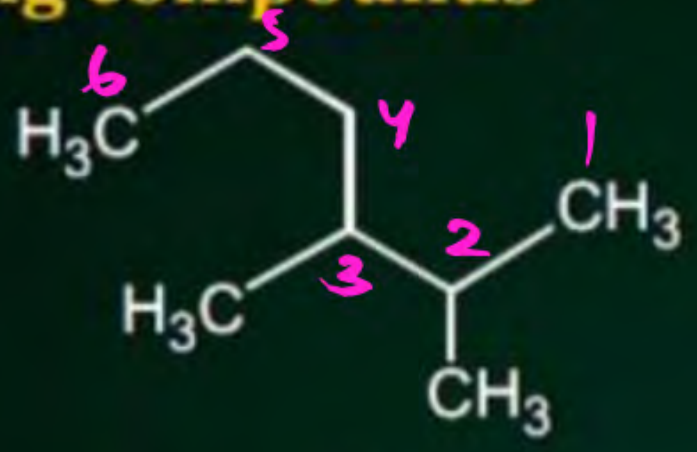
- **A** 5
- **B** 6
- **C** 7
- **D** [✓ None of these]

QUESTION

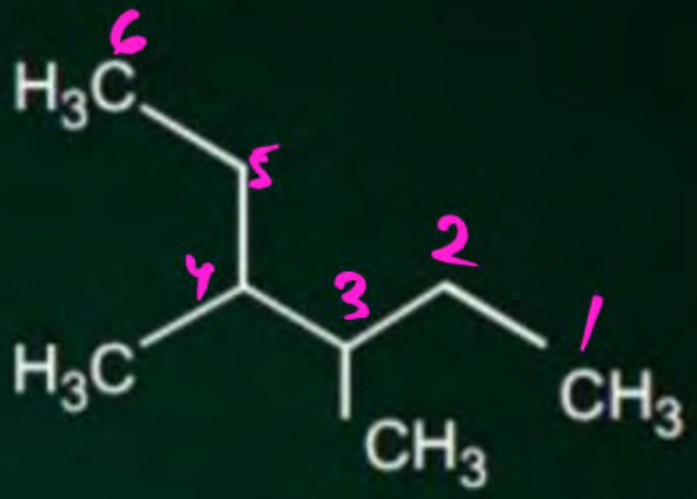
Among the following compounds


H3C
CH3
H3C
CH3
5
4
3
2
1

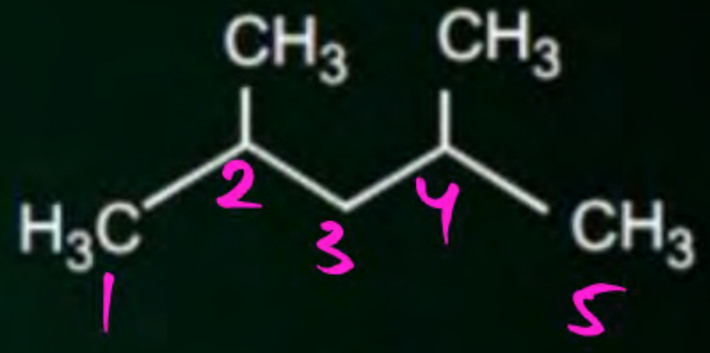
(i)


H3C
H3C
CH3
CH3
6
5
4
3
2
1

(ii)


H3C
H3C
CH3
CH3
6
5
4
3
2
1

(iii) ✗


CH3
CH3
H3C
CH3
1
2
3
4
5

(iv) ✗

2, 3-dimethylhexane is:

A (i)

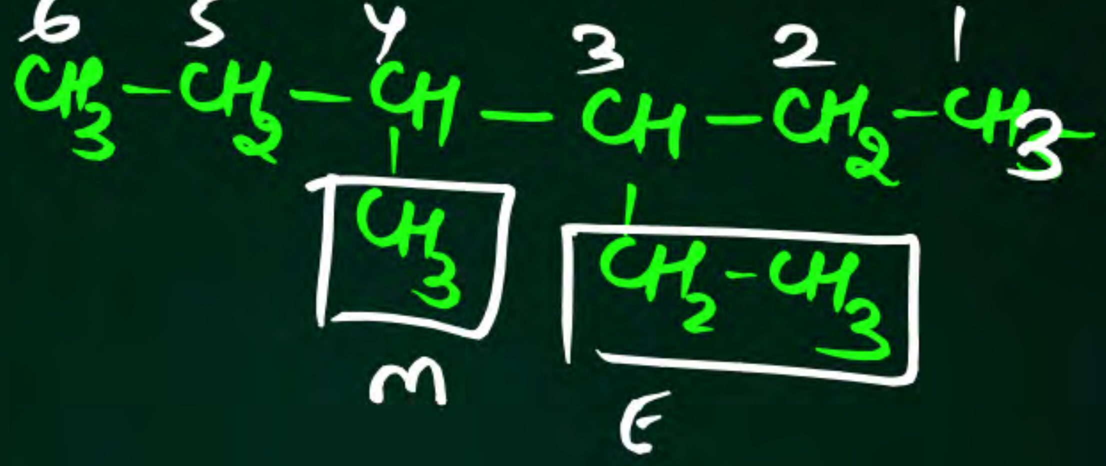
[✓ B] (ii)

C (iii)

D (iv)

QUESTION

The correct IUPAC name of $CH_3CH_2CH(CH_3)CH(C_2H_5)_2$ is:



$$\overset{6}{CH_3}-\overset{5}{CH_2}-\underset{\underset{m}{\boxed{CH_3}}}{\overset{4}{CH}}-\underset{\underset{E}{\boxed{CH_2-CH_3}}}{\overset{3}{CH}}-\overset{2}{CH_2}-\overset{1}{CH_3}$$

A 4-ethyl-3-methyl hexane

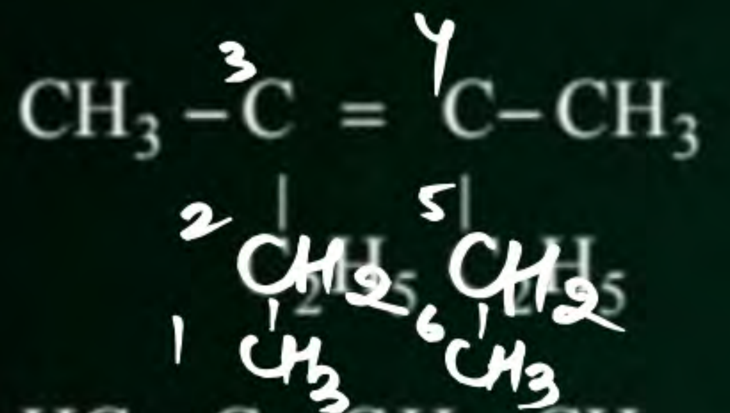
[✓ B] 3-ethyl-4 methyl hexane

C 4-methyl-3-ethyl hexane

D 2, 4-diethylpentane

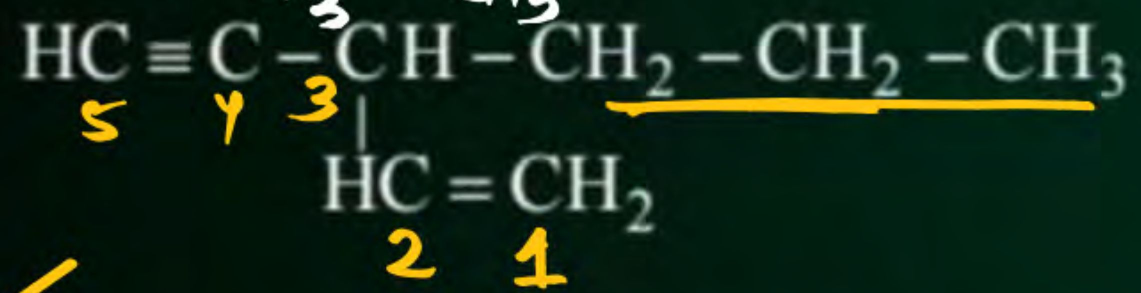
QUESTION

Which IUPAC name is correct:

(A) 

$$CH_3-\underset{\substack{|\\ \overset{2}{CH_2}\\ |\\ \overset{1}{CH_3}}}{\overset{3}{C}}=\underset{\substack{|\\ \overset{5}{CH_2}\\ |\\ \overset{6}{CH_3}}}{\overset{4}{C}}-CH_3$$

→ 2,3-Diethylbutene

(B) 

$$H\underset{5}{C}\equiv\underset{4}{C}-\underset{\substack{3\\ |\\ \underset{2}{HC}=\underset{1}{CH_2}}}{CH}-\underline{CH_2-CH_2-CH_3}$$

→ 3-Ethynylpenta-1,4-diene

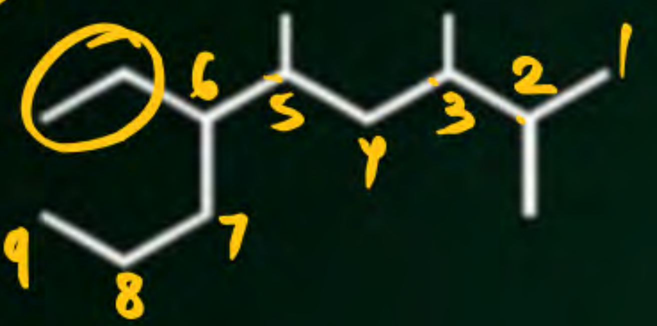
(C) $H\underset{4}{C}\equiv\underset{3}{C}-\underset{2}{CH}=\underset{1}{CH_2}$ → But-1-en-3-yne

(D) $\underset{5}{CH_3}-\underset{4}{CH}=\underset{3}{CH}-\underset{2}{C}\equiv\underset{1}{CH}$ → Pent-1-yne-3-ene

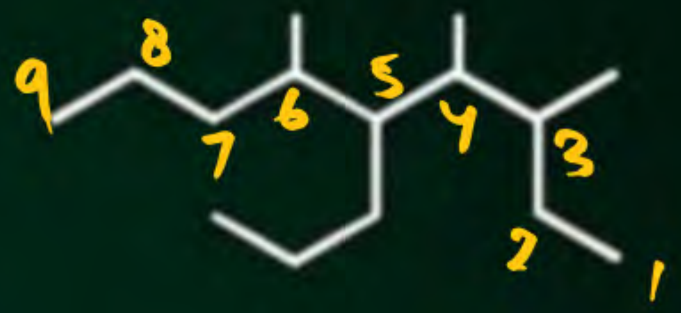
QUESTION

The correct structure of 6-Ethyl-2, 3, 5-trimethylnonane is:

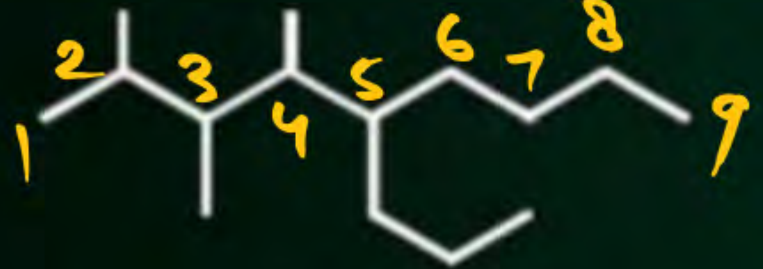
A



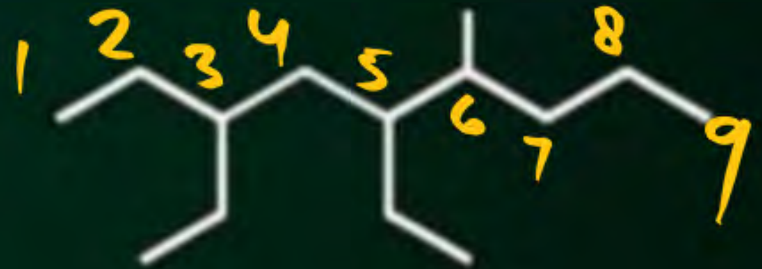
B



C

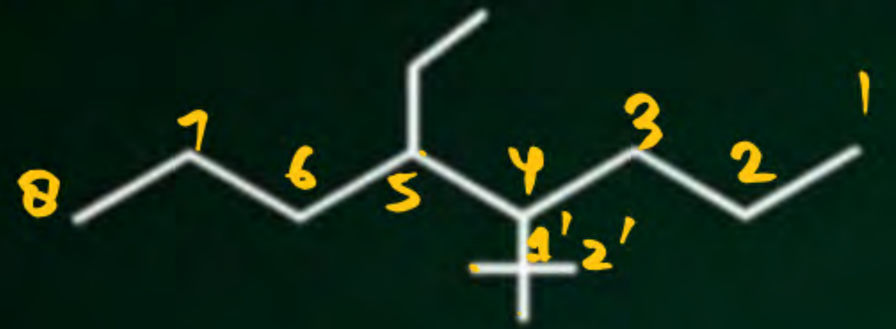


D



QUESTION

Correct IUPAC name of the following compound is:



[✓ A] 4-(1,1-dimethylethyl)-5-ethyloctane

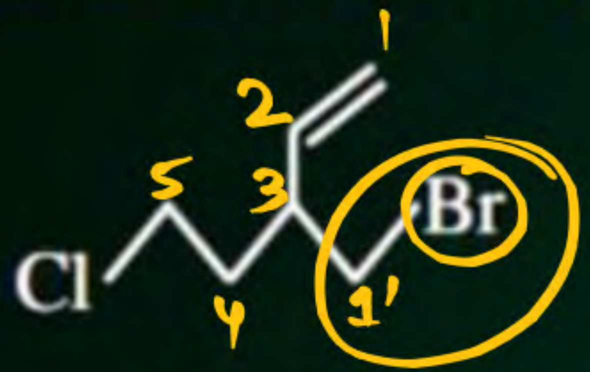
B 5-ethyl-4-(1,1-dimethylethyl)octane

C 5-(1,1-dimethylethyl)-4-ethyloctane

D 5-ethyl-5-(1,1-dimethylethyl)octane

QUESTION

The IUPAC name of the compound is:



(A) 1-Bromo-4-chloro-3-ethenyl butane

(B) 4-Bromo-1-Chloro-3-ethenyl butane

[✓ (C) 3-(Bromomethyl)-5-chloropent-1-ene]

(D) 3-(Bromomethyl)-1-chloropent-4-ene

QUESTION

The IUPAC name of the compound $\overset{1}{C}H_3\overset{2}{C}H = \overset{3}{C}H\overset{4}{C}H=\overset{5}{C}H\overset{6}{C} \equiv \overset{7}{C}\overset{8}{C}H_3$ is:

A. Octa-4,6-diene-2-yne ✗

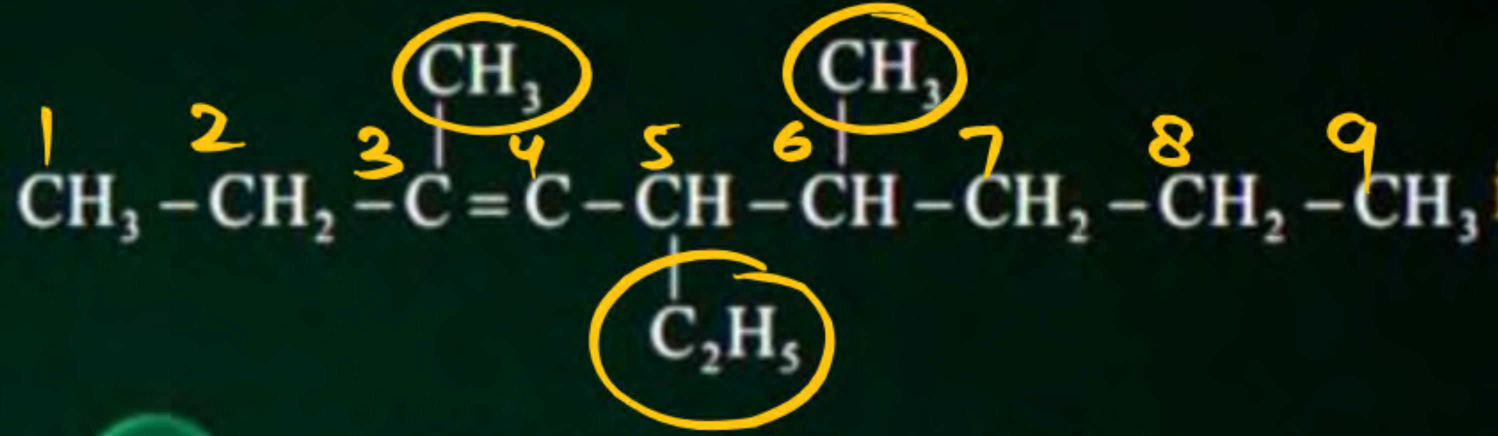
[✓ B.] Octa-2,4-dien~~e~~-6-yne

C. Oct-2-yne-4,6-diene ✗

D. Oct-6-yne-2,4-diene ✗

QUESTION

The correct IUPAC name of the compound



$\overset{1}{\mathrm{C}}\mathrm{H_3}-\overset{2}{\mathrm{C}}\mathrm{H_2}-\overset{3}{\overset{\mathrm{CH_3}}{\mathrm{C}}}=\overset{4}{\mathrm{C}}-\underset{\mathrm{C_2H_5}}{\overset{5}{\mathrm{C}}\mathrm{H}}-\overset{6}{\overset{\mathrm{CH_3}}{\mathrm{C}}}\mathrm{H}-\overset{7}{\mathrm{C}}\mathrm{H_2}-\overset{8}{\mathrm{C}}\mathrm{H_2}-\overset{9}{\mathrm{C}}\mathrm{H_3}$ is:

[✓ (A)] 5-Ethyl-3,6-dimethytnon-3-ene

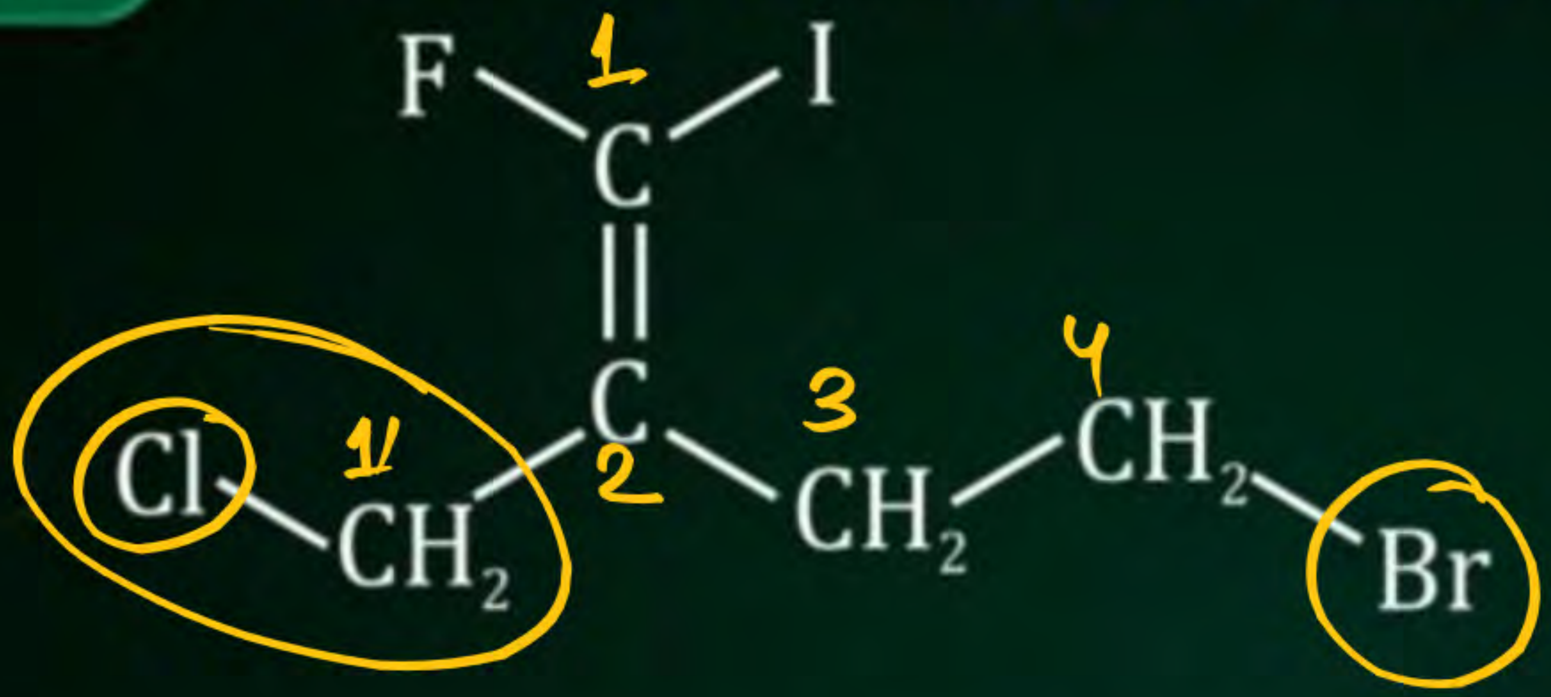
(B) 5-Ethyl-4,7-dimethylnon-3-ene

(C) 4-Methyl-5,7-diethyloct-2-ene

(D) 2,4-Dimethyl-5-ethyloct-2-ene

QUESTION

The correct IUPAC name of the compound is:


F
1
I
C
C
Cl
1'
CH2
2
3
CH2
4
CH2
Br

A 4-Bromo-1-chloro-2-fluoroiodomethylbutene

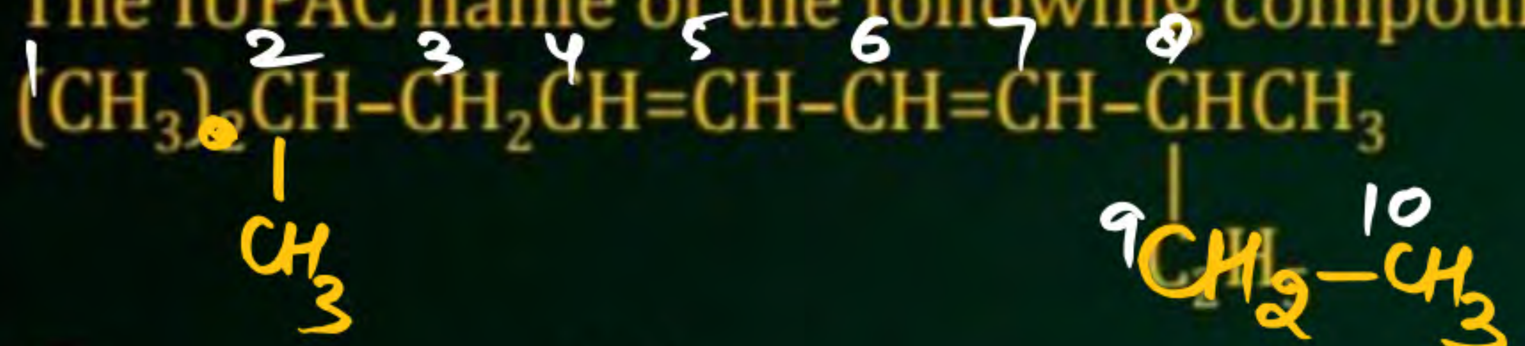
B 4-Bromo-2-chloromethyl-1-fluoro-1-iodobut-1-ene

C 2-(2-Bromoethyl)-3-chloro-1-fluoro-1-iodoprop-1-ene

D 1-Bromo-3-chloromethyl-4-fluoro-4-iodobut-1-ene

QUESTION

The IUPAC name of the following compounds is:



$$\overset{1}{(CH_3)_2}\underset{\underset{CH_3}{|}}{\overset{2}{C}}H-\overset{3}{C}H_2\overset{4}{C}H=\overset{5}{C}H-\overset{6}{C}H=\overset{7}{C}H-\underset{\underset{^{9}CH_2-^{10}CH_3}{|}}{\overset{8}{C}}HCH_3$$

A 1, 1, 7, 7-tetramethyl-2, 5-octadiene

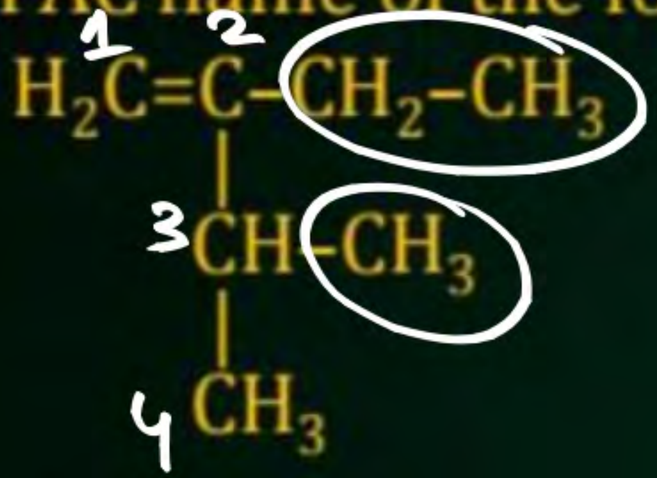
B 2, 8-dimethyl-3, 6-decadiene

C 1, 5-diisopropyl-1, 4-hexadiene

[✓ D] 2, 8-dimethyl-4, 6-decadiene

QUESTION

The IUPAC name of the following compound is:



$$\begin{array}{l} H_2C=C-CH_2-CH_3 \\ \qquad\;\; | \\ \qquad\; CH-CH_3 \\ \qquad\;\; | \\ \qquad\; CH_3 \end{array}$$

[✓ A] 2-ethyl-3-methylbut-1-ene

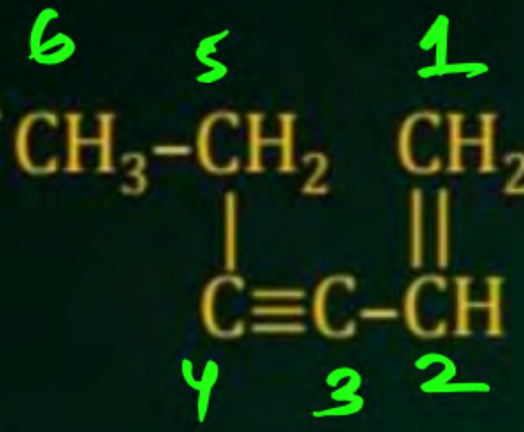
B 2-isopropylbut-1-ene

C 2-methyl-3-ethylbut-3-ene

D ethyl isopropyl ethene

QUESTION

The correct name of is:



$$CH_3-CH_2-C\equiv C-CH=CH_2$$

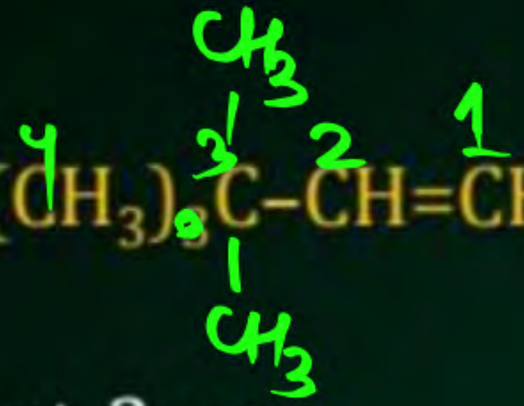
(A) hex-3-yn-5-ene

(B) hex-5-en-3-yne

(C) hex-3-yn-1-ene

[✓ (D) hex-1-en-3-yne]

QUESTION



The IUPAC name of $(\overset{4}{C}H_3)_3\overset{3}{C}-\overset{2}{C}H=\overset{1}{C}H_2$ is:

$$\overset{4}{C}H_3-\underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{\overset{3}{C}}}-\overset{2}{C}H=\overset{1}{C}H_2$$

A 2, 2-dimethylbut-3-ene

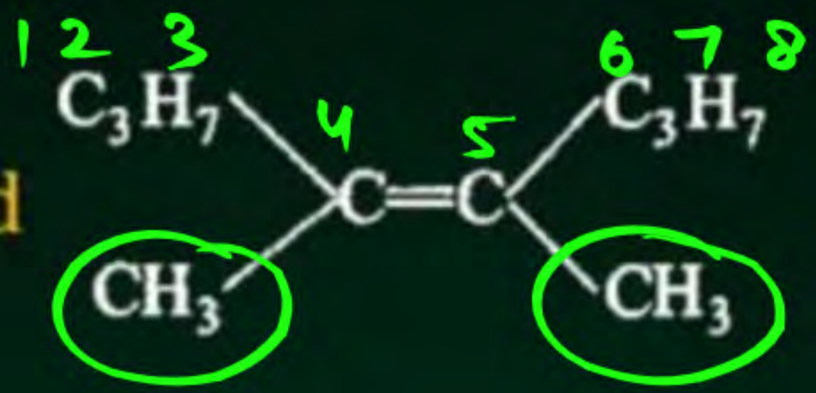
B 2, 2-dimethylpent-4-ene

[✓ C] 3, 3-dimethylbut-1-ene

D hex-1-ene

QUESTION

The IUPAC name of the compound is:


1 2 3
C_3H_7
4
5
6 7 8
C_3H_7
C=C
CH_3
CH_3

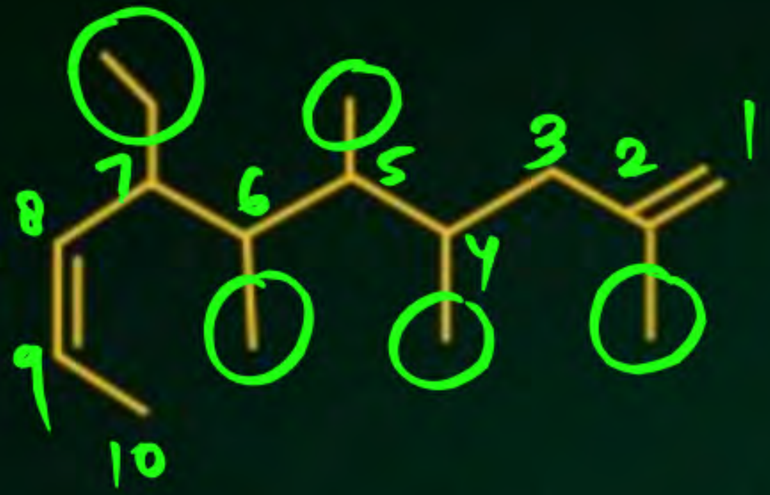
(A) [✓ 4, 5-dimethyloct-4-ene]

(B) 2, 3-dipropylbut-2-ene

(C) 4-methyl-5-propylhex-4-ene

(D) none of the above

QUESTION

The IUPAC name of  is:

[✓ A] 7-Ethyl-2, 4, 5, 6-tetramethyldeca-1, 8-diene

B 7-Ethyl-2, 4, 5, 6-tetramethyldeca-1, 7-diene

C 7-(1-Propenyl)-2, 3, 4, 5-tetramethyl-non-1-ene

D 4-Ethyl-5, 6, 7, 9-tetramethyldeca-2, 9-diene

Home Work

Discuss L-04

QUESTION 01

The IUPAC name of $\overset{5}{C}H_3\overset{4}{C}H(\underline{OH})\overset{3}{C}H_2\overset{2}{C}H_2\overset{1}{C}OOH$ is:

[✓ A] 4-hydroxy pentanoic acid

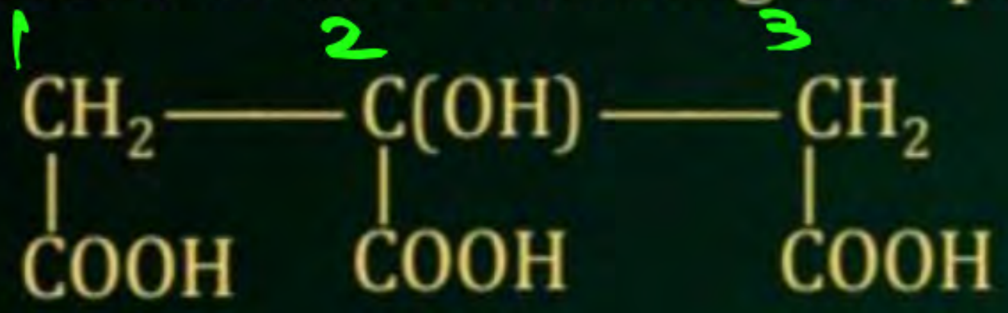
B 1-carboxybutan-3-ol

C 1-carboxybutan-4-ol

D 4-carboxybutan-2-ol

QUESTION 02

The name of the following compound is:



$$\overset{1}{\underset{\displaystyle COOH}{CH_2}}-\overset{2}{\underset{\displaystyle COOH}{C(OH)}}-\overset{3}{\underset{\displaystyle COOH}{CH_2}}$$

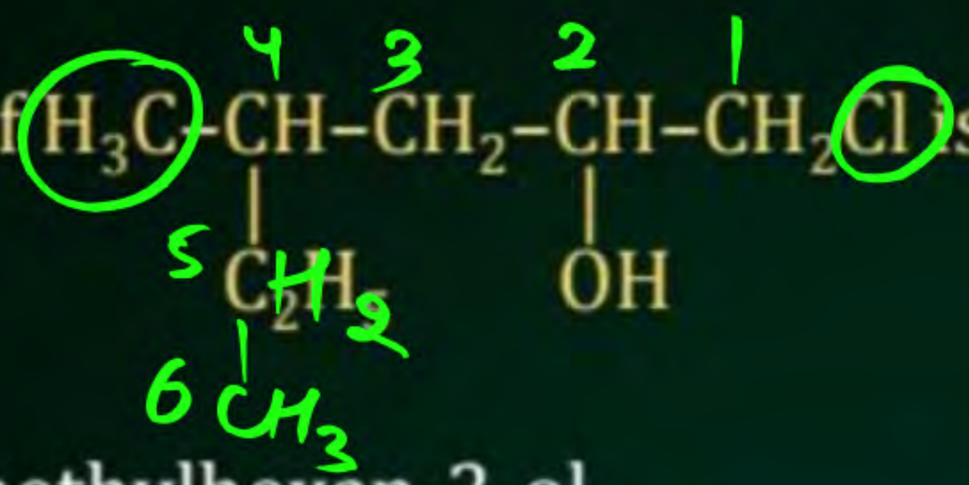
[✓ A] 2-hydroxypropane-1, 2, 3-tricarboxylic acid

B 3-carboxy-3-hydroxy-1, 5-pentanedioic acid

C citric acid

D all of the above

QUESTION 03

The IUPAC name of  is:

$$H_3C-\underset{\underset{C_2H_5}{|}}{CH}-CH_2-\underset{\underset{OH}{|}}{CH}-CH_2Cl$$

[✓ A] 1-chloro-4-methylhexan-2-ol

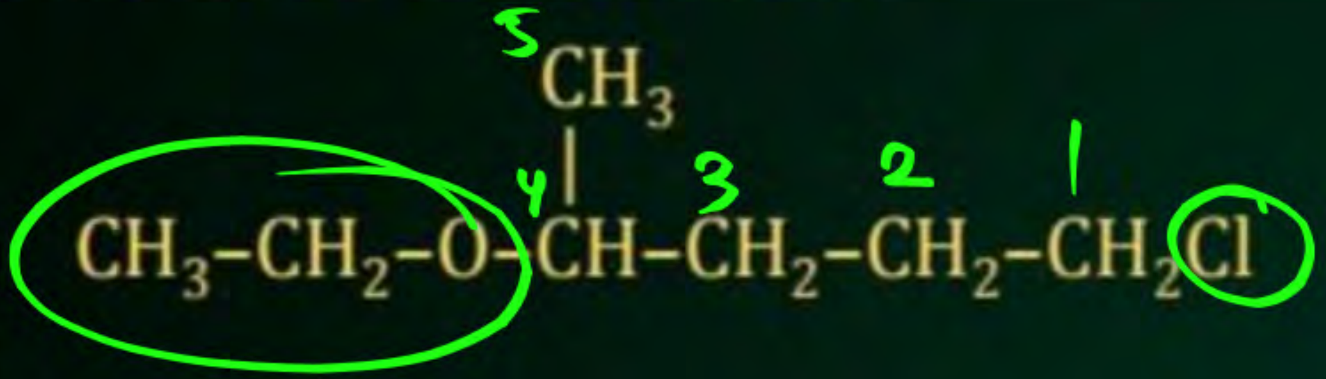
B 1-chloro-4-methylhexan-2-al ×

C 1-chloro-4-ethylpentan-2-ol

D 1-chloro-2-hydroxy-4-methylhexane

QUESTION 04

The correct IUPAC name for



$$CH_3-CH_2-O-\overset{\overset{5}{CH_3}}{\overset{|}{\underset{4}{C}H}}-\overset{3}{C}H_2-\overset{2}{C}H_2-\overset{1}{C}H_2Cl$$

is:

A 2-ethoxy-5-chloropentane

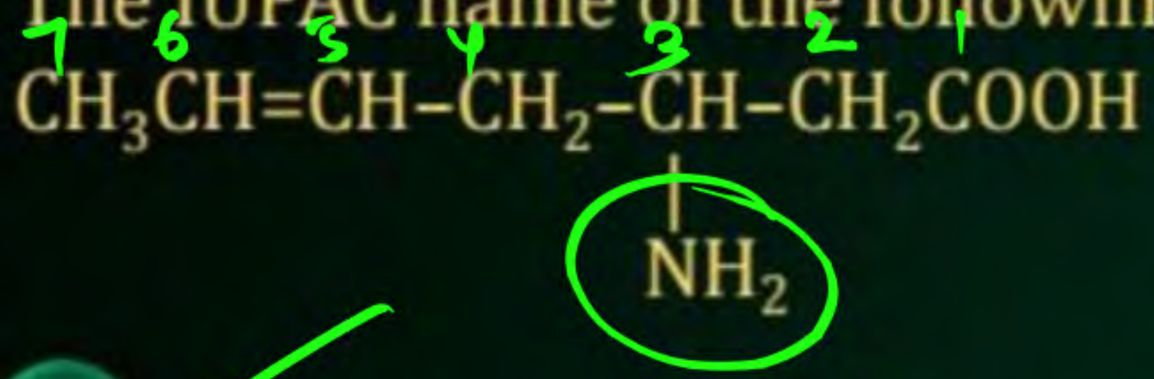
B 1-chloro-4-ethoxy-4-methyl butane

[✓ C] 1-chloro-4-ethoxy pentane

D ethyl-1-chloropentyl ether

QUESTION 05

The IUPAC name of the following is:



$\overset{7}{C}H_3\overset{6}{C}H=\overset{5}{C}H-\overset{4}{C}H_2-\underset{NH_2}{\overset{3}{C}H}-\overset{2}{C}H_2\overset{1}{C}OOH$

[✓ A] 3-aminohept-5-enoic acid

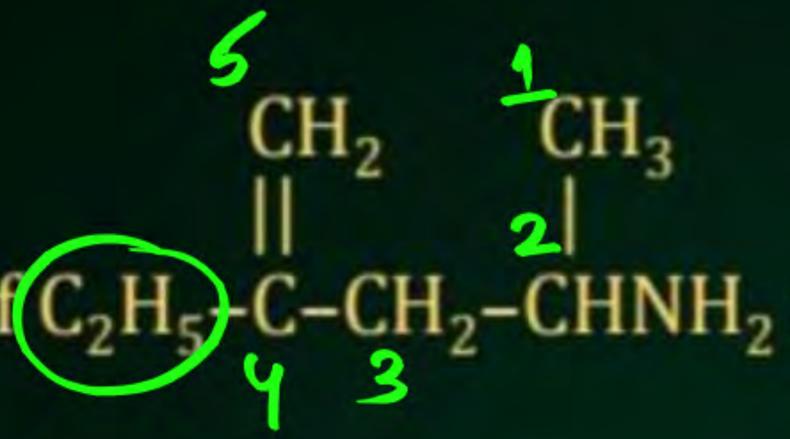
B 5-aminohex-2-ene-carboxylic acid

C 3-amino-δ-heptanoic acid

D 5-aminohept-2-enoic acid

QUESTION 06

The IUPAC name of

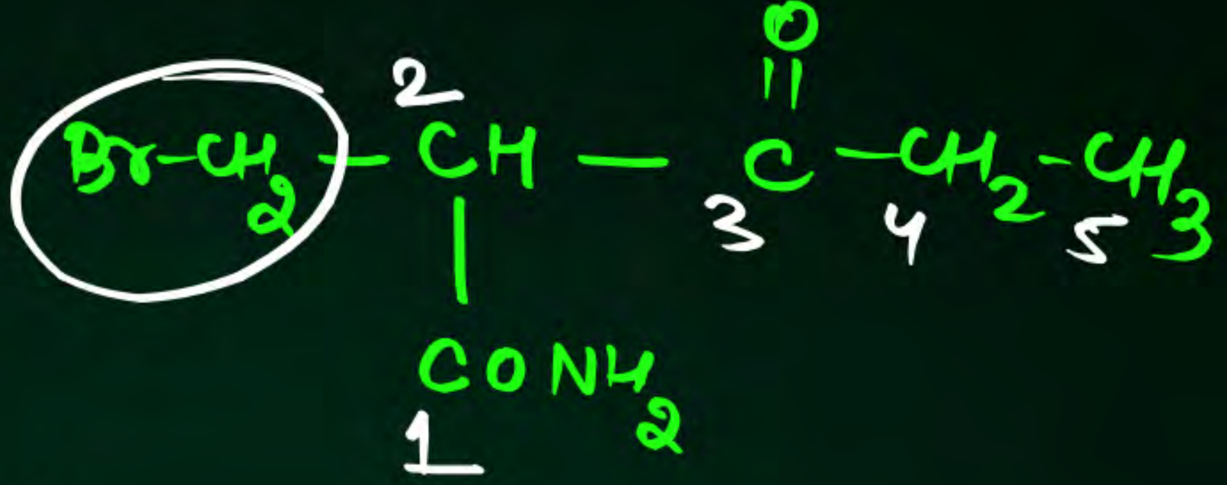


$C_2H_5-\overset{\overset{CH_2}{\|}}{C}-CH_2-\overset{\overset{CH_3}{|}}{CH}NH_2$ is:

- **A** 4-amino-2-ethylpent-1-ene
- **B** 2-ethylpentan-4-amine
- **C** aminopent-4-ene
- [✓ **D**] 4-ethylpent-4-en-2-amine

QUESTION 07

The IUPAC name of the compound $BrCH_2–(CONH_2)CH–CO–CH_2–CH_3$ is:



Br-CH2
2
CH
O
C
3
CH2
4
CH3
5
CONH2
1

A 2-(bromoethyl)-3-oxopentanamide

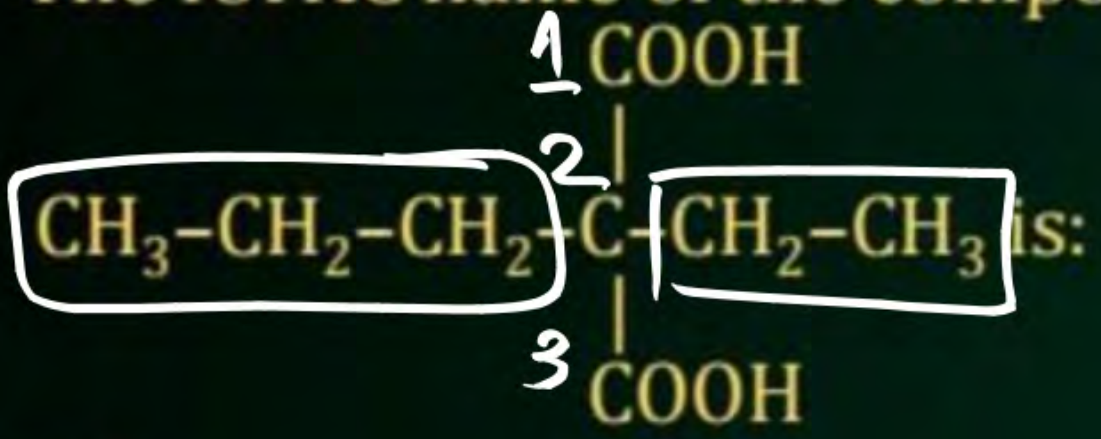
B 2-(bromoethyl)-3keto pentanamide

[✓ C] 2-(bromomethyl)-3-oxopentanamide

D 3-(bromoethyl)-3-oxopentanamide

QUESTION 08

The IUPAC name of the compound



$$CH_3-CH_2-CH_2-\overset{\overset{COOH}{|}}{\underset{\underset{COOH}{|}}{C}}-CH_2-CH_3$$ is:

(A) 2-propyl-2-ethyl propanedioic acid

1,3

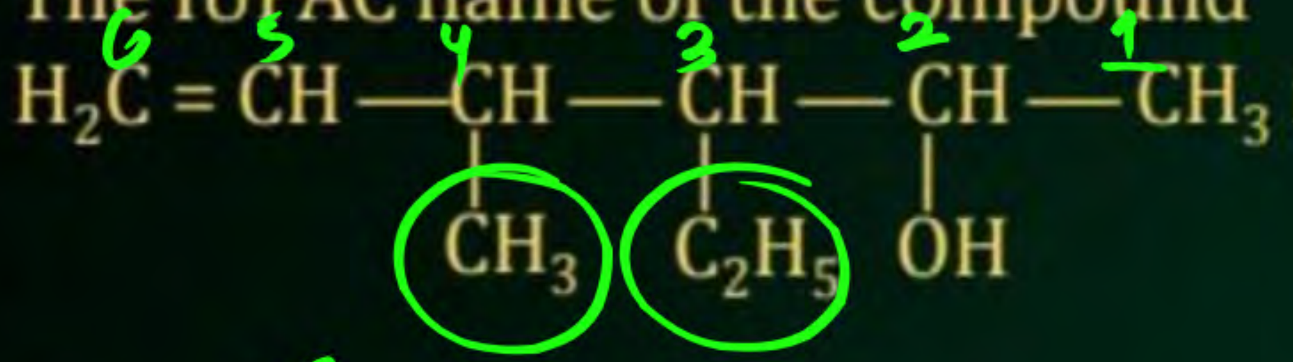
[✓ (B)] 2-ethyl-2-propyl propanedioic acid

(C) 2-ethyl-2-carboxy pentanoic acid

(D) 2-carboxy-2-ethyl pentanoid acid

QUESTION 09

The IUPAC name of the compound



$$\overset{6}{H_2C}=\overset{5}{CH}-\underset{CH_3}{\overset{4}{CH}}-\underset{C_2H_5}{\overset{3}{CH}}-\underset{OH}{\overset{2}{CH}}-\overset{1}{CH_3}$$ is:

[✓ A] 3-ethyl-4-methylhex-5-en-2-ol

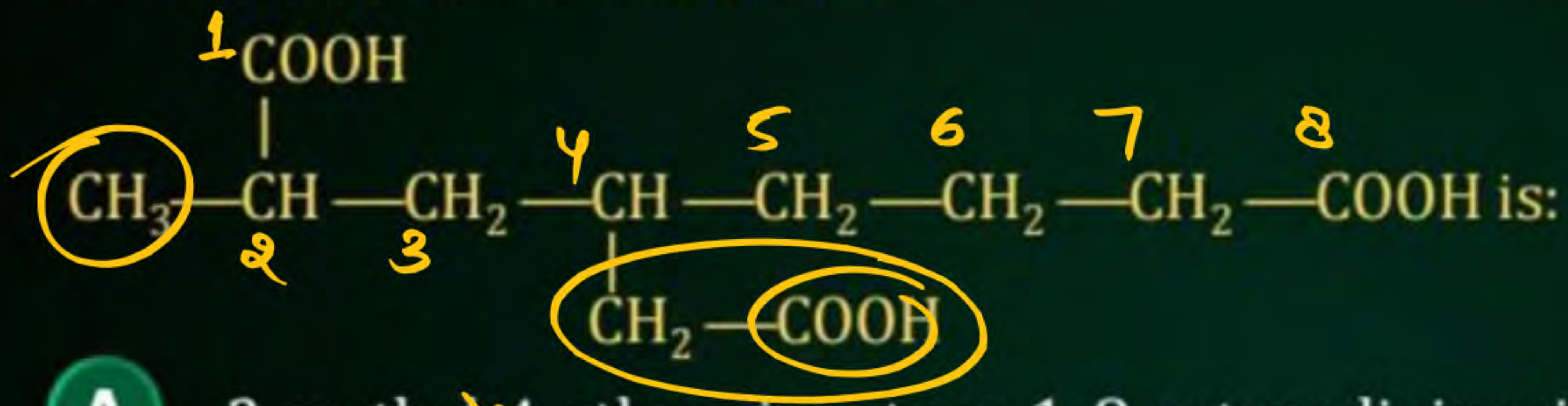
B 3-methyl-4-ethylhex-1-en-5-ol

C 3-ethy-2-hydroxy-4-methylhex-5-ene

D none of the above

QUESTION 10

IUPAC name of the compound



$$\mathrm{CH_3-\overset{\overset{\displaystyle COOH}{|}}{C}H-CH_2-\underset{\underset{\displaystyle CH_2-COOH}{|}}{C}H-CH_2-CH_2-CH_2-COOH}$$ is:

- Ⓐ 2-methyl-4-ethanoic octane-1, 8-octanedioic acid
- [✓ Ⓑ] 2-methyl-4-(carboxy methyl) octane-1, 8-dioic acid
- Ⓒ 2-methyl-1, 1, 6-heptane tricarboxylic acid
- Ⓓ none of these

ANSWER KEY

1. A
2. A
3. A
4. C
5. A
6. D
7. C
8. B
9. A
10. B

Thank you!!

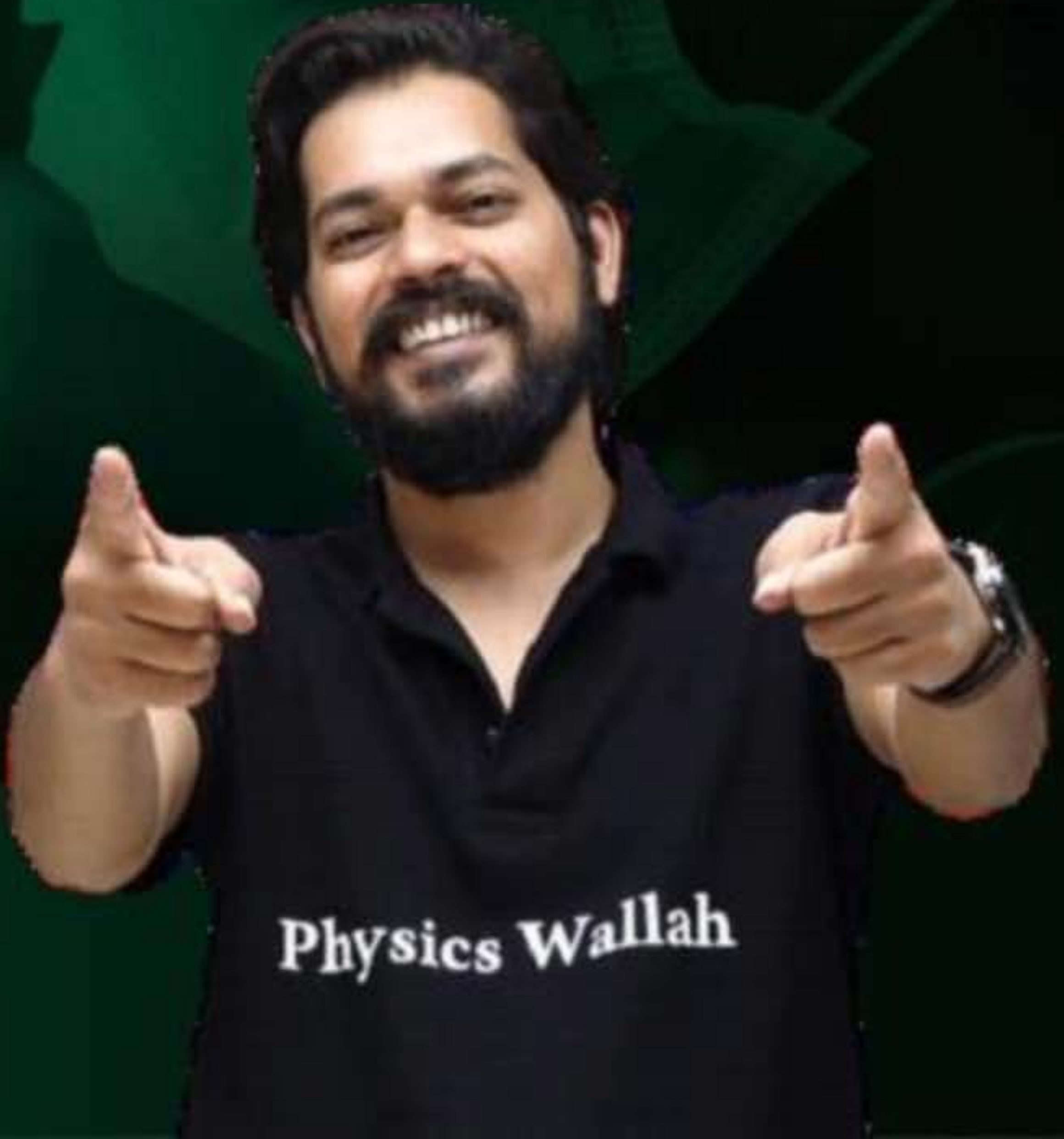
YAKEEN 2.0

FOR NEET 2025

Lecture- 06 **Organic Chemistry**

Some Basic Principles and Techniques (IUPAC Naming)

By- Pankaj Sir(POPU MAMA)


Physics Wallah

Topics *to be covered*

1. IUPAC Naming of Benzene Derivatives ✓
2. Practice

IUPAC Naming of Benzene Derivatives

suffix-1

Prefix -2 + [Word root+suffix-2]

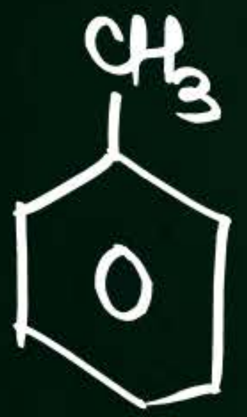
Or

Prefix -2 + Benzene +suffix-2 | SP suffix-2

IUPAC Naming of Benzene Derivatives

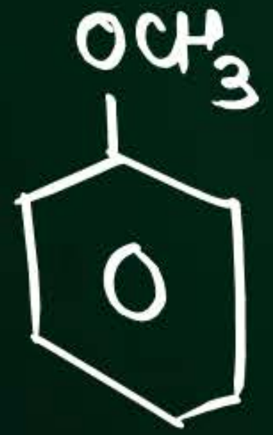
Rules

1. If organic Compound is having one P.F.G then common name is retained in IUPAC.



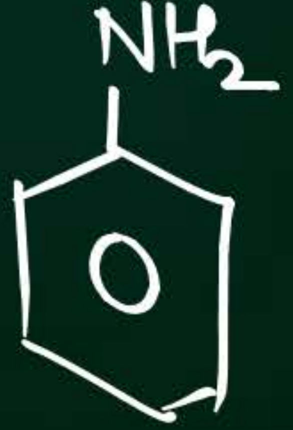
Toluene

or methyl benzene



Anisole

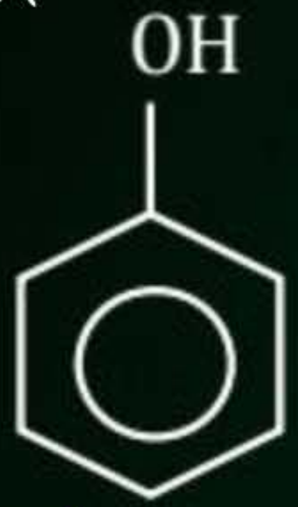
methoxy benzene

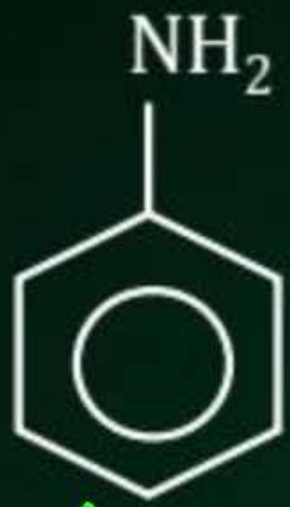


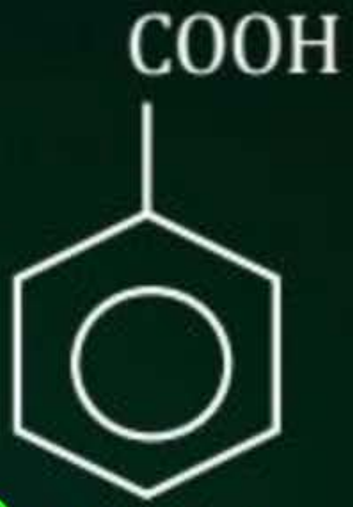
Aniline

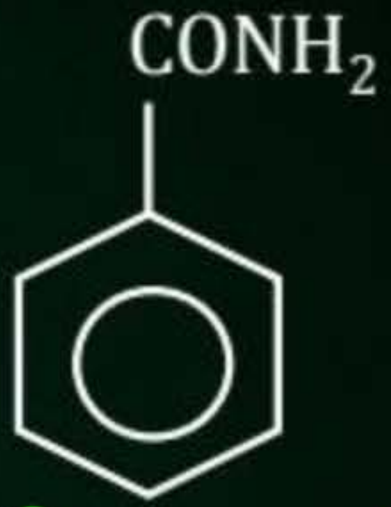
Amino benzene

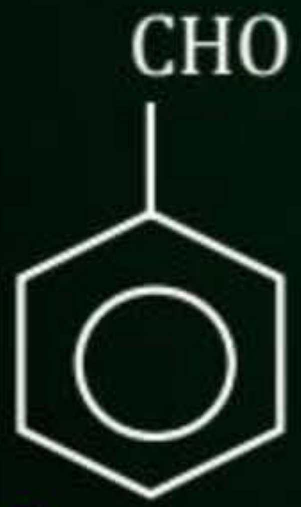
(Common name
IUPAC name)

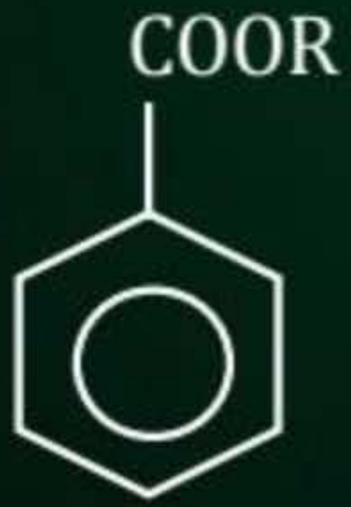
(a)

Phenol

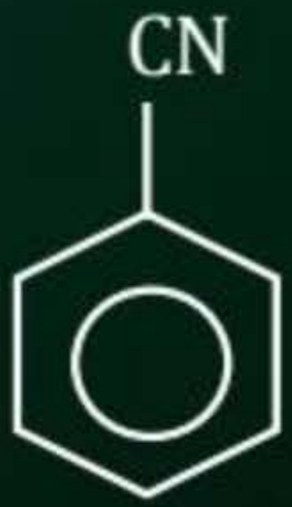
(b)

Aniline

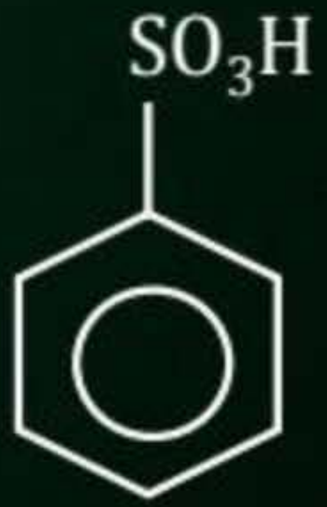
(c)

Benzoic acid

(d)

Benzamide

(e)

Benzaldehyde

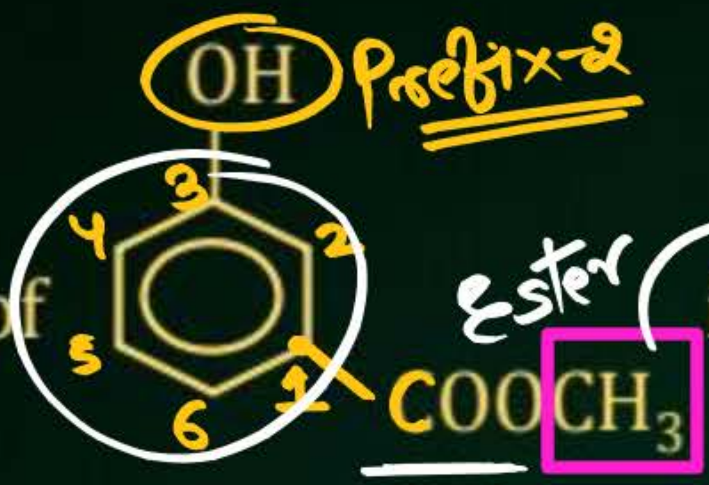
(f)

Benzoate

(g)

Benzonitrile

(h)

Benzene sulphonic acid

QUESTION

The IUPAC name of


OH
Prefix-2
4
3
2
5
1
6
COOCH3
Ester
super prefix

is:

- (A) 2-hydroxy methyl benzoate
- (B) 2-hydroxy ethyl benzoate
- [✓ (C)] Methyl -3-hydroxy benzoate
- (D) 1-hydroxy methyl benzoate

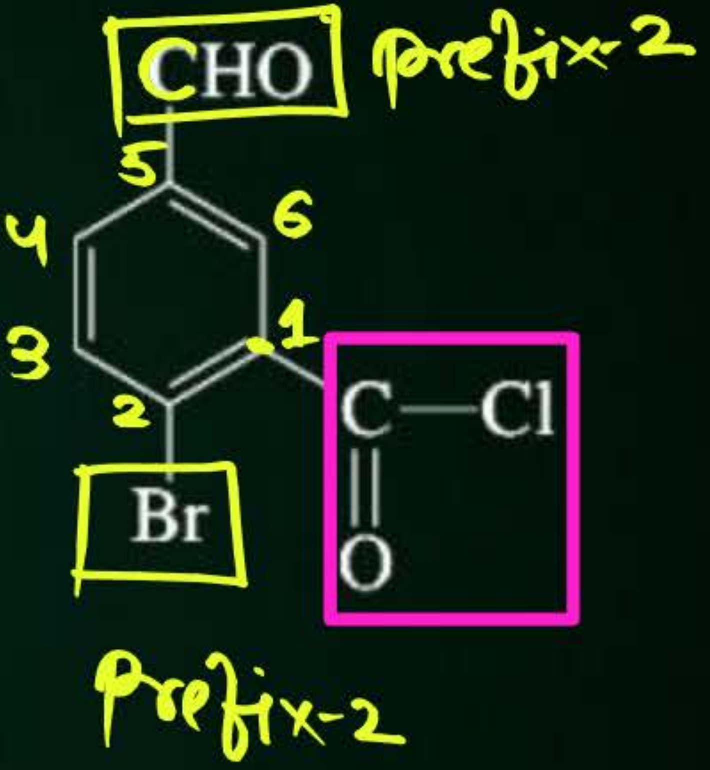
Methyl- 3-hydroxy benzoate

or

Methyl-3-hydroxy benzene carboxylate

QUESTION

The IUPAC name of the following compound is:


CHO
prefix-2
5
6
4
3
1
2
C—Cl
O
Br
Prefix-2

(A) 4-bromo-3-chloroformyl benzaldehyde

(B) ✓ 2-bromo-5-formyl benzene carbonyl chloride

or benzoyl chloride

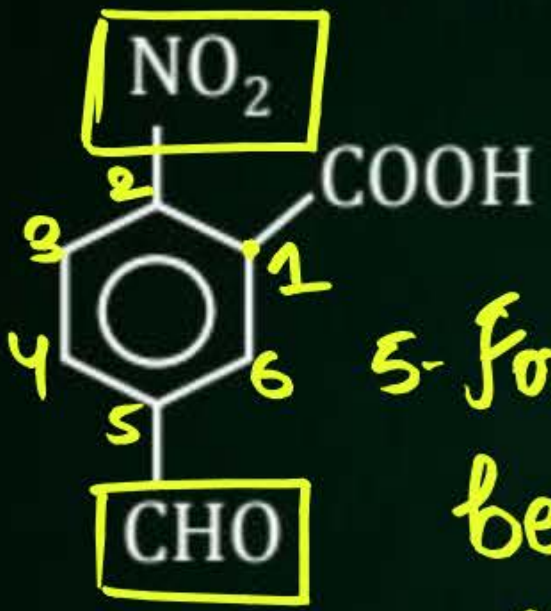
(C) 2-chloro carbonyl bromobenzne

(D) 6-bromo-3-formylbenzo-3-yl chloride

QUESTION

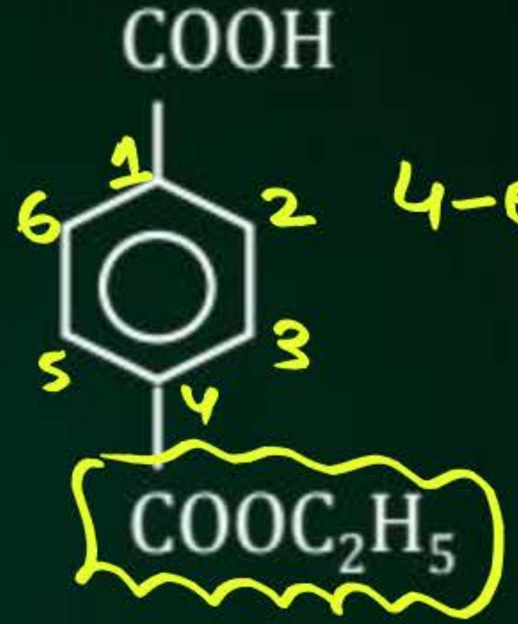
Write the correct IUPAC names of the following:

A


NO$_2$
COOH
2
3
1
4
6
5
CHO

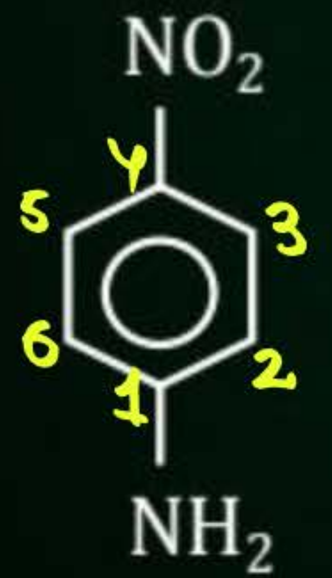
5-Formyl-2-nitro benzoic acid
or
benzene-1-carboxylic acid

B


COOH
1
6
2
5
3
4
COOC$_2$H$_5$

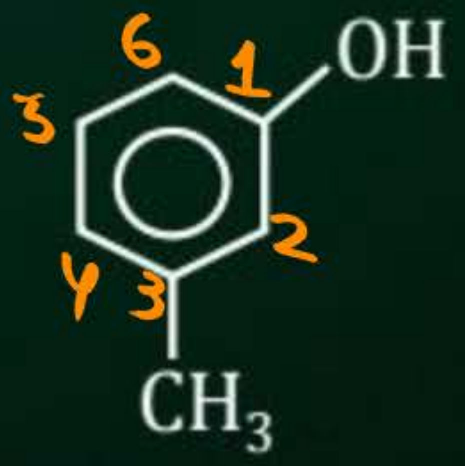
4-ethoxycarbonyl benzoic acid

C


NO$_2$
4
5
3
6
2
1
NH$_2$

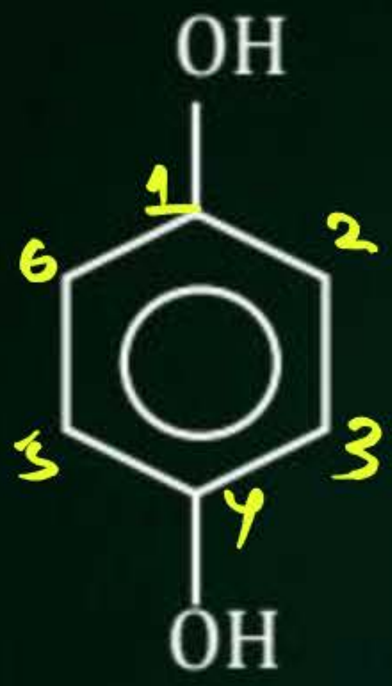
4-Nitro aniline
or
amino benzene

D

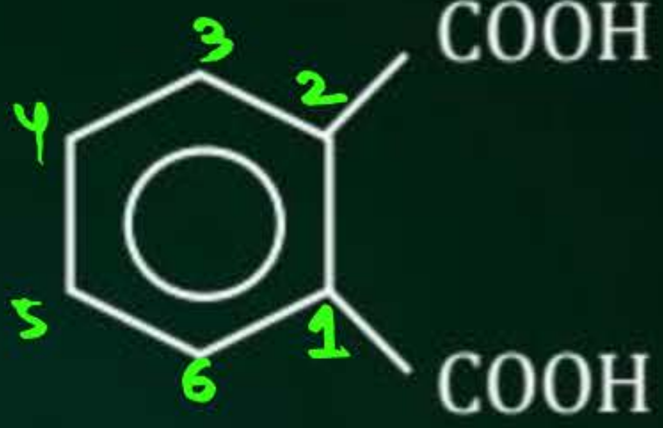

6
1
OH
5
2
4
3
CH$_3$

3-methyl phenol

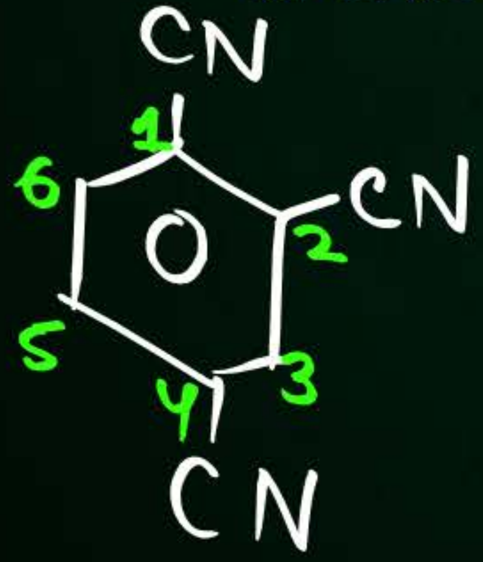
2. If more than one F.G are present


OH
1
6
2
3
3
4
OH

Benzene-1,4-diol

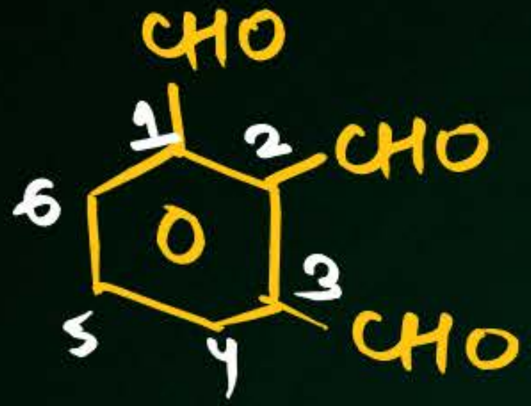

3
COOH
4
2
5
1
6
COOH

Benzene-1,2-dicarboxylic acid


CN
1
6
CN
2
5
4
3
CN

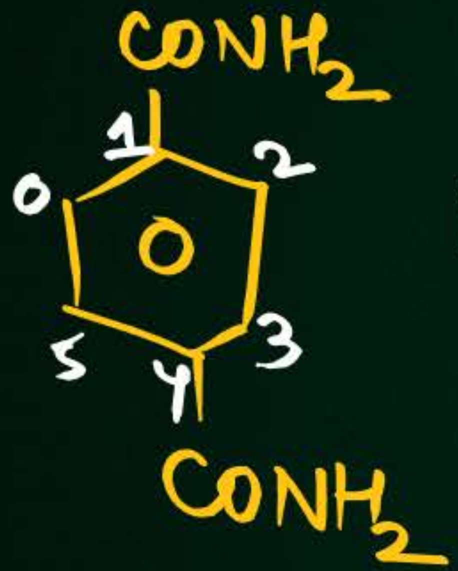
Benzene-1,2,4-tricarbonitrile

Q 1)


CHO
1
2
CHO
6
5
4
3
CHO

Benzene-1,2,3-tricarbaldehyde

2)

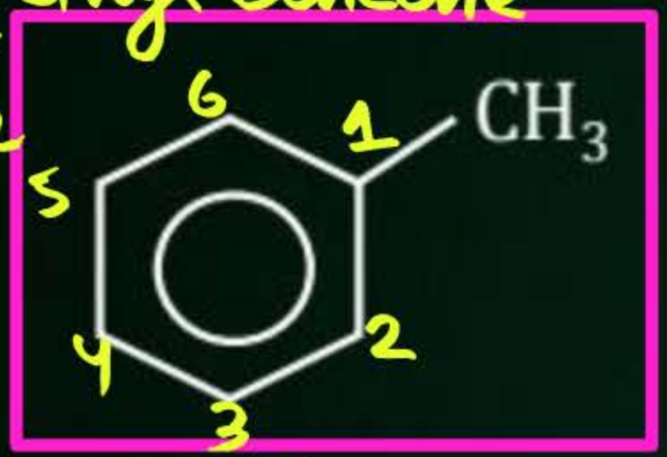

CONH$_2$
1
2
0
5
4
3
CONH$_2$

Benzene-1,4-dicarboxamide

3. If Hydrocarbon is combination of both open and ring part then except Me and Et open part is taken as main part.

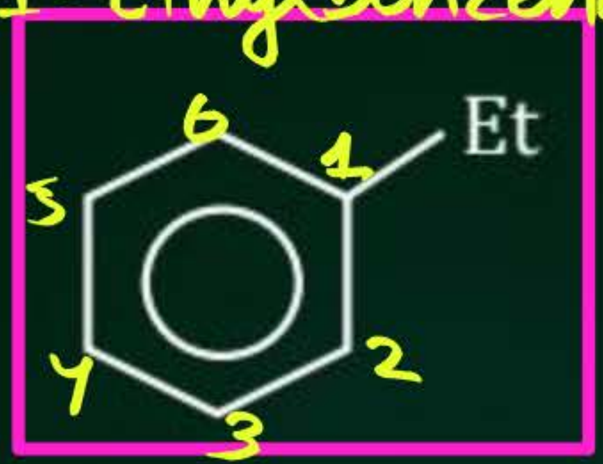
1-Methyl benzene
or
Toluene

(a)

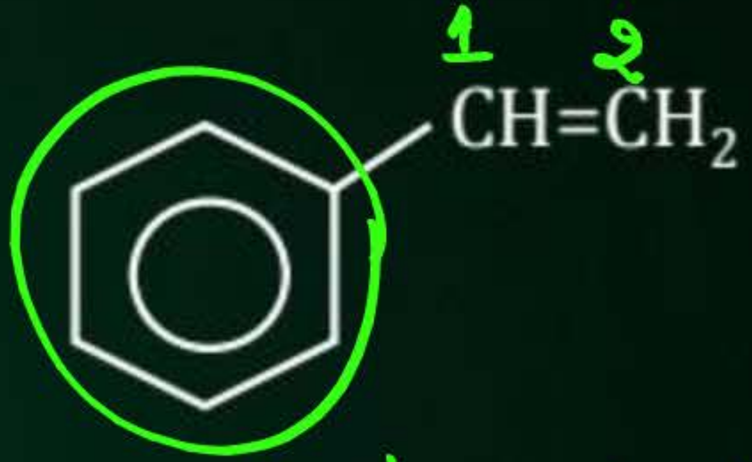


1-Ethyl benzene

(b)

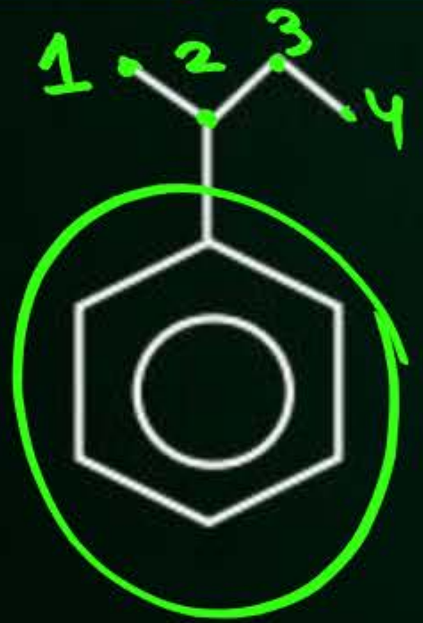


(c)



1-phenyl ethene

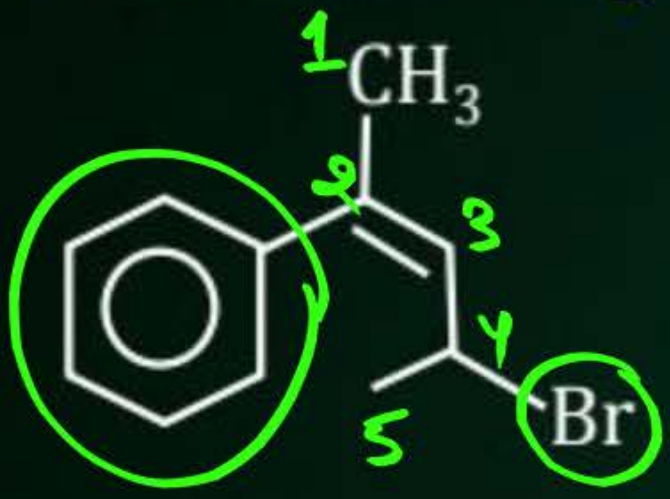
(d)



2-phenyl butane

QUESTION (AIIMS 26 May, 2018 (M))

IUPAC name of the following is:



[✓ A] 4-Bromo-2-phenylpent-2-ene

B 2-Bromo-4-phenylpent-2-ene

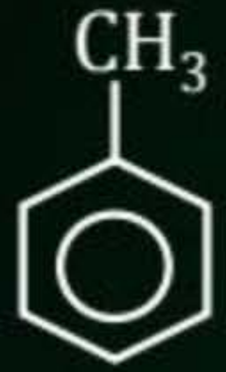
C 4-Bromo-2-phenylpent-4-ene

D 2-Bromo-4-phenylpent-3-ene

QUESTION

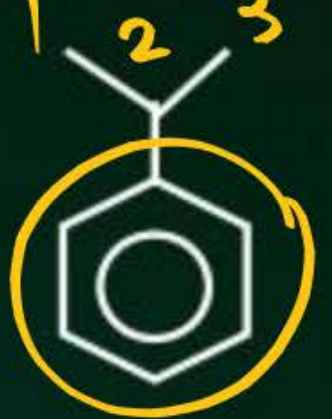
Write IUPAC names of the following:

(A)



methyl benzene
or
Toluene

(B)



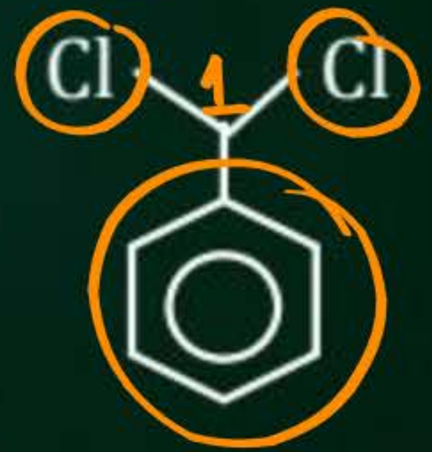
2-phenyl propane

(C)

$\boxed{\text{Ph}}-\overset{1}{\text{CH}_2}-\boxed{\text{Ph}}$

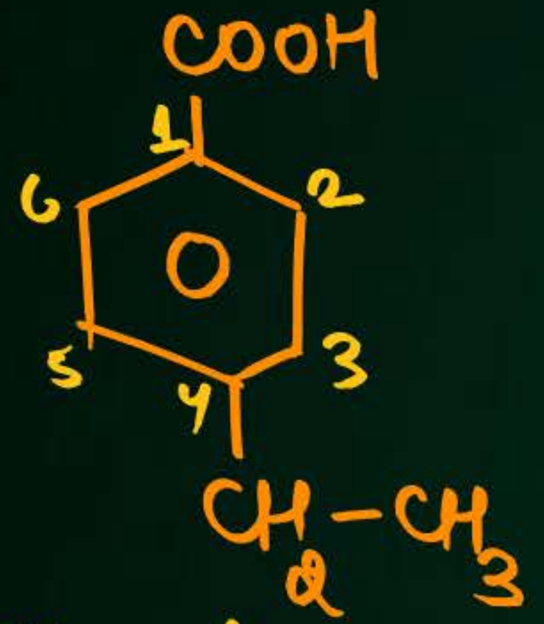
1,1-Diphenyl methane

(D)

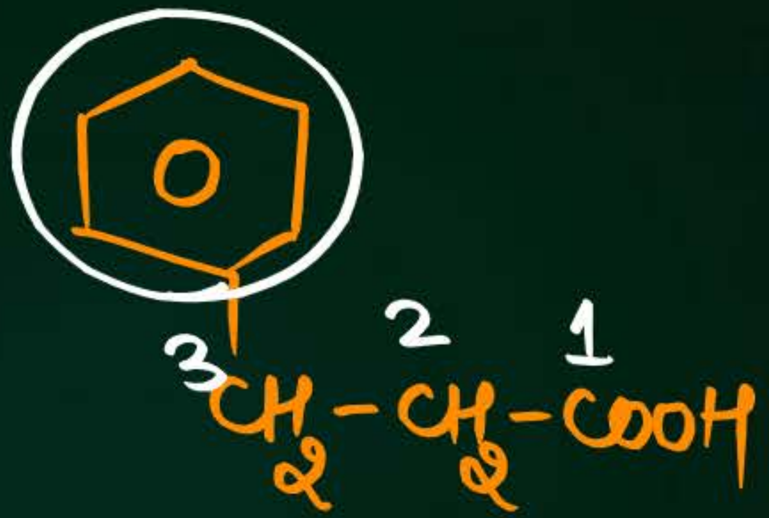


1,1-Dichloro-1-phenyl methane

4. If organic compound is having P.F.G then part having P.F.G is taken as main part.

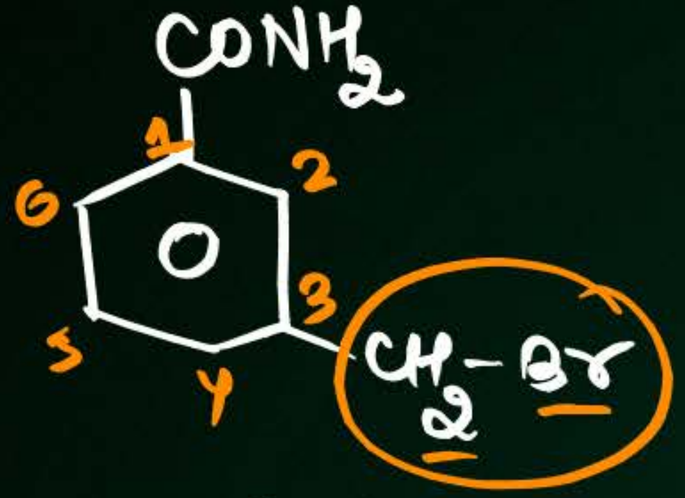

COOH
1
2
3
4
5
6
CH_2-CH_3

4-Ethyl benzoic acid

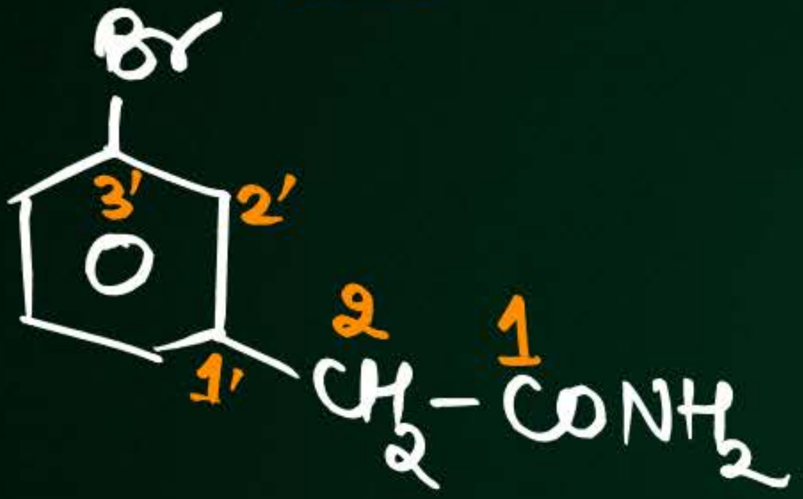

3
2
1
CH_2-CH_2-COOH

3-phenyl propanoic acid

Q/

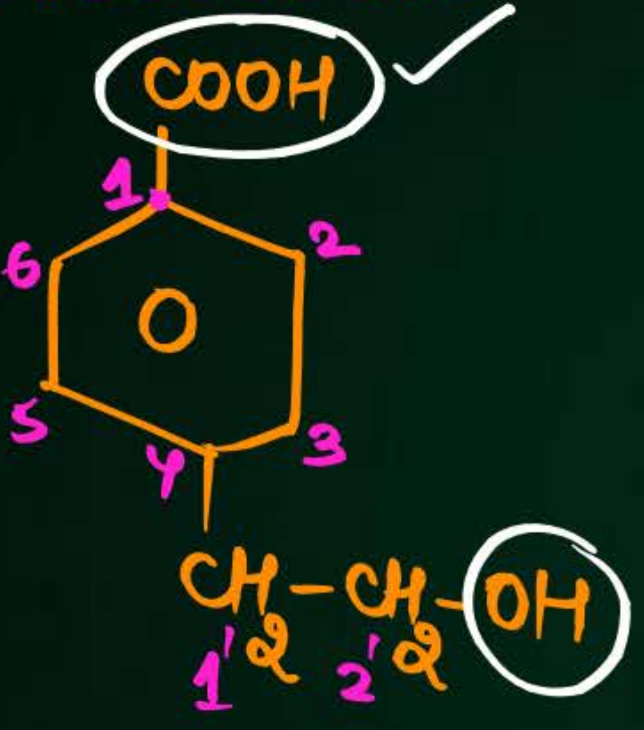

CONH$_2$
1
2
3
4
5
6
CH$_2$-Br

3-Bromomethyl benzamide

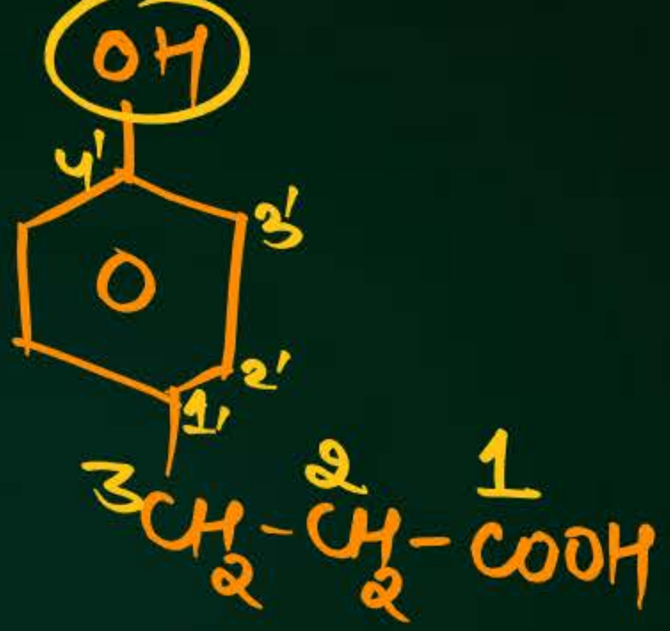

Br
3'
2'
1'
2
1
CH$_2$-CONH$_2$

2-(3'-Bromophenyl) ethanamide

5. If both parts are having P.F.G then part having higher priority P.F.G is taken as main part.

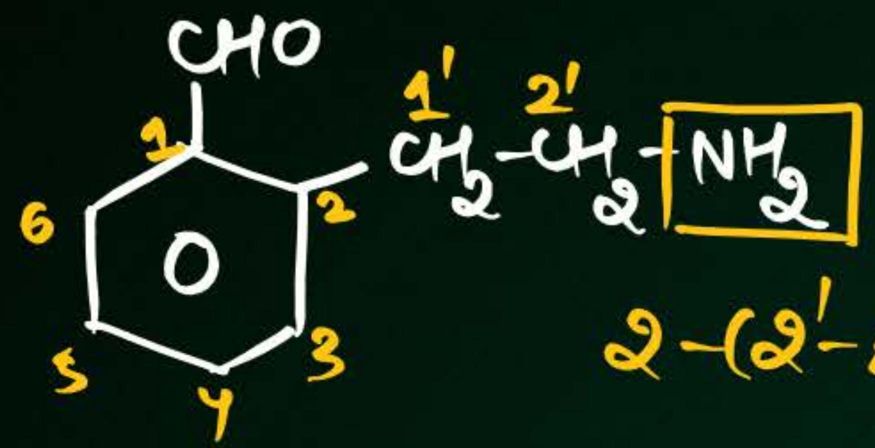

COOH
1
2
3
4
5
6
CH₂–CH₂–OH
1' 2'

4-(2'-Hydroxy ethyl) benzoic acid


OH
4'
3'
2'
1'
3 CH₂–CH₂–COOH
2
1

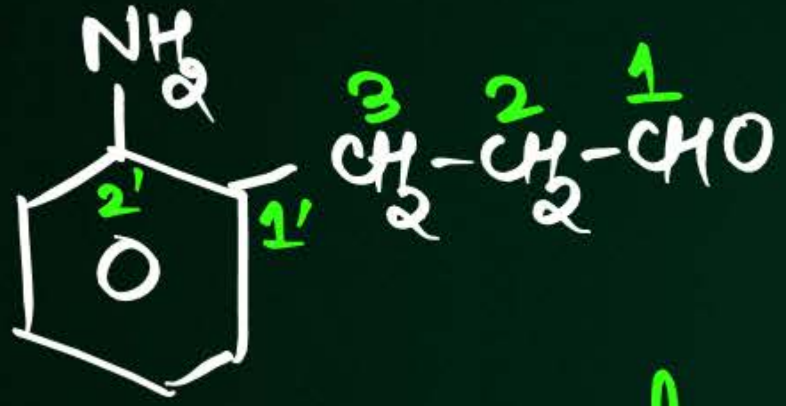
3-(4'-Hydroxy phenyl) propanoic acid

Q/



CHO
1'
2'
CH2-CH2-NH2
1
2
3
4
5
6

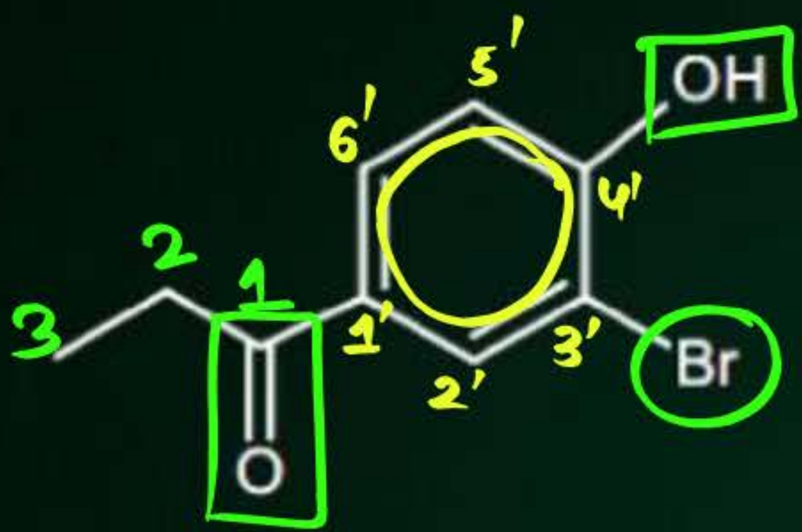
2-(2'-Aminoethyl) benzaldehyde)



NH2
3
2
1
CH2-CH2-CHO
2'
1'

3-(2'-Aminophenyl) propanal

QUESTION What is the IUPAC name for

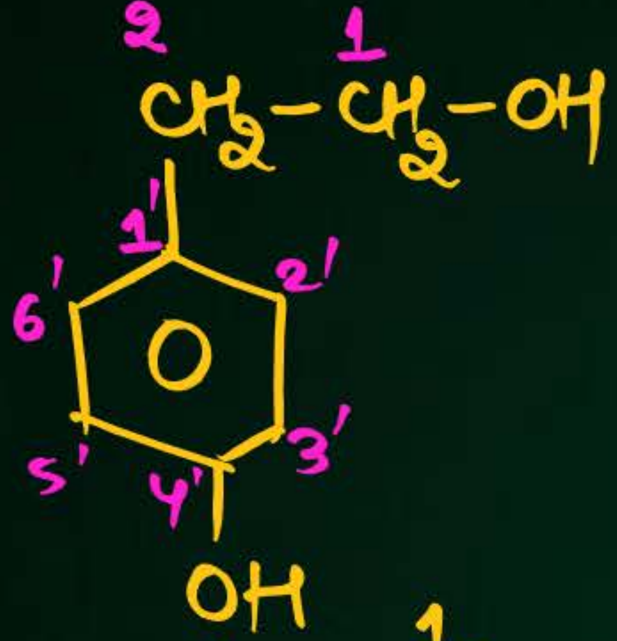


1-(3'-Bromo-4'-hydroxy phenyl) propan~~e~~-1-one

- A m-Bromo-p-hydroxy propiophenone
- B 2-Bromo-4-propanoyl phenol
- [✓ C] 3-Bromo-4-hydroxy phenyl propan-1-one
- D 2-Hydroxy-5-propanoyl bromo benzene

6. If there is choice priority is given to open part.

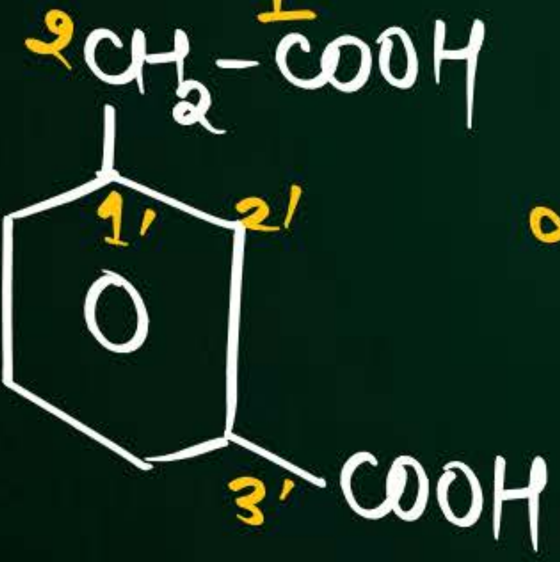
1)



2
1
CH2-CH2-OH
1'
2'
6'
3'
5'
4'
OH

2-(4'-Hydroxy phenyl) ethanol

2)

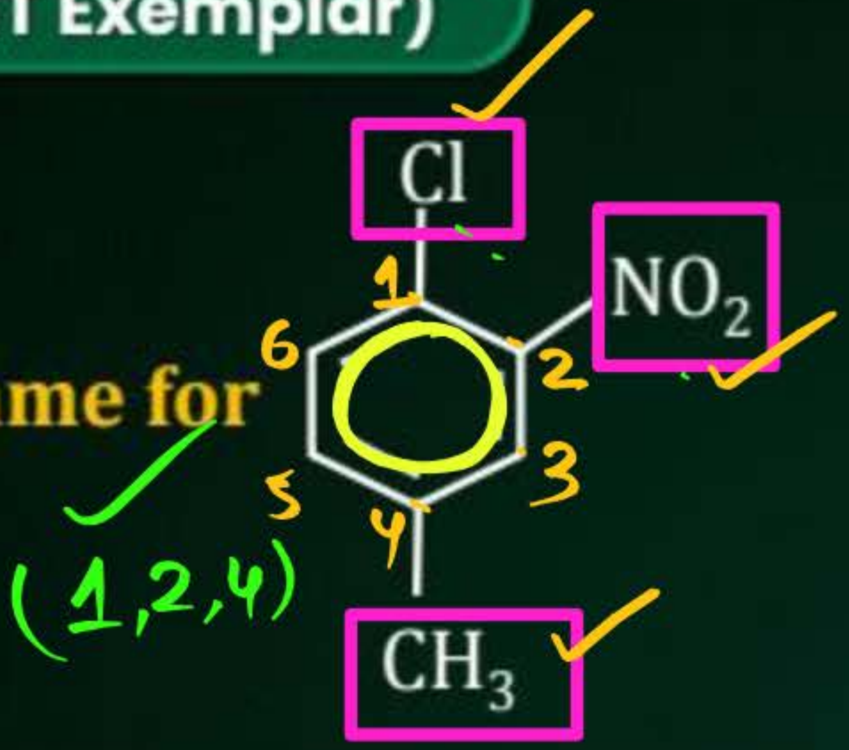


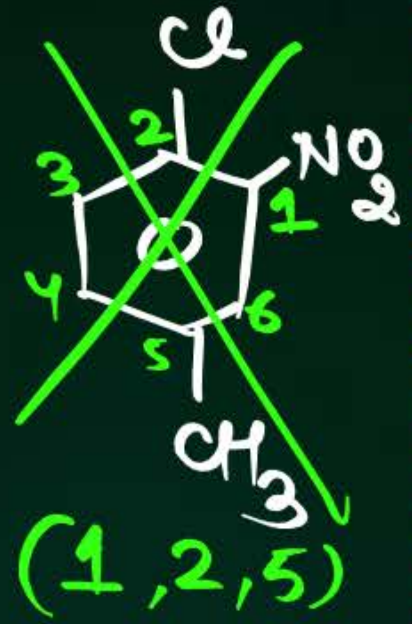
1
2 CH2-COOH
1'
2'
3'
COOH

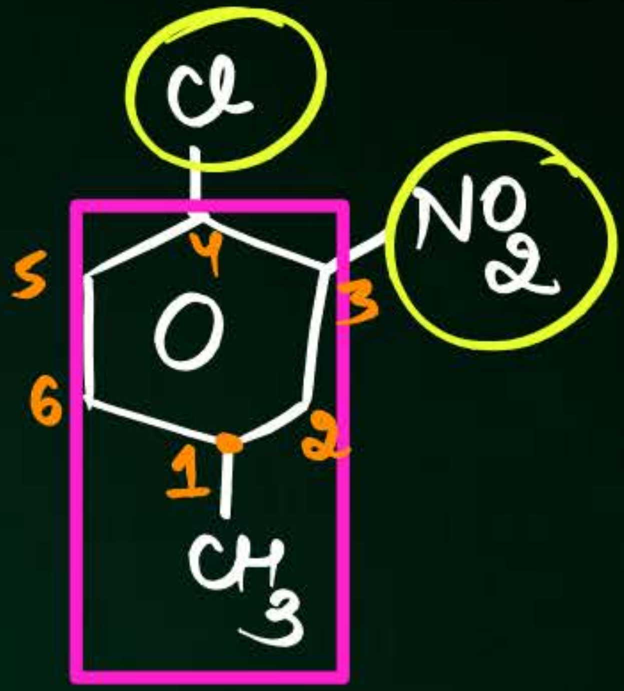
2-(3'-Carboxy phenyl) ethanoic acid

QUESTION (NCERT Exemplar)

The IUPAC name for


Cl
NO2
CH3
1
2
3
4
5
6
(1,2,4)


Cl
NO2
CH3
1
2
3
4
5
6
(1,2,5)


Cl
NO2
CH3
1
2
3
4
5
6

4-chloro-3-nitro toluene

(A) 1-Chloro-2-nitro-4-methylbenzene

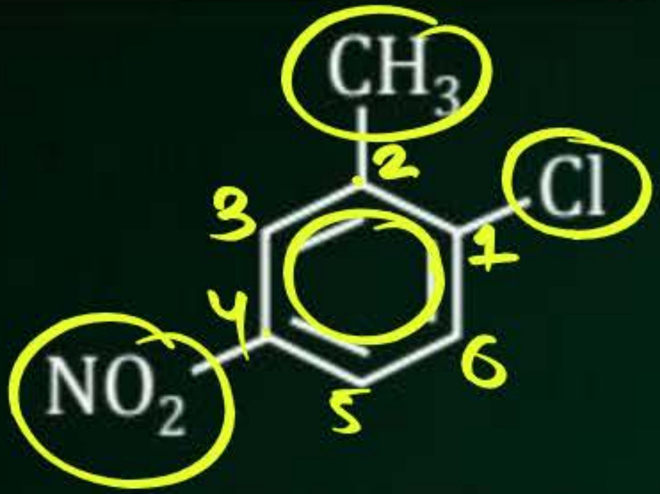
(B) 1-Chloro-4-methyl-2-nitrobenzene ✓

(C) 2-Chloro-1-nitro-5-methylbenzene

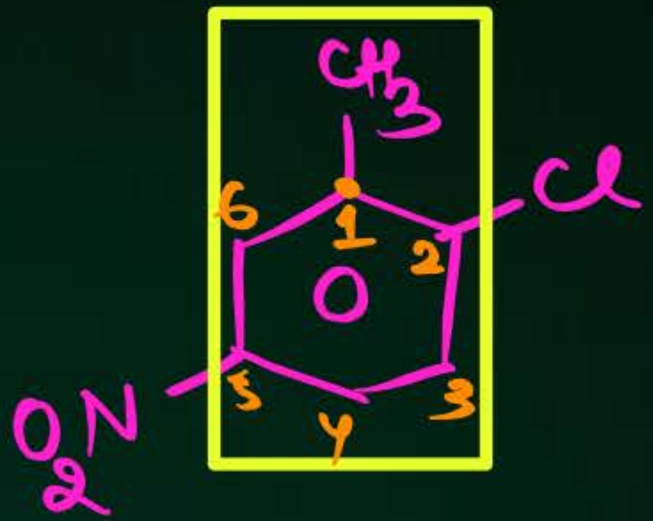
(D) *m*–Nitro-*p*-chlorotoluene ✗

QUESTION (AIIMS 2019, 26 May)

IUPAC name of


CH$_3$
Cl
NO$_2$
1
2
3
4
5
6

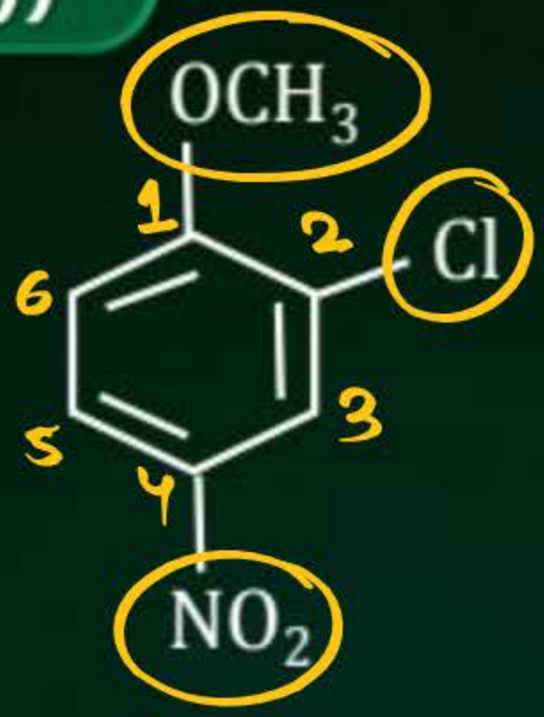
- [✓ A] 1-Chloro-2-methyl-4-nitro benzene
- B 2-Chloro-1-methyl-5-nitro benzene
- C 1-Nitro-2-methyl-4-chloro benzene
- D 2-Methyl-1-chloro-4-nitro benzene

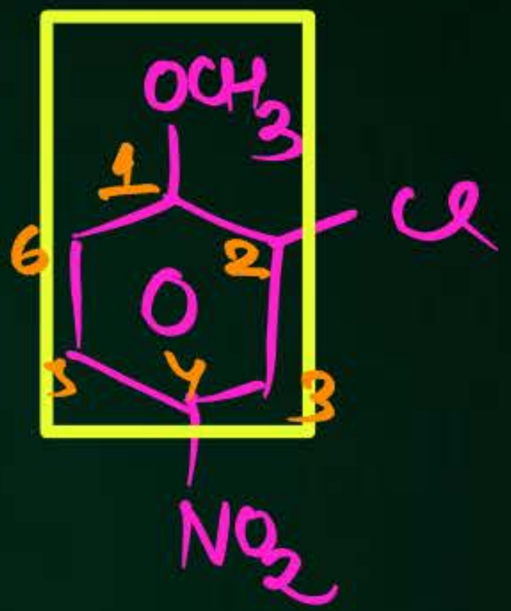

CH$_3$
Cl
O$_2$N
1
2
3
4
5
6

2-chloro-5-nitro toluene

QUESTION (AIIMS 27 May, 2018 (M))

IUPAC name of the following is:


OCH$_3$
Cl
NO$_2$
1
2
3
4
5
6


OCH$_3$
Cl
NO$_2$
1
2
3
4
5
6

(1,2,4)

A ✓ 2-chloro-1-methoxy-4-nitrobenzene

B ✗ 2-chloro-4-nitro Toluene

C 3-chloro-4-methoxy-1-nitrobenzene

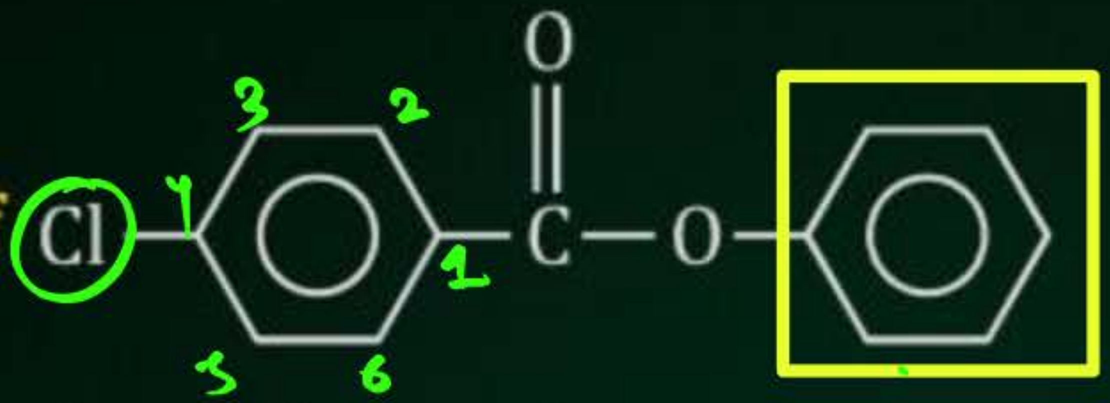
D 1-chloro-2-methoxy-5-nitrobenzene

(1,2,5)

2-chloro-4-nitro anisole

QUESTION

IUPAC name of



A 4-Chlorophenyl benzoate

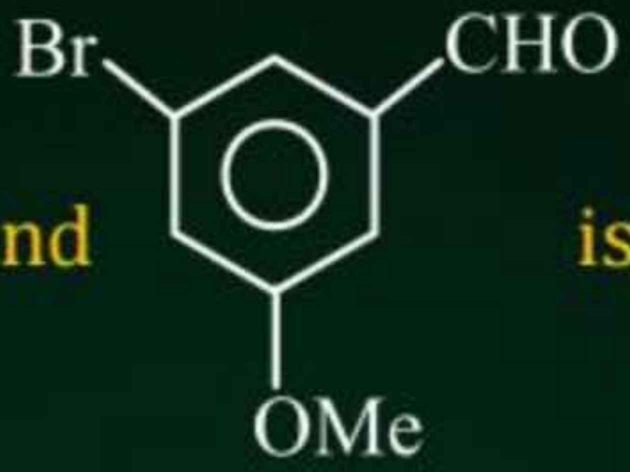
[✓ B] Phenyl 4-chlorobenzenecarboxylate

C Benzyl 4-chlorobenzenecarboxylate

D 4-Chlorodiphenylcarboxylate

Home Work

QUESTION 01

Correct IUPAC name for the compound  is:

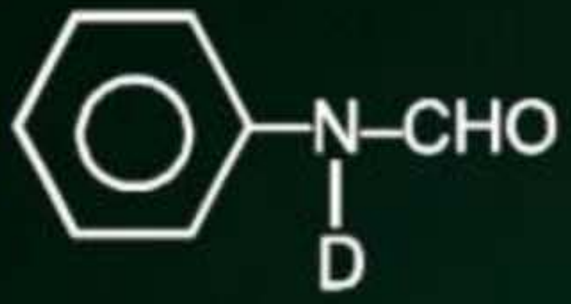
(A) 3-Methoxy-5-bromo benzenecarbaldehyde

(B) 3-Formyl-5-bromo phenylmethylether

(C) 3-Formyl-5-bromo-1-methoxybenzene

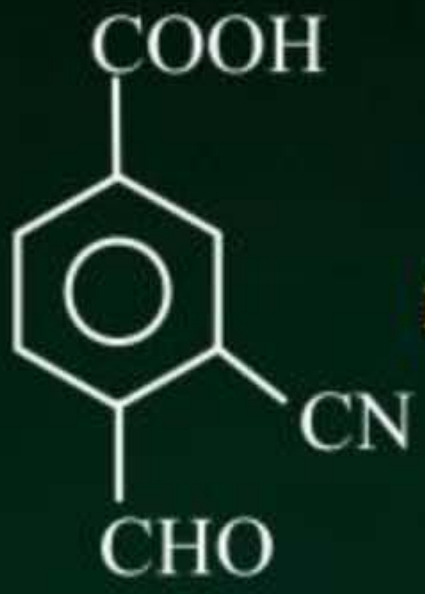
(D) 3-Bromo-5-methoxy benzenecarbaldehyde

QUESTION 02

IUPAC name of  is:

- **A** N-Deutero-N-fomylbenzenamine
- **B** N-Phenylamino-N-deuteromethanal
- **C** N-Deutero-N-phenylmethanamide
- **D** N-Deuterobenzene carboxamide

QUESTION 03

The IUPAC name of the compound  is:

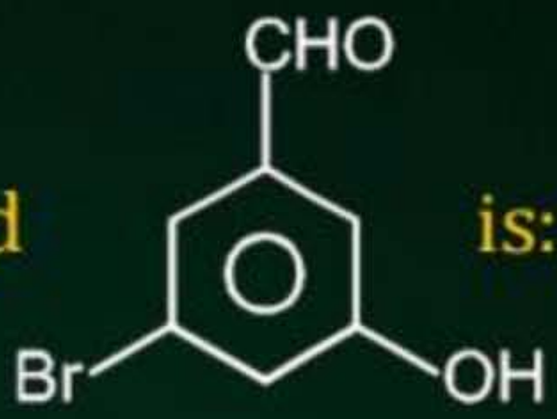
(A) 2-Cyano-1-formyl benzene-4-carboxylic acid

(B) 3-Cyano-4-formyl benzene-1-carboxylic acid

(C) 4-Carboxy-2-cyano benzene-1-carbaldehyde

(D) 2-Formyl-5-carboxy benzene-1-carbonitrile

QUESTION 04

The IUPAC name of the following compound  is:

(A) 5-Bromo-3-hydroxy benzene carbaldehyde

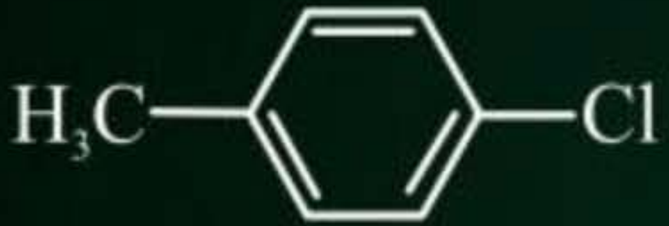
(B) 3-Bromo-5-formyl phenol

(C) 3-Bromo-5-hydroxy benzene carbaldehyde

(D) 1-Bromo-3-formyl-5-hydroxybenzene

QUESTION 05

The IUPAC name of the following compound is:



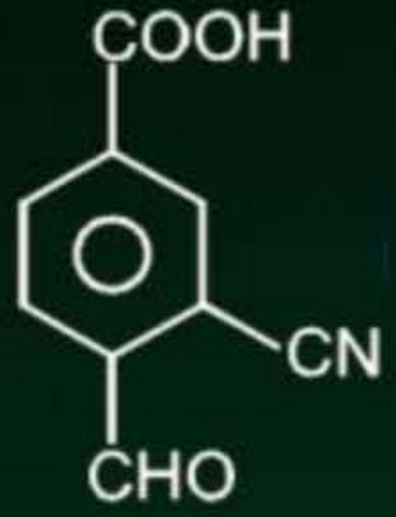
A 1-Chloro-4-methylbenzene

B 1-methyl-4-chlorobenzene

C 4-methyl chlorobenzene

D None of these

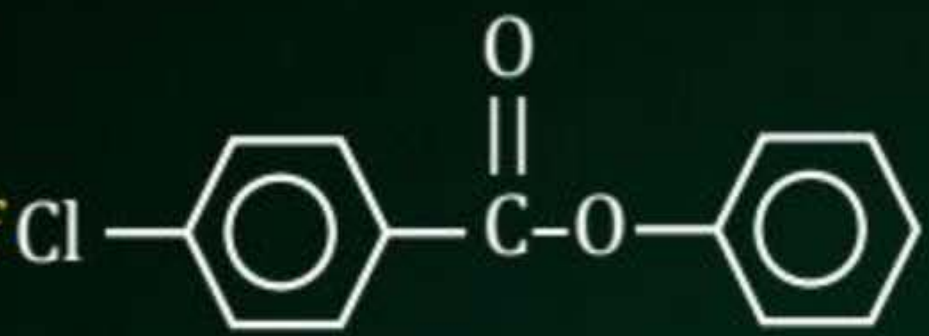
QUESTION 06

The IUPAC name of the compound  is:

- **A** 3-Cyano-1-formyl benzene-4-carboxylic acid
- **B** 3-Cyano-4-formyl benzene-1-carboxylic acid
- **C** 4-Carboxy-2-cyano benzene-1-carbaldehyde
- **D** 2-Formyl-5-carboxy benzene-1-carbonitrile

QUESTION 07

IUPAC name of



A 4-Chlorophenyl benzoate

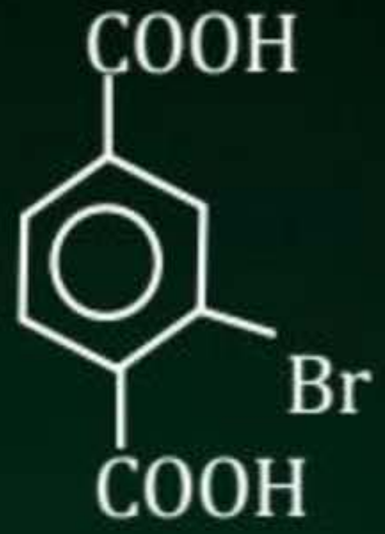
B Phenyl 4-chlorobenzenecarboxylate

C Benzyl 4-chlorobenzenecarboxylate

D 4-Chlorodiphenylcarboxylate

QUESTION 08

IUPAC name of the following molecule is



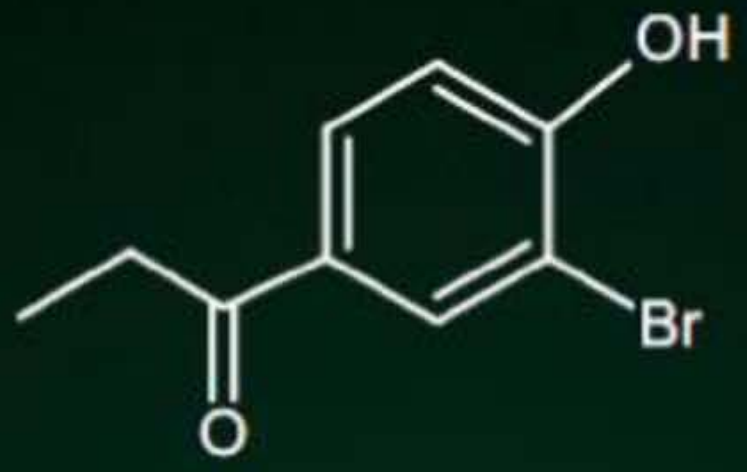
(A) 2-Bromobenzene-1, 4-dioic acid

(B) 3-Bromobenzene-1, 4-dicarboxylic acid

(C) 2-Bromobenzene-1, 4-dicarboxylic acid

(D) 3-Bromobenzene-1, 6-dicarboxylic acid

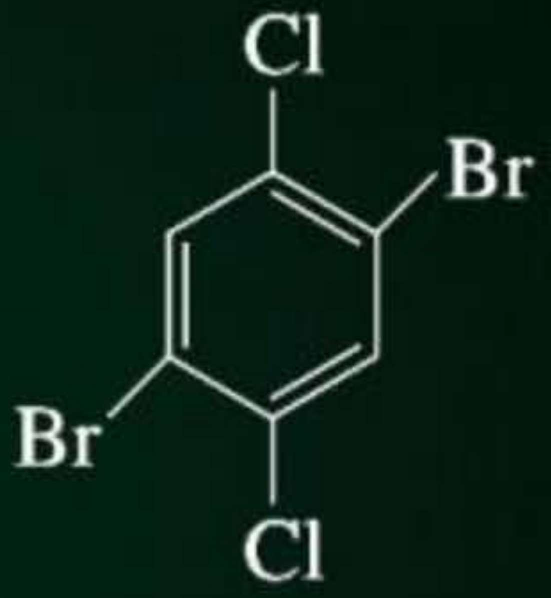
QUESTION 09

What is the IUPAC name for  compound?

- **A** m-Bromo-p-hydroxy propiophenone
- **B** 2-Bromo-4-propanoyl phenol
- **C** 3-Bromo-4-hydroxy phenyl propan-1-one
- **D** 2-Hydroxy-5-propanoyl bromo benzene

QUESTION 10

What is the correct IUPAC name of the following compound?



- **A** 2, 5-dibromo-1-4-dichlorobenzene
- **B** 1, 4-dibromo-3, 5-dichlorobenzene
- **C** 3, 5-dibromo-1, 4-dichlorobenzene
- **D** 1, 4-dibromo-2, 5-dichlorobenzne

ANSWER KEY

1. D
2. C
3. B
4. C
5. A
6. B
7. B
8. C
9. C
10. D

Home Work From PW Module (Yakeen NEET)

Prabal: Q 10

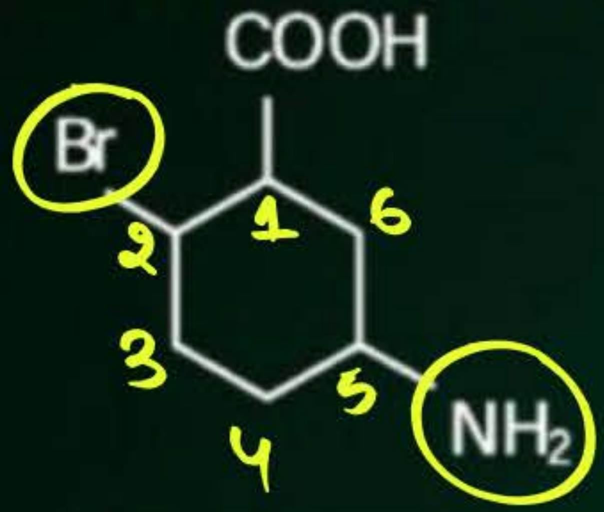
Parikshit: Q 03

Home Work

Discussion - L - 05

QUESTION 01

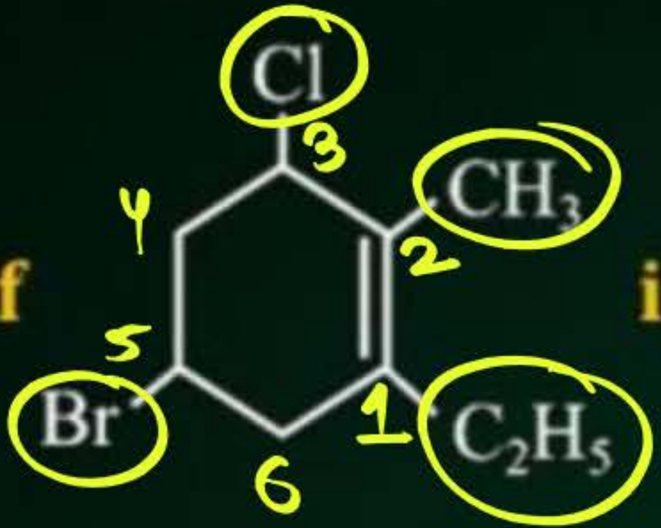
The correct IUPAC name of compound is:



- A 3-Amino-6-bromocyclohexane-1-carboxylic acid
- B 2-Bromo-5-aminocyclohexane-1-carboxylic acid
- [✓ C] 5-Amino-2-bromocyclohexane-1-carboxylic acid
- D 4-Bromo-5-carboxycyclohexanamine

QUESTION 02

IUPAC name of



is:

A 4-Bromo-6-chloro-2-ethyl-1-methylcyclohex-1-ene

B 5-Bromo-1-chloro-3-ethyl-2-methylcyclohex-2-ene

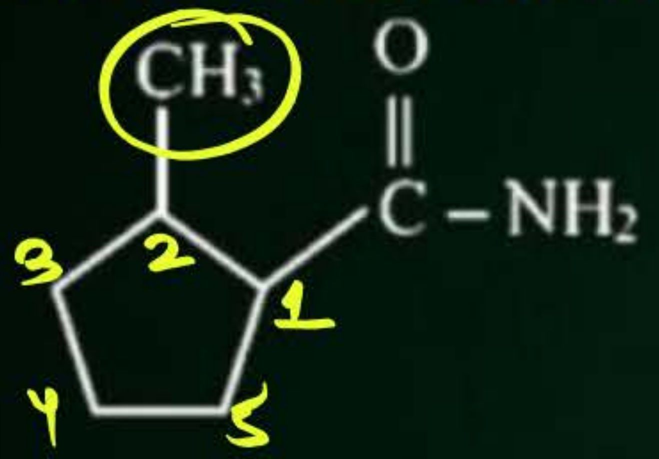
[✓ C] 5-Bromo-3-chloro-1-ethyl-2-methylcyclohex-1-ene

D 1-Bromo-5-chloro-3-ethyl-4-methylcyclohex-3-ene

QUESTION 03

Which of the following IUPAC names is incorrect?

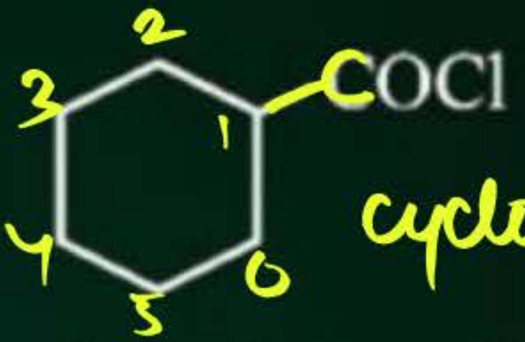
(A)



CH_3
O
C − NH_2
1
2
3
4
5

2-Methylcyclopentanecarboxamide

✓ (B)

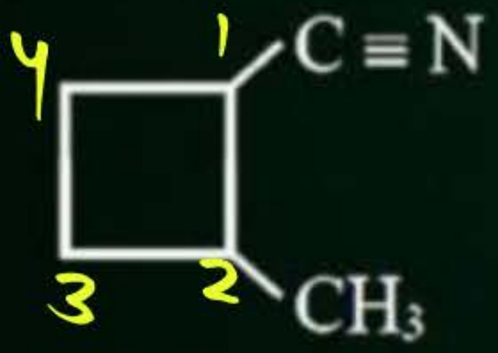


COCl
1
2
3
4
5
6

cyclohexane carbonyl chloride

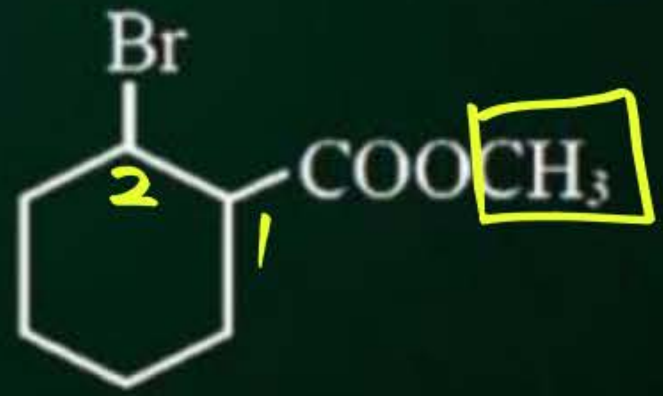
Cyclohexanoyl chloride

(C)



2-Methylcyclobutanecarbonitrile

(D)

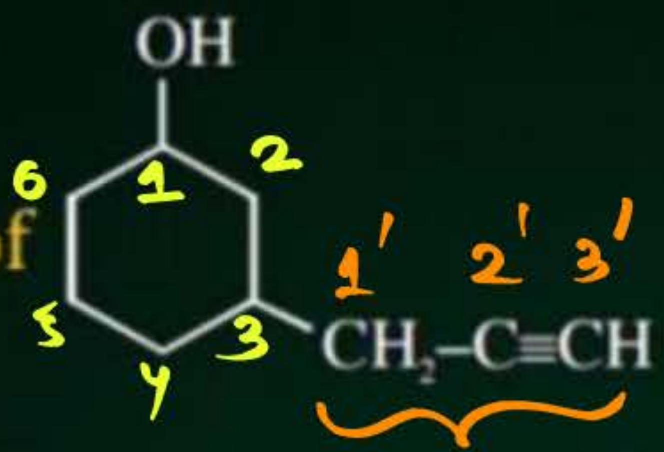


Br
$COOCH_3$
1
2

Methyl 2-bromocyclohexanecarboxylate

QUESTION 04

The correct IUPAC name of


OH
6
1
2
3
4
5
1'
2'
3'
$CH_2-C\equiv CH$

A 3-Cyclohexanolpropyne

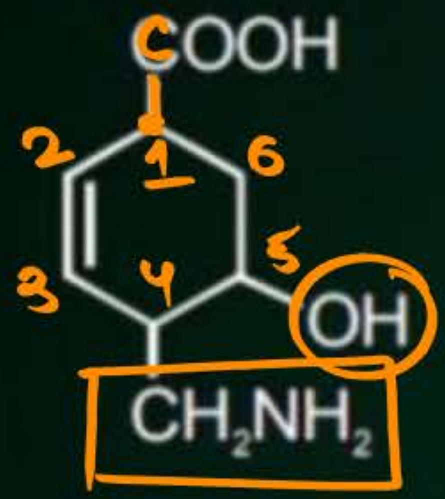
B 3-[3-Hydroxycyclohexyl]propyne

C 3-Propynylcyclohexanol

[✓ D] 3-(2-Propynyl)cyclohexanol

QUESTION 05

The correct IUPAC name of following compound is:



(A) 4-Aminomethyl-3-hydroxycyclohex-5-ene-1-carboxylic acid

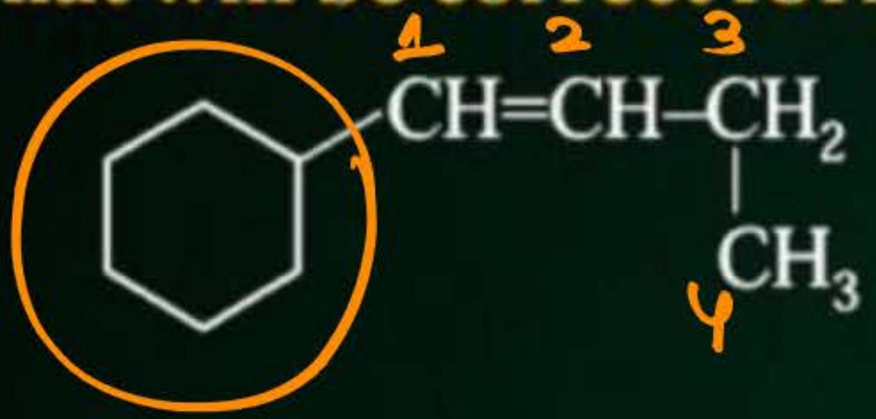
(B) 2-Aminomethyl-5-carboxycyclohex-3-en-1-ol

[✓ (C)] 4-Aminomethyl-5-hydroxycyclohex-2-ene-1-carboxylic acid

(D) 3-Hydroxy-4-aminomethylcyclohex-5-en-1-oic acid

QUESTION 06

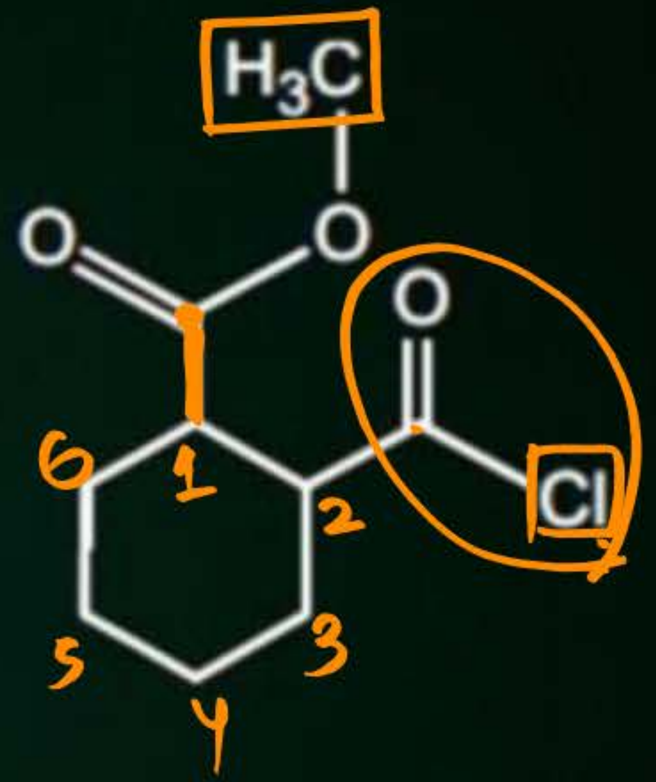
What will be correct IUPAC name for the following compound.



- **A** 1-(But-1-enyl) cyclohexane
- **B** 1-Cyclohexyl-2-ethyl ethene
- [✓ **C**] 1-Cyclohexyl but-1-ene
- **D** 1-Cyclohexyl-3-methyl prop-1-ene

QUESTION 07

IUPAC name of the given compound is:



[✓ A] Methyl 2-chloroformyl-1-cyclohexanecarboxylate

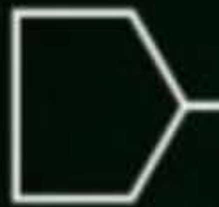
B 2-Methoxy carbonyl Cyclohexanecarbonyl chloride

C Methyl 2-chloroformyl-1-cyclohexanoate

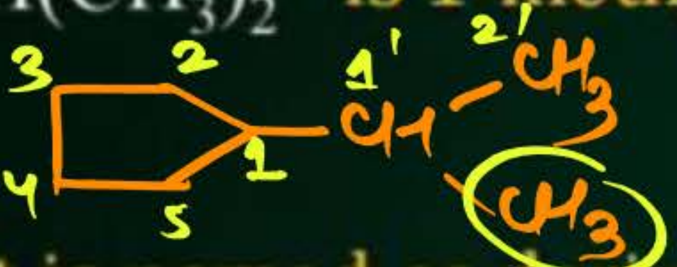
D 2-Methoxy carbonyl Cyclohexanonyl chloride

QUESTION 08

Assertion(A): The correct IUPAC name for the compound



—CH(CH$_3$)$_2$ is 1-methyl ethyl cyclopentane.



Reason(R): It is named as derivative of cyclopentane because the number of carbon atoms in the ring is more than the side chain.

[✓ A] If both assertion and reason are correct and reason is the correct explanation of the assertion.

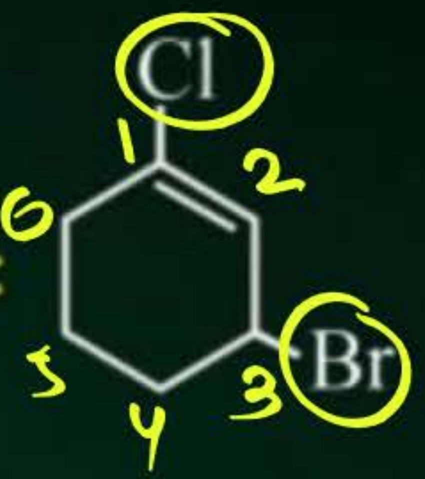
B If both assertion and reason are correct but reason is not correct explanation of the assertion.

C If assertion is correct but reason is incorrect.

D If assertion is incorrect but reason is correct.

QUESTION 09

The IUPAC name of the compound shown below is:



A 2-bromo-6-chlorocyclohex-1-ene

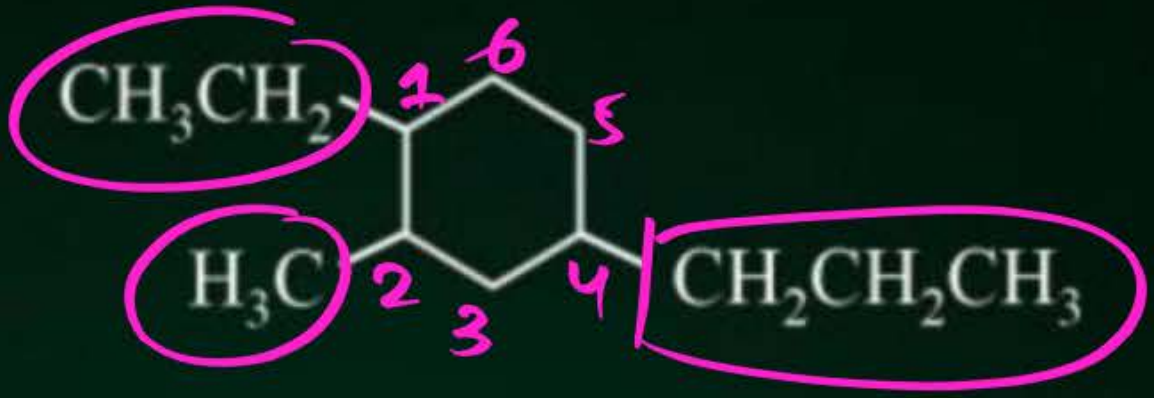
B 6-bromo-2-chlorocyclohexene

[✓ C] 3-bromo-1-chlorocyclohexene

D 1-bromo-3-chlorocyclohexene

QUESTION 10

The IUPAC name of the compound



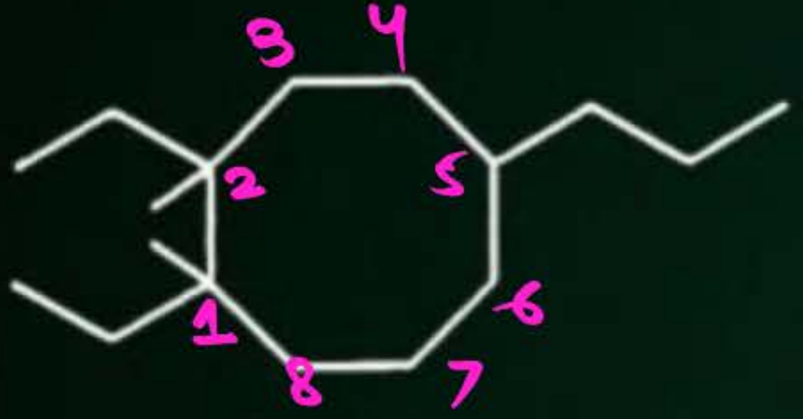
CH_3CH_2
H_3C
$CH_2CH_2CH_3$
1
2
3
4
5
6

- [✓ A] 1-Ethyl-2-methyl-4-propylcyclohexane
- B 2-Ethyl-1-methyl-5-propylcyclohexane
- C 4-Ethyl-3-methyl-1-propylcyclohexane
- D All the three

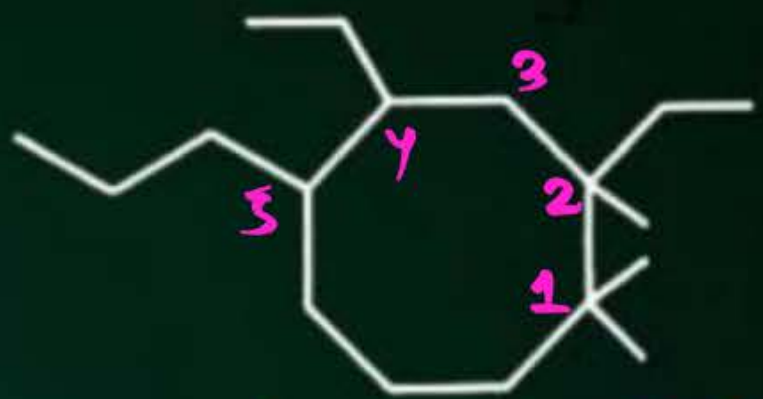
QUESTION 11

The correct structural formula of 1, 2-Diethyl-1,8-dimethyl-5-propyl cyclooctane is:

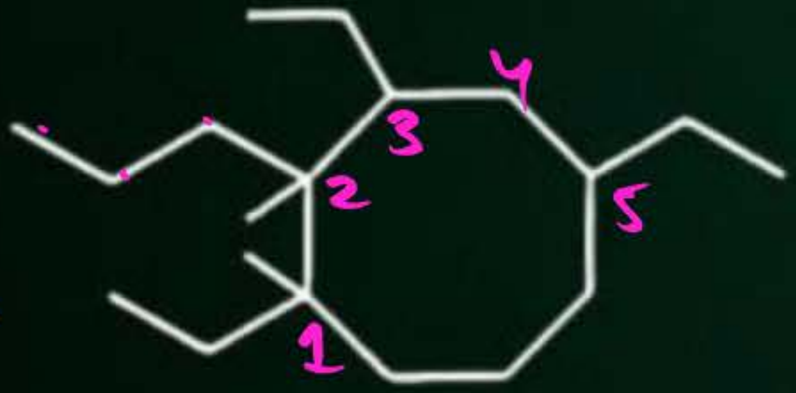
(A)



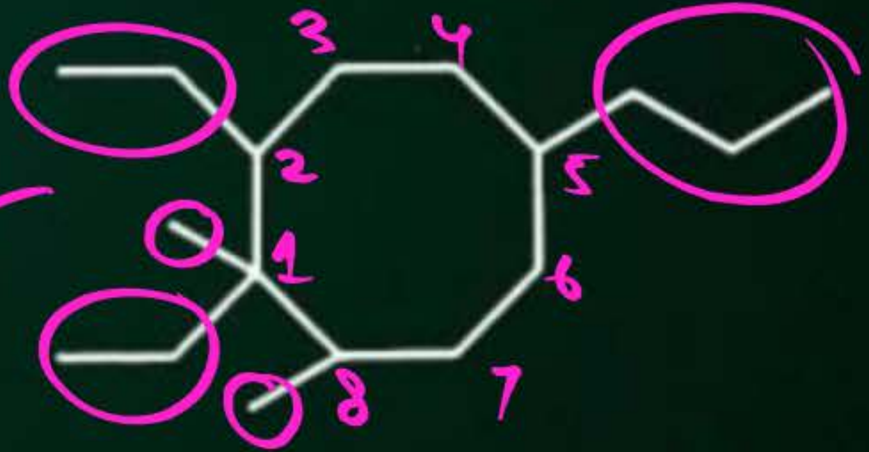
(B)



(C)

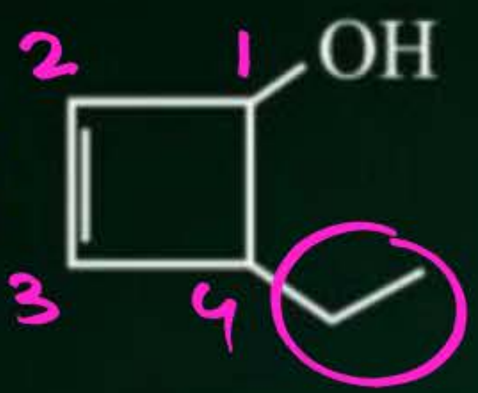


[✓ (D)]



QUESTION 12

The IUPAC name of is:



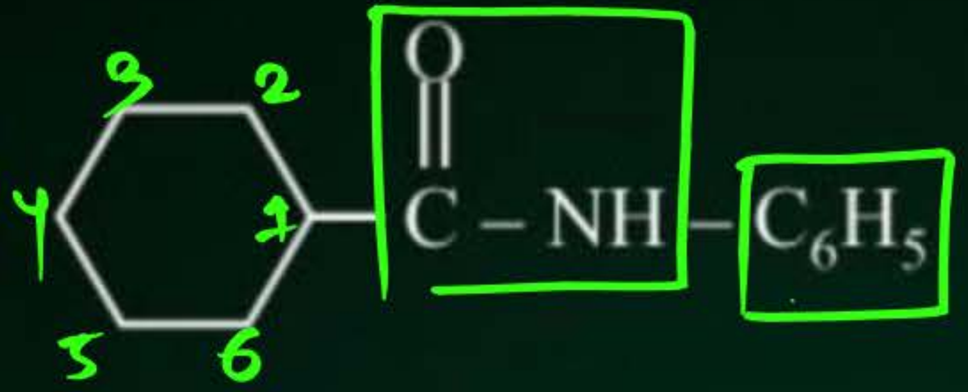
[✓ A] 4-ethyl cyclobut-2-en-1-ol

B 4-ethyl cyclobut-1-en-3-ol

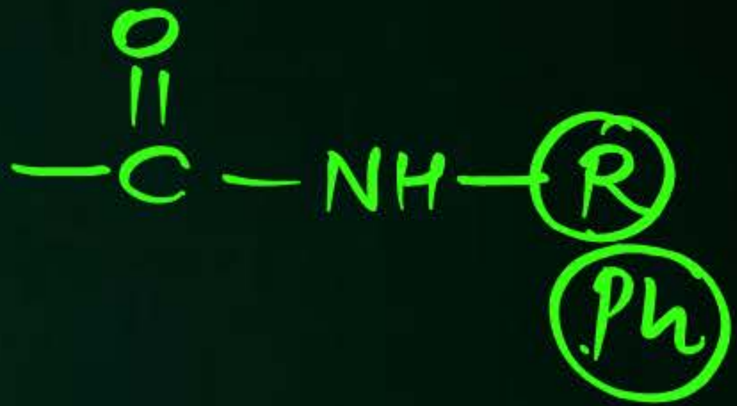
C 3-ethyl cyclobut-1-en-2-ol

D 2-ethyl cyclobut-3-en-1-ol

QUESTION 13

The IUPAC name of  is:

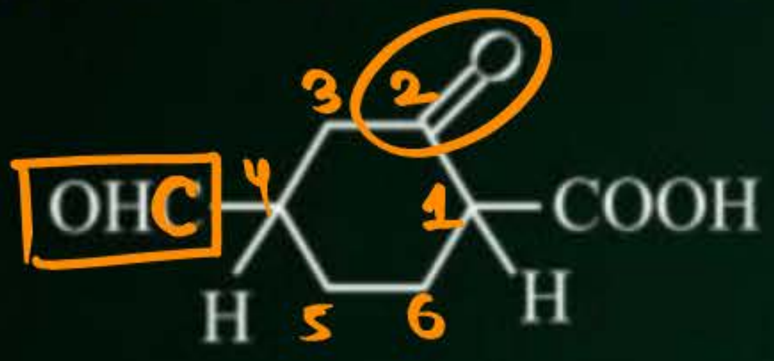
- (A) N-cyclohexyl benzamide
- (B) N-cyclohexyl-N-phenyl methyl amide
- (C) N-phenyl-N-cyclohexyl methanamide
- (D) ✓ N-phenyl cyclohexane carboxamide



$$-\overset{O}{\overset{\|}{C}}-NH-R$$

QUESTION 14

Write the IUPAC name of the following compound?



A 2, 4-Dioxocycloheptanoic acid

[✓ B] 4-Formyl-2-oxocyclohexane-1-carboxylic acid

C 2, 4-Dioxocyclohexanecarboxylic acid

D 2, 4-Dioxocyclohexane-1-carboxylic acid

ANSWER KEY

1. C
2. C
3. B
4. D
5. C
6. C
7. A
8. A
9. C
10. A
11. D
12. A
13. D
14. B

Thank you!!

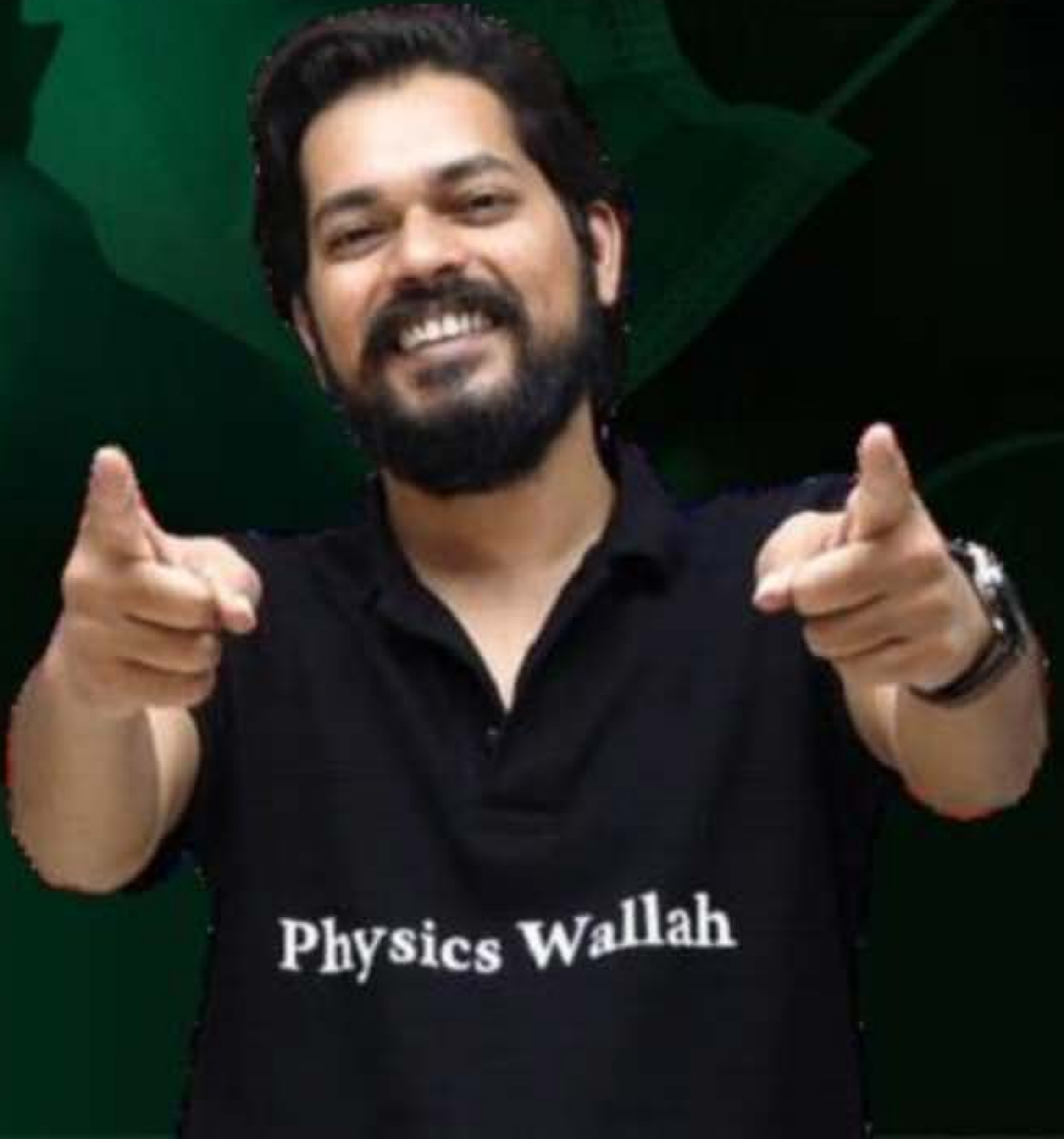
YAKEEN 2.0

FOR NEET 2025

Lecture- 07 **Organic Chemistry**

Some Basic Principles and Techniques (IUPAC Naming)

By- Pankaj Sir(POPU MAMA)


Physics Wallah

Topics *to be covered*

1. Common Names ✓
2. Doubt and Practice ✓

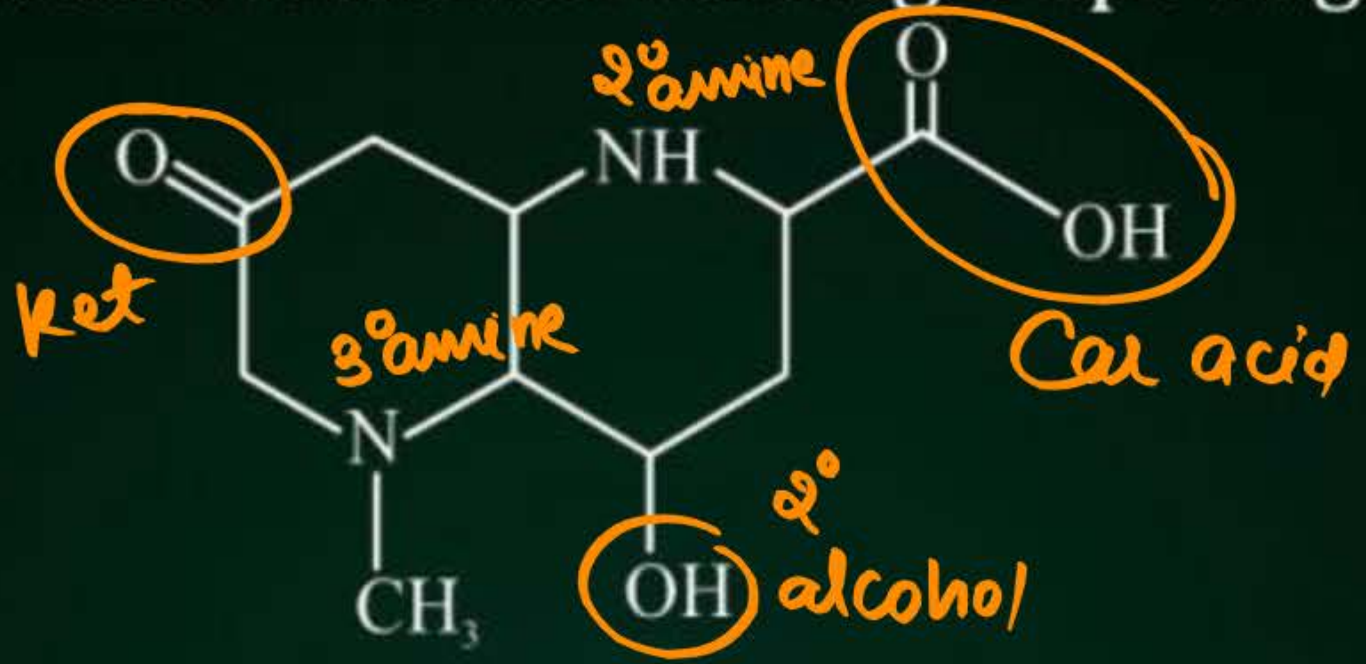
Func^n groups ÷ Responsible for diff chemical Rxn

$-COOH$	Carboxylic acid
$-SO_3H$	sulphonic acid
⋮	⋮

op point

1) $1^\circ, 2^\circ, 3^\circ$ amines are considered as diff func^n group
2) $1^\circ, 2^\circ, 3^\circ$ amides are considered as diff func^n group
3) $1^\circ, 2^\circ, 3^\circ$ alcohols are considered as same func^n group
4) $1^\circ, 2^\circ, 3^\circ$ same halide are considered as same func^n group
5) Alkenes & Alkynes are considered as diff func^n groups.

Q. Find the number of different functional groups in given compound.


2° amine
O
O
NH
OH
Ket
3° amine
Car acid
N
2° alcohol
CH3
OH

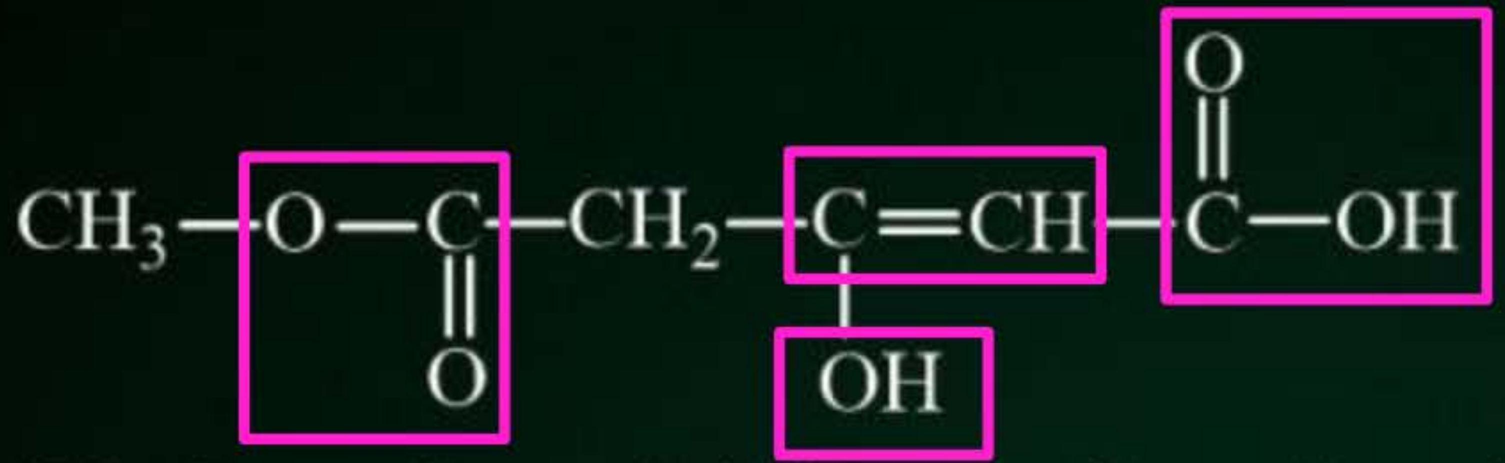
① 3

② 4

[✓ ③ 5]

④ 6

Q.



$$CH_3-\boxed{O-\underset{\underset{O}{\|}}{C}}-CH_2-\boxed{\underset{\underset{\boxed{OH}}{|}}{C}=CH}-\boxed{\overset{\overset{O}{\|}}{C}-OH}$$

Find number of different functional groups in given molecule.

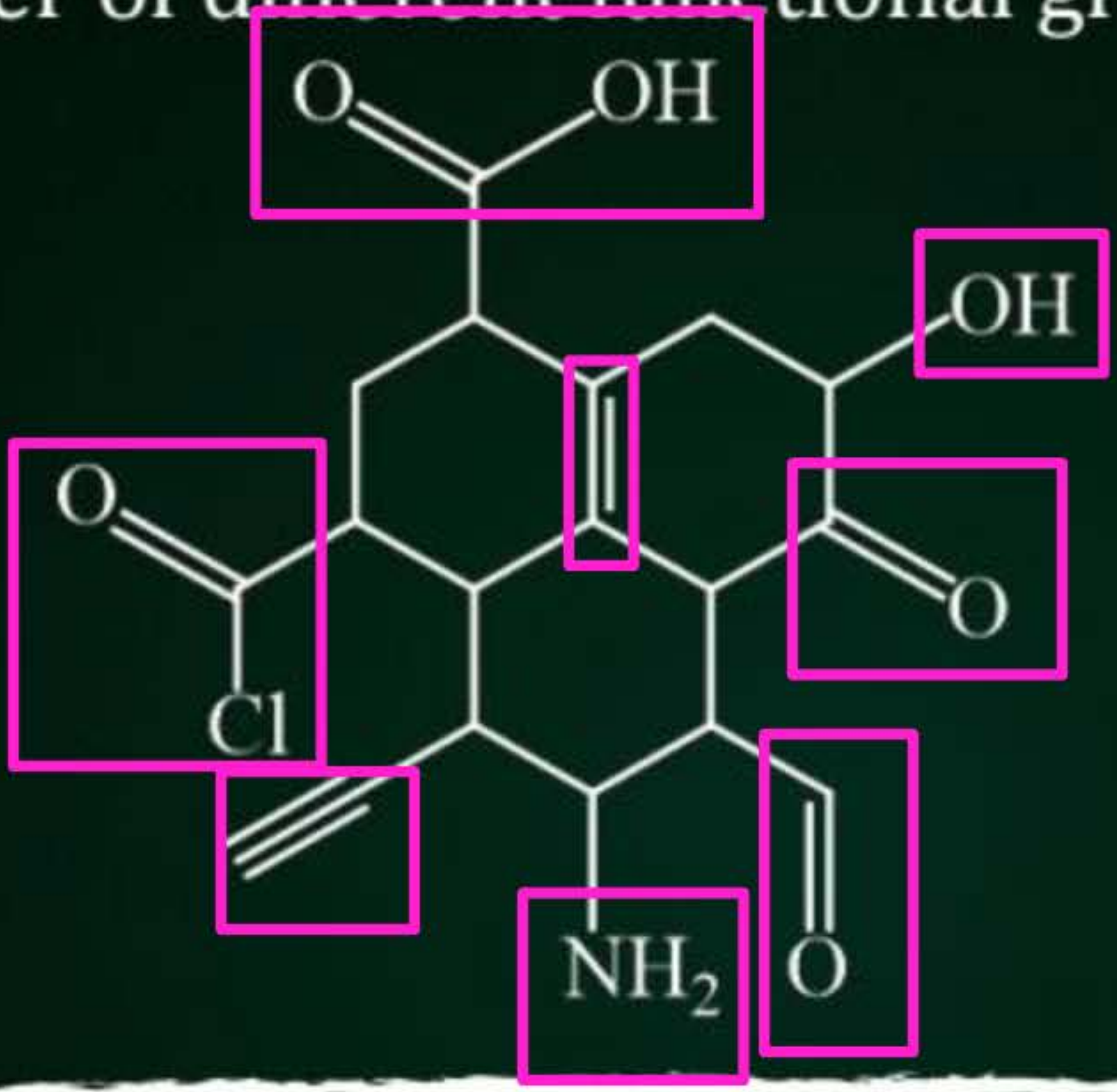
① 3

② [✓ 4]

③ 5

④ 6

Q. Total number of different functional groups are:


O
OH
OH
O
O
Cl
NH$_2$
O

① 5

② 6

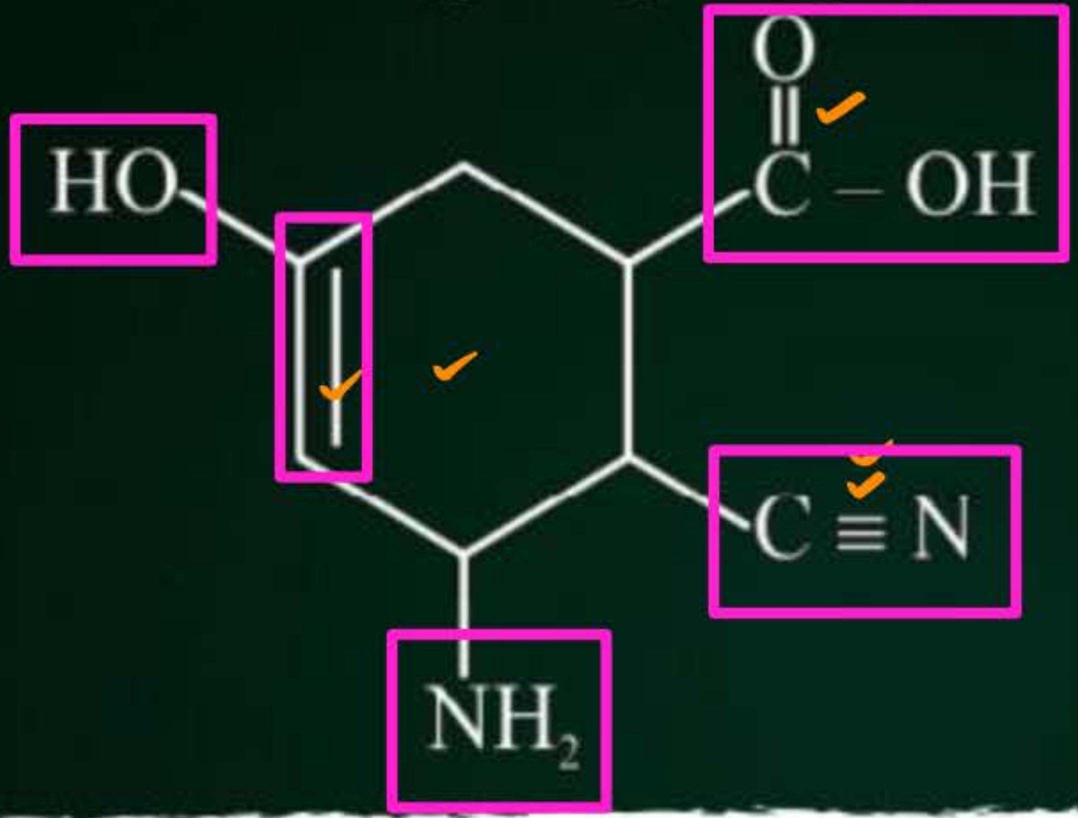
③ 7

[✓ ④ 8]

Q. If in given compound double bond equivalent is 'x' and number of different functional group is 'y'. compute (x + y):

$x = 5$

$y = 5$



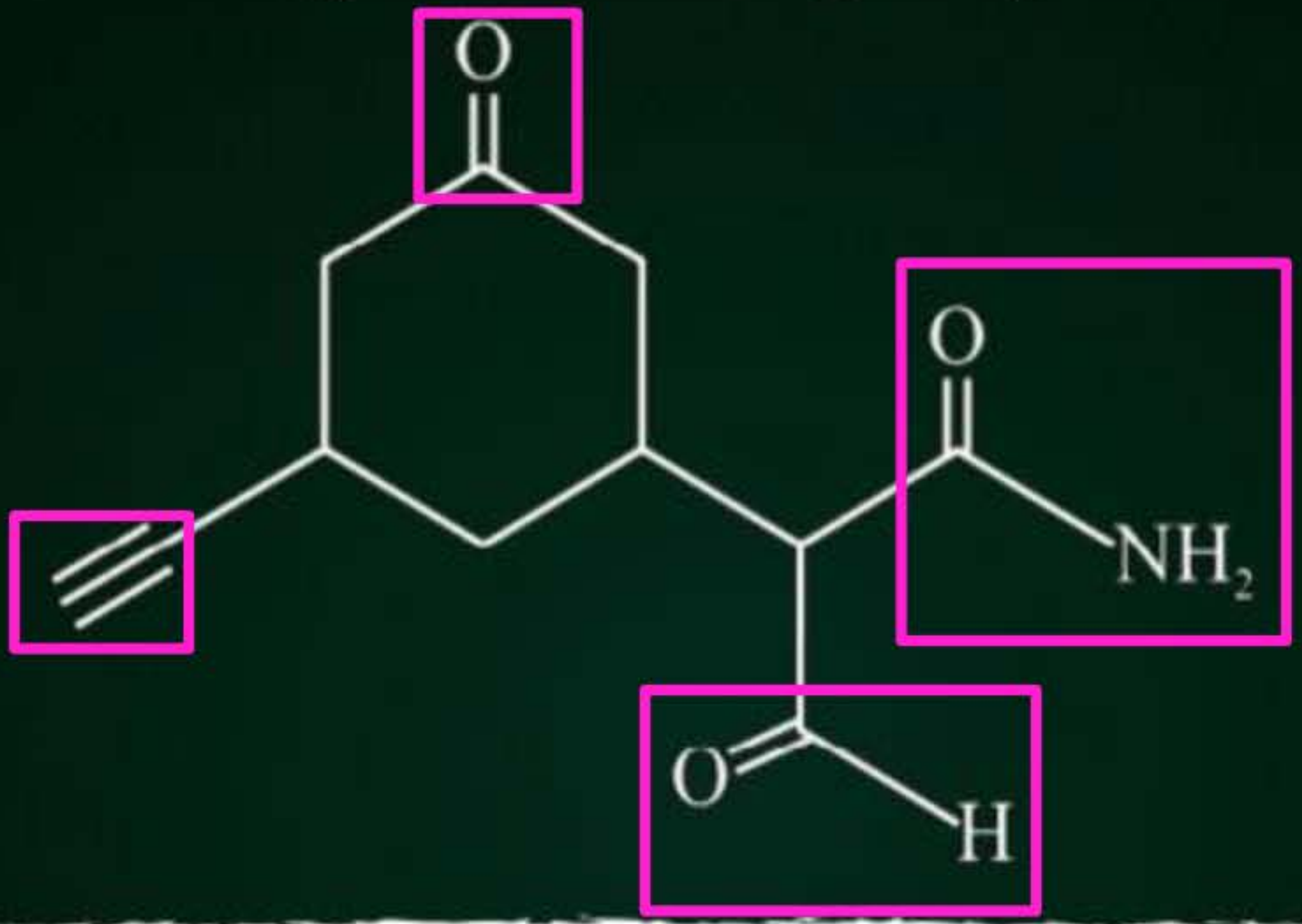
① 8

② 9

[✓ ③ 10]

④ 11

Q. Which of the following functional group is absent in given compound.



1 Aldehyde

2 Ketone

3 Alkyne

4 [✓ Amine]

Common Names

Naming of hydrocarbons

$\underbrace{\text{Prefix}}\ +\underbrace{\text{word root}}+\underbrace{\text{suffix}}$

Common Names

Alkanes

$\overset{1}{C}H4$ Methane

C2H6 $\overset{1}{C}H_3-\overset{2}{C}H_3$ Ethane

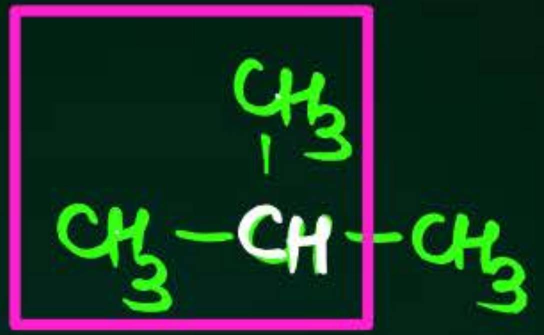
C3H8 $\overset{1}{C}H_3-\overset{2}{C}H_2-\overset{3}{C}H_3$ Propane

Common Names

Alkanes

(Me$_2$CH)

iso



$CH_3-\overset{\overset{CH_3}{|}}{CH}-CH_3$

neo

$(Me_3C)-C$

C4H10

(n=normal)

$\overset{1}{CH_3}-\overset{2}{CH_2}-\overset{3}{CH_2}-\overset{4}{CH_3}$

n-butane

isobutane

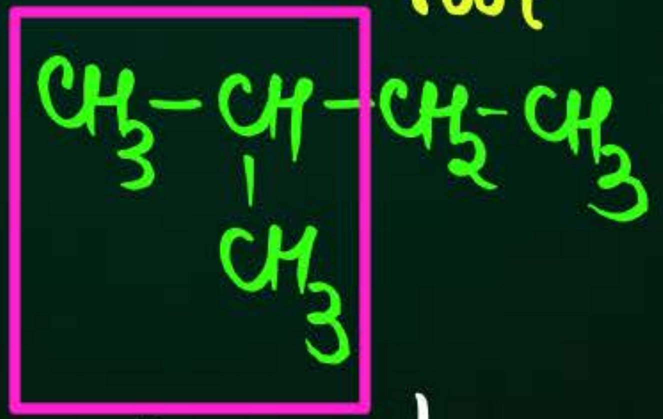
↙ prefix ↓ word root ↘ suffix

neo

C5H12

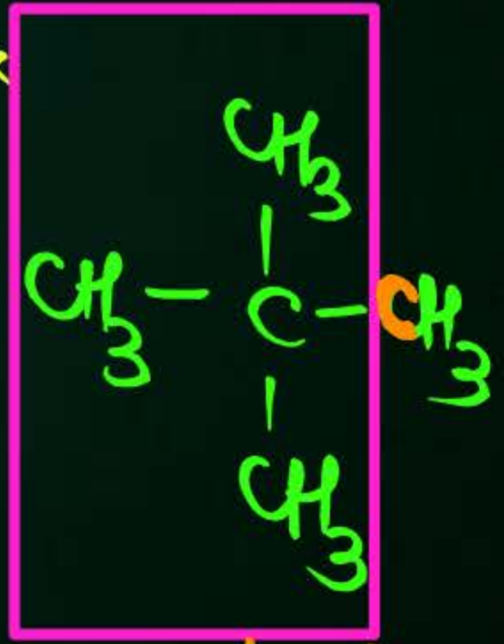
$\overset{1}{CH_3}-\overset{2}{CH_2}-\overset{3}{CH_2}-\overset{4}{CH_2}-\overset{5}{CH_3}$

n-pentane



$CH_3-\underset{\underset{CH_3}{|}}{CH}-CH_2-CH_3$

isopentane



$CH_3-\overset{\overset{CH_3}{|}}{\underset{\underset{CH_3}{|}}{C}}-CH_3$

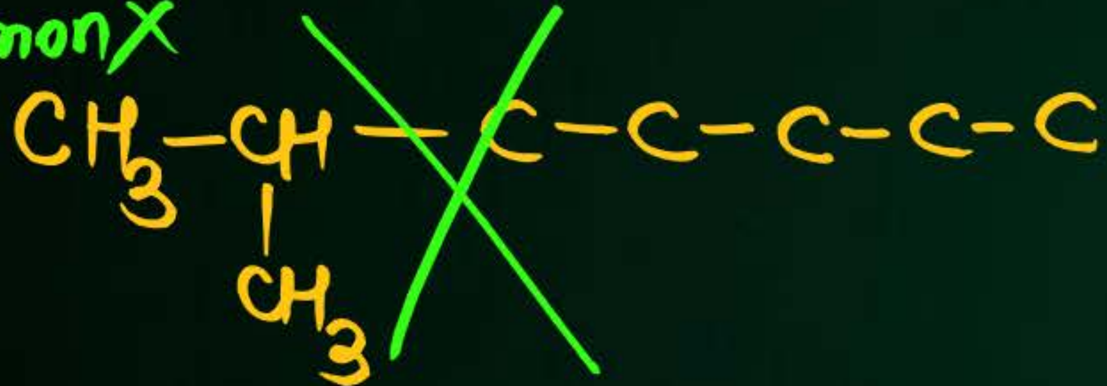
neopentane

Common Names

OP point

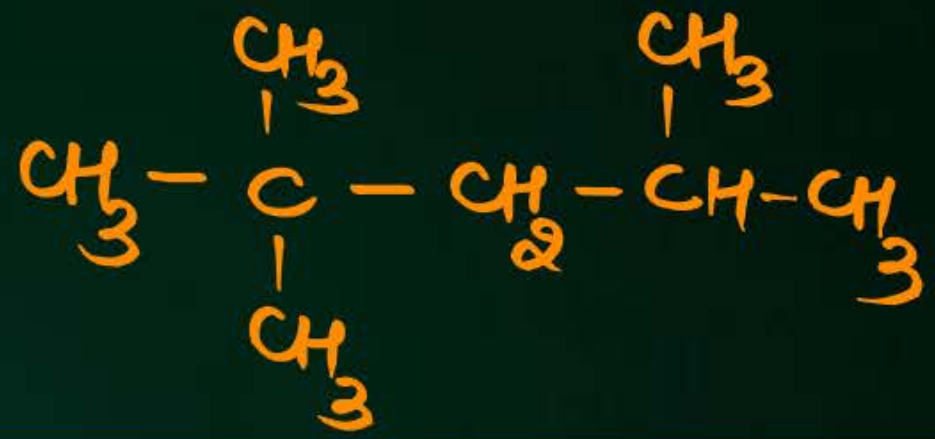
ISOOCTANE *

Common X



$$CH_3-\underset{\underset{CH_3}{|}}{CH}-C-C-C-C-C$$

Isooctane



$$CH_3-\overset{\overset{CH_3}{|}}{\underset{\underset{CH_3}{|}}{C}}-CH_2-\overset{\overset{CH_3}{|}}{CH}-CH_3$$

Common Names

Alkenes (Alkylenes)

C2H4 $CH_2=CH_2$ ethylene or ethene

C3H6 $CH_3-CH=CH_2$ propylene or propene

C4H8

$\overset{\delta}{CH_3}-\overset{\gamma}{CH_2}-\overset{\beta}{CH}=\overset{\alpha}{CH_2}$

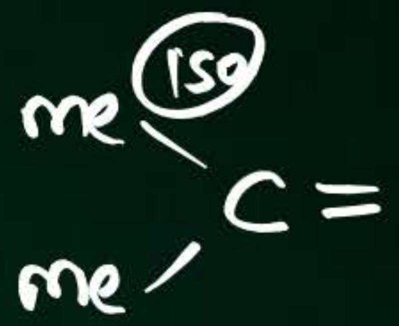
α-Butylene

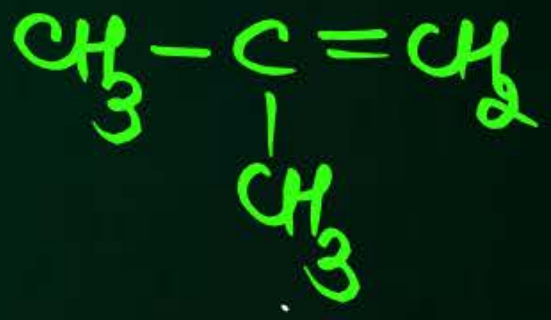
Butene

$\overset{\delta}{CH_3}-\overset{\gamma}{CH}=\overset{\beta}{CH}-\overset{\alpha}{CH_3}$

β-Butylene

Butene





$CH_3-\underset{\displaystyle CH_3}{\underset{|}{C}}=CH_2$

Isobutylene

butene

Common Names

Alkynes

$-(C\equiv C)-$

Common name - Acetylene

$\boxed{CH\equiv CH}$	Acetylene
$CH_3-\boxed{C\equiv CH}$	Methyl acetylene
$CH_3-\boxed{C\equiv C}-CH_3$	Dimethyl acetylene
$C_2H_5-\boxed{C\equiv C}-CH_3$	Ethyl methyl acetylene

Common Names

Naming of hydrocarbons derivative

a) Radical based

i) CH_4 CH_3- methyl

ii) CH_3-CH_3 $CH_3-CH_2-NH_2$ Ethyl

iii) $CH_3-CH_2-CH_3$ $CH_3-CH_2-CH_2-$ n-propyl

sec ~~p~~ropyl

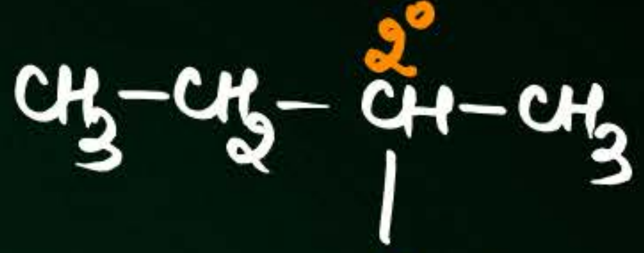
$CH_3-\underset{|}{CH}-CH_3$

isopropyl

iv) $\overset{}{CH_3}-CH_2-\overset{\downarrow}{CH_2}-\overset{\downarrow}{CH_3}$

$CH_3-CH_2-CH_2-CH_2-$

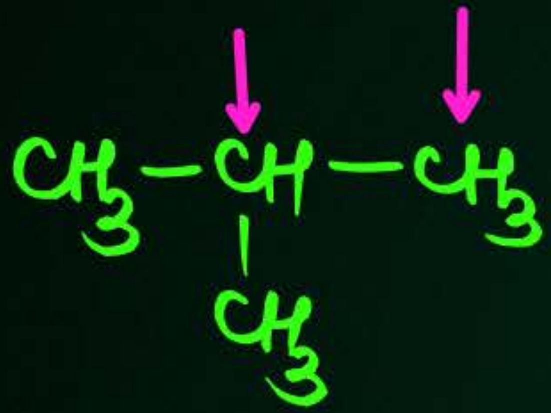
n-butyl



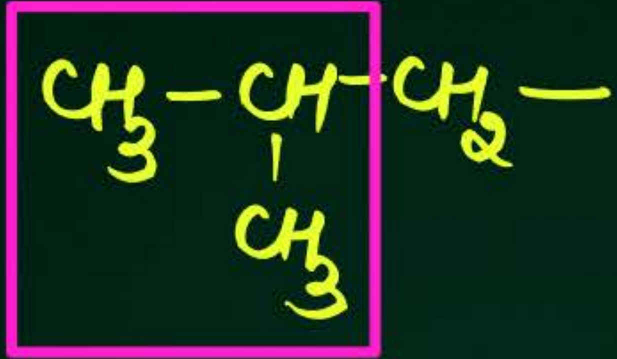
$CH_3-CH_2-\overset{2^\circ}{C}H-CH_3$

Sec-butyl

v)

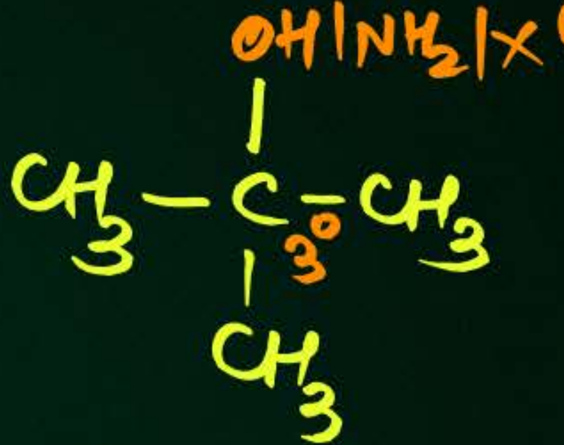


$CH_3-\overset{\downarrow}{C}H(CH_3)-\overset{\downarrow}{CH_3}$



$CH_3-CH(CH_3)-CH_2-$

isobutyl



$OH|NH_2|X$

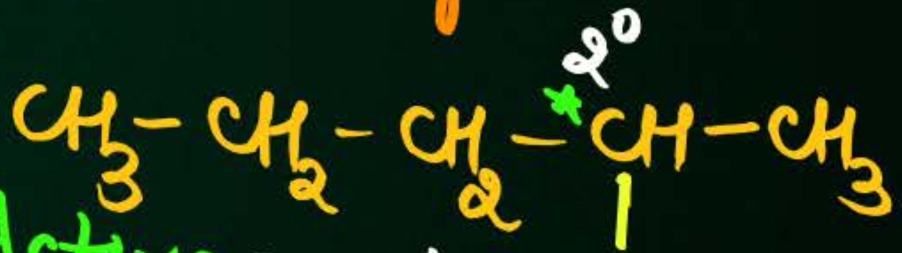
$CH_3-\underset{3^\circ}{C}(CH_3)-CH_3$

tert-butyl

vi) $CH_3-CH_2-\overset{\downarrow}{CH_2}-\overset{\downarrow}{CH_2}-\overset{\downarrow}{CH_3}$

$CH_3-CH_2-CH_2-CH_2-CH_2-$

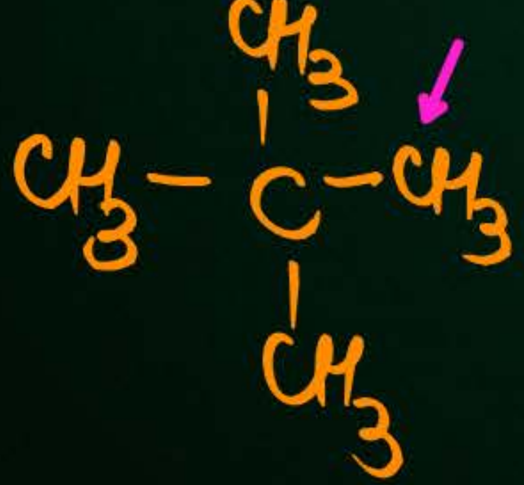
n pentyl



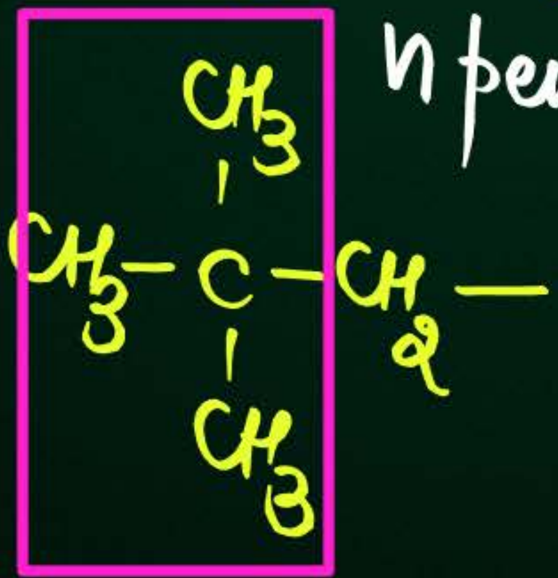
$CH_3-CH_2-CH_2-\overset{*\,2^\circ}{C}H-CH_3$

Active sec-pentyl

vii)

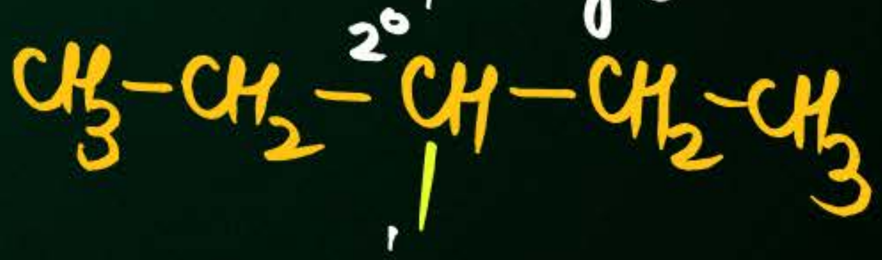


$CH_3-C(CH_3)_2-\overset{\downarrow}{CH_3}$



$CH_3-C(CH_3)_2-CH_2-$

neopentyl

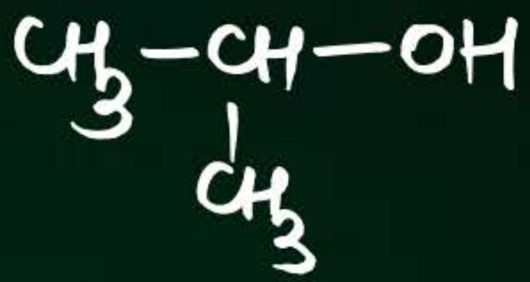


$CH_3-CH_2-\overset{2^\circ}{C}H-CH_2-CH_3$

Sec-pentyl

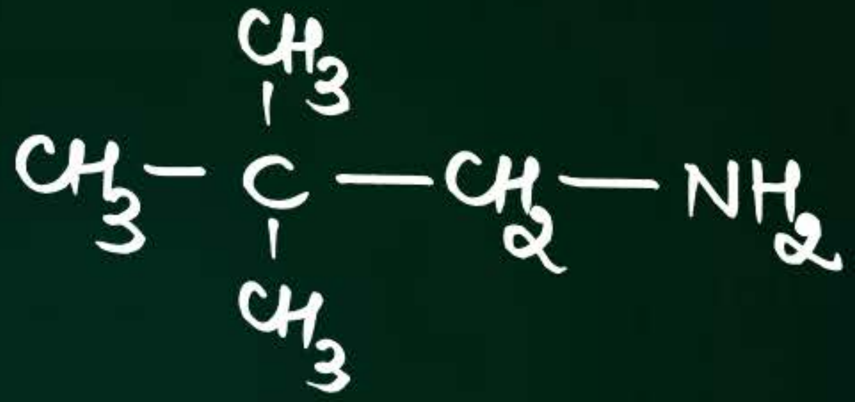
Practice

1. Isopropyl Alcohol



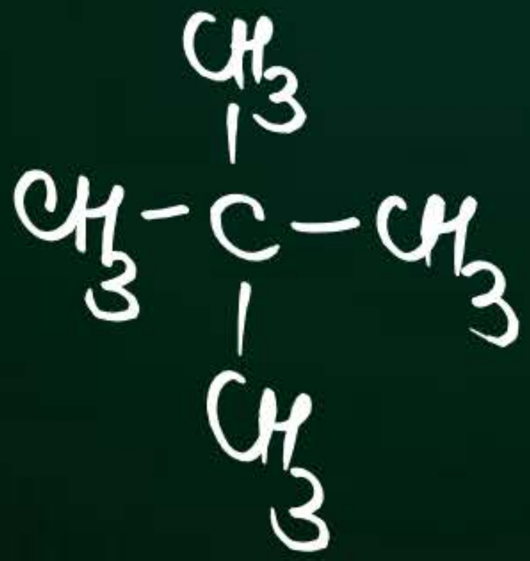
$CH_3-CH(CH_3)-OH$

2. Neopentyl amine



$CH_3-C(CH_3)_2-CH_2-NH_2$

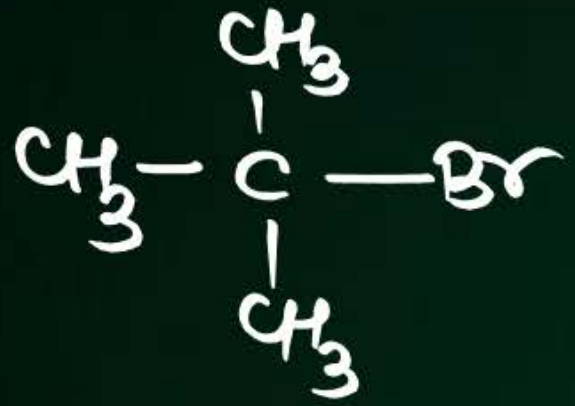
3. Neopentane



$CH_3-C(CH_3)_2-CH_3$

Practice

4. Tert butyl bromide



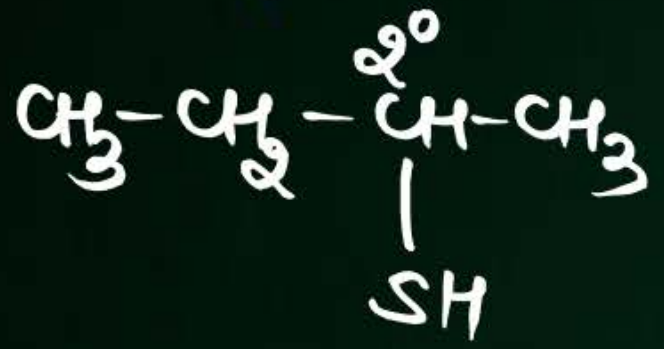
$$CH_3-\overset{\overset{CH_3}{|}}{\underset{\underset{CH_3}{|}}{C}}-Br$$

5. Ethyl methyl ether

$$Et-O-Me$$

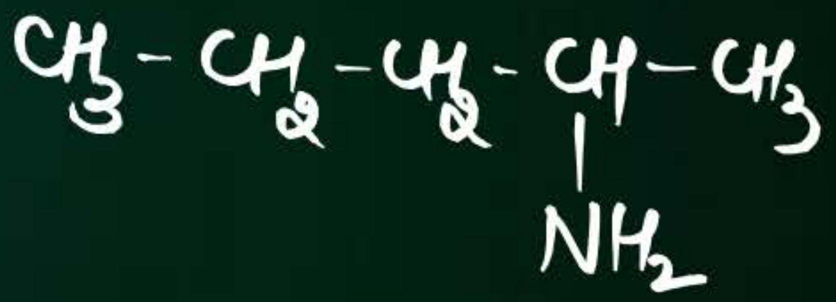
Practice

6. Sec butyl thiol SH



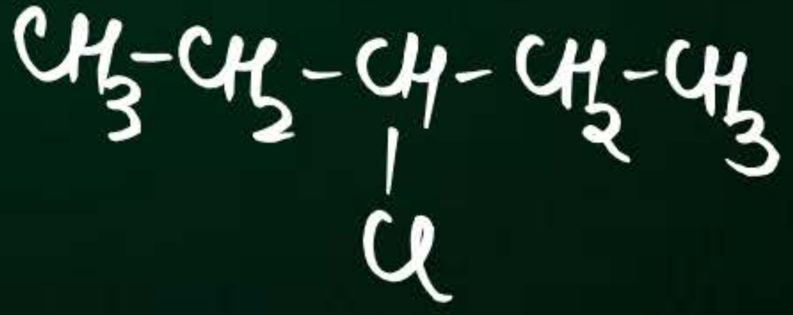
$CH_3-CH_2-\underset{\substack{|\\SH}}{\overset{2^\circ}{CH}}-CH_3$

7. Active sec pentyl amine NH_2



$CH_3-CH_2-CH_2-\underset{\substack{|\\NH_2}}{CH}-CH_3$

8. Sec pentyl chloride Cl



$CH_3-CH_2-\underset{\substack{|\\Cl}}{CH}-CH_2-CH_3$

Common Names

Naming of hydrocarbons derivative

A) Functional group based C

COOH ….ic acid

COOR alkyl…..oate

COOCO ….ic anhydride

COCl ….yl chloride

Common Names

Naming of hydrocarbons derivative

CONH2 ….amide

CHO ….aldehyde

CN ….onitrile

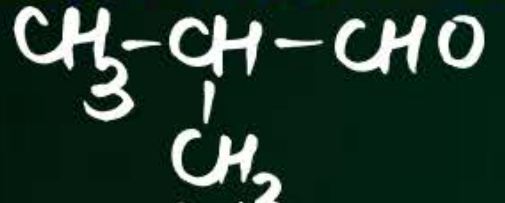
NC ….oisonitrile

Common Names

Naming of hydrocarbons derivative

a) Functional group based

- C1 form
- C2 acet
- C3 propion
- C4 butyr (n,iso)



$CH_3-\underset{CH_3}{\underset{|}{C}H}-CHO$

isobutyr + Aldehyde

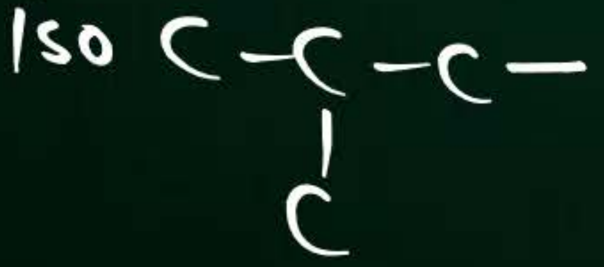
isobutyraldehyde

$\overset{2}{C}H_3-\overset{1}{C}\equiv N$

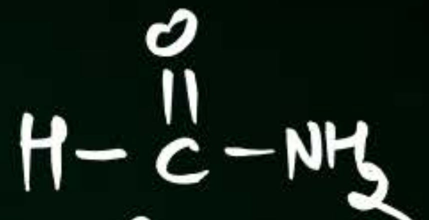
Acet + o nitrile

Acetonitrile

n $C-C-C-C-$



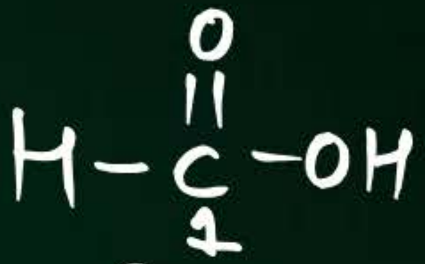
iso $C-\underset{C}{\underset{|}{C}}-C-$



$H-\overset{O}{\overset{\|}{C}}-NH_2$

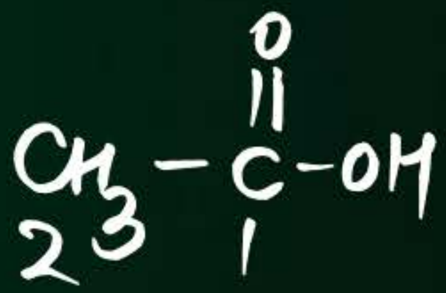
form + amide

formamide



$H-\underset{1}{\overset{O}{\overset{\|}{C}}}-OH$

form + ic acid



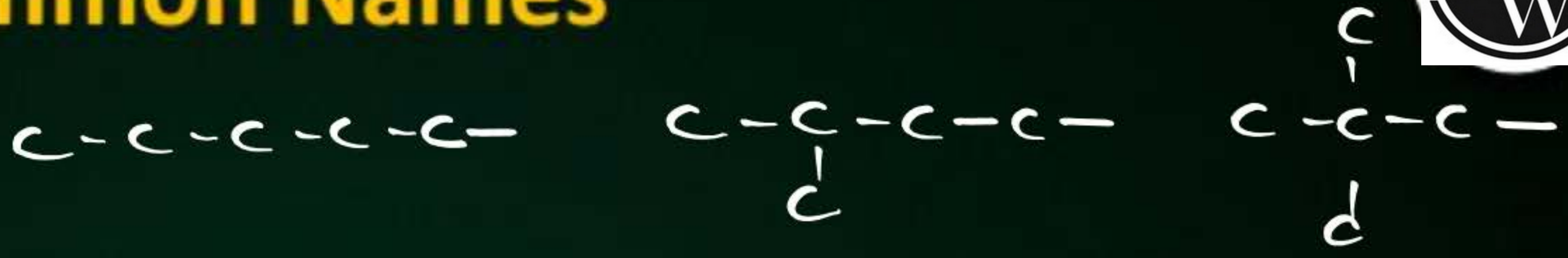
$\underset{2}{CH_3}-\underset{1}{\overset{O}{\overset{\|}{C}}}-OH$

Acet + ic acid

Acetic acid

Common Names

C5 valer (n,iso,neo)



$C-C-C-C-C-$

$C-\underset{C}{\underset{|}{C}}-C-C-$

$C-\overset{C}{\overset{|}{\underset{C}{\underset{|}{C}}}}-C-$

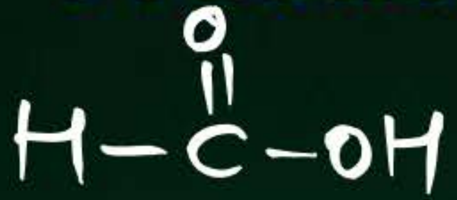
C=C-C acryl

C-C=C-C croton

CH3CO pyruv

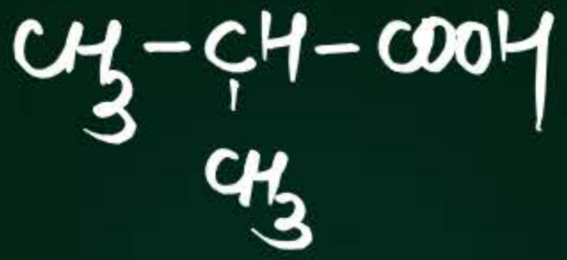
Practice

1. **Formic acid**



$$H-\overset{\overset{\displaystyle O}{\|}}{C}-OH$$

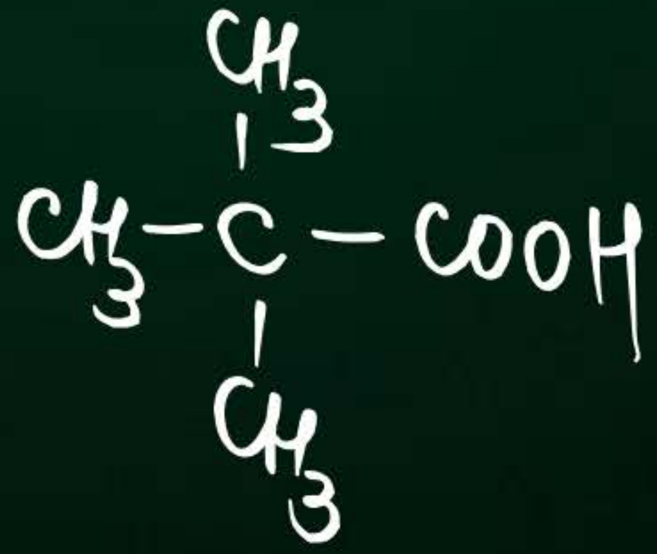
2. **Isobutyric acid**



$$CH_3-\underset{\underset{\displaystyle CH_3}{|}}{CH}-COOH$$

3. **Acetonitrile** $CH_3-C\equiv N$

4. **Neovaleric acid**



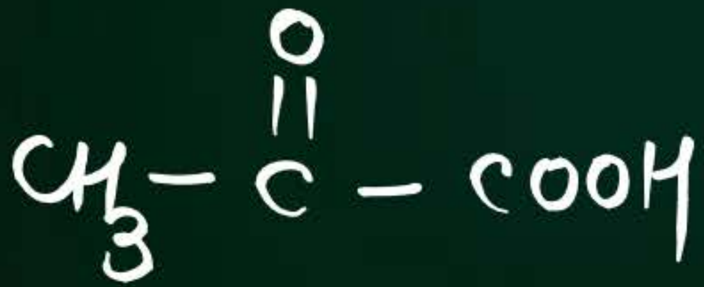
$$CH_3-\overset{\overset{\displaystyle CH_3}{|}}{\underset{\underset{\displaystyle CH_3}{|}}{C}}-COOH$$

Practice

5. Acrylic acid $CH_2=CH-COOH$

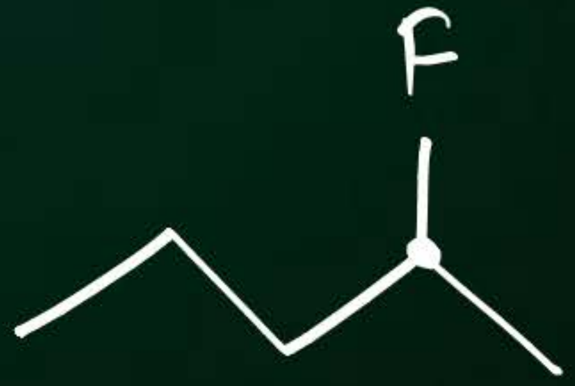
6. Crotonaldehyde $CH_3-CH=CH-CHO$

7. Pyruvic acid



$CH_3-\overset{\overset{O}{\|}}{C}-COOH$

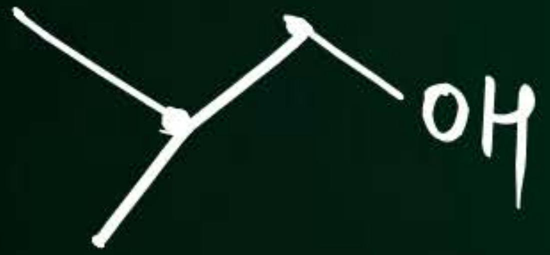
8. Active sec pentyl fluoride



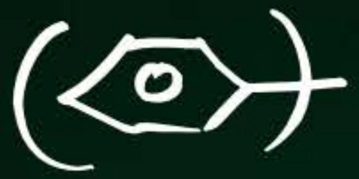
Practice

9. Crotonic acid $CH_3-CH=CH-COOH$

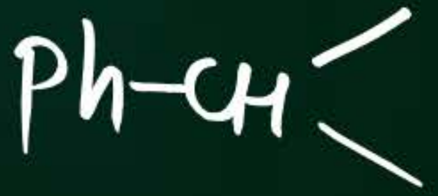
10. Isobutyl alcohol

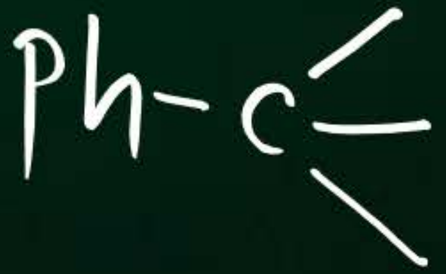


Common name of Benzene derivative

1. **Phenyl** Ph– 

2. **Benzyl** (Ph-CH_2–)

3. **Benzal (Benzylidine)** 

4. **Benzo (Benzylidyne)** 

Some other Common names

1. Alkanes

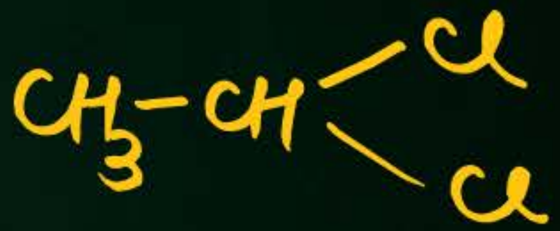
$R-CH_3$

$R-CH_2-$ Alkyl

$R-CH\begin{smallmatrix}\diagup\\ \diagdown\end{smallmatrix}$ Alkylidine

$R-C\begin{smallmatrix}\diagup\\ -\\ \diagdown\end{smallmatrix}$ Alkylidyne

Ethylidine chloride



$CH_3-CH\begin{smallmatrix}Cl\\ Cl\end{smallmatrix}$

Some other Common names

2. Alkenes

i) $CH_2=\overset{\downarrow}{C}H_2$

$CH_2=CH-$

Vinyl (ethenyl)

ii) $\overset{\downarrow}{C}H_2=\overset{\downarrow}{C}H-\overset{\downarrow}{C}H_3$

$\overset{3'}{C}H_2=\overset{2'}{C}H-\overset{1'}{C}H_2-$

Allyl

(Prop-2'-enyl)

$CH_2=\overset{|}{C}-CH_3$

isopropenyl

$-\overset{1'}{C}H=\overset{2'}{C}H-\overset{3'}{C}H_3$

Propenyl

Some other Common names

3. Alkynes

$CH\equiv \overset{\downarrow}{C}H$

$\overset{\downarrow}{C}H_3-C\equiv C\overset{\downarrow}{H}$

$CH\equiv C-$

Ethynyl

$\overset{3'}{C}H_3-\overset{2'}{C}\equiv\overset{1'}{C}-$

Propynyl

$-\overset{1'}{C}H_2-\overset{2'}{C}\equiv\overset{3'}{C}H$

Prop-2'-ynyl (or Propargyl)

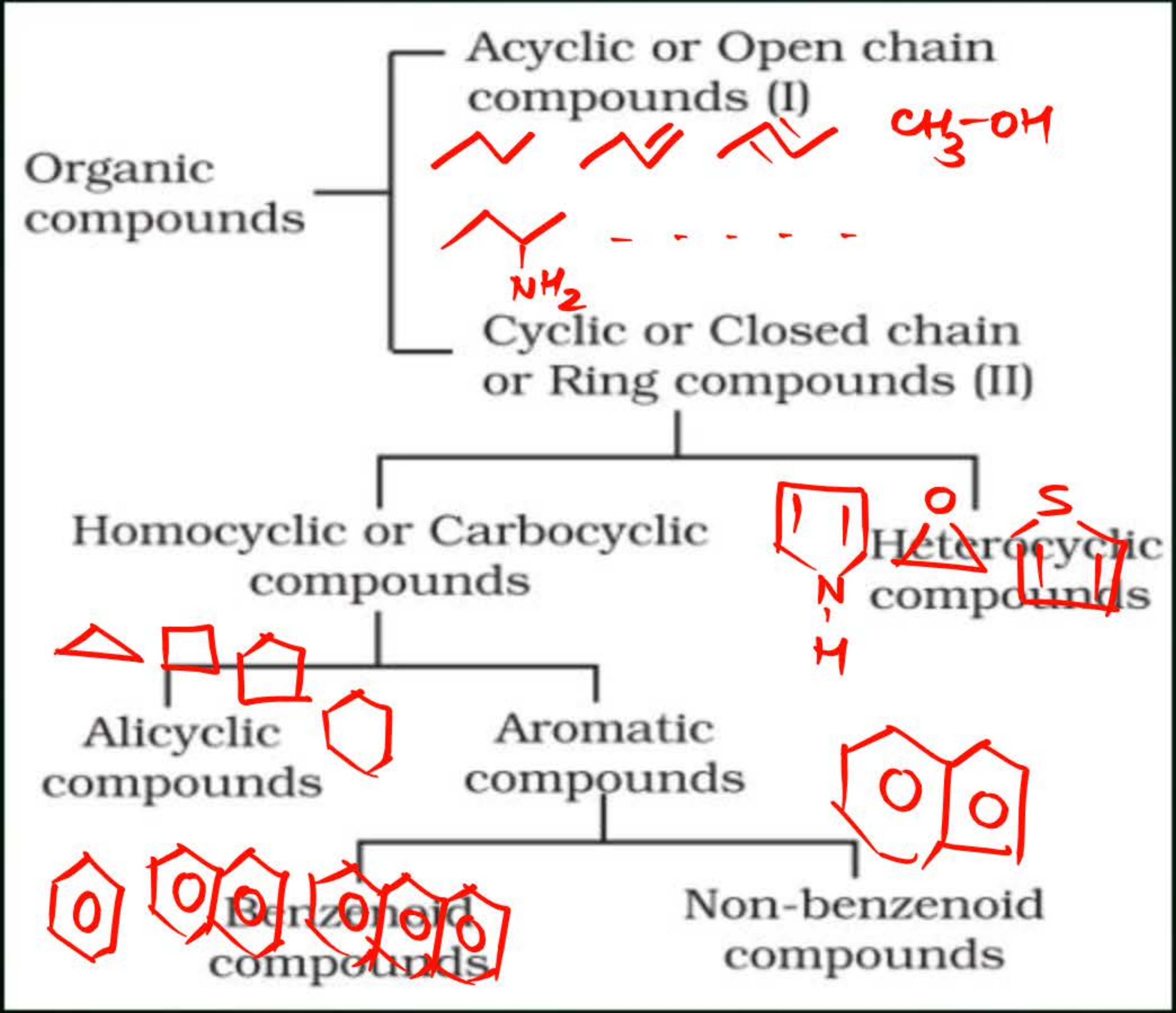
$-CH_2-CH=CH_2$

Allyl

$-CH_2-C\equiv CH$

propargyl

Classification of Organic Compounds:



Organic compounds

Acyclic or Open chain compounds (I)

Cyclic or Closed chain or Ring compounds (II)

Homocyclic or Carbocyclic compounds

Heterocyclic compounds

Alicyclic compounds

Aromatic compounds

Benzenoid compounds

Non-benzenoid compounds

Home Work

QUESTION ①

The IUPAC name of tertiary butyl iodide is:

Ⓐ 1-idodo-3-methyl propane

Ⓑ 2-iodo-2-methyl propane

Ⓒ 4-iodobutane

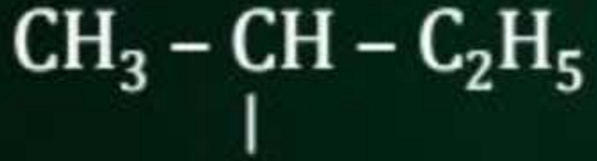
Ⓓ 2-iodobutane

QUESTION ②

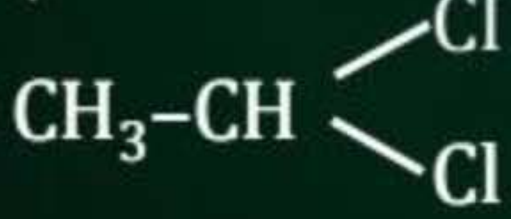
Which of the following is not correctly matched?

(A) Acetonitrile $CH_2 = CHCN$

(B) Allyl chloride $CH_2 = CH - CH_2Cl$

(C) s-Butyl group 

$CH_3 - \underset{|}{CH} - C_2H_5$

(D) Ethylidene chloride 

QUESTION 03

Select correct common name of the compound.

$CH_3 - CO - COOH$

(A) Lactic acid

(B) Pyruvic acid

(C) Carbonic acid

(D) Crotonic acid

QUESTION 04

The IUPAC name of vinyl acetylene is:

A Pent-1-en-4-yne

B Pent-4-yn-1-ene

C But-1-en-3-yne

D But-1-yn-3-ene

QUESTION 5

The structure of allyl vinyl thioether is:

(A) $CH_2 = CH - CH_2 - S - CH_2 - CH = CH_2$

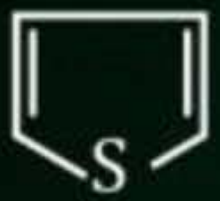
(B) $CH_2 = CH - S - CH_2 - CH = CH_2$

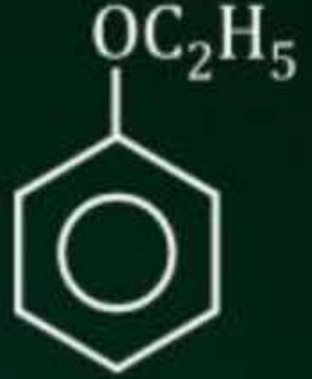
(C) $CH_2 = CH - S - CH = CH_2$

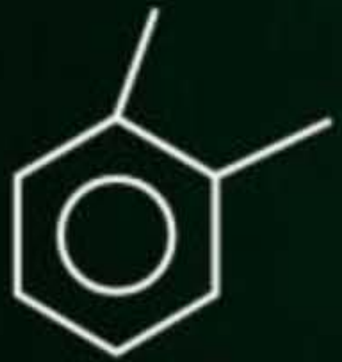
(D) None

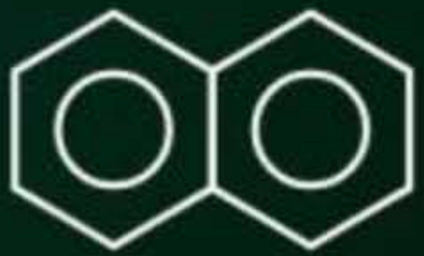
QUESTION 06

Which of the following common name is incorrect?

A  Thiophene

B  ⇒ Phenetol

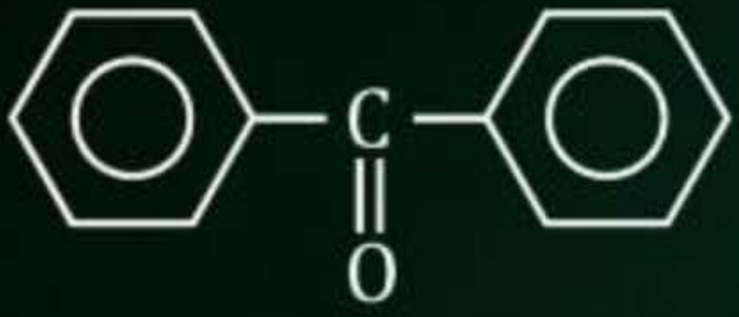
C  ⇒ M-xylene

D  ⇒ Naphthalene

QUESTION 07

Which of the following are correct common name?

A

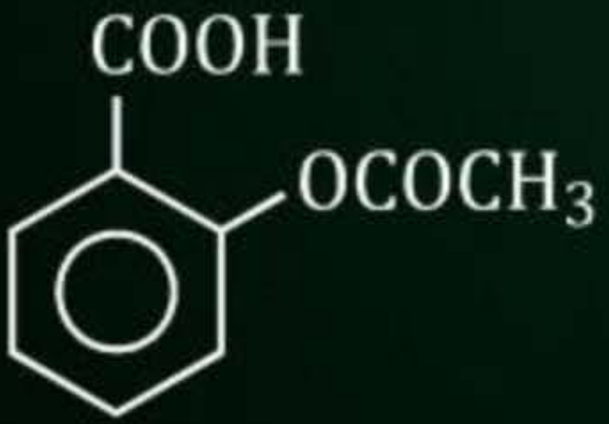


Acetophenone

B CH_3COCH_3 Anisole

C $PhCOCH_3$ Benzophenone

D



Aspirin (Acetyl salicylic acid)

QUESTION 08

The IUPAC name of acrolein is:

- (A) But-2-enal
- (B) Prop-2-enal
- (C) But-3-enal
- (D) 2-Methyl prop-2-enal

QUESTION ⑨

The IUPAC name of iso-octane is:

(A) 2, 2-dimethylpentane

(B) 2, 3-dimethylpentane

(C) 2, 3, 3-trimethylpentane

(D) 2, 2, 4-trimethylpentane

QUESTION 10

Which of the following common names are correct?

A CH_3CHCl_2 ⇒ Ethylidene chloride

B $CH_2=CH-Cl$ ⇒ Allyl chloride

C $CH\equiv C-CH_2-OH$ ⇒ Allyl alcohol

D $CH_2=CH-CH_2-OH$ ⇒ Propargyl alcohol

ANSWER KEY

1. B
2. A
3. B
4. C
5. B
6. C
7. D
8. B
9. D
10. A

Home Work From PW Module (Yakeen NEET)

Prarambh: Q 08, 12, 40, 42, 45, 46, 48

Prabal: Q 07

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11th NEET REAL TEST SERIES SYLLABUS

Cohort	Class	Name of the Test	Exam Date	Mode	Physics	Chemistry	Botany	Zoology
NEET	11	Test 1	13-Oct-2024	Online	Basic Maths & Calculus (Mathematical Tools) Vectors Units and Measurements Motion in a straight line	Structure of Atom Some Basic Concepts of Chemistry Classification of Elements and Periodicity in Properties	Cell - The Unit of Life Cell Cycle and Cell Division	Structural Organization in Animals Breathing and Exchange of Gases

12th NEET REAL TEST SERIES SYLLABUS

Cohort	Class	Name of the Test	Exam Date	Mode	Physics	Chemistry	Botany	Zoology
NEET	12	Test 1	13-Oct-2024	Online	Electric Charges and Fields Electrostatic Potential and Capacitance	Solution Electrochemistry	Sexual Reproduction in Flowering Plant	Human Reproduction

DROPPER NEET REAL TEST SERIES SYLLABUS

Cohort	Class	Name of the Test	Exam Date	Mode	Physics	Chemistry	Botany	Zoology
NEET	Dropper	Test 1	13-Oct-2024	Online	Basic Maths & Calculus (Mathematical Tools) Vectors Units and Measurements Motion in a straight line Motion in a plane Circular motion Laws of motion	Some Basic Concept of Chemistry Redox Reaction Solutions Thermodynamics Equilibrium Electrochemistry	Cell - The Unit of Life Cell Cycle and Cell Division The Living World Biological Classification Plant Kingdom Morphology of Flowering Plants	Structural Organization in Animals Breathing and Exchange of Gases Body Fluids and Circulation Excretory Products & their Elimination

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- **Exam Duration:** 60 Minutes

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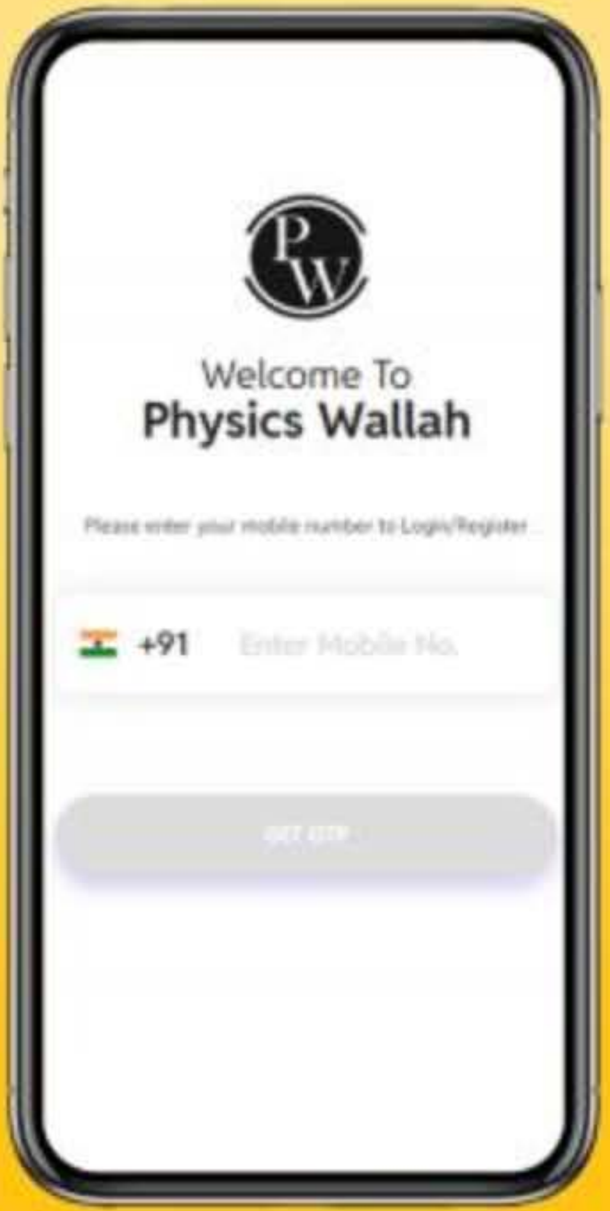
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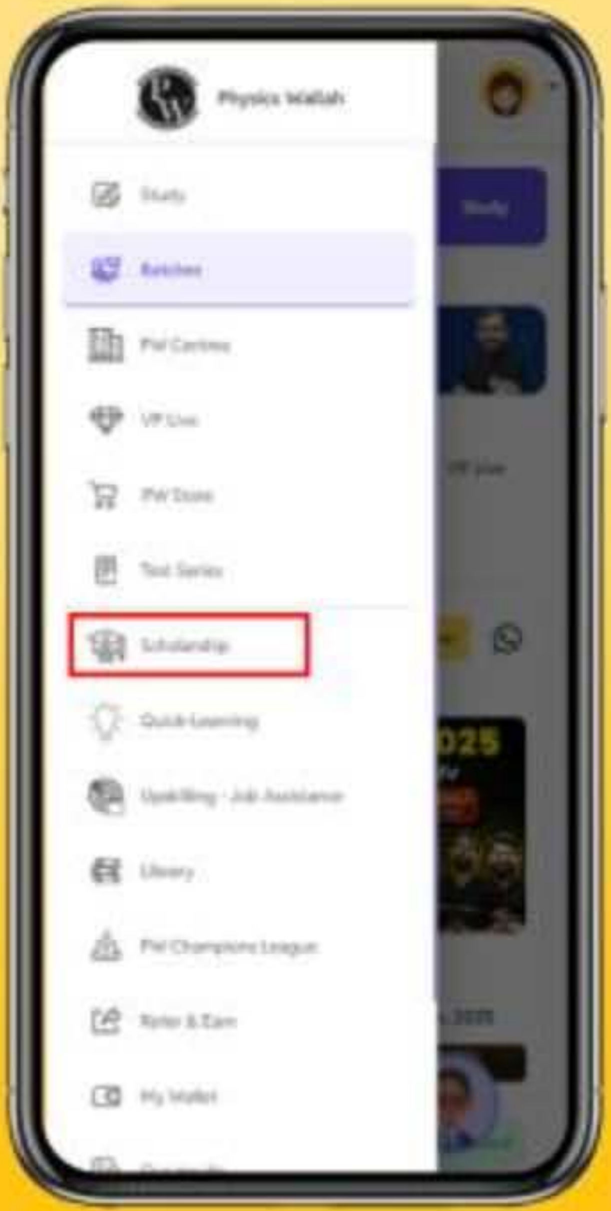
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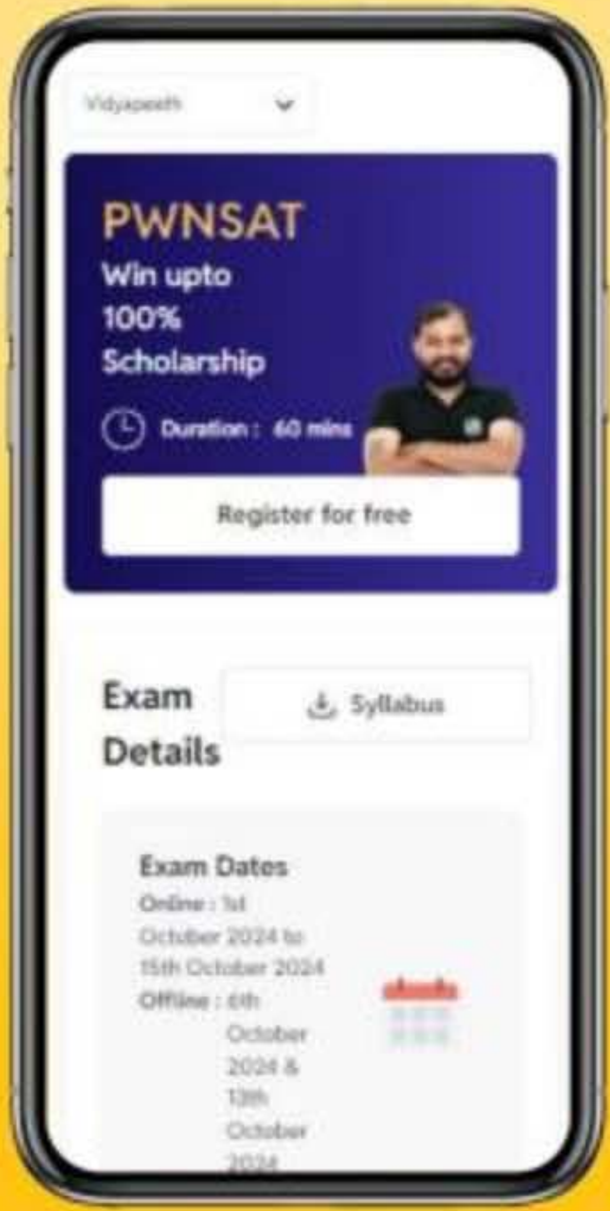
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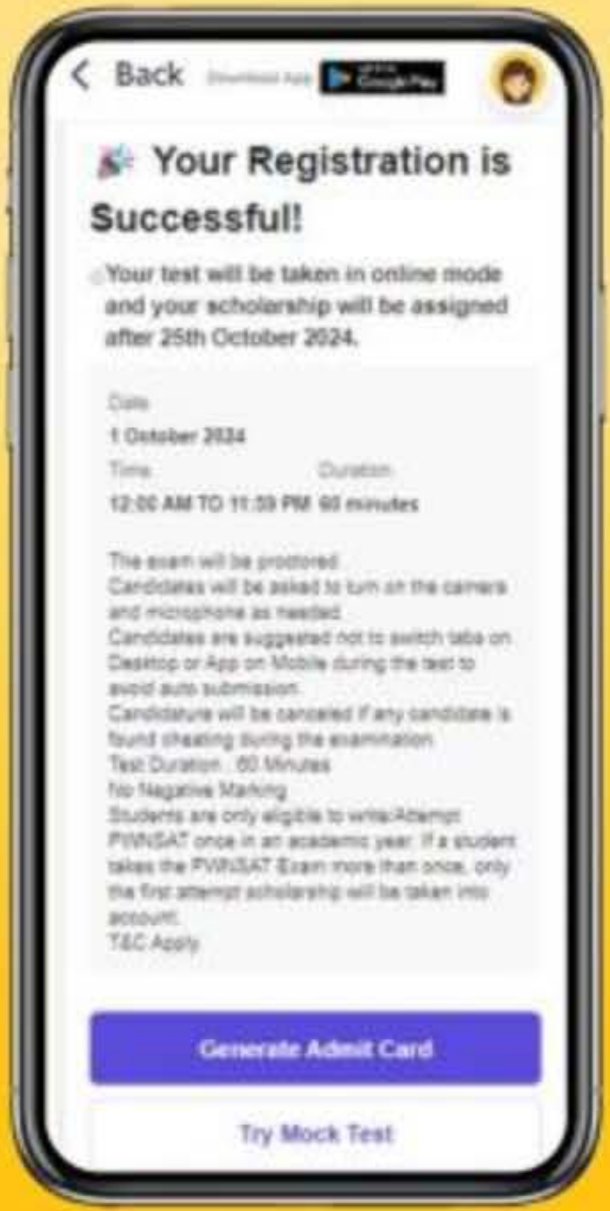
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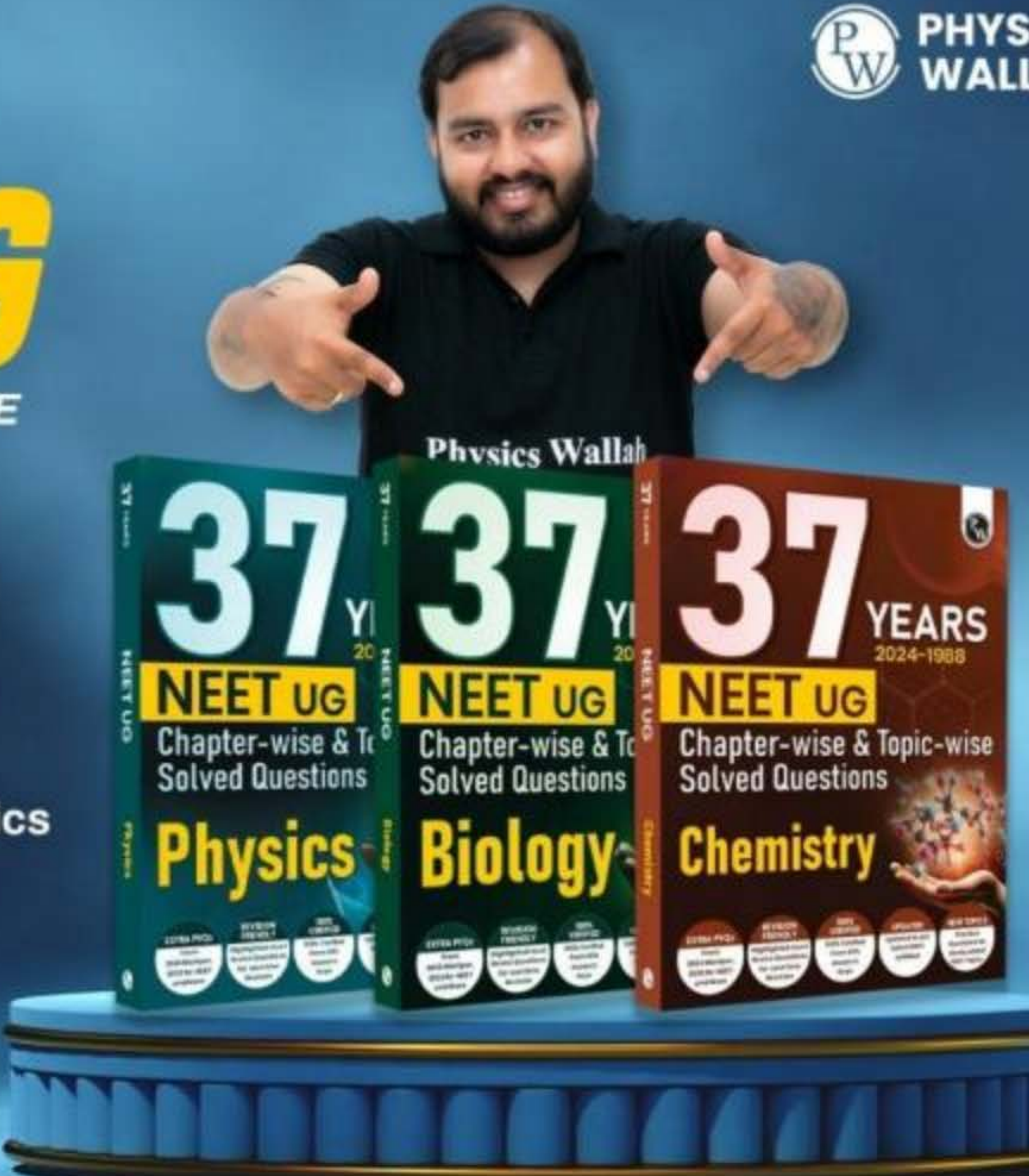
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Physics
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Chemistry

Thank you!!

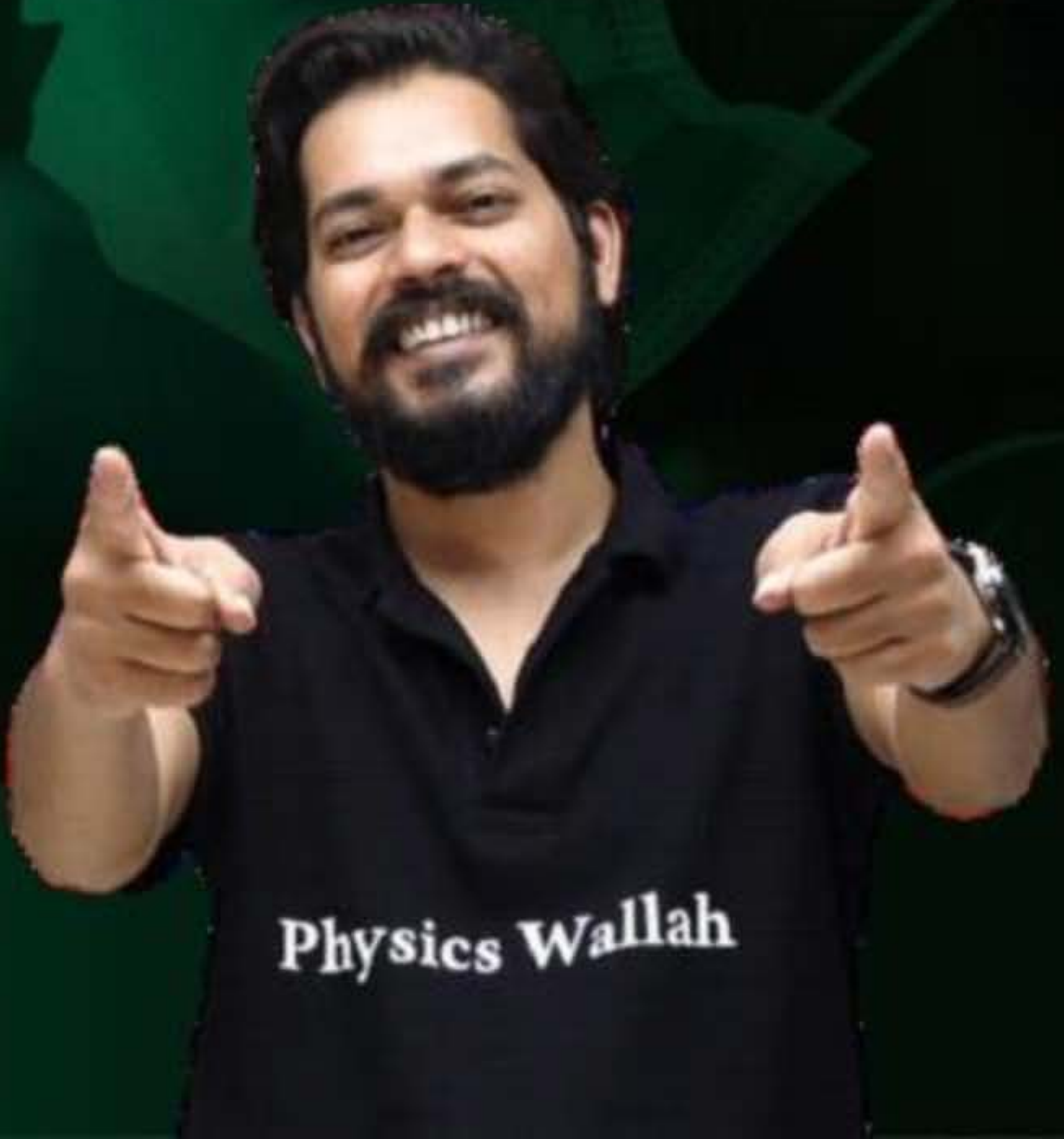
YAKEEN 2.0

FOR NEET 2025

Lecture- 08 | **Organic Chemistry**

Some Basic Principles and Techniques (IUPAC Naming)

By- Pankaj Sir(POPU MAMA)


Physics Wallah

Topics *to be covered*

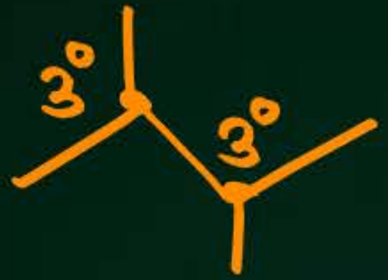
1. NEET & JEE Mains PYQs Discussion
2. Practice

NEET PYQs

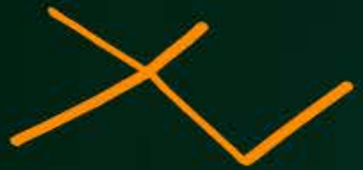
QUESTION (NEET 2024)

A compound with a molecular formula C_6H_{14} has two tertiary carbons. Its IUPAC name is:

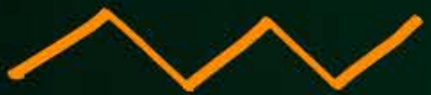
(A) ✓ 2, 3-dimethylbutane



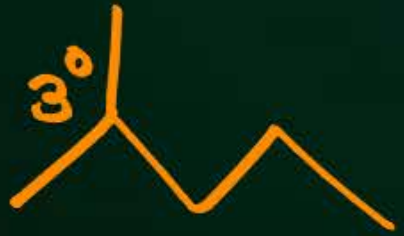
(B) ✗ 2, 2-dimethylbutane



(C) ✗ n-hexane



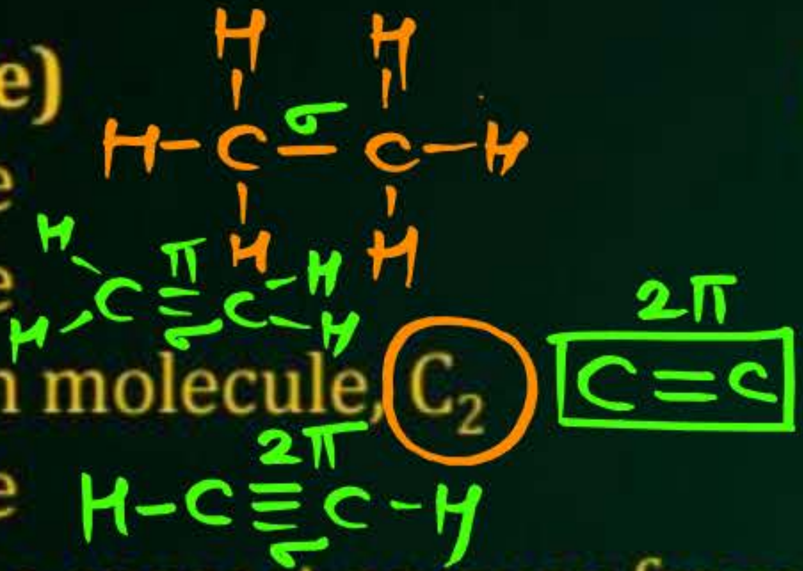
(D) 2-methylpentane



QUESTION (NEET 2024)

Match List I with List II.

List-I (Molecule)	List-II (Number and type of bonds b/w two carbon atoms)
III A. ethane	(I) one σ–bond and two π-bonds
IV B. ethene	(II) two π–bonds
II C. carbon molecule, C_2	(III) one σ-bond
I D. ethyne	(IV) one σ–bond and one π-bonds



Choose the correct answer from the options given below:

[✓ (A)] A-III, B-IV, C-II, D-I

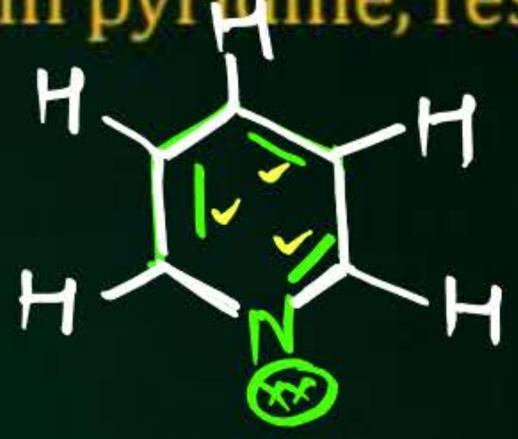
(B) A-III, B-IV, C-I, D-II

(C) A-I, B-IV, C-II, D-III

(D) A-IV, B-III, C-II, D-I

QUESTION (NEET 2023)

The number of sigma, Pi bonds and lone pair of electrons in pyridine, respectively are:



A 12, 2, 1

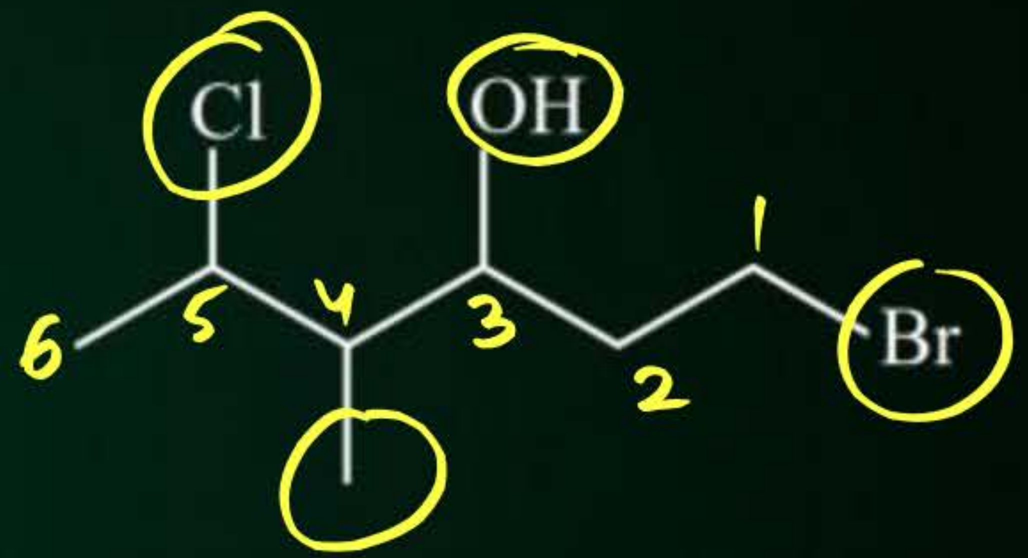
B 11, 2, 0

C 12, 3, 0

[✓ **D**] 11, 3, 1

QUESTION (NEET 2022)

The correct IUPAC name of the following compound is:

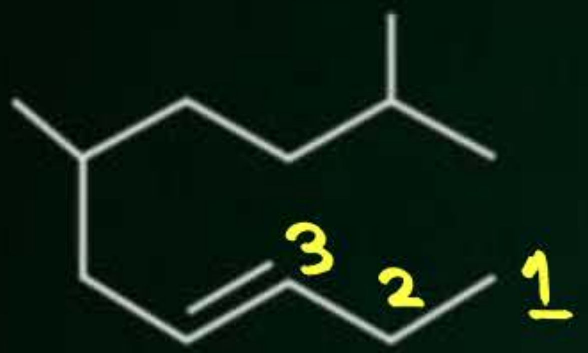


- A 6-bromo-4-methyl-2-chloro hexan-4-ol
- [✓ B] 1-bromo-5-chloro-4-methyl hexan-3-ol
- C 6-bromo-2-chloro-4-methyl hexan-4-ol
- D 1-bromo-4-methyl-5-chloro hexan-3-ol

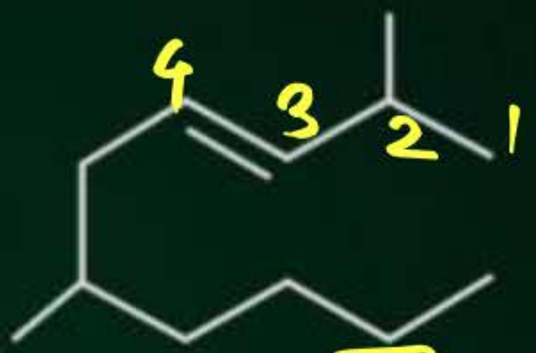
QUESTION (NEET 2021)

The correct structure of 2, 6-Dimethyl-dec-4-ene is:

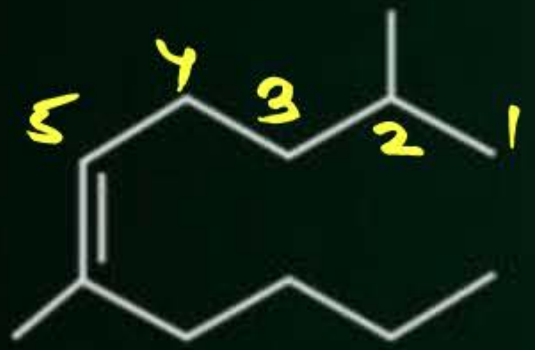
(A)



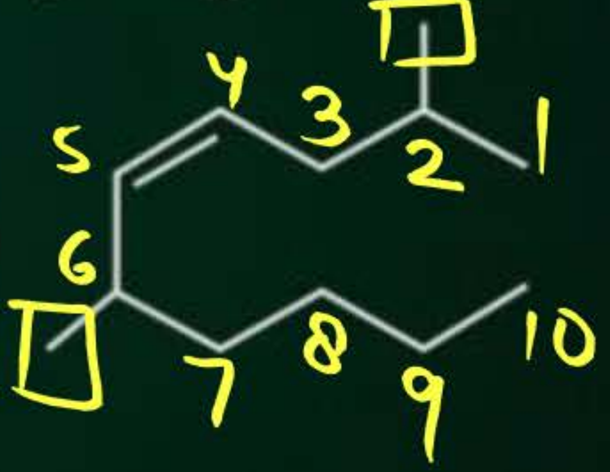
(B)



(C)



✓ (D)


1
4
3
2
1
5
6
7
8
9
10

QUESTION (NEET 2018)

Which of the following molecules represents the order of hybridization sp^2, sp^2, sp, sp from left to right atoms?

(A) $\overset{sp}{HC} \equiv \overset{sp}{C} - \overset{sp}{C} \equiv \overset{sp}{CH}$

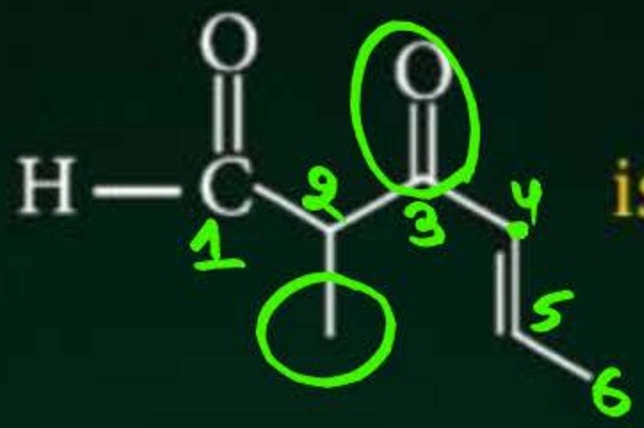
[✓ (B)] $\overset{sp^2}{CH_2} = \overset{sp^2}{CH} - \overset{sp}{C} \equiv \overset{sp}{CH}$

(C) $\overset{sp^3}{CH_3} - \overset{sp^2}{CH} = \overset{sp^2}{CH} - \overset{sp^3}{CH_3}$

(D) $\overset{sp^2}{CH_2} = \overset{sp^2}{CH} - \overset{sp^2}{CH} = \overset{sp^2}{CH_2}$

QUESTION (NEET 2017)

The IUPAC name of the compound



is:

(A) 5-formylhex-2-en-3-one

(B) 5-methyl-4-oxohex-2-en-5-al

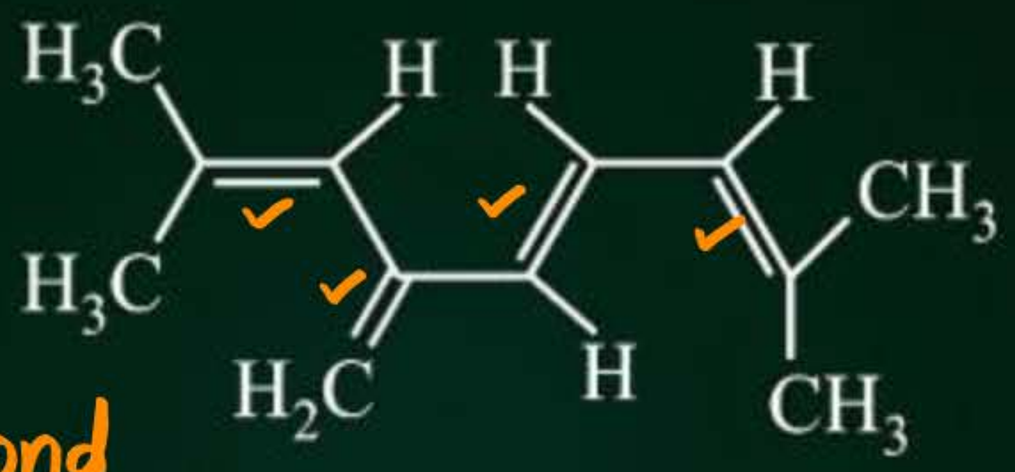
(C) 3-keto-2-methylhex-5-enal

[✓ (D)] 3-keto-2-methylhex-4-enal

2-methyl-3-oxohex-4-enal

QUESTION (NEET 2015)

The total number of π-bond electrons in the following structure is:


H_3C
H
H
H
CH_3
H_3C
H_2C
H
CH_3

4 π Bond

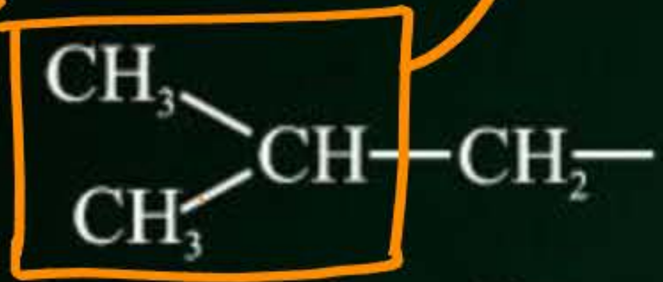
$4 \times 2\ \pi e^{\ominus}s$

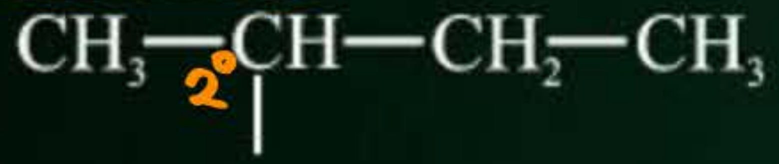
$8\ \pi e^{\ominus}s$

- **A** 12
- **B** 16
- **C** 4
- **D** 8 ✓

QUESTION (NEET 2013)

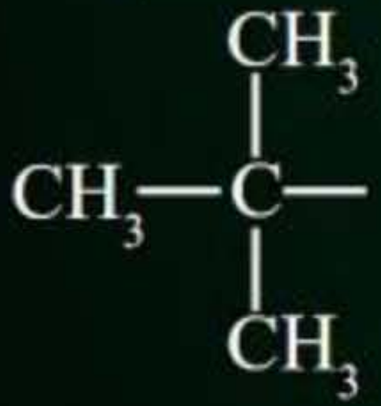
The structure of isobutyl group in an organic compound is:

[✓ A] 

B 

$CH_3-\underset{|}{CH}-CH_2-CH_3$ sec butyl

C $CH_3-CH_2-CH_2-CH_2-$ n butyl

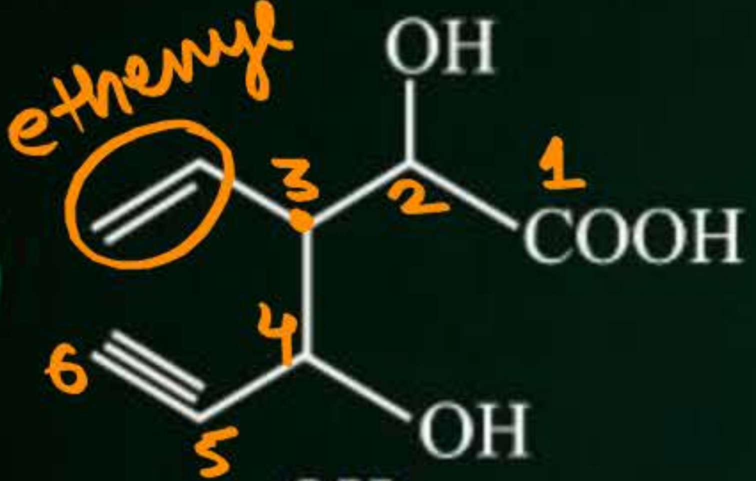
D 

$CH_3-\underset{CH_3}{\underset{|}{\overset{CH_3}{\overset{|}{C}}}}-$ tert butyl

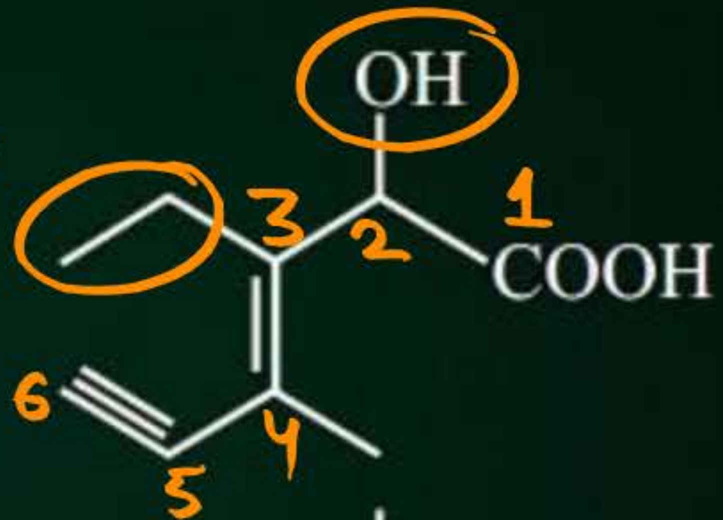
QUESTION (NEET 2013)

Structure of the compound whose IUPAC name is 3-Ethyl-2-hydroxy-4-methylhex-3-en-5-ynoic acid is:

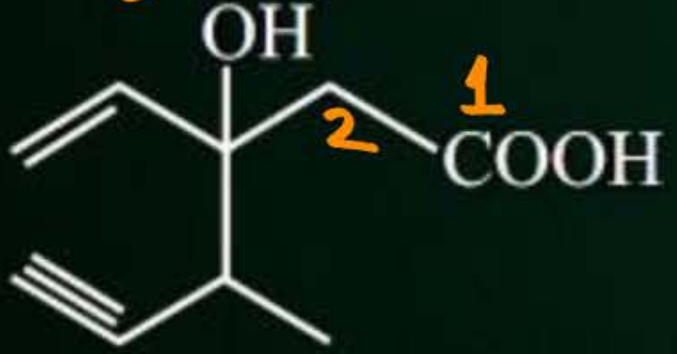
A


ethenyl
OH
3
2
1
COOH
6
4
5
OH

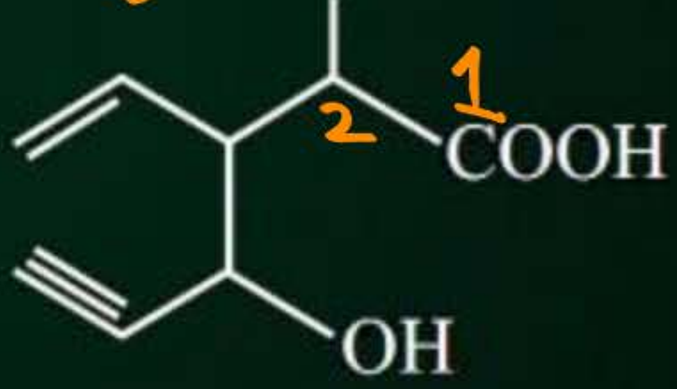
[✓ B]


OH
3
2
1
COOH
6
4
5

C



D



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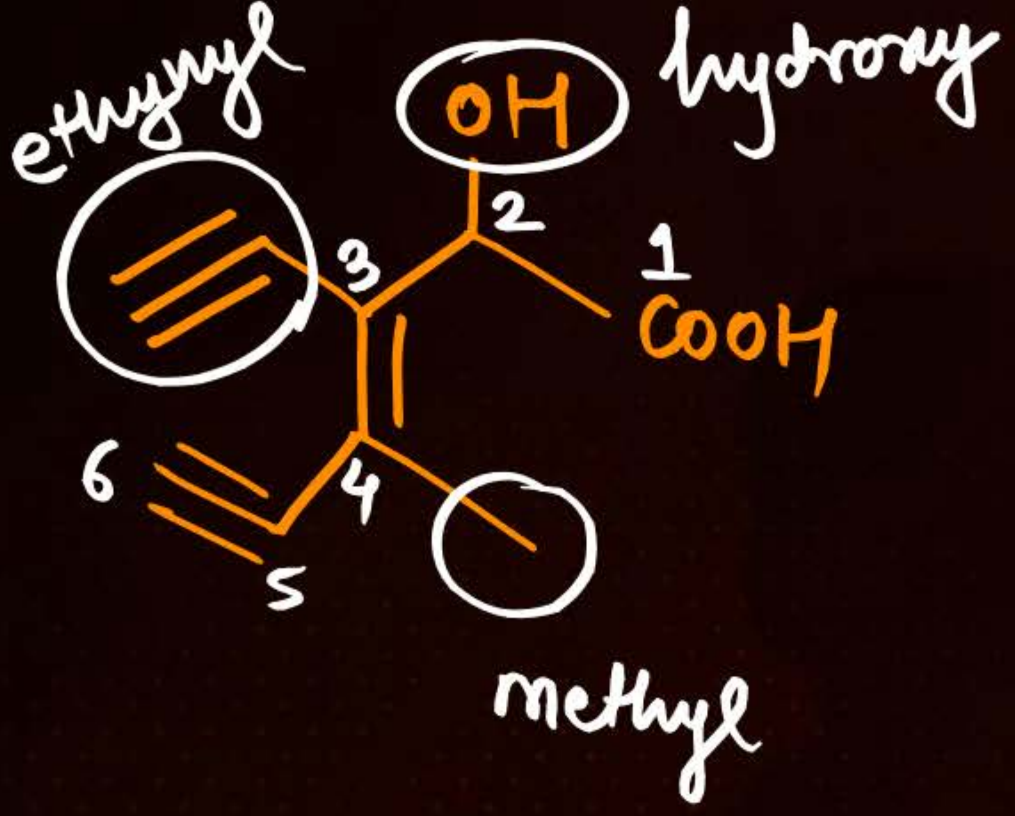

ethynyl
OH
hydroxy
2
3
1
COOH
6
4
5
methyl

3- Ethynyl-2-hydroxy-4-methyl hex-3-en~~e~~-5-yn~~e~~-1-oic acid

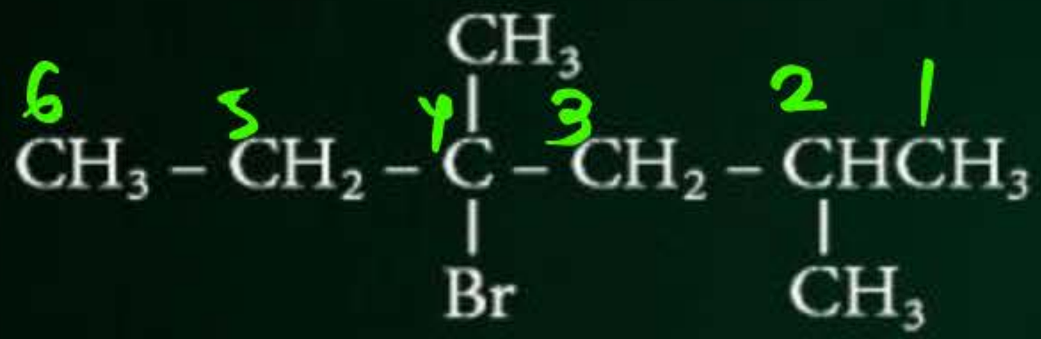
QUESTION (AIPMT 2012)

Which nomenclature is not according to IUPAC system?

[✓ (A)] $Br-\overset{3}{C}H_2-\overset{2}{C}H=\overset{1}{C}H_2$

1-Bromoprop-2-ene

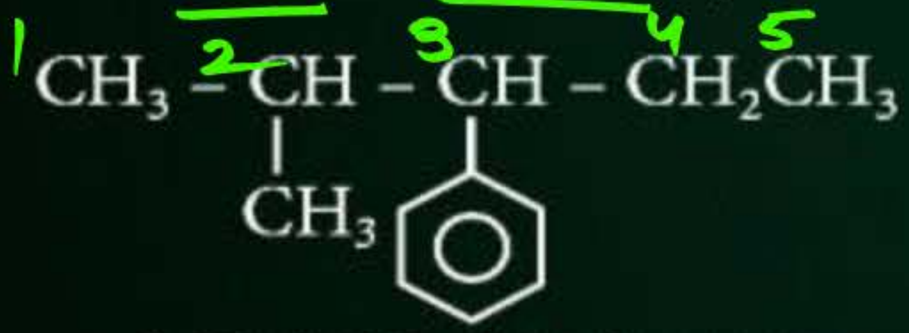
(B)



$$\overset{6}{C}H_3-\overset{5}{C}H_2-\overset{CH_3}{\underset{Br}{\overset{4}{C}}}-\overset{3}{C}H_2-\underset{CH_3}{\overset{2}{C}H}\overset{1}{C}H_3$$

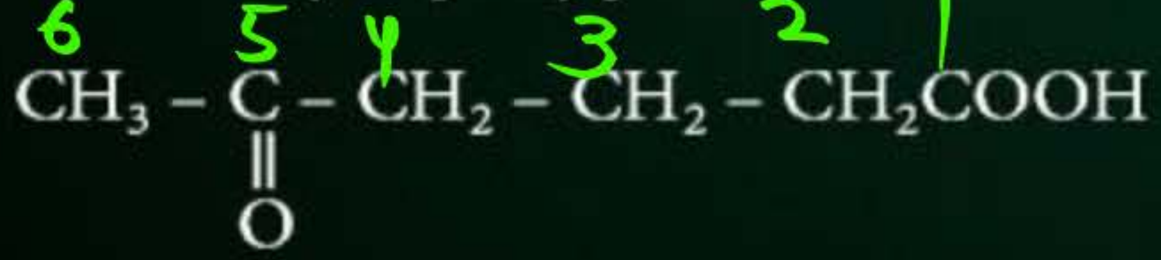
4-Bromo-2,4-dimethylhexane

(C)



2-Methyl-3-phenylpentane

(D)

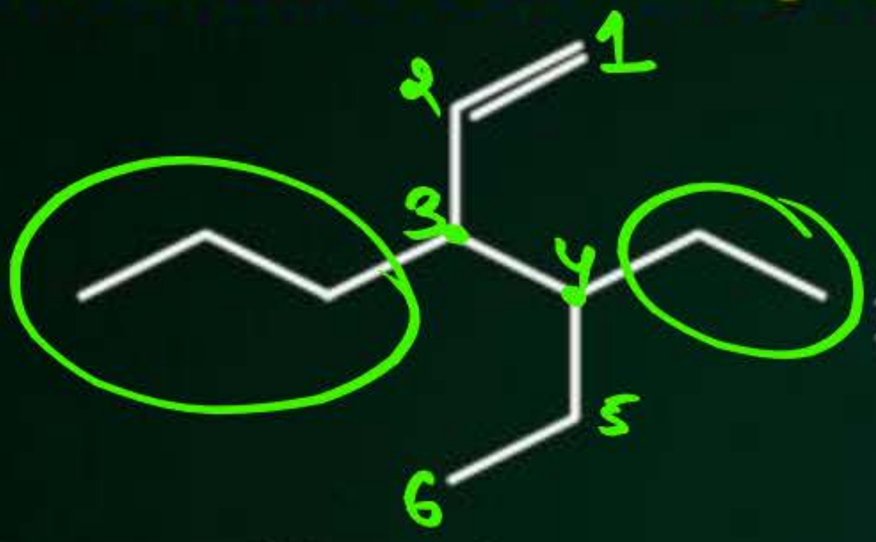


$$\overset{6}{C}H_3-\underset{\overset{\|}{O}}{\overset{5}{C}}-\overset{4}{C}H_2-\overset{3}{C}H_2-\overset{2}{C}H_2\overset{1}{C}OOH$$

5-Oxohexanoic acid

QUESTION (AIPMT 2011)

The correct IUPAC name of the compound



is

[✓ A] 4-Ethyl-3-propyl hex-1-ene

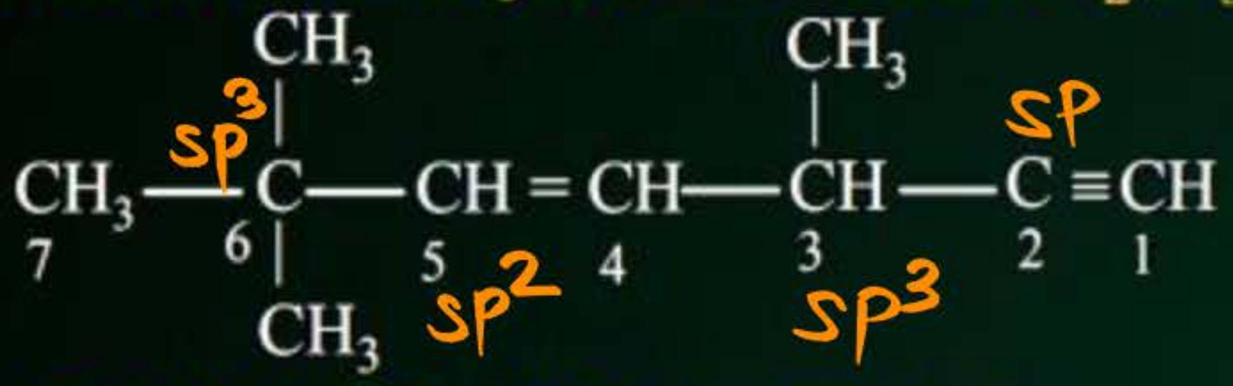
B 3-Ethyl-4-ethenyl heptane

C 3-Ethyl-4-propyl hex-1-ene

D 3-(1-ethyl propyl) hex-1-ene

QUESTION (AIPMT 2009)

The state of hybridization of C_2, C_3, C_5 and C_6 of the hydrocarbon,



$$\underset{7}{\mathrm{CH_3}}-\underset{6}{\overset{\overset{\mathrm{CH_3}}{|}}{\underset{\underset{\mathrm{CH_3}}{|}}{\mathrm{C}}}}-\underset{5}{\mathrm{CH}}=\underset{4}{\mathrm{CH}}-\underset{3}{\overset{\overset{\mathrm{CH_3}}{|}}{\mathrm{CH}}}-\underset{2}{\mathrm{C}}\equiv\underset{1}{\mathrm{CH}}$$

is in the following sequence:

A sp^3, sp^2, sp^2 and sp

B sp, sp^2, sp^2 and sp^3

C sp, sp^2, sp^3 and sp^2

[✓ **D**] sp, sp^3, sp^2 and sp^3

QUESTION (AIPMT 2008)

In the hydrocarbon

$$\underset{6}{CH_3}-\underset{5}{CH}\overset{sp^2}{=}\underset{4}{CH}-\underset{\overset{sp^3}{3}}{CH_2}-\underset{2}{C}\equiv\underset{1}{\overset{sp}{CH}}$$

The state of hybridization of carbons 1, 3 and 5 are in the following sequence:

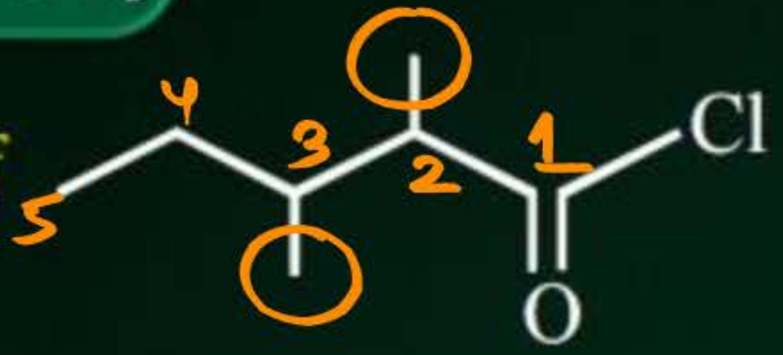
(A) sp^2, sp, sp^3

[✓ (B)] sp, sp^3, sp^2

(C) sp, sp^2, sp^3

(D) sp^3, sp^2, sp

QUESTION (AIPMT 2006)

The IUPAC name of 

is:

A 1-chloro-1-oxo-2, 3-dimethyl pentane

B 2-ethyl-3-methyl butanoyl chloride

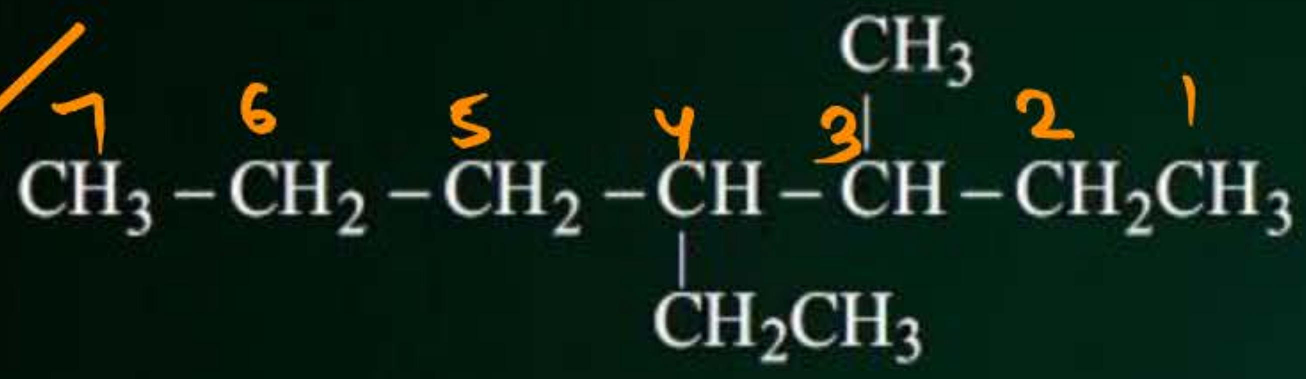
[✓ **C**] 2, 3-dimethyl pentanoyl chloride

D 3, 4-dimethyl pentanoyl chloride

QUESTION (AIPMT 2005)

Names of some compounds are given. Which one is not correct in IUPAC system?

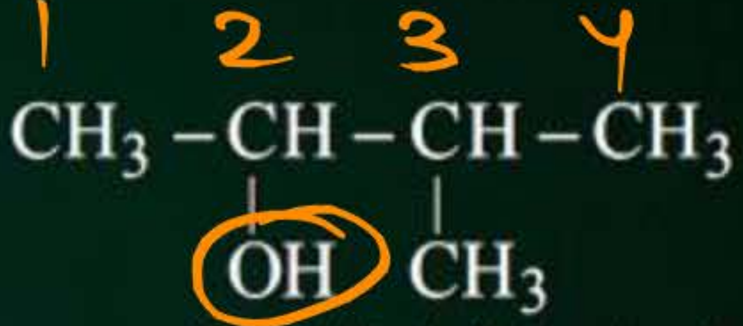
(A) ✓



$CH_3-CH_2-CH_2-\underset{CH_2CH_3}{\underset{|}{CH}}-\overset{CH_3}{\overset{|}{CH}}-CH_2CH_3$

3-Methyl-4-ethylheptane

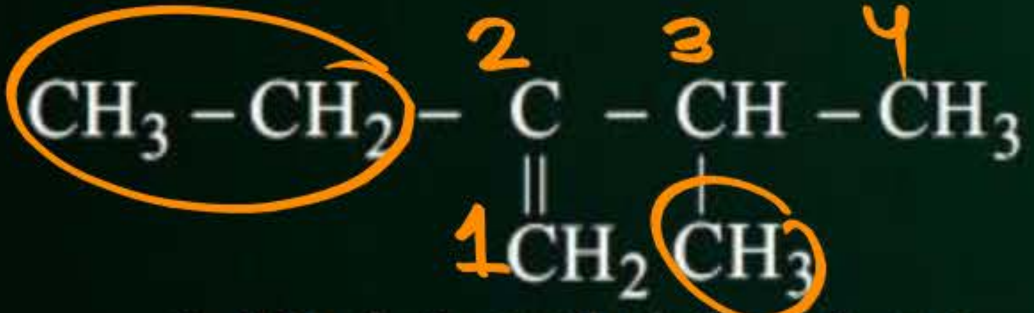
(B)



$CH_3-\underset{OH}{\underset{|}{CH}}-\underset{CH_3}{\underset{|}{CH}}-CH_3$

3-Methyl-2-butanol

(C)



$CH_3-CH_2-\underset{CH_2}{\underset{\|}{C}}-\underset{CH_3}{\underset{|}{CH}}-CH_3$

2-Ethyl-3-methyl-but-1-ene

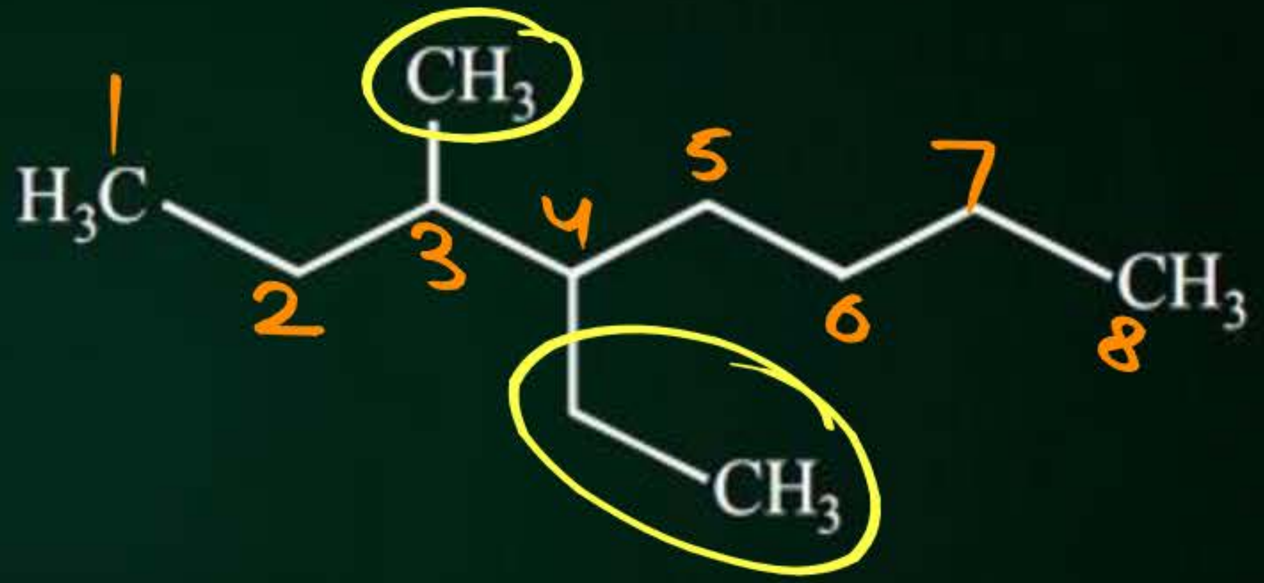
(D) $\overset{1}{C}H_3-\overset{2}{C}\equiv\overset{3}{C}-\overset{4}{C}H-(\overset{5}{C}H_3)_2$

4-Methyl-2-pentyne

$\underset{CH_3}{|}$

QUESTION (AIPMT 2003)

Name of the compound given below is:


H$_3$C
CH$_3$
CH$_3$
CH$_3$
1
2
3
4
5
6
7
8

(A) 5-ethyl-6-methyl octane

[✓ (B)] 4-ethyl-3-methyl octane

(C) 3-methyl-4-ethyl octane

(D) 2, 3-diethyl heptane

QUESTION (AIPMT 2002)

IUPAC name of the following is:

$\overset{1}{C}H_2=\overset{2}{C}H-\overset{3}{C}H_2-\overset{4}{C}H_2-\overset{5}{C}\equiv\overset{6}{C}H$

A ✗ 1, 5-hexenyne

[✓ B] 1-hexen-5-yne

C 1-hexyne-5-ene

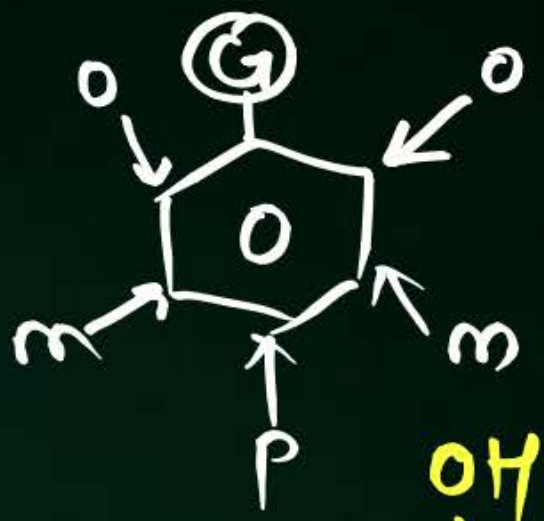
D 1, 5-hexynene

JEE Mains PYQs

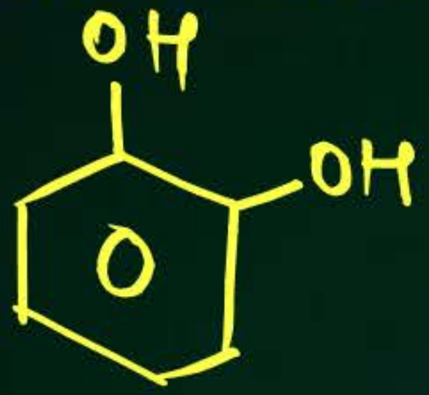
QUESTION (JEE Mains 4th April 2024, Evening Shift)

Common name of Benzene-1, 2-diol is:

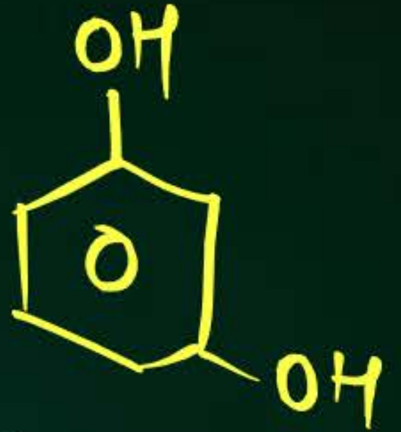
- (A) quinol
- (B) resorcinol
- (C) [✓ catechol]
- (D) o-cresol



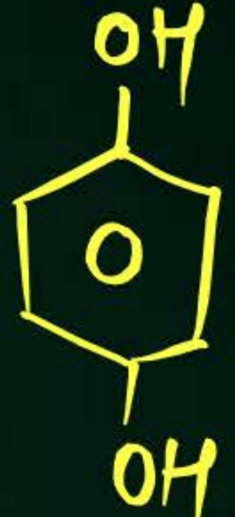
o — ortho
m — meta
p — para



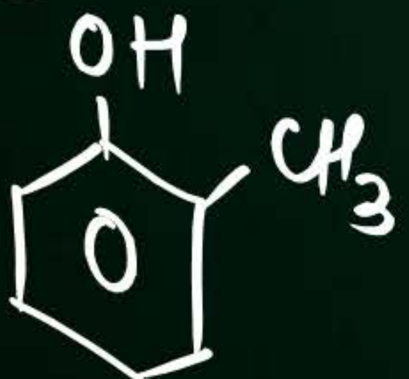
Catechol



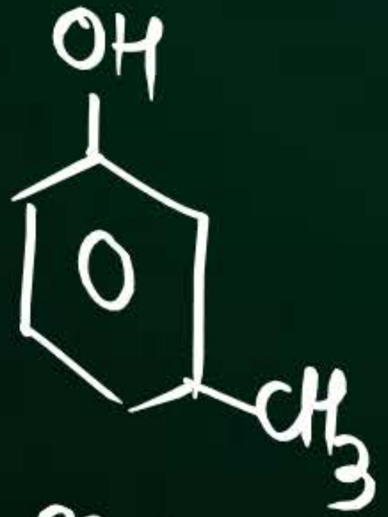
Resorcinol



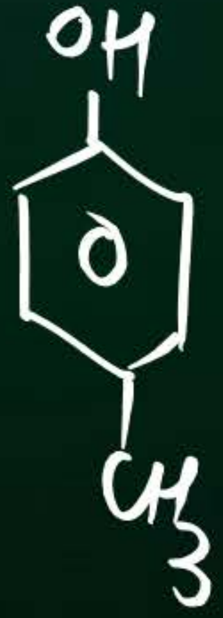
Hydroquinol



o-cresol



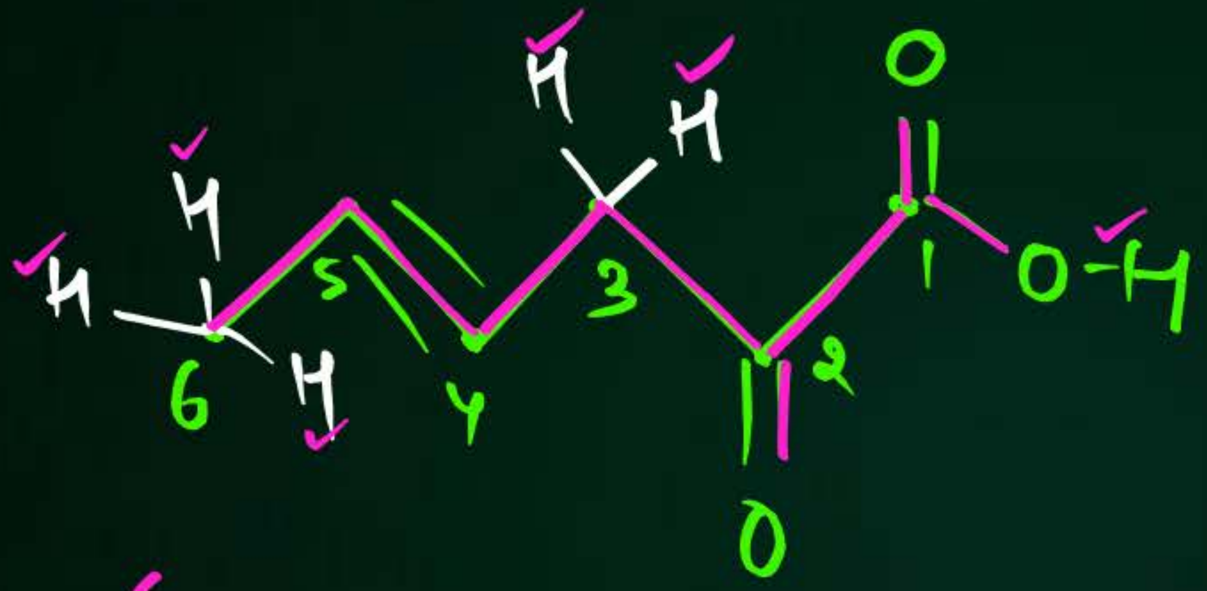
m-cresol



p-cresol

QUESTION (JEE Mains 4th April 2024, Evening Shift)

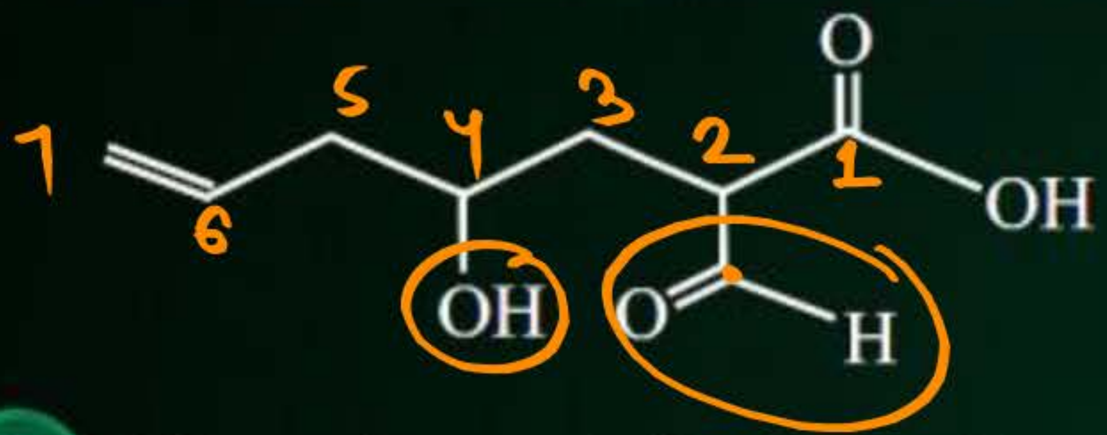
The total number of 'sigma' and 'Pi' bonds in 2-oxohex-4-ynoic acid is___.


H
H
H
H
H
O
H
1
O-H
6
H
4
5
3
2
O

$(14\sigma, 4\pi)$

QUESTION (JEE Mains 5th April 2024, Evening Shift)

The correct nomenclature for the following compound is:



A 2–carboxy–4–hydroxy hept–6–enal

B 2–carboxy–4–hydroxy hept–7–enal

[✓ C] 2–formyl–4–hydroxy hept–6–enoic acid

D 2–formyl–4–hydroxy hept–7–enoic acid

QUESTION (JEE Mains 5th April 2024, Morning Shift)

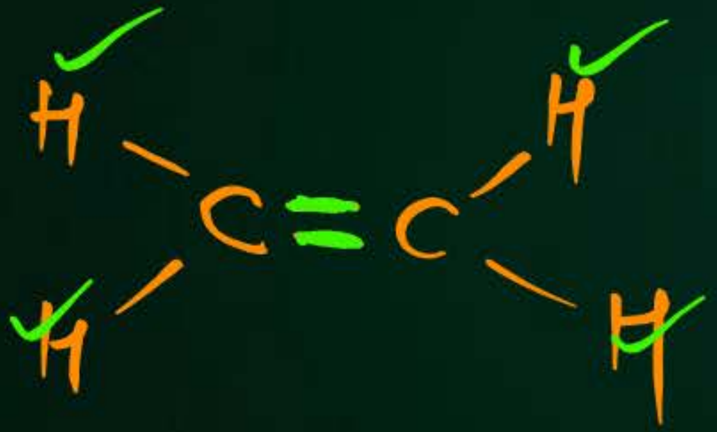
Number of σ and π bonds present in ethylene molecule is respectively:

A 3 and 1

B 5 and 2

C 4 and 1

[✓ D] 5 and 1

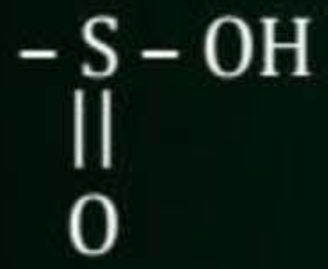


QUESTION (JEE Mains 6th April 2024, Morning Shift)

Functional group present in Sulphonic acid is:

(A) SO_4H

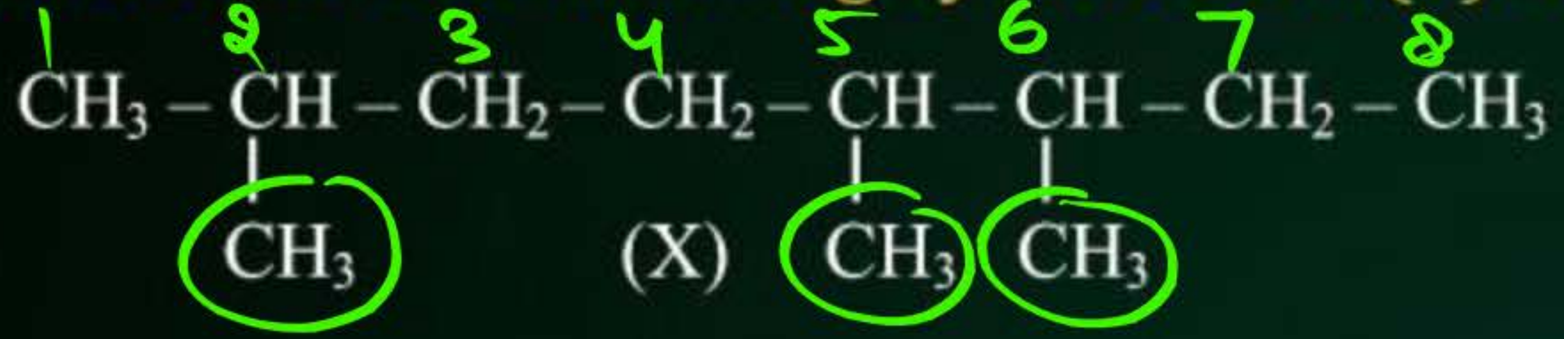
[✓ (B)] SO_3H

(C) 
$-\underset{\underset{O}{\|}}{S}-OH$

(D) $-SO_2$

QUESTION (JEE Mains 8th April 2024, Evening Shift)

IUPAC name of following hydrocarbon (X) is:



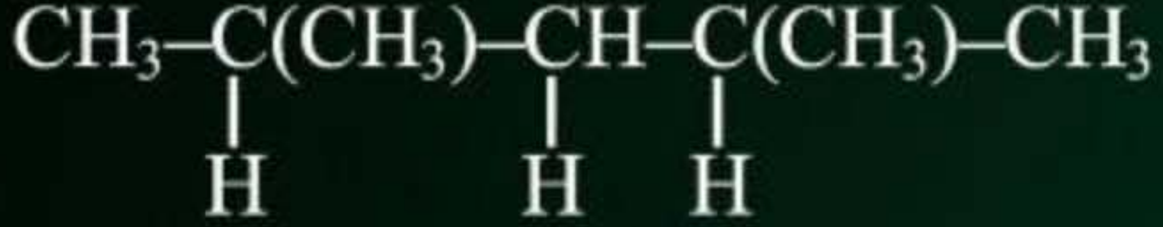
$$\mathrm{CH_3-\underset{\underset{CH_3}{|}}{CH}-CH_2-CH_2-\underset{\underset{CH_3}{|}}{CH}-\underset{\underset{CH_3}{|}}{CH}-CH_2-CH_3}$$

(X)

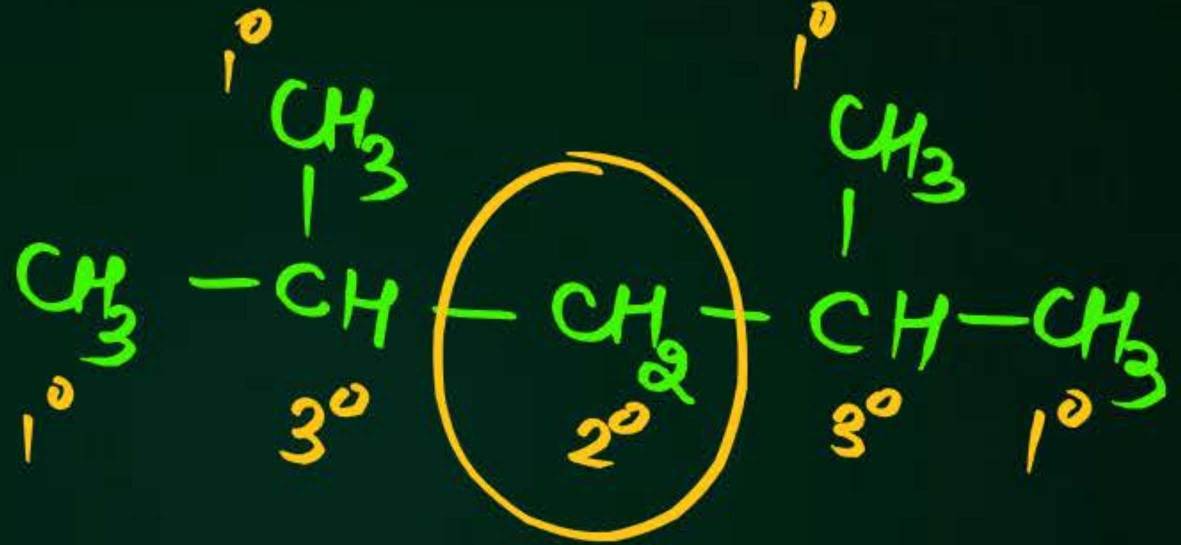
- A 2-Ethyl-3, 6-dimethylheptane
- B 2-Ethyl-2, 6-diethylheptane
- [✓ C] 2, 5, 6-Trimethyloctane
- D 3, 4, 7-Trimethyloctane

QUESTION (JEE Mains 8th April 2024, Morning Shift)

In the given compound, the number of 2° carbon atom/s is ____.



$$CH_3-\underset{\overset{|}{H}}{C}(CH_3)-\underset{\overset{|}{H}}{C}H-\underset{\overset{|}{H}}{C}(CH_3)-CH_3$$


1°
CH3
1°
CH3
CH3 – CH – CH2 – CH – CH3
1°
3°
2°
3°
1°

(A) Three

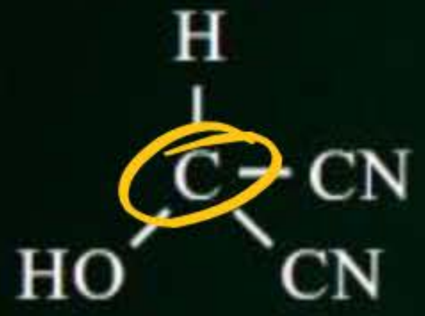
(B) [✓ One]

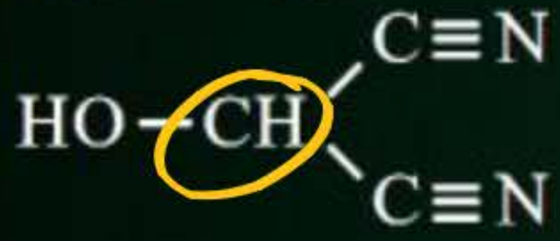
(C) Two

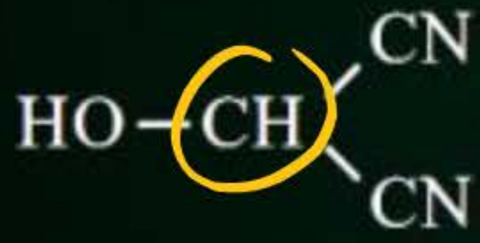
(D) Four

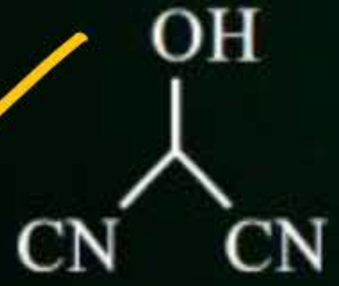
QUESTION (JEE Mains 27th January 2024, Evening Shift)

Bond line formula of $HOCH(CN)_2$ is:

A


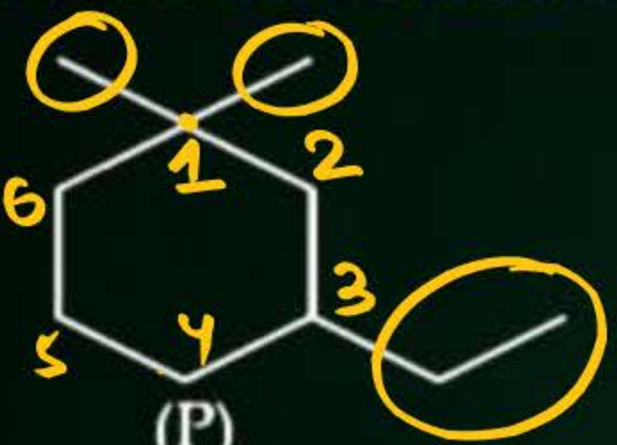
B


C


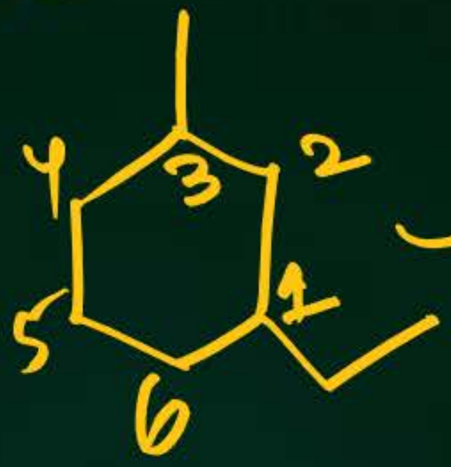
[✓ D]


QUESTION (JEE Mains 27th January 2024, Morning Shift)

IUPAC name of following compound (P) is:



(P)



A 1-Ethyl-5, 5-dimethylcyclohexane

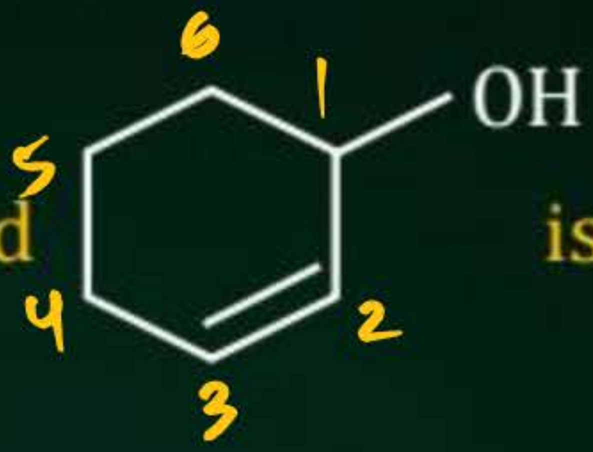
[✓ B] 3-Ethyl-1, 1-dimethylcyclohexane

C 1-Ethyl-3, 3-dimethylcyclohexane

D 1, 1-Dimethyl-3-ethylcyclohexane

QUESTION (JEE Mains 29 January 2024, Evening Shift)

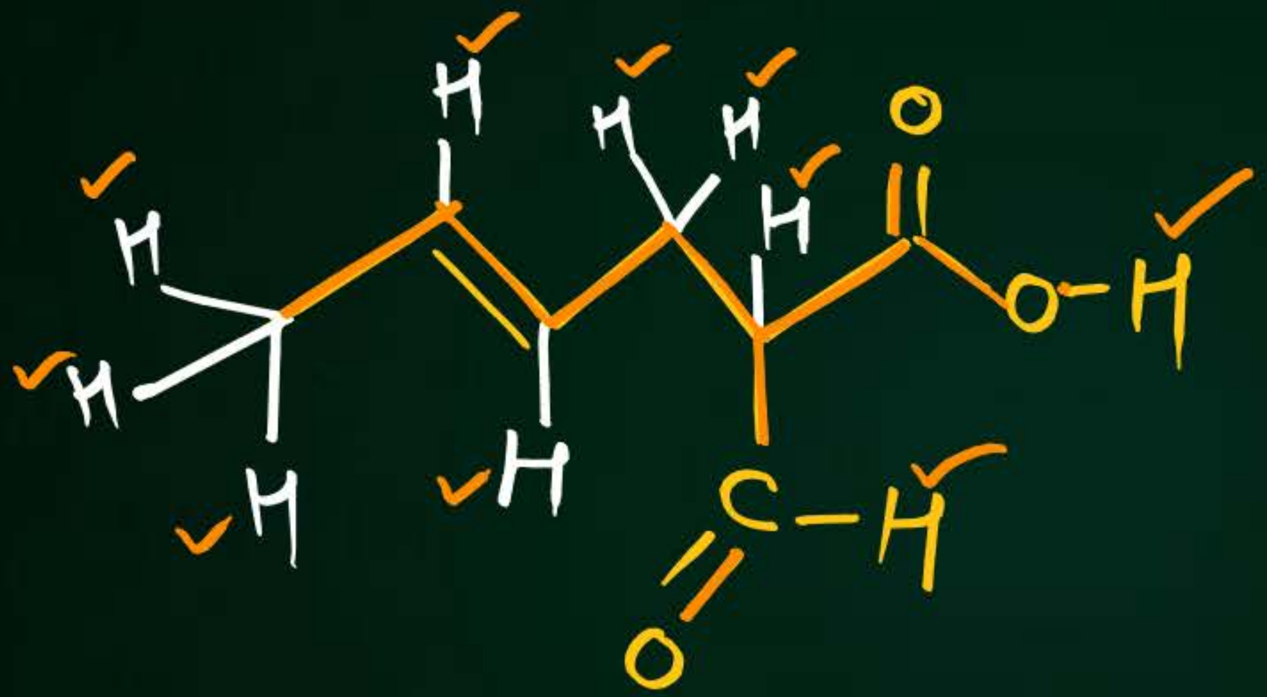
According to IUPAC system, the compound is named as



- A Cyclohex-1-en-2-ol
- B 1-Hydroxyhex-2-ene
- C Cyclohex-1-en-3-ol
- [✓ D Cyclohex-2-en-1-ol]

QUESTION (JEE Mains 29 January 2024, Evening Shift)

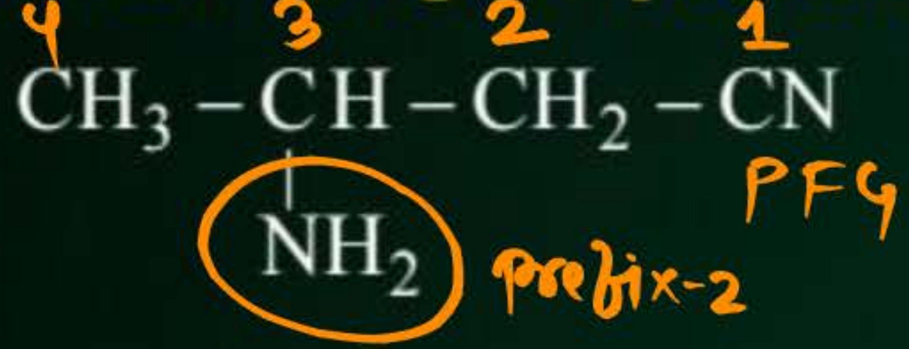
The total number of 'Sigma' and Pi bonds in 2-formylhex-4-enoic acid is ___.



19σ, 3π

QUESTION (JEE Mains 30 January 2024, Evening Shift)

IUPAC name of following compound is:



$$\overset{4}{CH_3}-\underset{NH_2}{\overset{3}{C}}H-\overset{2}{CH_2}-\overset{1}{CN}$$

PFG

prefix-2

A 2–Aminopentanenitrile

B 2–Aminobutanenitrile

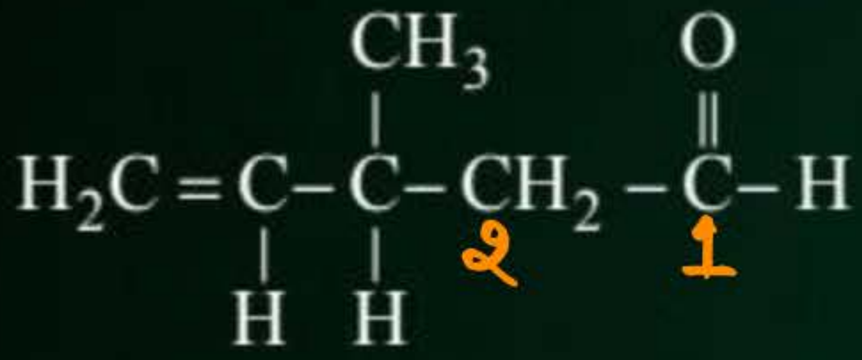
[✓ C] 3–Aminobutanenitrile

D 3–Aminopropanenitrile

QUESTION (JEE Mains 30 January 2024, Morning Shift)

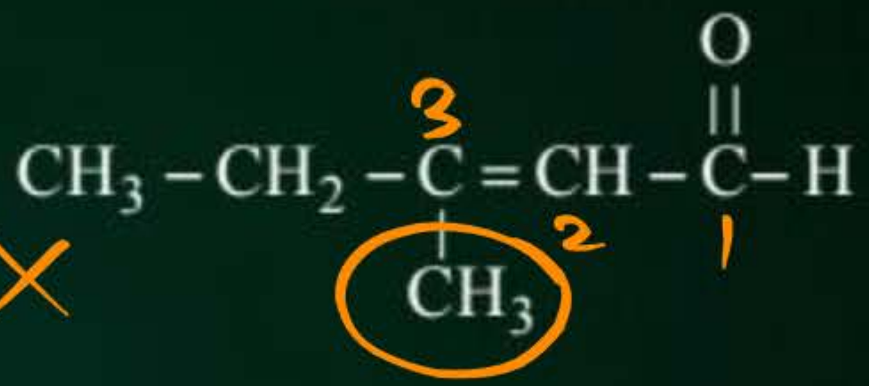
Structure of 4-Methylpent-2-enal is:

A ✗



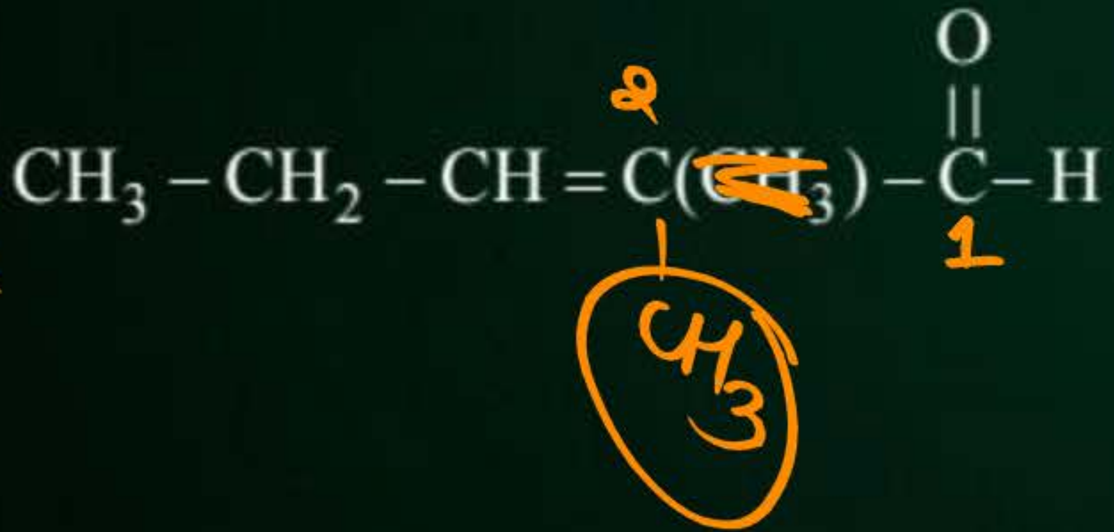
$\mathrm{H_2C=\underset{H}{\underset{|}{C}}-\underset{H}{\underset{|}{\overset{CH_3}{\overset{|}{C}}}}-CH_2-\overset{O}{\overset{\|}{C}}-H}$

B ✗



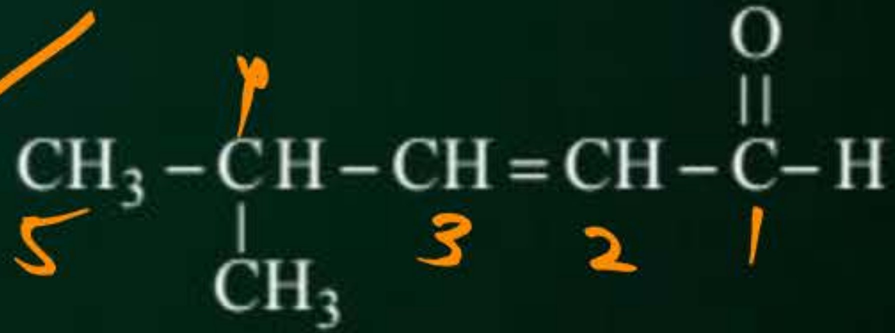
$\mathrm{CH_3-CH_2-\underset{CH_3}{\underset{|}{C}}=CH-\overset{O}{\overset{\|}{C}}-H}$

C ✗



$\mathrm{CH_3-CH_2-CH=C(CH_3)-\overset{O}{\overset{\|}{C}}-H}$

D ✓

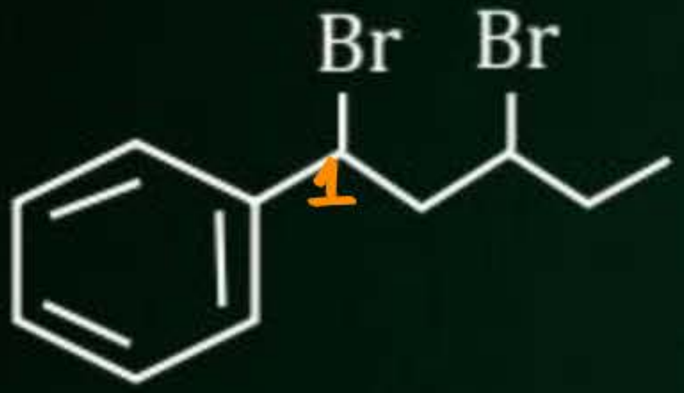


$\mathrm{CH_3-\underset{CH_3}{\underset{|}{CH}}-CH=CH-\overset{O}{\overset{\|}{C}}-H}$

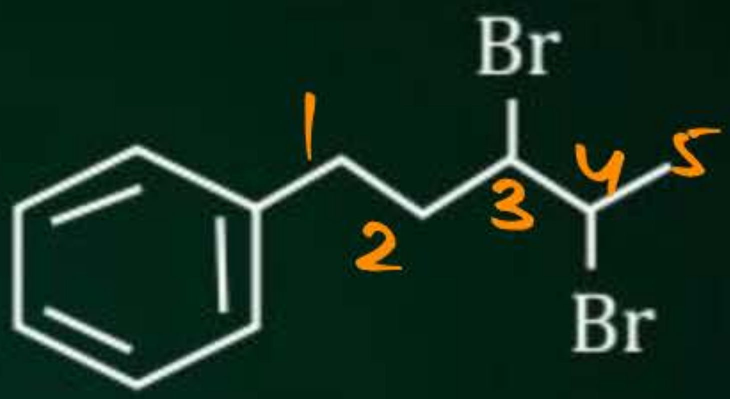
QUESTION (JEE Mains 31 January 2024, Evening Shift)

Identify structure of 2, 3-dibromo-1-phenylpentane is:

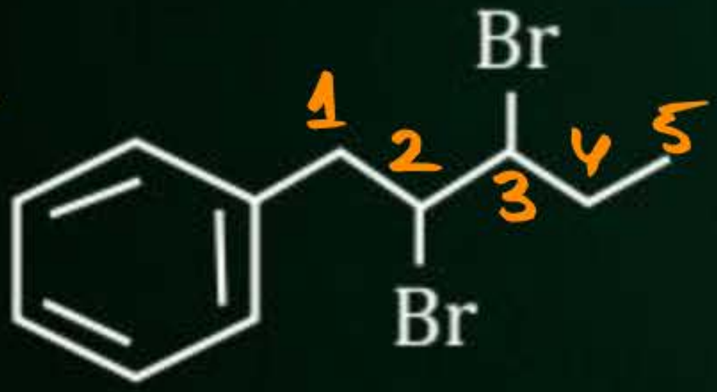
✗ (A)



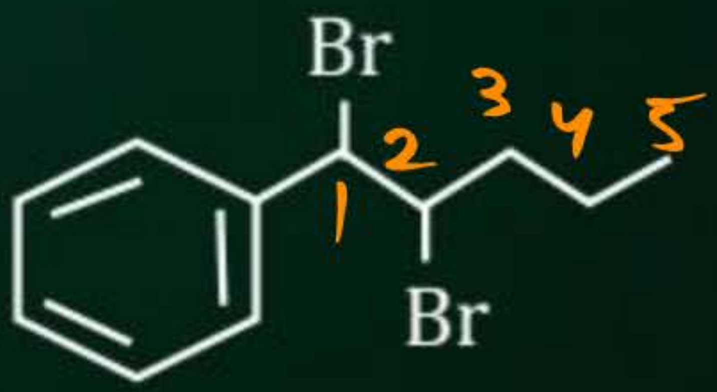
(B)



✓ (C)



(D)



QUESTION (JEE Mains 31 January 2024, Morning Shift)

Given below are two statements:

Statement I: IUPAC name of $HO-\overset{7}{C}H_2-(\overset{6\ 5\ 4}{\overset{C-C-C}{CH_2}})_3-\overset{3}{C}H_2-\overset{2}{C}O\overset{1}{C}H_3$ is 7-hydroxyheptan-2-one.

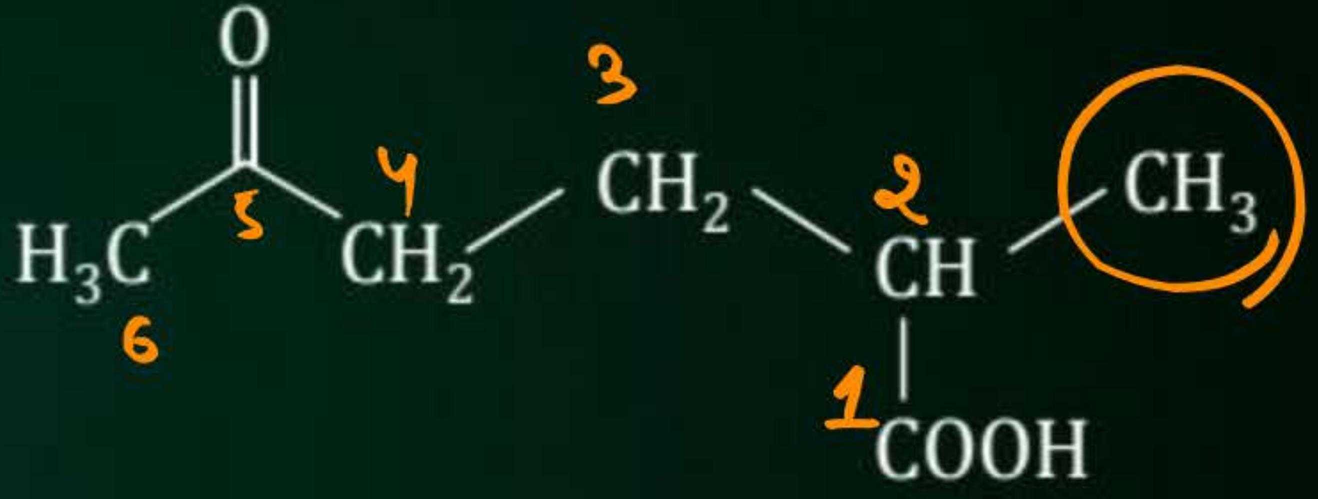
Statement II: 2-oxoheptan-7-ol is the correct IUPAC name for above compound.

In the light of the above statements. choose the most appropriate answer from the options given below:

- (A) Statement I is correct but Statement II is incorrect. ✓
- (B) Both Statement I and Statement II are incorrect.
- (C) Both Statement I and Statement II are correct.
- (D) Statement I is incorrect but Statement II is correct.

QUESTION [8 April, 2023 (Shift-II)]

The correct IUPAC nomenclature for the following compound is:



O
H_3C
CH_2
CH_2
CH
CH_3
COOH
6
5
4
3
2
1

- A 5-Formyl-2-methylhexanoic acid
- [✓ B] 2-Methyl-5-oxohexanoic acid
- C 2-Formyl-5-methylhexan-6-oic acid
- D 5-Methyl-2-oxohexan-6-oic acid

QUESTION (JEE Mains 26 July 2022, Evening Shift)

The correct decreasing order of priority of functional groups in naming an organic compound as per IUPAC system of nomenclature is:

A ✗ $-COOH > -CONH_2 > -COCl > -CHO$

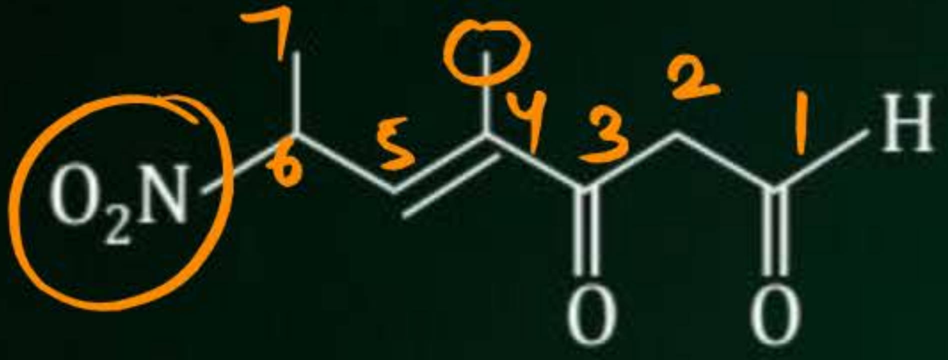
[✓ B] $-SO_3H > -COCl > -CONH_2 > -CN$

C $-COOR > -COCl > -NH_2 > CO$

D $-COOH > -COOR > -CONH_2 > -COCl$

QUESTION (28th June 2nd Shift 2022)

The correct IUPAC name of the following compound is:



A 4-methyl-2-nitro-5-oxohept-3-enal

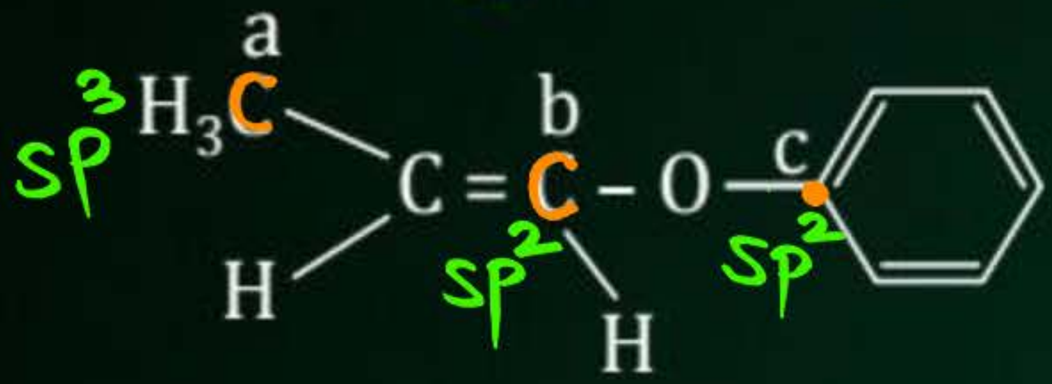
B 4-methyl-5-oxo-2-nitrohept-3-enal

[✓ **C**] 4-methyl-6-nitro-3-oxohept-4-enal

D 6-formyl-4-methyl-2-nitrohex-3-enal

QUESTION (Main 18th March 2nd Shift 2021)

In the following molecule,


a
b
c
H_3C
$C = C - O$
H
H
sp3
sp2
sp2

(A) sp^3, sp^2, sp

(B) sp^3, sp, sp^2

(C) sp^3, sp, sp

[✓ (D)] sp^3, sp^2, sp^2

QUESTION (Main 26th Feb 2nd Shift 2021)

In $\overset{sp^2}{{}^1CH_2} = \overset{sp}{{}^2C} = \overset{sp^2}{{}^3CH} - \overset{sp^3}{{}^4CH_3}$ molecule, the hybridization of carbon 1, 2, 3 and 4 respectively, are:

A sp^3, sp, sp^3, sp^3

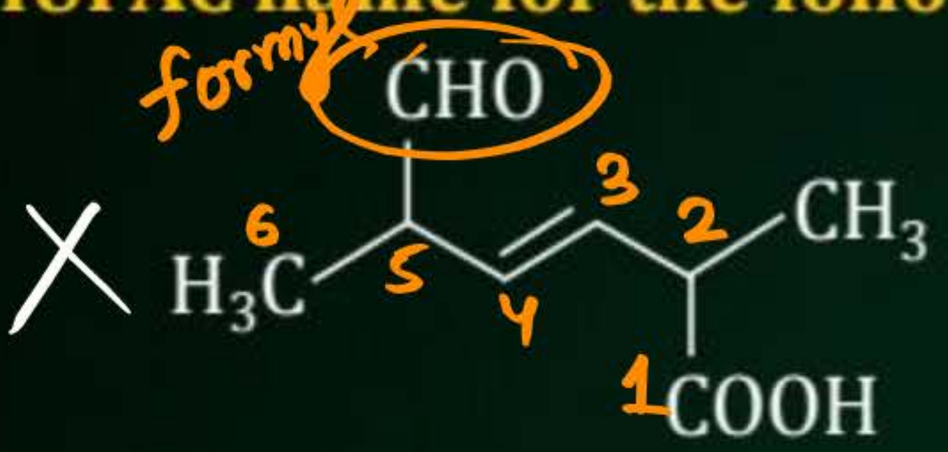
B sp^2, sp^3, sp^2, sp^3

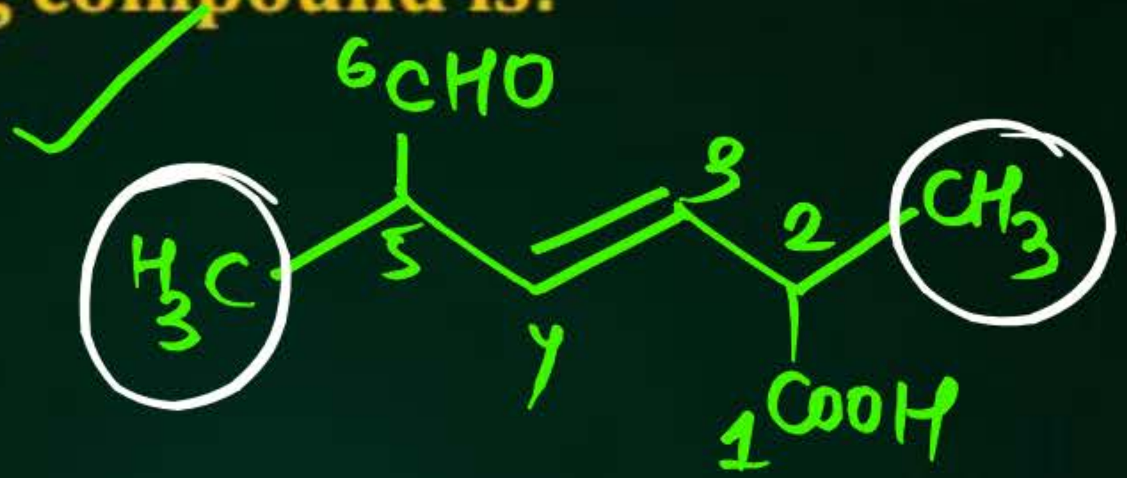
C sp^2, sp^2, sp^2, sp^3

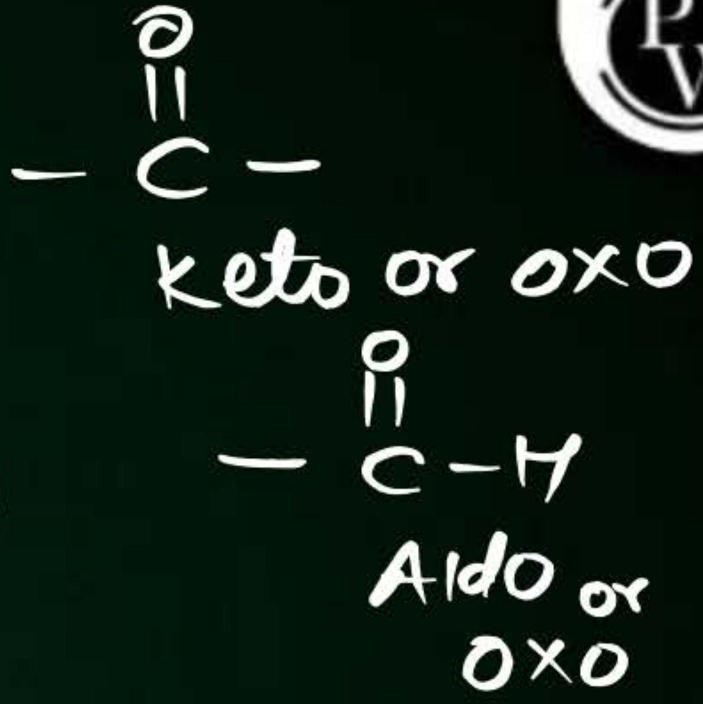
[✓ D] sp^2, sp, sp^2, sp^3

QUESTION (Main 2nd Sept 1st Shift 2020)

The IUPAC name for the following compound is:


formyl
CHO
6
H3C
5
4
3
2
CH3
1
COOH


6 CHO
H3C
5
4
3
2
CH3
1 COOH


Keto or oxo
Aldo or oxo

A 2, 5-dimethyl-5-carboxy-hex-3-enal

B 2, 5-dimethyl-6-carboxy-hex-3-enal

[✓ C] 2, 5-dimethyl-6-oxo-hex-3-enoic acid

D 6-formyl-2-methyl-hex-3-enoic acid.

QUESTION (Main 4th Sept 1st Shift 2020)

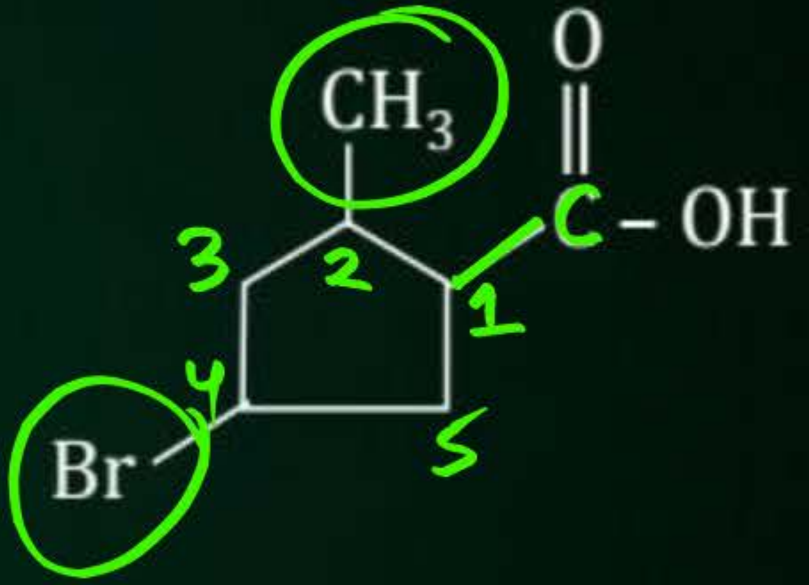
The IUPAC name of the following compound is:

A 3-bromo-5-methylcyclopentanoic acid

[✓ **B**] 4-bromo-2-methylcyclopentane carboxylic acid

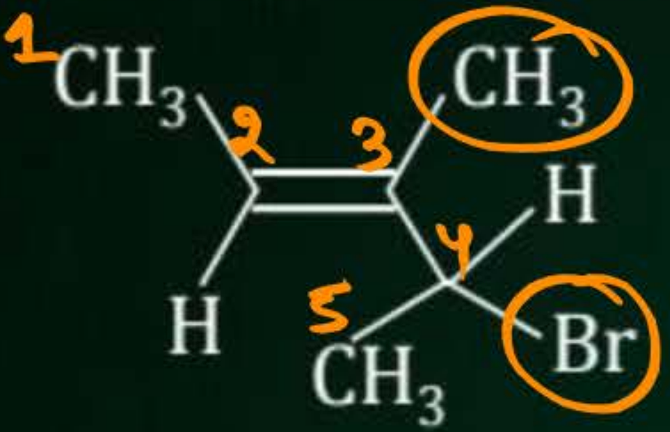
C 3-bromo-5-methylcyclopentane carboxylic acid

D 5-bromo-3-methylcyclopentanoic acid



QUESTION (JEE Main (Jan)-2019)

What is the IUPAC name of the following compound?



1
CH3
2
3
CH3
H
4
H
5
CH3
Br

(A) 3-Bromo-1, 2-dimethylbut-1-ene

[✓ (B)] 4-Bromo-3-methylpent-2-ene

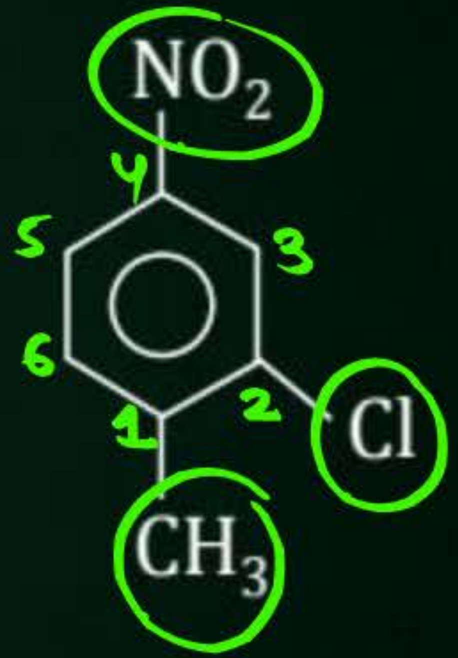
(C) 2-Bromo-3-methylpent-3-ene

(D) 3-Bromo-3-methyl-1, 2-dimethylprop-1-ene

QUESTION (JEE Main (April)-2019)

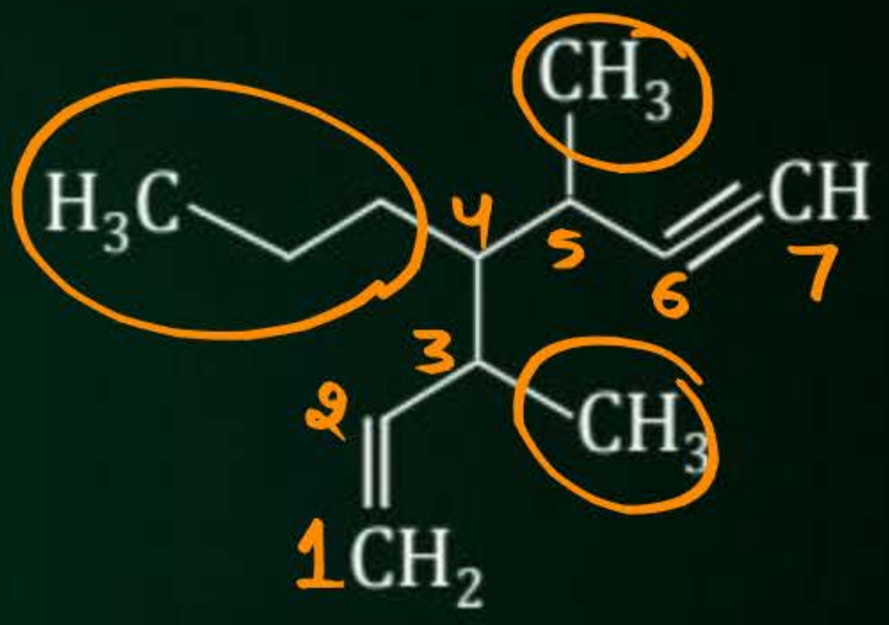
The correct IUPAC name of the following compound is:

- A 5-chloro-4-methyl-1-nitrobenzene
- B 2-methyl-5-nitro-1-chlorobenzene
- C 3-chloro-4-methyl-1-nitrobenzene
- [✓ D] 2-chloro-1-methyl-4-nitrobenzene



QUESTION (JEE Main (April)-2019)

The IUPAC name of the following compound is:


CH$_3$
H$_3$C
CH
4
5
6
7
3
2
CH$_3$
1
CH$_2$

A 3, 5-dimethyl-4-propylhept-6-en-1-yne

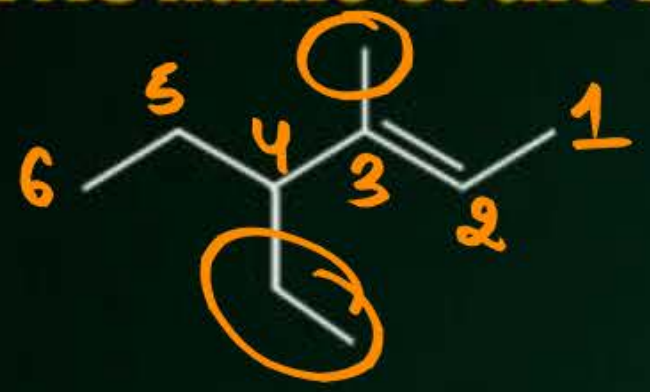
B 3-methyl-4-(3-methylprop-1-enyl)-1-heptyne

C 3-methyl-4-(1-methylprop-2-ynyl)-1-heptane

[✓ D] 3, 5-dimethyl-4-propylhept-1-en-6-yne

QUESTION (JEE Main 2018)

The IUPAC name of the following compound is:



- A 4-methyl-3-ethylhex-4-ene
- B 4, 4-diethyl-3-methylbut-2-ene
- C 3-ethyl-4-methylhex-4-ene
- [✓ D] 4-ethyl-3-methylhex-2-ene

QUESTION (AIEEE-2009)

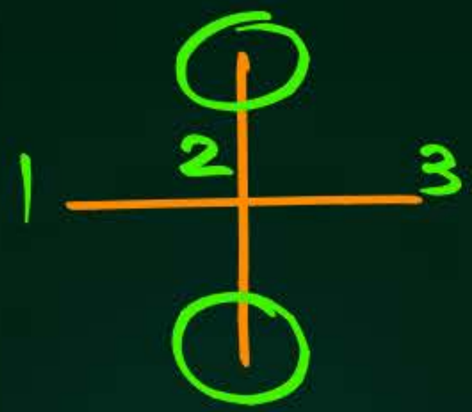
The IUPAC name of neopentane is:

[✓ Ⓐ 2, 2-dimethylpropane]

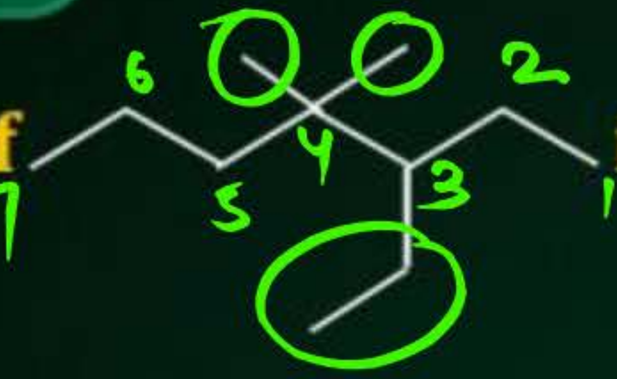
Ⓑ 2-methylpropane

Ⓒ 2, 2-dimethylbutane

Ⓓ 2-methylbutane

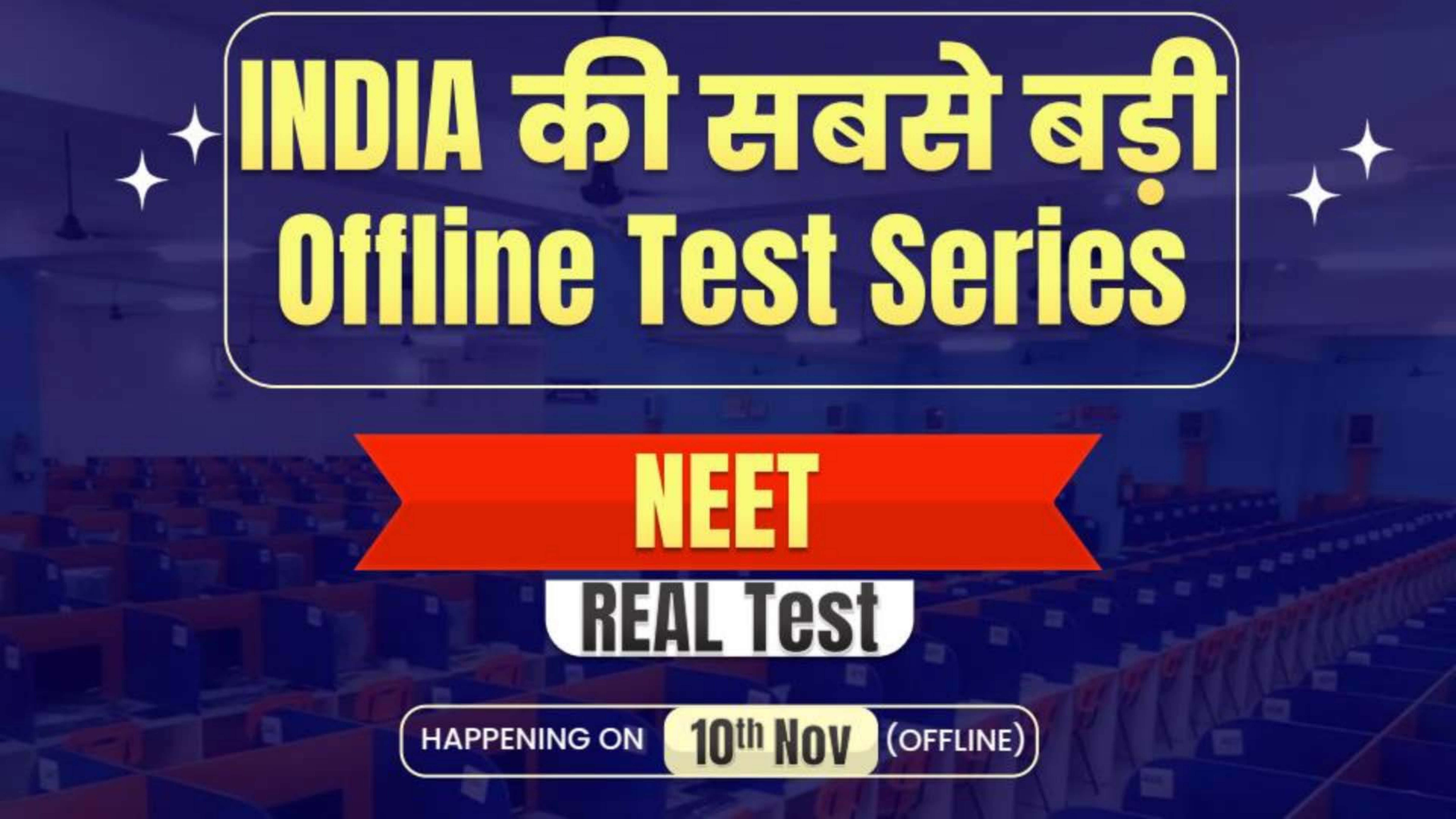


QUESTION (AIEEE-2007)

The IUPAC name of  **is:**

- A 5, 5-Diethyl-4, 4-dimethylpentane
- [✓ B] 3-Ethyl-4, 4-dimethylheptane
- C 1, 1-Diethyl-2, 2-dimethylpentane
- D 4, 4-Dimethyl-5, 5-diethylpentane

Dropper NEET



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NEET

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Exam	Class	Test	Student Name	Marks	Total Marks	Rank	Location
NEET	Dropper	Test 01	Akarsh Mishra	700	720	1	BARABANKI
NEET	Dropper	Test 01	Vedika Naithani	700	720	2	KARNAL
NEET	Dropper	Test 01	Utkarsh Mishra	700	720	3	AURAIYA
NEET	Dropper	Test 01	Anand Chauhan	695	720	4	SIDDHARTHNAGAR
NEET	Dropper	Test 01	Muskan Kumari	691	720	5	KATIHAR
NEET	Dropper	Test 01	Ankit Yadav	690	720	6	WEST DELHI
NEET	Dropper	Test 01	Akshat Upadhyay	690	720	7	BANDA
NEET	Dropper	Test 01	Aditya Raj	690	720	8	NALANDA
NEET	Dropper	Test 01	Garima	687	720	9	HANUMANGARH
NEET	Dropper	Test 01	Monami Bera	687	720	10	EAST MIDNAPORE

DROPPER NEET REAL TEST 02 SYLLABUS

Overview

Exam Date	Mode	Pattern	Test No.	Physics	Chemistry	Botany	Zoology
Sunday, November 10, 2024	Offline	NEET	Test 2	Circular Motion Work, energy and power Centre of mass and System of Particles Rotational Motion Gravitation Mechanical Properties of Solids	Chemical Kinetics Structure of Atom Classification of Elements and Periodicity in Properties Chemical Bonding and Molecular Structure	Anatomy of Flowering Plants Respiration in Plants	Locomotion & Movement Neural Control & Coordination

HURRY UP

Register Now @ https://realtest.pw.live/

Thank you!

YAKEEN 2.0

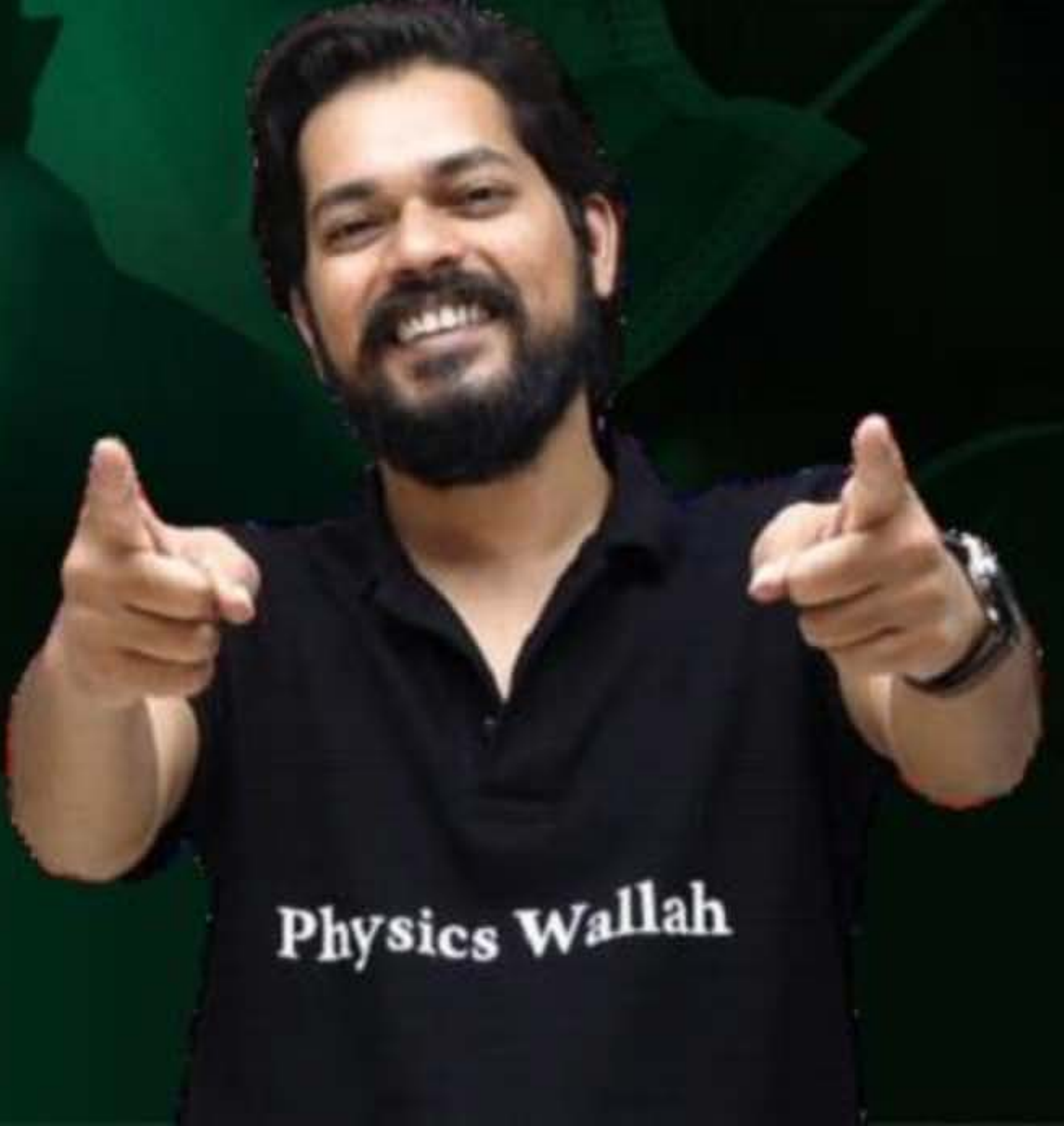
FOR NEET 2025

Lecture- 01 **Organic Chemistry**

Some Basic Principles and Techniques (GOC)

General organic chemistry

By- Pankaj Sir(POPU MAMA)



Topics *to be covered*

1. Basics/Introduction ✓
2. Inductive Effect ✓
3. Practice

Why organic chemistry is difficult???

1. Lack of practice ✓
2. Short notes avoid ✓
3. Misconceptions ✓

stability   L to R EN

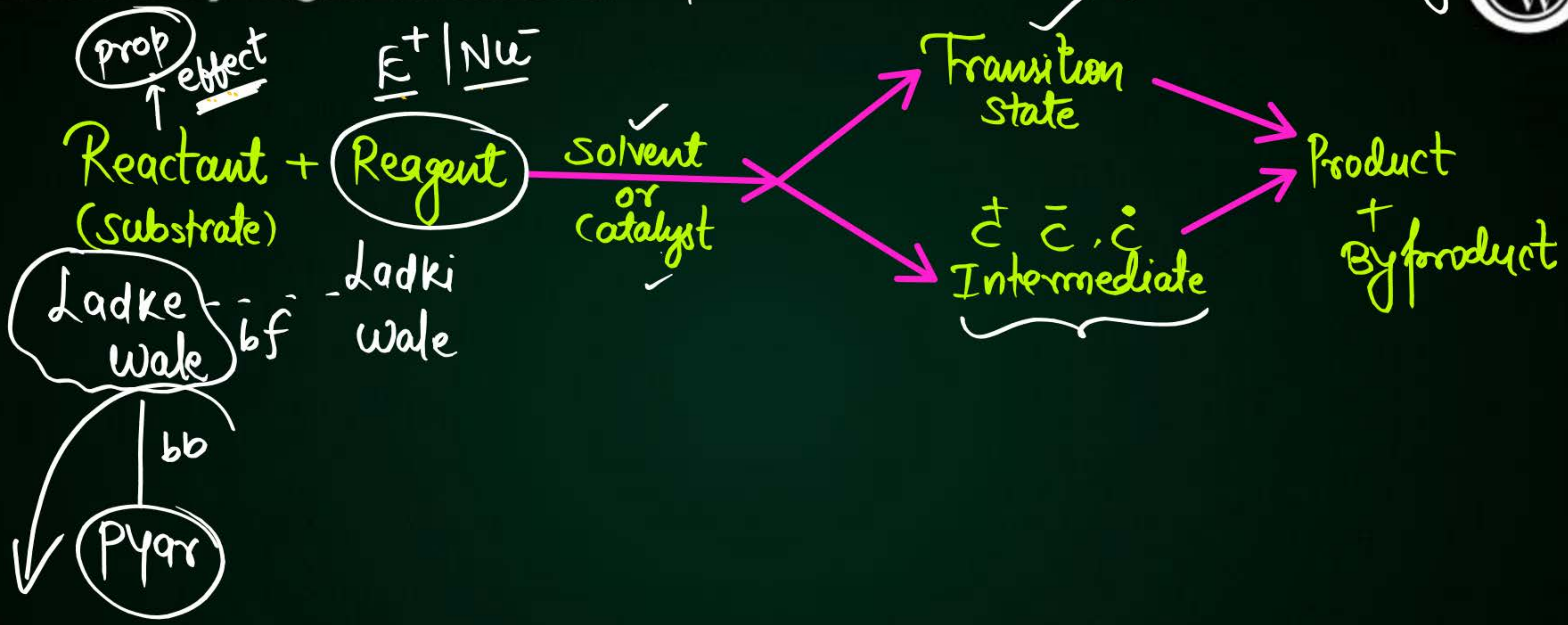
$C^- < N^- < O^- < F^-$

T to B Size

stability $F^- < Cl^- < Br^- < I^-$

Basic of any Organic reaction

P.O.C = Personal organic chemistry



prop

↑ effect

E^+ | Nu^-

Reactant (substrate) + Reagent

Solvent or Catalyst

Transition state

$\overset{+}{C}$ $\overset{-}{C}$, $\overset{\bullet}{C}$

Intermediate

Product + Byproduct

Ladke wale - - bf - - Ladki wale

bb

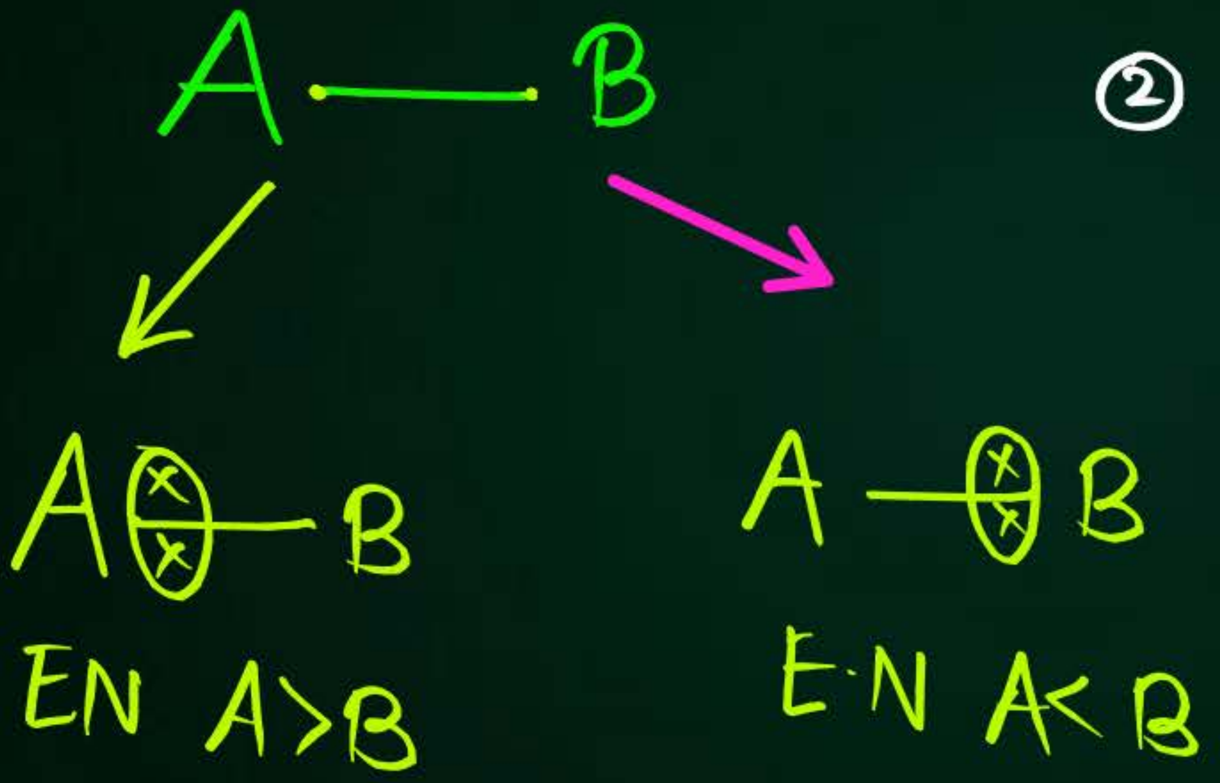
Pyar

Electronegativity

Electronegativity: The tendency to attract electron pair towards itself in a covalently bonded bond.

① L to R :- E.N increases
C < N < O < F

② T to B :- E.N decreases
F > Cl > Br > I



$\boxed{\text{Modified EN of }\overset{\checkmark}{\text{Key}}\text{ Element}}$

Priority sabse Jyada hoti hai.

1. Charge

E.N $\overset{\oplus}{A} > A > \overset{\ominus}{A}$

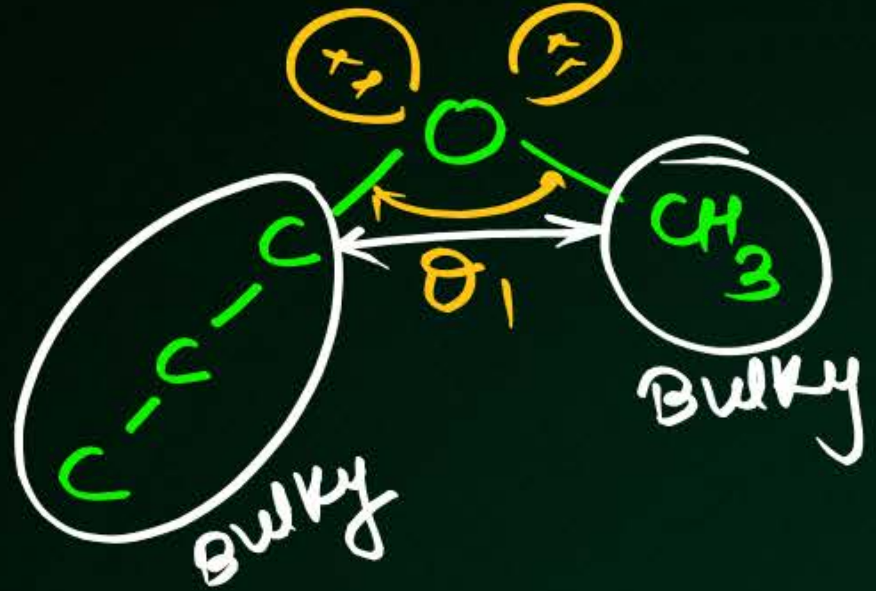
2. Hybridization %S ↑ E.N ↑

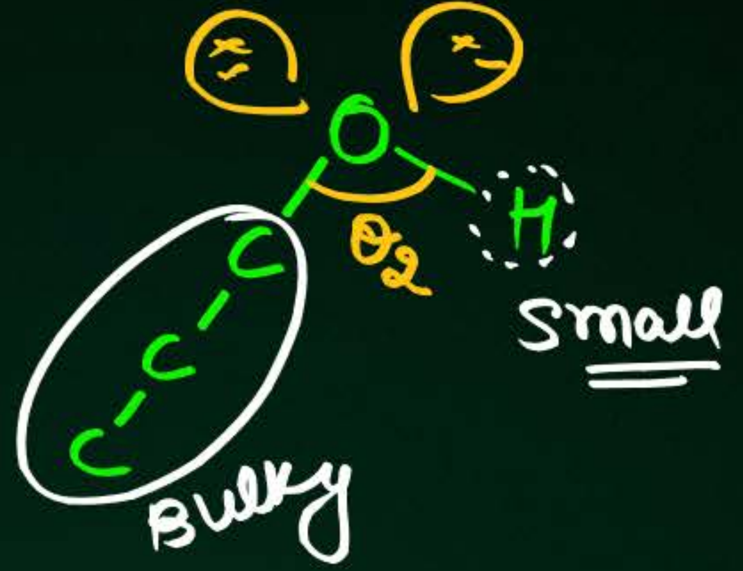
$$-\overset{\downarrow}{C}\equiv CH > -\overset{\downarrow}{CH}=CH_2 > -\overset{\downarrow}{CH_2}-CH_3$$

$$\text{sp} \qquad \text{sp}^2 \qquad \text{sp}^3$$

3. Effect of bond angle÷ $-\overset{\downarrow}{O}CH_3 > -\overset{\downarrow}{O}H$

B.A ↑ %S ↑ E.N ↑


O
CH3
C
C
C
θ1
Bulky
Bulky


O
H
C
C
C
θ2
Small
Bulky

$\theta_1 > \theta_2$

%S↑ EN↑

Electronic displacement Effect

Hamesha lagte hai

Permanent Effect

1. Inductive Effect ✓
2. Mesomeric Effect ✓
3. Hyperconjugation ✓

Temporary Effect

Jab reagent aa jaye

1. Electronic Effect

Covalent bond

(formed by sharing of $e^{\ominus}s$)

CH_3-CH_3
↓
non polar

$\overrightarrow{CH_3-Cl}$
↓
Polar

Polar D.M $\mu \neq 0$

non polar D.M $\mu = 0$

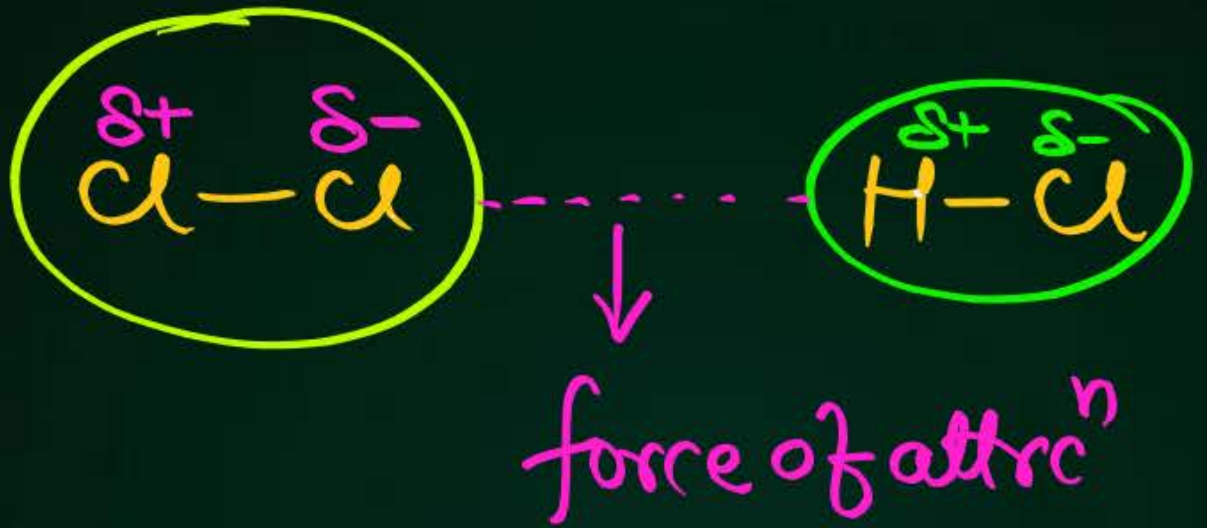
D.M

Less E.N $\longrightarrow$ More E.N

DP-IDP force

sangati ka asar

operates b/w one polar & one nonpolar molecule



$\overset{\delta+}{Cl}-\overset{\delta-}{Cl}$ - - - - - - $\overset{\delta+}{H}-\overset{\delta-}{Cl}$

↓

force of attrc^{n}

δ ÷ partial

$H^{\oplus}$ $Cl^{\ominus}$

$\left.\begin{matrix}\oplus\\ \ominus\end{matrix}\right\}$ actual charge

Inductive effect

$\overset{\delta+}{C}-\overset{\delta-}{C}$ .... $\overset{\delta+}{C}-\overset{\delta-}{Cl}$ ✓

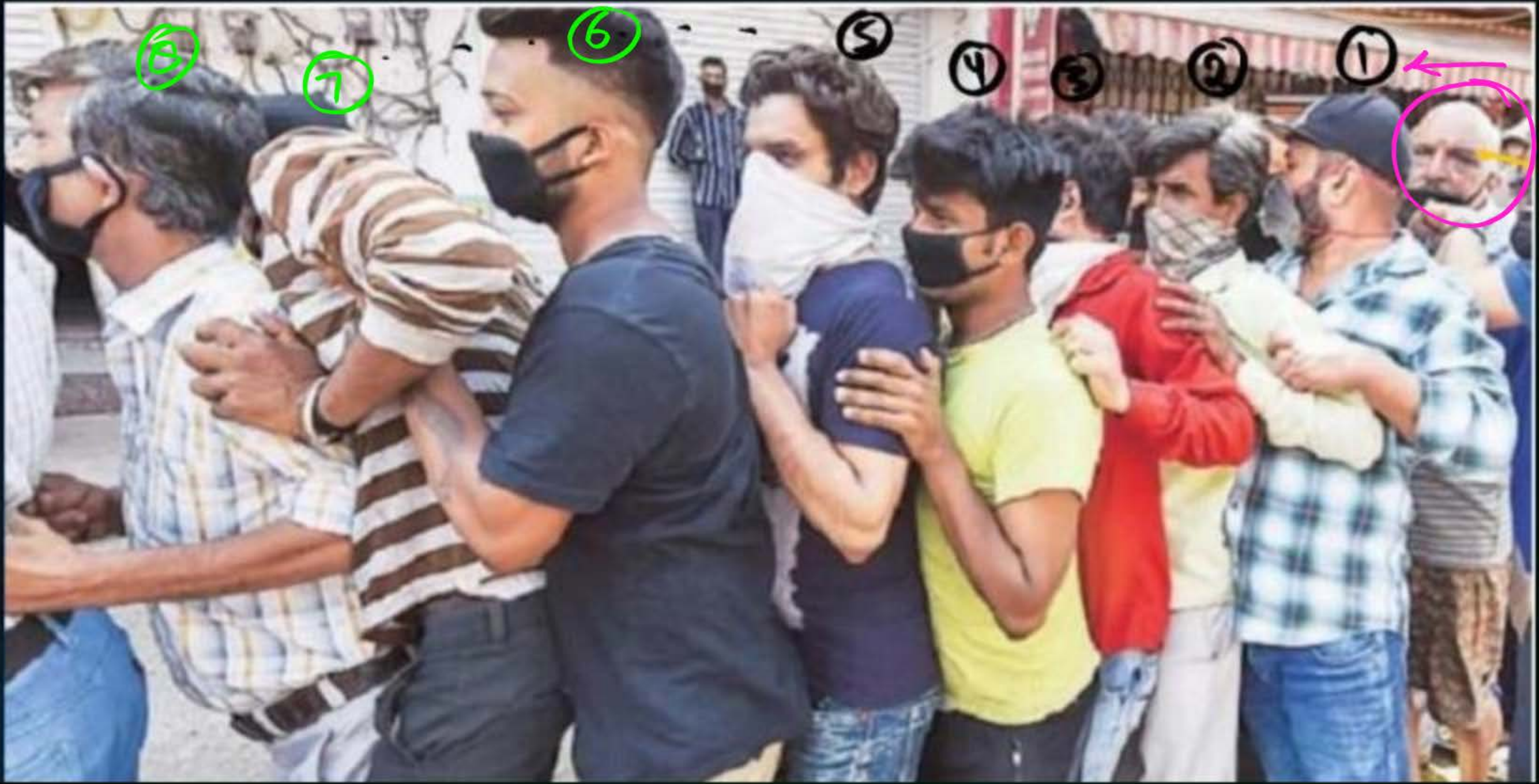
$\overset{\delta_3+}{C} \rightarrow \overset{\delta_2+}{C} \longrightarrow \overset{\delta_1+}{C} \rightarrow \overset{\delta-}{Cl}$ ✓

$$\boxed{\delta_1+ > \delta_2+ > \delta_3+}$$

Inductive Effect

1. Operate to sigma bond. ✓
2. Partial charge development. ✓
3. Distance dependent effect. ✓
4. Can be neglected after 3rd carbon atom. ✓

[① > ② > ③ > ④ > ⑤]



Types

+I

$\overset{\delta_3^-}{C} - \overset{\delta_2^-}{C} - \overset{\delta_1^-}{C} \leftarrow \boxed{G}$

$\delta_1^- > \delta_2^- > \delta_3^-$

G → +I grp

→ edg (electron donating grp)

→ erg (electron releasing grp)

-I

$\overset{\delta_3^+}{C} - \overset{\delta_2^+}{C} - \overset{\delta_1^+}{C} \rightarrow \boxed{G}$

$\delta_1^+ > \delta_2^+ > \delta_3^+$

G → -I grp

→ ewg ($e^\ominus$ withdrawing grp)

→ esg ($e^\ominus$ seeking grp)

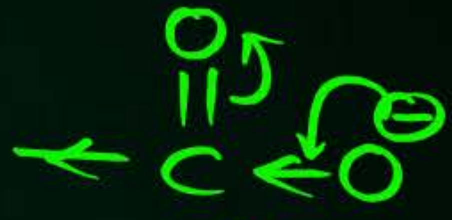
+I Group

stability $\bar{C} < \bar{N} < \bar{O}$ (E·N)

donation $\bar{C} > \bar{N} > \bar{O}$

1. **Excess –ve charge** ✓

$\leftarrow \overset{\ominus}{C}H_2 > \leftarrow \overset{\ominus}{N}H > \leftarrow O^{\ominus} > \leftarrow COO^{\ominus}$



Reso main busy

(Stable)

$CH_3-CH_2-\overset{Base}{\boxed{H}} \longrightarrow CH_3-CH_2-G$

2. **Alkyl group** no of C ↑ +I power ↑

$(3^\circ > 2^\circ > 1^\circ)$ $Me_3C- > Me_2CH- > Me\cdot CH_2- > Me-$

3. **Isotopes of H**

mass no ↑ B·L ↓ B·S ↑

Bond strength

$T > D > H$

H ↓ Zero inductive

$C \leftarrow T$

$C \longleftarrow D$

How to compare +I power?

① > ② > ③

$$-\overset{\ominus}{C}H_2 > -\overset{\ominus}{N}H > -\overset{\ominus}{O} > -CO\overset{\ominus}{O} > 3^\circ R > 2^\circ R > 1^\circ R > T > D > \underset{\substack{\downarrow \\ \text{Reference}}}{\overset{\text{zero inductive}}{\textcircled{H}}}$$

-I Group

1. Actual +ve charge ✓✓

$-\overset{\oplus}{N}F_3 > -\overset{\oplus}{N}R_3 > -\overset{\oplus}{S}R_2 > -\overset{\oplus}{N}H_3$

$\overrightarrow{C-C-C-}$ more EN key

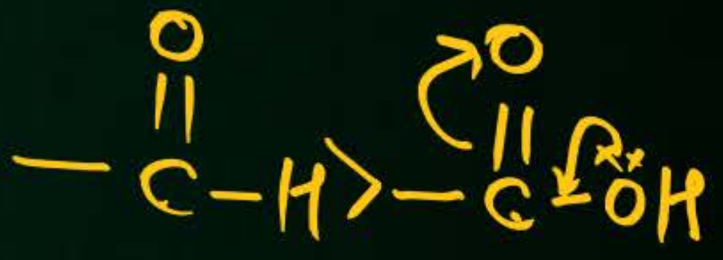
EN

$\boxed{N_{sp^2} > C_{sp^2}}$

$-\overset{\delta+}{N}O_2$ sp^2 $-\overset{\delta+}{C}HO$ sp^2

2. Partial +ve charge

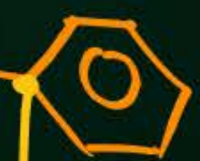
$-\overset{\delta+}{N}O_2 > -\overset{\delta+}{S}O_3H > -\overset{\delta+}{C}N > -\overset{\delta+}{C}HO > -\overset{\delta+}{C}OOH$



$-\overset{O}{\overset{\|}{C}}-H > -\overset{O}{\overset{\|}{C}}-\overset{\delta+}{O}H$

$F > Cl > Br > I$

(Bond angle)

$-OR > -\underset{sp^3}{O}H > \boxed{-\underset{sp}{C}\equiv CH} > -\underset{sp^3}{N}H_2 >$  sp^2 $> -CH=CH_2 > -H$ (sp^2)

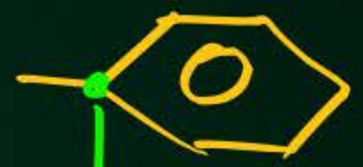
$-NO_2$ $-C\equiv N$

$N_{sp^2} > C_{sp}$

3. Neutral & More E.N ✓ ✓

Hybridisation ✓

$F > Cl > Br > I$

$\overbrace{-OR > -OH}^{\text{Bond angle}} > -C\equiv C-H \; -NH_2 >$  $> -CH=CH_2 > H$

$\downarrow$ O_{sp^3}

$\downarrow$ O_{sp^3}

$\downarrow$ C_{sp}

$\downarrow$ N_{sp^3}

$\downarrow$ C_{sp^2} (more)

$\downarrow$ C_{sp^2} (less)

How to compare -I power?

① > ② > ③

(Halogens > Hybridisation)

E.N

$$\boxed{C_{sp^3} < C_{sp^2} < N_{sp^3} < C_{sp} < N_{sp^2} < O_{sp^3} < N_{sp} < O_{sp^2}}$$

Hybridisation -one jump rule

$$C_{sp^3} < C_{sp^2} < C_{sp} < N_{sp^3} < N_{sp^2} < N_{sp} < O_{sp^3} < O_{sp^2}$$

Power of (-I) Inductive Effect

Nafarhan Naritik shahrukh nahimesh naampuri salman cyna

$$\underbrace{-\overset{+}{N}F_3 > -\overset{+}{N}R_3 > -\overset{+}{S}R_2 > -\overset{+}{N}H_3} > \underbrace{-NO_2 > -SO_3H > -CN}$$

ali ki Car main father collector beta Inspector aur alcohol ki mummy

$$> \underbrace{-CHO > -COOH} > \underbrace{-F > -Cl > -Br > -I} > \underbrace{-OR > -OH}$$

alkyne nahi hai Benz ene hai

$$> \underbrace{-C \equiv CH > -NH_2 > -\text{Benzene} > \text{Ene}} > H$$

QUESTION

Assertion: Inductive effect is a permanent effect. ✓

Reason: $-CH_3$ groups shows + I effect if attached to more E.N element. ✓

$Cl \overset{\leftarrow}{-} CH_3$

+I

(A) Both Assertion & Reason are true and the reason is the correct explanation of the assertion.

[✓ (B)] Both Assertion & Reason are true but the reason is not the correct explanation of the assertion.

(C) Assertion is a true statement but Reason is false.

(D) Both Assertion and Reason are false statements.

QUESTION

Inductive effect refers to:

[✓ A] electron displacement along a carbon chain.

B complete transfer of one of the shared pair of ✗ electrons to one of the atoms joined by a double bond.

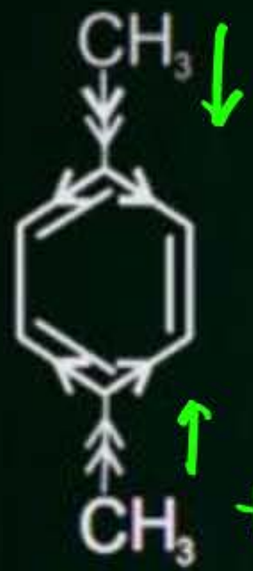
C complete transfer of electrons pi electrons. ✗

D none of the above

QUESTION

Which of the following has incorrect direction of inductive effect?

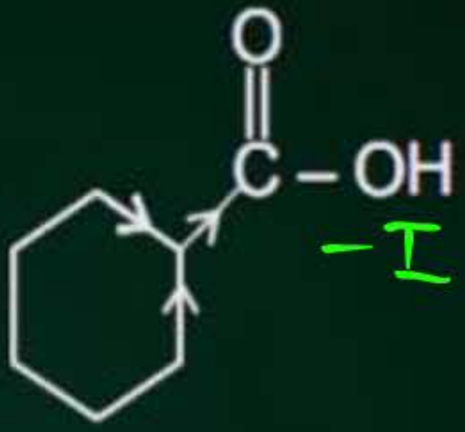
(A)



+I

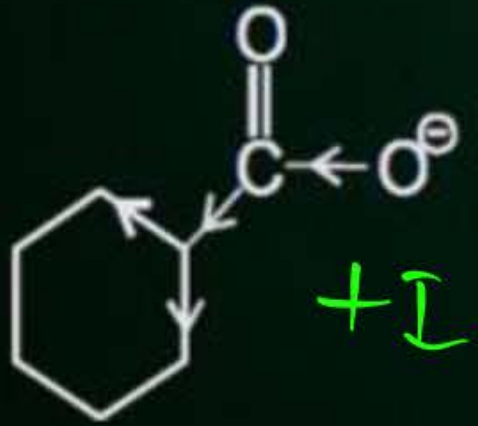
+I

(B)



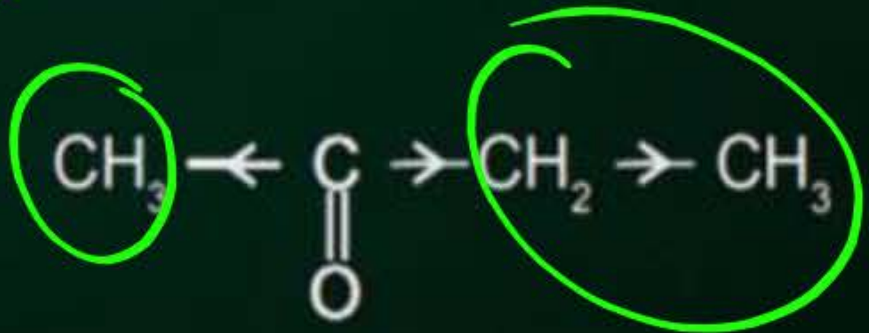
-I

(C)



+I

(D)



$CH_3 \leftarrow \underset{\underset{O}{\|}}{C} \rightarrow CH_2 \rightarrow CH_3$

QUESTION

Which of the following groups has highest inductive effect?

A CH_3-

B CH_3CH_2-

C $(CH_3)_2CH-$

[✓ D] $(CH_3)_3C-$

QUESTION

Maximum —*I* effect is exerted by the group:

A C_6H_5-

B $-OCH_3$

C $-Cl$

D [✓ $-NO_2$]

QUESTION

Arrange the following groups in the order of decreasing (–I) effect.

A. $\mathrm{CN} > \mathrm{F} > \mathrm{Br} > \mathrm{Cl} > \mathrm{COOH} > \mathrm{I} > \mathrm{H}$

B. $\mathrm{COOH} > \mathrm{CN} > \mathrm{F} > \mathrm{Br} > \mathrm{Cl} > \mathrm{I} > \mathrm{H}$

C. $\mathrm{H} > \mathrm{COOH} > \mathrm{CN} > \mathrm{I} > \mathrm{Cl} > \mathrm{F} > \mathrm{Br}$

[✓ D.] $\mathrm{CN} > \mathrm{COOH} > \mathrm{F} > \mathrm{Cl} > \mathrm{Br} > \mathrm{I} > \mathrm{H}$

QUESTION

Zero inductive effect is exerted by:

A C_6H_5-

[✓ B H]

C CH_3-

D Cl

QUESTION

Which of the following groups show +I effect with benzene ?

(a) $-OH$ $-I$

(b) $-O^{\ominus}$ $+I$

(c) $-NH_2$ $-I$

(d) $-\overset{\ominus}{N}H$ $+I$

(e) $-COOH$ $-I$

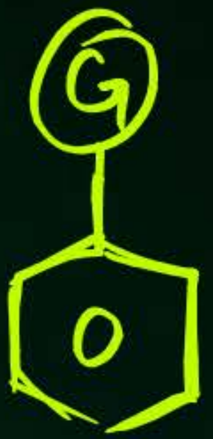
(f) $-COO^{\ominus}$ $+I$

(f) $-Me$ $+I$

(g) $-OMe$ $-I$

(i) $-F$ $-I$

(j) $-\overset{\oplus}{N}F_3$ $-I$



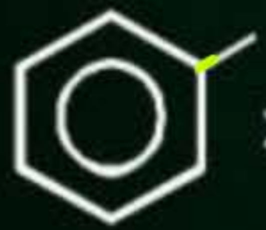
QUESTION

Which of the following is false order of –I effect ?

A $-F > -Cl > -Br > -I$

B $-\overset{\oplus}{N}R_3 > -\overset{\oplus}{N}H_3 > -NO_2$

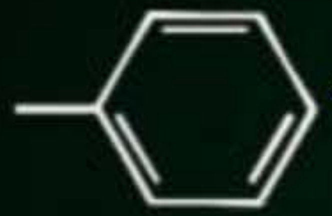
C $-F > -OH > -NH_2$

[✓ D]  $> -C \equiv CH > -H$

QUESTION

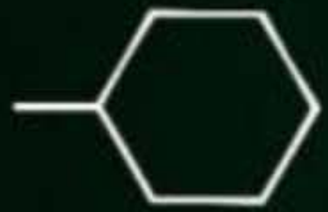
Which of the following groups have +I effect?

(A)



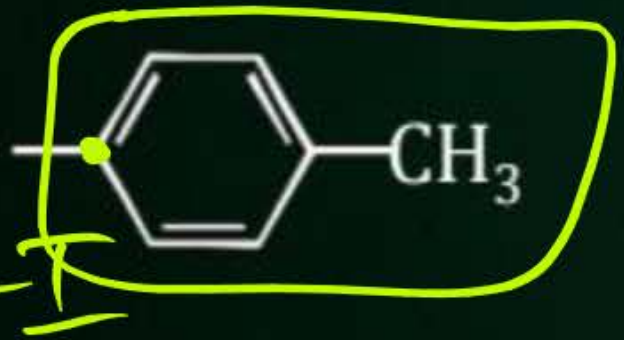
-I

(B)



+I

(C) C-C-C



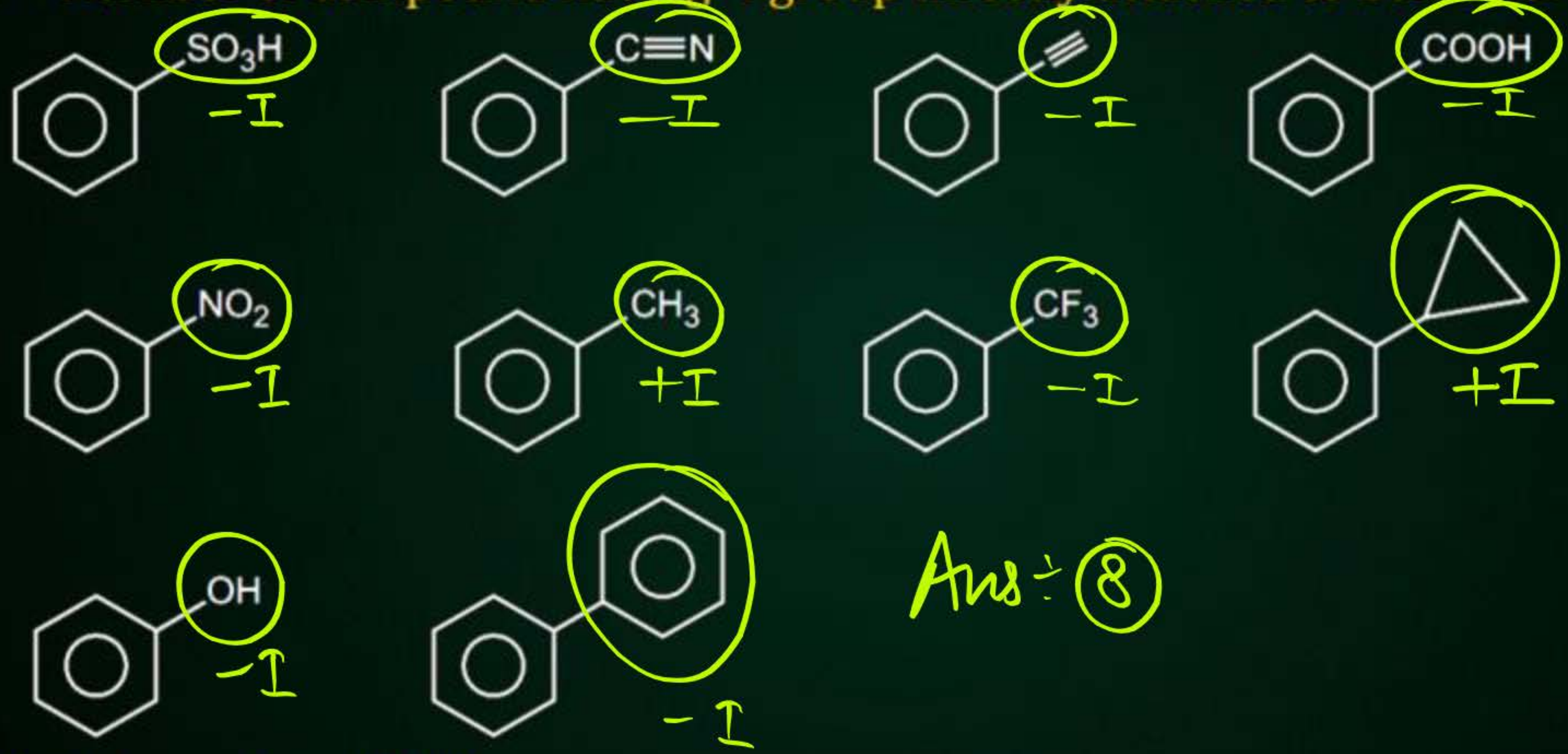
-I

(D) $-CH = CH_2$

-I

QUESTION

'X' = Number of compound having -I group directly attached to benzene.


SO_3H
-I
$C\equiv N$
-I
-I
COOH
-I
NO_2
-I
CH_3
+I
CF_3
-I
+I
OH
-I
-I

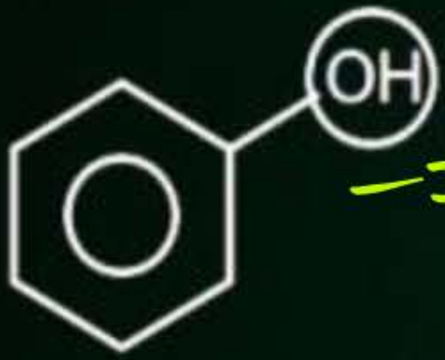
Ans :- ⑧

Find the value of 'X' ?

QUESTION

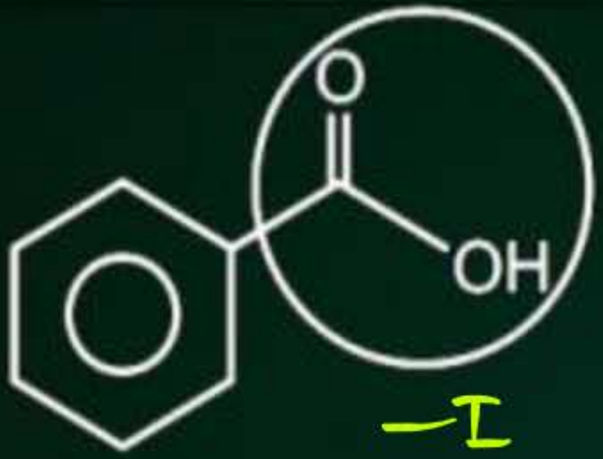
Identify +I or -I effect which is present by circled group?

(a)



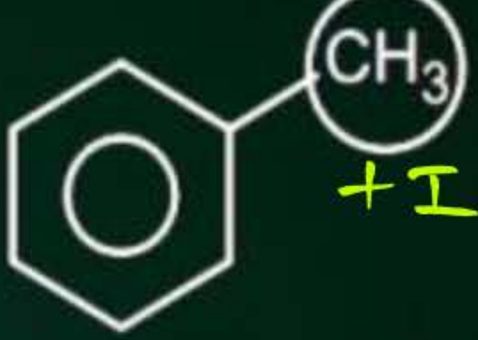
−I

(b)



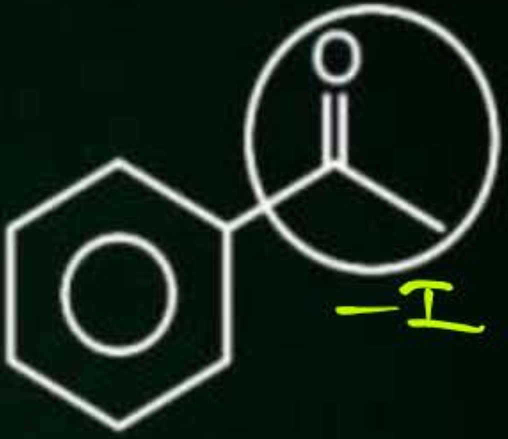
−I

(c)



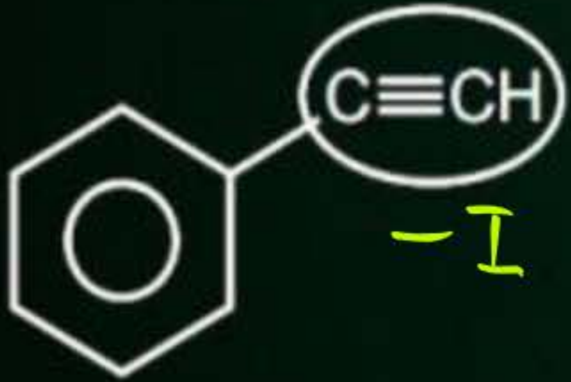
+I

(d)



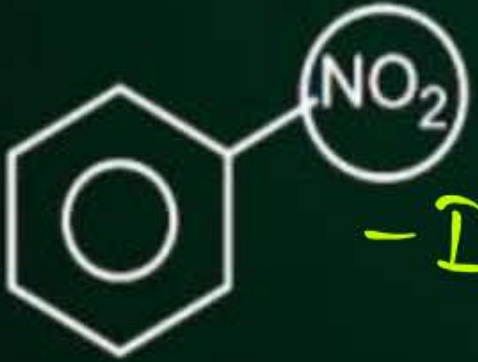
−I

(e)



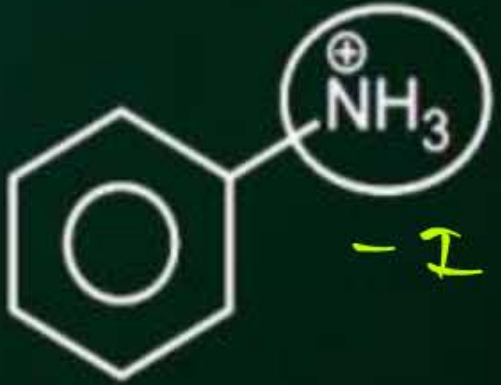
−I

(f)



−I

(g)



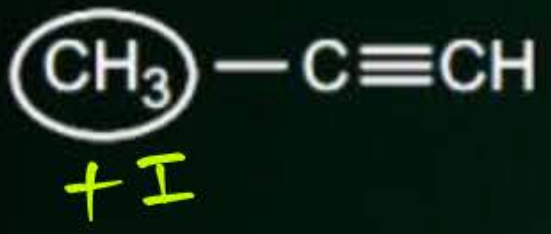
−I

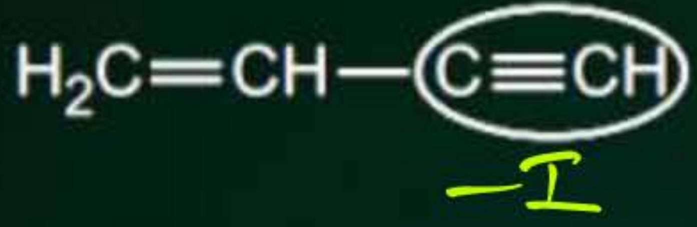
(h) $CH_3-CH=CH_2$

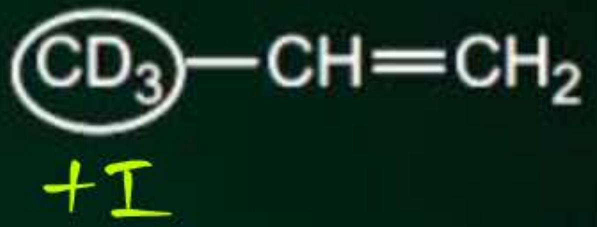
+I

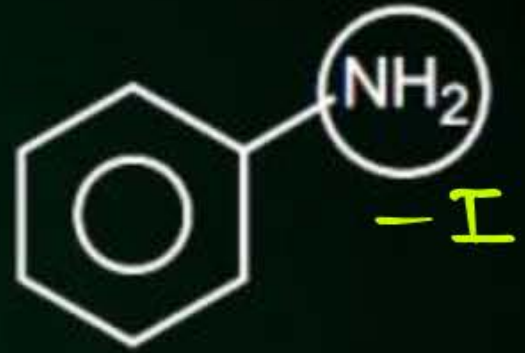
QUESTION

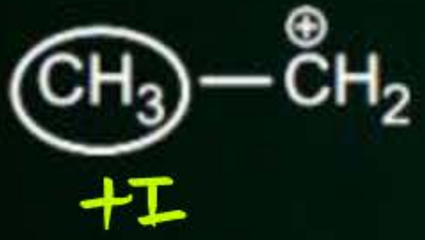
Identify +I or -I effect which is present by circled group?

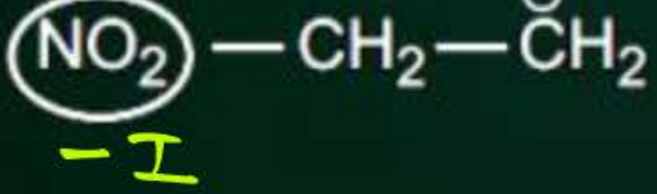
(i)


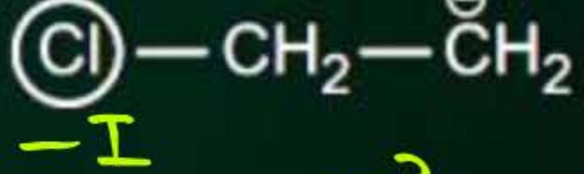
(j)


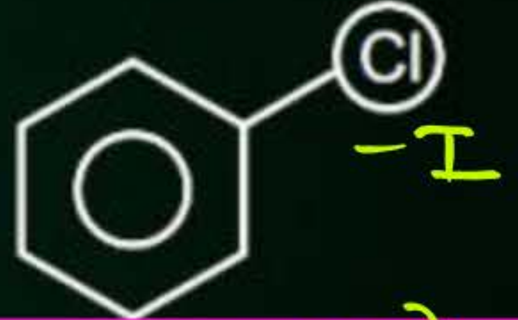
(k)


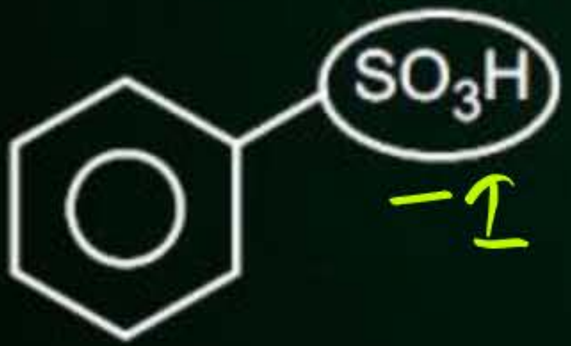
(l)


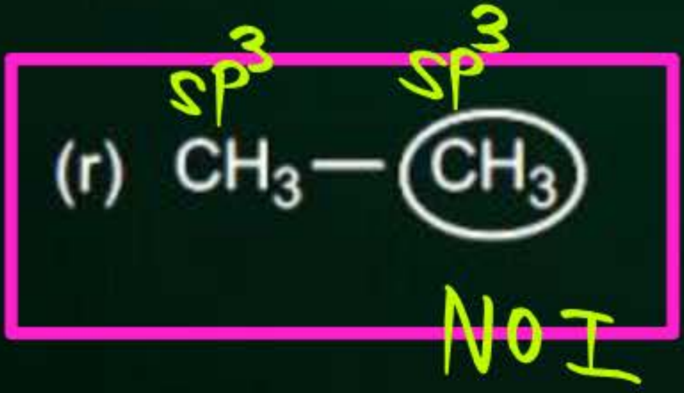
(m)


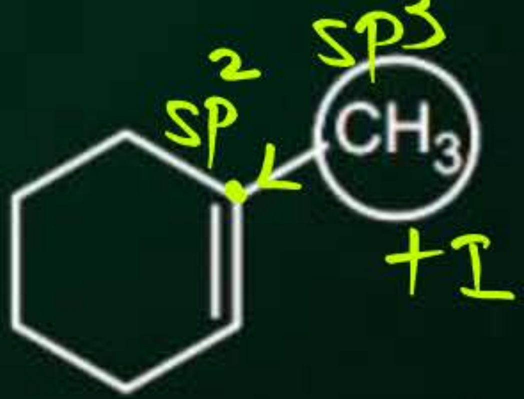
(n)

NO2
CH2
⊖
CH2
−I

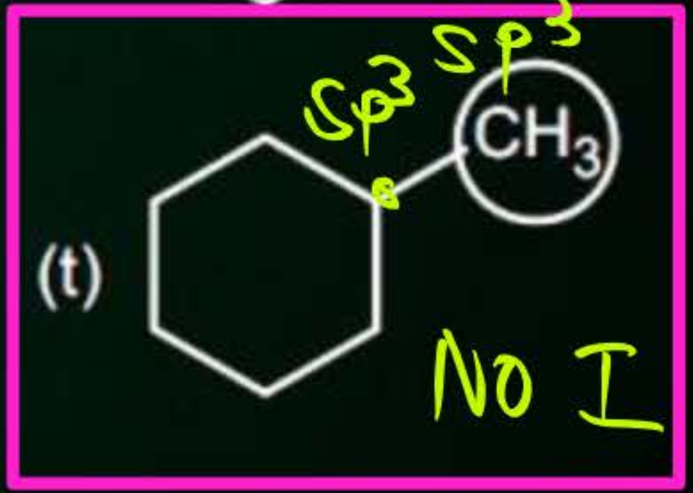
(o)


(p)


(q)


(r)

sp3
sp3
CH3
CH3
No I

(s)

sp2
sp3
CH3
+I

(t)

sp3
sp3
CH3
No I

QUESTION

+ I effect is shown by:

A $-NO_2$

B $-Cl$

C $-Br$

[✓ D $-CH_3$]

QUESTION

Which of the following is the strongest $-I$ group ?

[✓ A] $-N^+(\underset{R}{CH_3})_3$

B $-{}^+NH_3$

C $-{}^+S(CH_3)_2$

D $-F$

QUESTION

The correct –I effect order is:

[✓ A] $-F > -Cl > -Br > -I$

B $-F > -Cl > -CN > -NO_2$

C $-F > -NO_2 > -OH > -COOH$

D $-CN > -F > -NO_2 > -I$

QUESTION

Incorrect order in given inductive effect.

(A) $-\overset{+}{N}H_3 > -NO_2$ [–I]

[✓ (B)] $-NH_2 > -C \equiv CH$ [–I]

(C) $-F > -Cl$ [–I]

(D) $-CD_3 > -CH_3$ [+I]

QUESTION

$-NH_2$ $-NR_2$

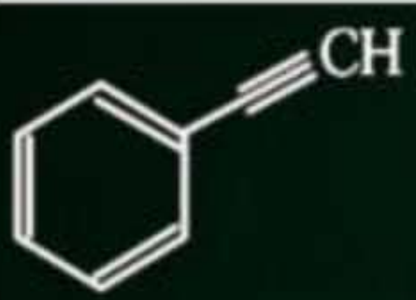
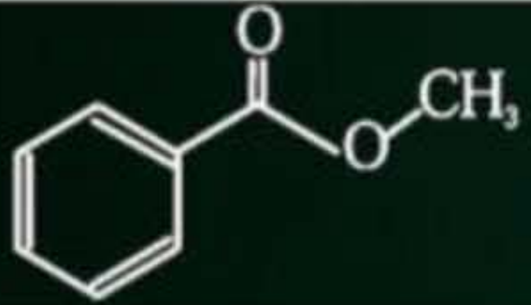
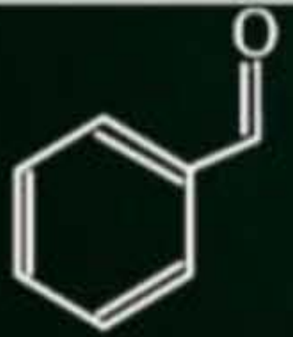
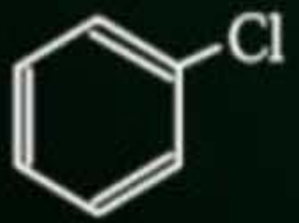
How any groups can show –I effect ?

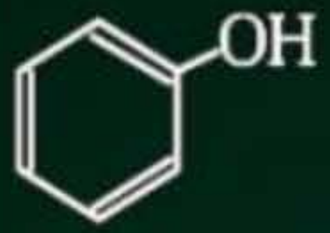
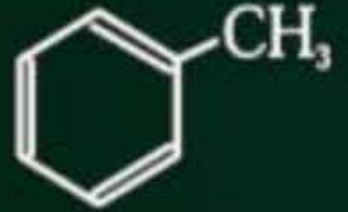
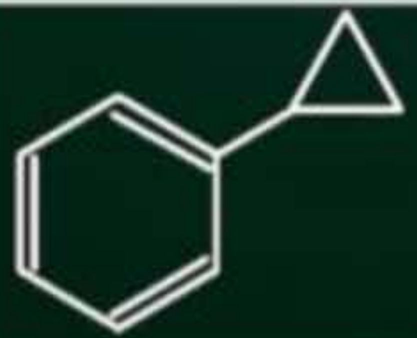
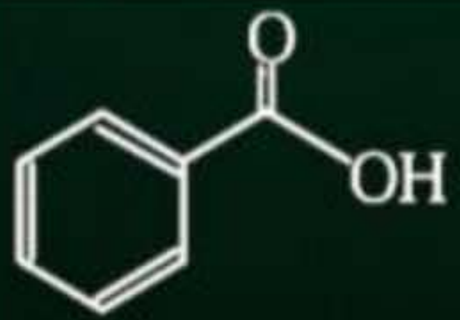
$-CCl_3$,	$-NO_2$,	$-OH$,	$-N(CH_3)_2$,	$-SO_3H$,	$-O^{\ominus}$,	$-CHO$,	$-Cl$,	$-COO^{\ominus}$
$-I$	$-I$	$-I$	$-I$	$-I$	$+I$	$-I$	$-I$	$+I$

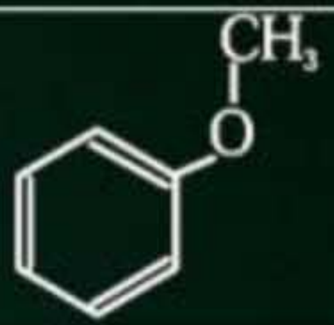
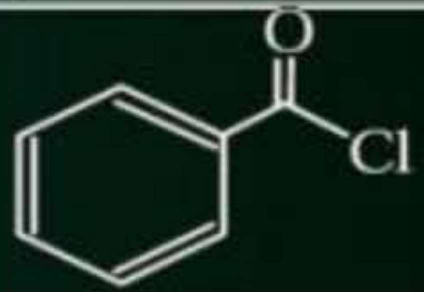
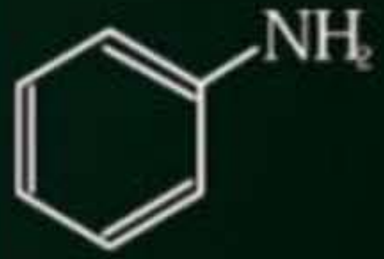
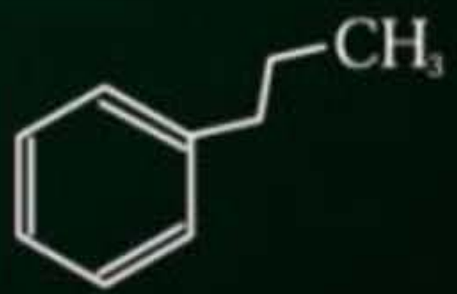
Home work

QUESTION

Identify inductive effect (–I or +I or not I) attached on ring.

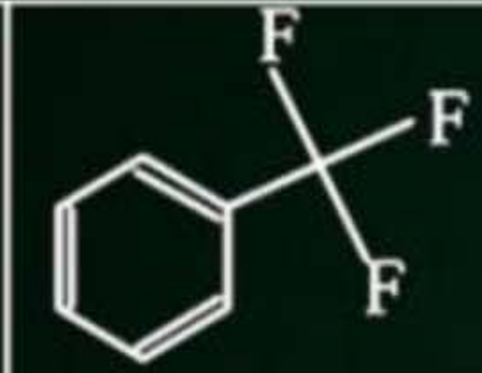
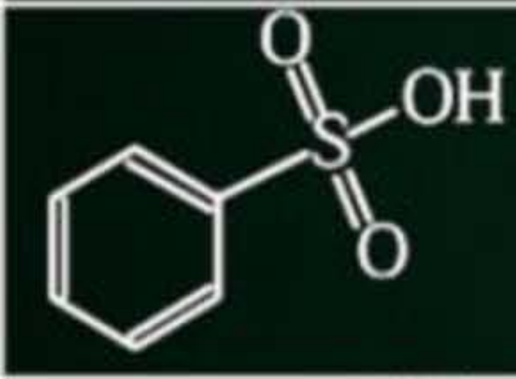
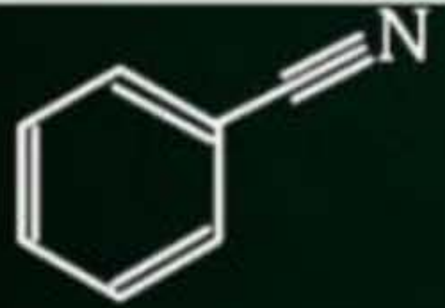
1.	
2.	
3.	
4.	

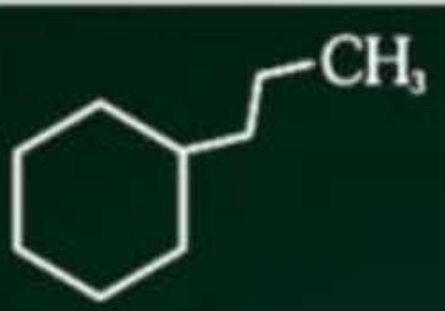
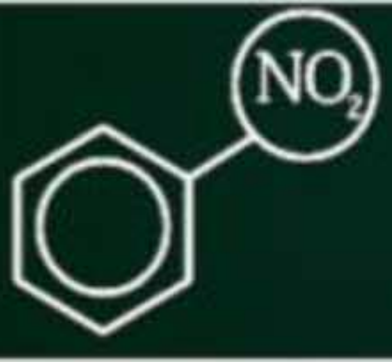
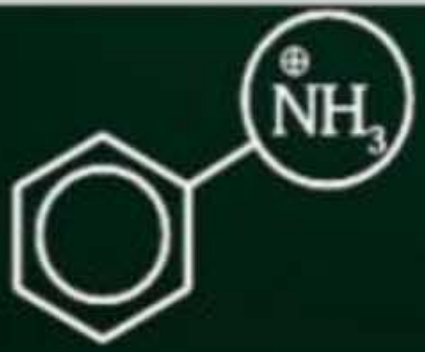
5.	
6.	
7.	
8.	

9.	
10.	
11.	
12.	

QUESTION

Identify inductive effect (–I or +I or not I) attached on ring

13.	
14.	
15.	

16.	
17.	
18.	

Thank you!!

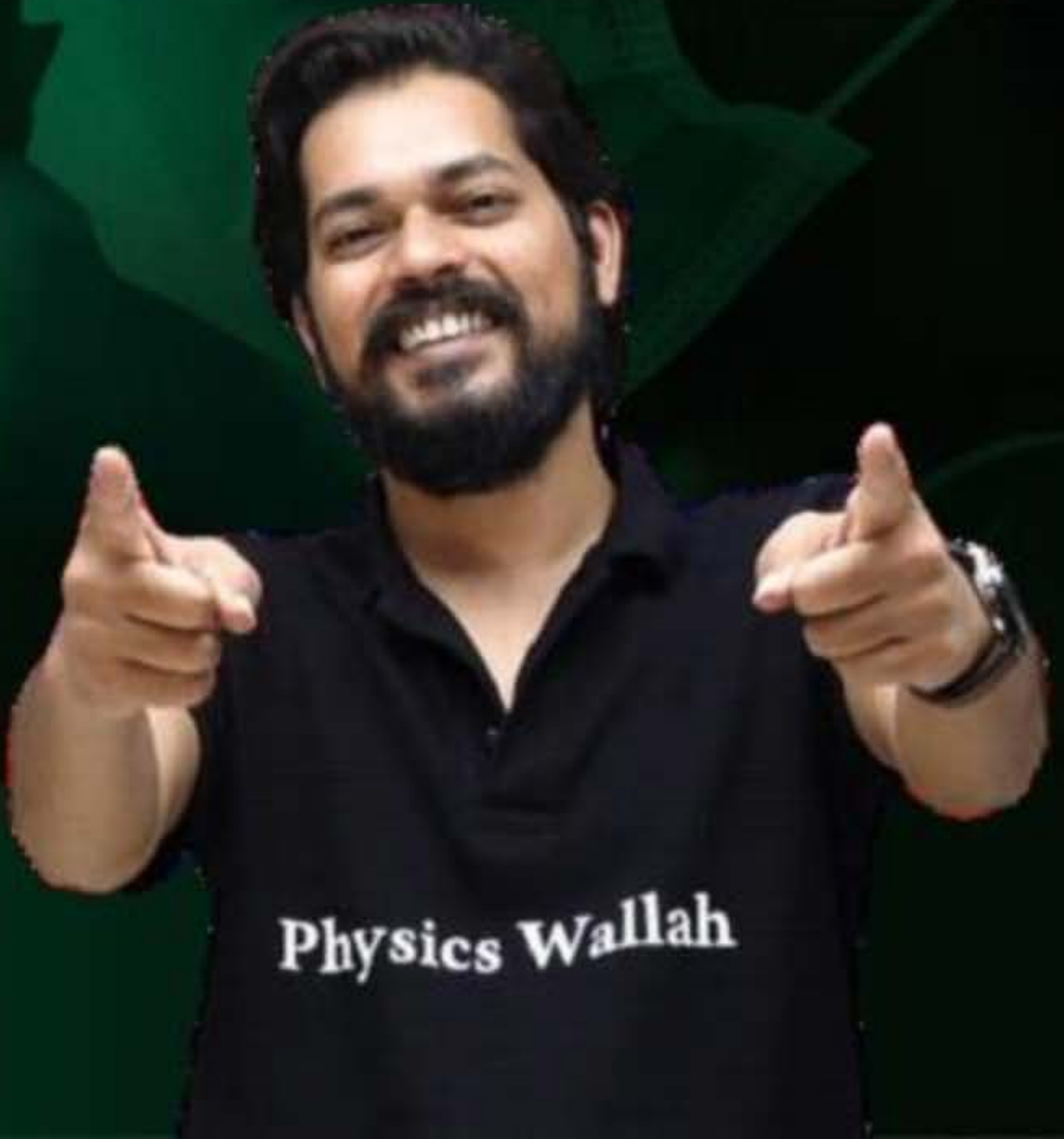
YAKEEN 2.0

FOR NEET 2025

Lecture- 02 | **Organic Chemistry**

Some Basic Principles and Techniques (GOC)

By- Pankaj Sir(POPU MAMA)


Physics Wallah

Topics *to be covered*

1. Applications of Inductive Effect
2. Practice

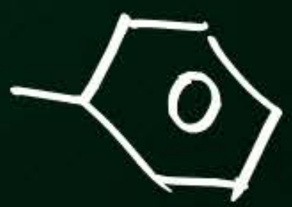
+I power

$$\underbrace{-\overset{\ominus}{C}H_2 > -\overset{\ominus}{N}H > -\overset{\ominus}{O} > -CO\overset{\ominus}{O}} > \underbrace{3^\circ R > 2^\circ R > 1^\circ R > Me}_{\text{Alkyl}} > \underbrace{T > D > H}_{\text{Isotope}} \rightarrow \text{No inductive}$$

-I power

$$\underbrace{-\overset{+}{N}F_3 > -\overset{+}{N}R_3 > -\overset{+}{S}R_2 > -\overset{+}{N}H_3} > \underbrace{-NO_2 > -SO_3H > -CN > -CHO > -COOH}$$

$$> \underbrace{F > Cl > Br > I} > \underbrace{-OR > -OH} > -C\equiv CH > -NH_2 >$$



$$> -CH=CH_2 > H$$

$pK_b = -\log K_b$ $p^{OH} = -\log[\bar{O}H]$

Applications of Inductive Effect

$pK_a = -\log K_a$ $p^H = -\log[H^+]$

(H⁺ donor)

$\left(\begin{matrix} -I \text{ grp maza} \\ +I \text{ '' saza} \end{matrix}\right)$

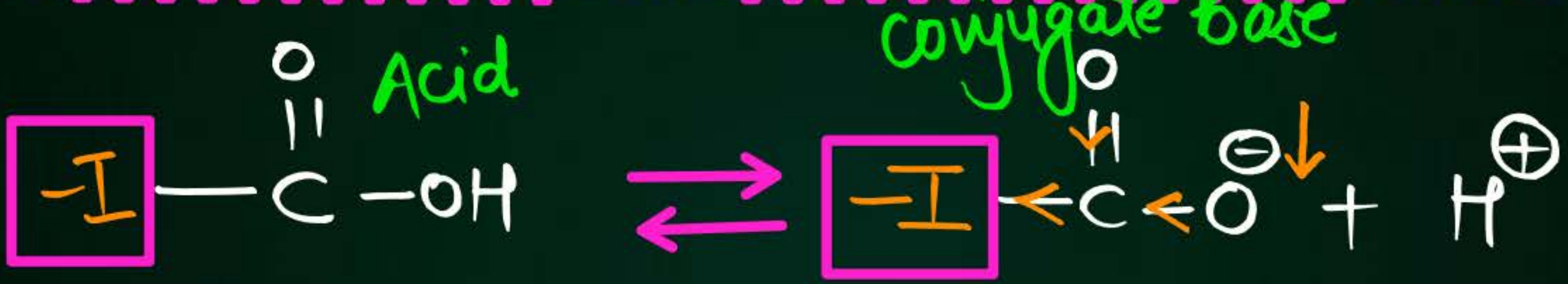
1. To compare acidic strength of Aliphatic carboxylic acids.

$(pK_a + pK_b = 14)$

$pK_b = 14 - pK_a$

$p^H + p^{OH} = 14$

$p^{OH} = 14 - p^H$



$$\boxed{-I}-\overset{\overset{O}{\|}}{C}-OH \rightleftharpoons \boxed{-I}\leftarrow\overset{\overset{O}{\|}}{C}\leftarrow\overset{\ominus}{O} + H^{\oplus}$$

$$K_a = \frac{[\text{conjugate base}][H^+]}{[\text{Acid}]}$$

K_a

Dissociation or Ionisation const

$$A.S \propto K_a \propto [H^+] \propto \frac{1}{pK_a} \propto \frac{1}{p^H} \propto pK_b \propto p^{OH} \propto \frac{1}{K_b} \propto \frac{1}{[\bar{O}H]}$$

$$\boxed{A.S \propto -I \propto \frac{1}{+I}}$$

do not play

$D > N > P$

Distance Number power

Example: 1. $H\boxed{COOH} > CH_3\boxed{COOH} > C_2H_5\boxed{COOH} > C_3H_7\boxed{COOH} > C_4H_9\boxed{COOH}$

D ✗
N ✗
P ✓

$\underbrace{+I \text{ power}}$ $(C_4H_9 > C_3H_7 > C_2H_5 > CH_3 > H)$

$As \propto \frac{1}{+I}$

2. $\overset{\downarrow}{F}CH_2\boxed{COOH} > \overset{\downarrow}{Cl}CH_2\boxed{COOH} > \overset{\downarrow}{Br}CH_2\boxed{COOH} > \overset{\downarrow}{I}CH_2\boxed{COOH}$

D ✗
N ✗
P ✓

$-I$ power $(F > Cl > Br > I)$

$As \propto -I$

3. $\overset{\downarrow}{C}Cl_3\boxed{COOH} > \overset{\downarrow}{C}HCl_2\boxed{COOH} > \overset{\downarrow}{C}H_2Cl\boxed{COOH} > \overset{\downarrow}{C}H_3\boxed{COOH}$

D ✗
N ✓

3 $-I$ 2 $-I$ 1 $-I$

$As \propto -I$

QUESTION

$H-CH_2-COOH$ $D-CD_2-COOH$ $T-CT_2-COOH$

Compare the Acidic Strength?

① $CH_3-COOH > CD_3-COOH > CT_3-COOH$

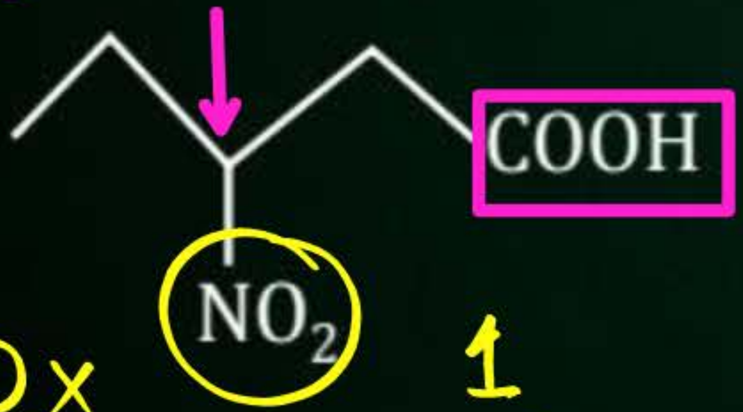
+I

$CH_3 < CD_3 < CT_3$

$H < D < T$

D×
N× +I power T>D>H
P✓ AS $\alpha \frac{1}{+I}$

②



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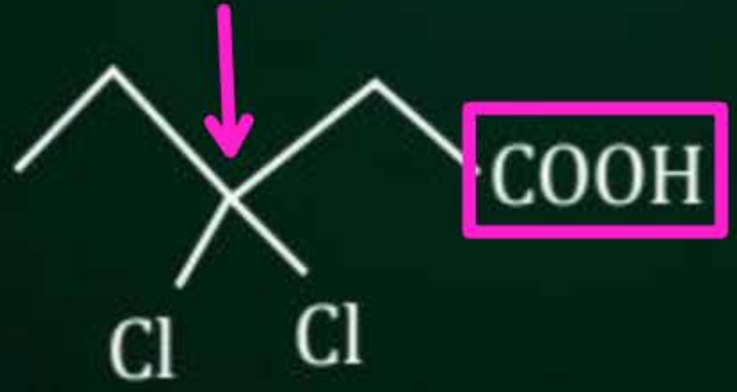


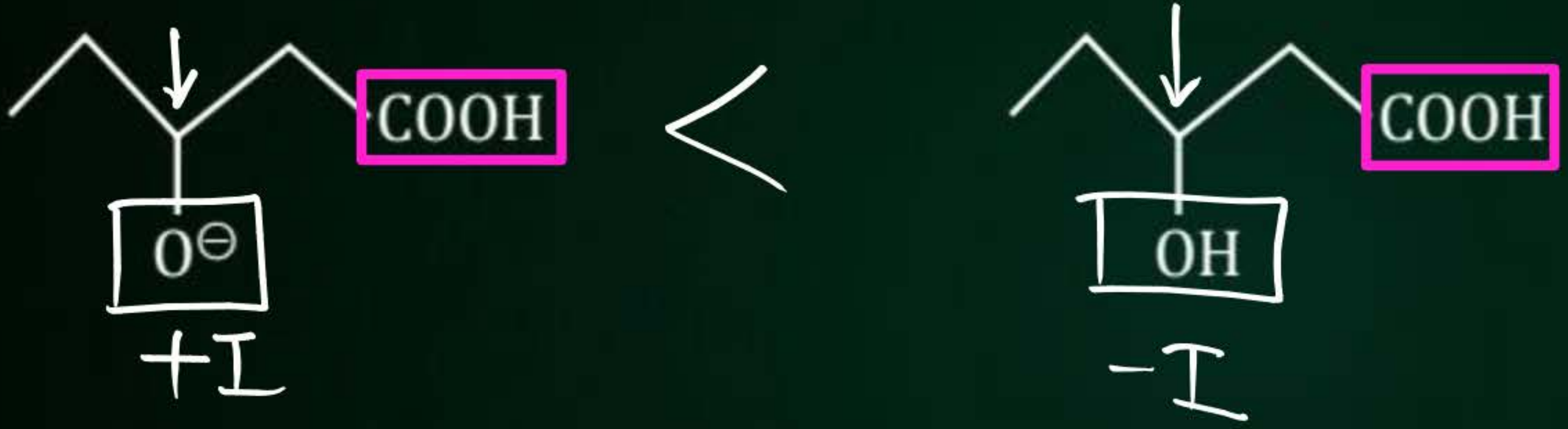
D×
N✓

1
−I

2
−I

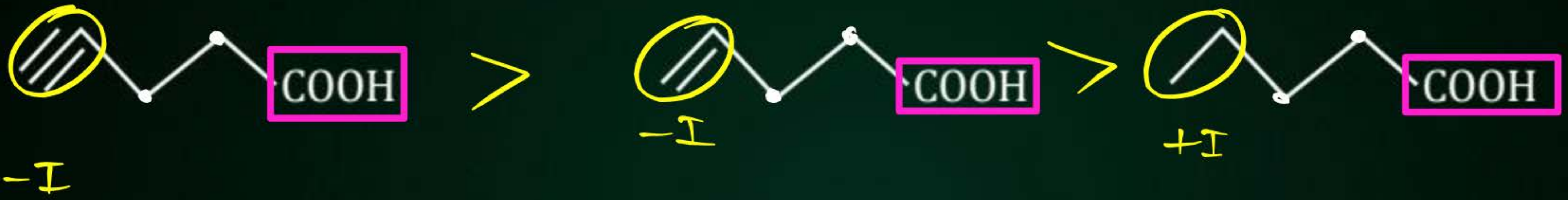
QUESTION

Compare the Acidic Strength?


COOH
O⊖
+I
<
COOH
OH
-I

QUESTION

Compare the Acidic Strength?


COOH
>
COOH
>
COOH
-I
-I
+I

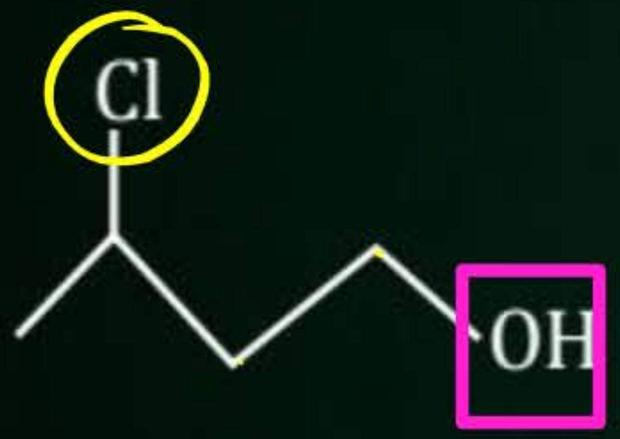
2. To compare acidic strength of Alcohols

(Same as Carboxylic acid)

Compare the Acidic Strength?

$-COOH \rightleftharpoons -\overset{O}{\overset{\|}{C}}-O^{\ominus} + H^{+}$

$-OH \rightleftharpoons -O^{\ominus} + H^{+}$



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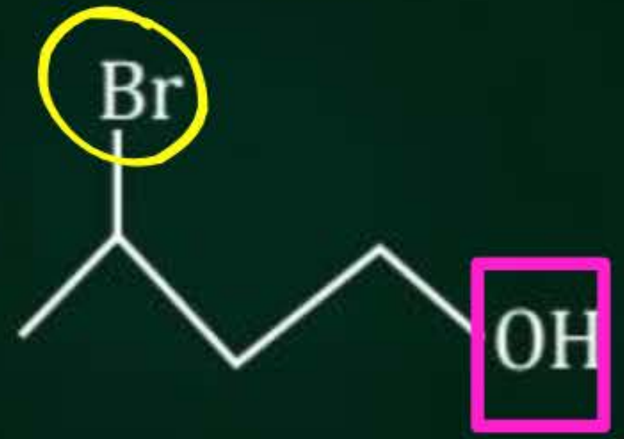
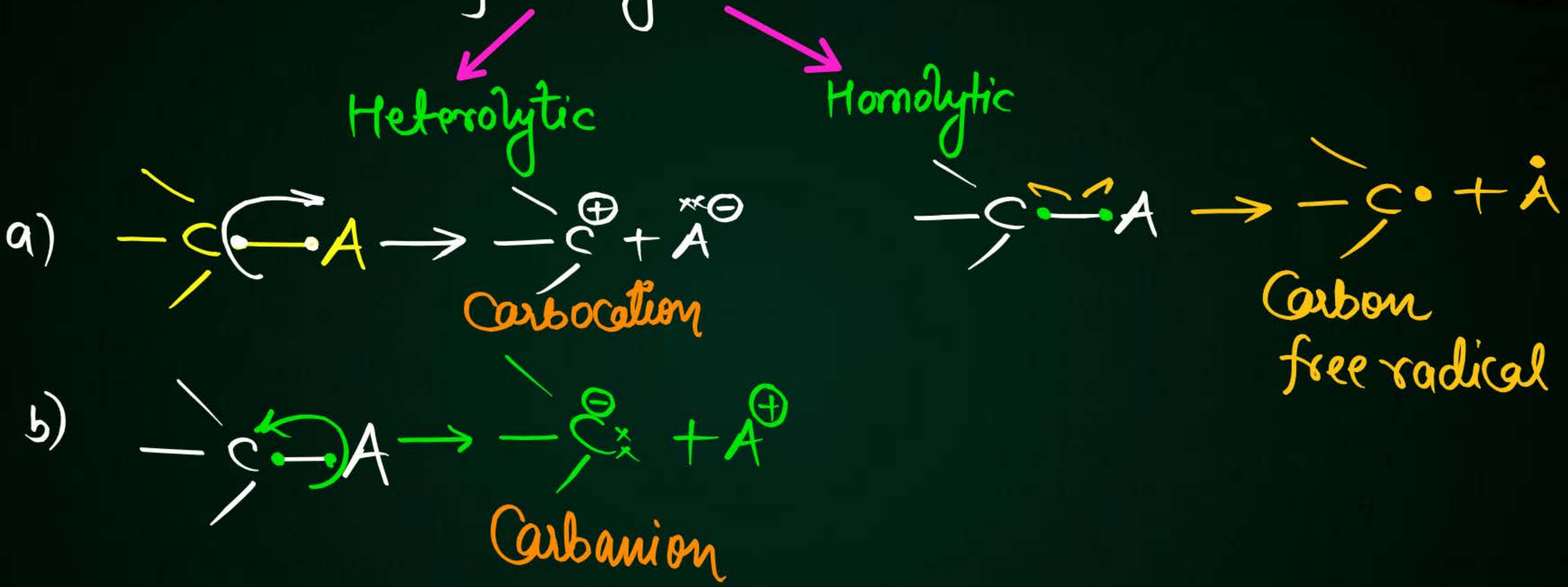
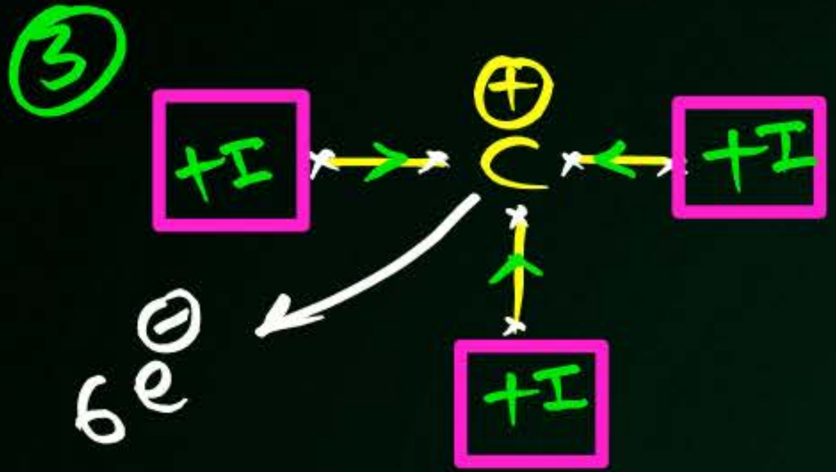


Formation of reactive intermediates

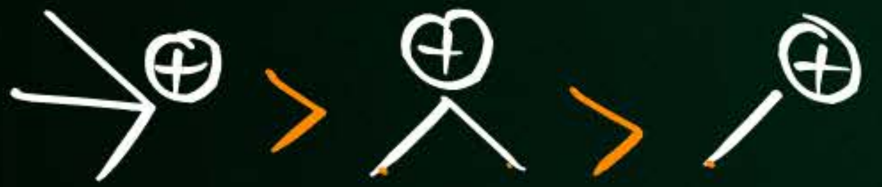
Bond breaking in organic molecule

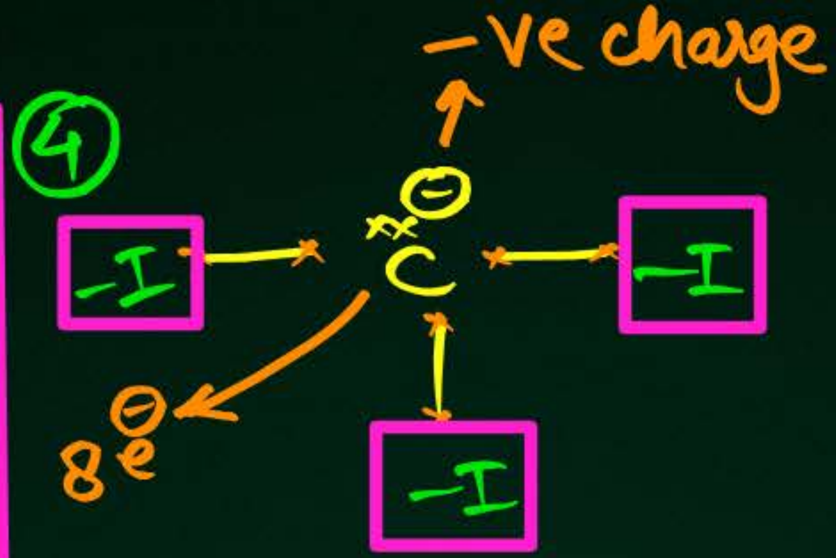

Heterolytic
Homolytic
a)
Carbocation
b)
Carbanion
Carbon free radical

Stability of Intermediate

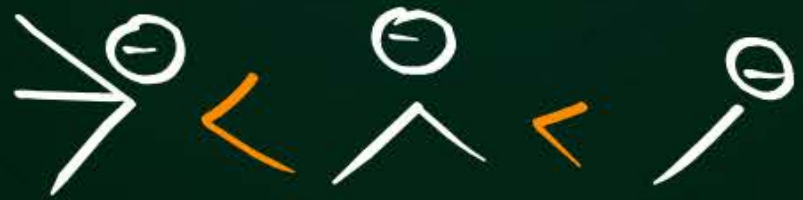


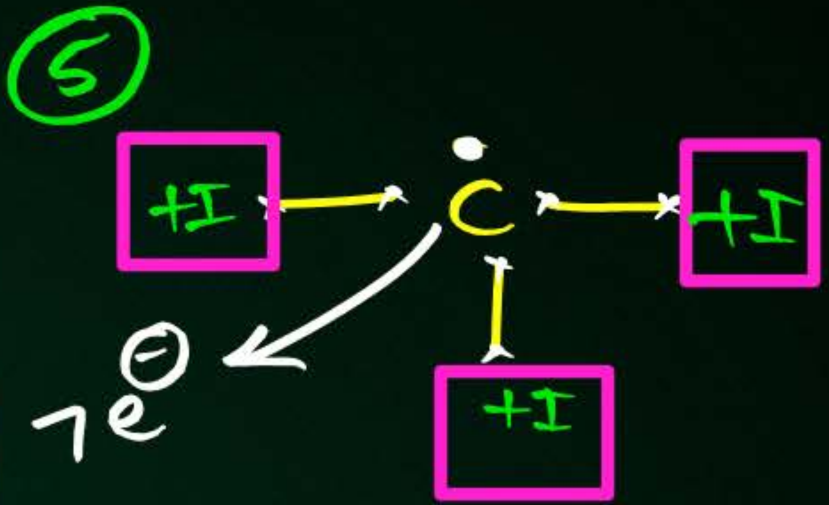
$$\text{stability} \propto +I \propto \frac{1}{-I}$$



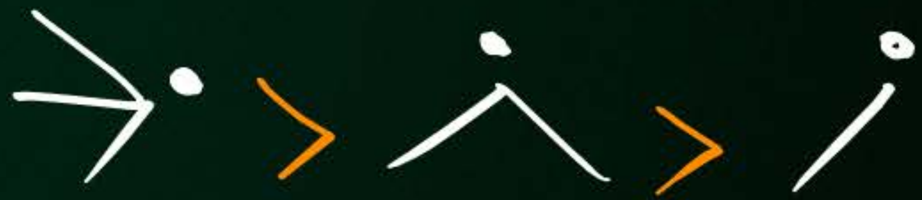

④
−ve charge
−I
−I
−I
C⊖
8e⊖

$$\text{stability} \propto -I \propto \frac{1}{+I}$$





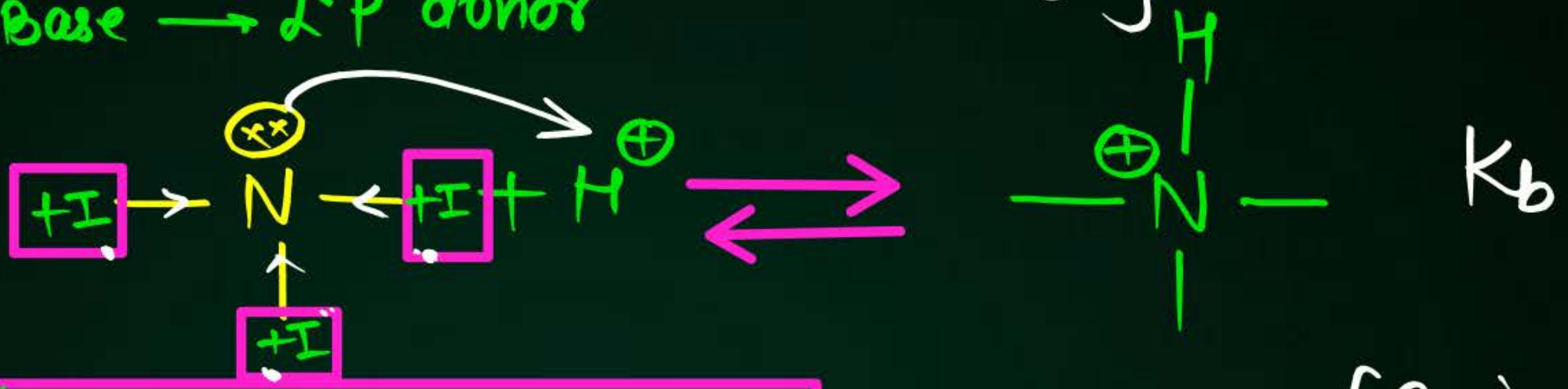
$$\text{stability} \propto +I \propto \frac{1}{-I}$$



6. To compare Basic Strength of Amines

↓

Lewis Base → L.P donor


Conjugate acid
+I
+I
+I
N
H⊕
⊕
H
N
K_b

$e^{\ominus}$ density on N ↑ B.S ↑

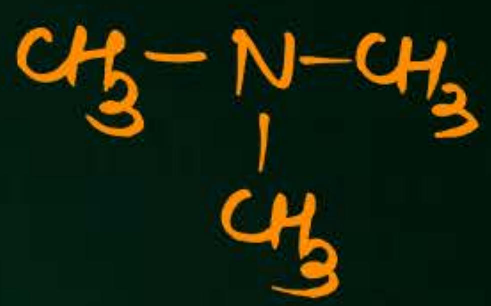
$$B.S \propto +I \propto \frac{1}{-I}$$

$$K_b = \frac{[\text{Conju acid}]}{[\text{Base}][H^+]}$$

Stability of conjugate acid ↑ B.S ↑

Q. Compare B.S

① $NH_3 < CH_3-NH_2 < CH_3-NH-CH_3 <$



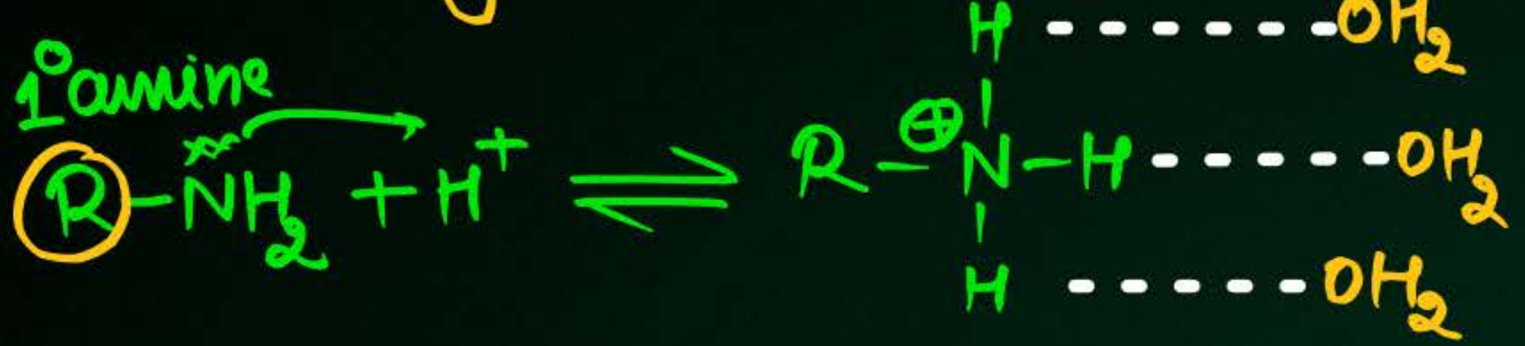
$CH_3-\underset{\underset{CH_3}{|}}{N}-CH_3$ (In gas phase)

without water

② $CH_3-NH_2 > \underset{-I}{Cl}-CH_2-NH_2$

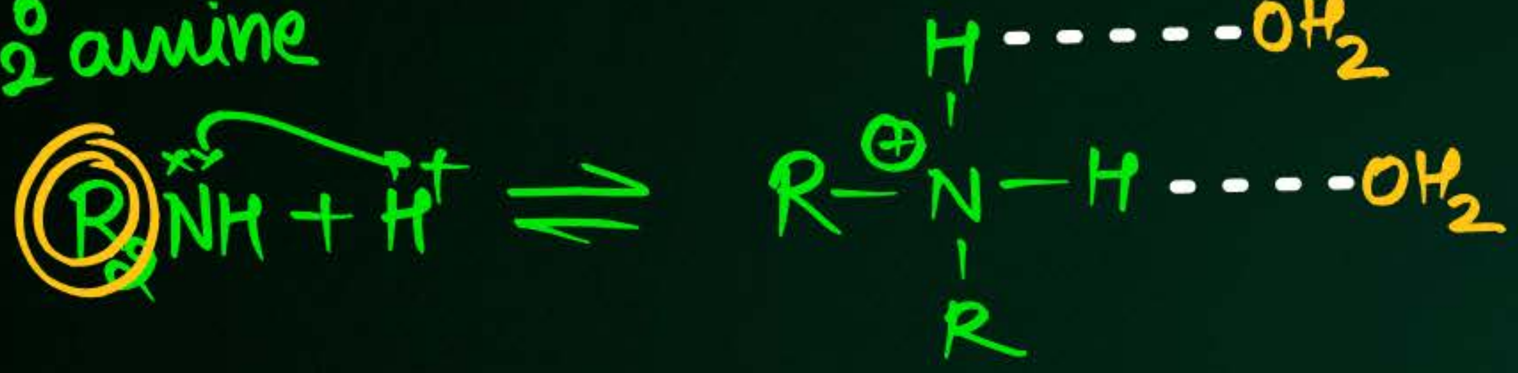
Basic strength of aliphatic amine in aq. medium (or polar protic solvent)

1° amine



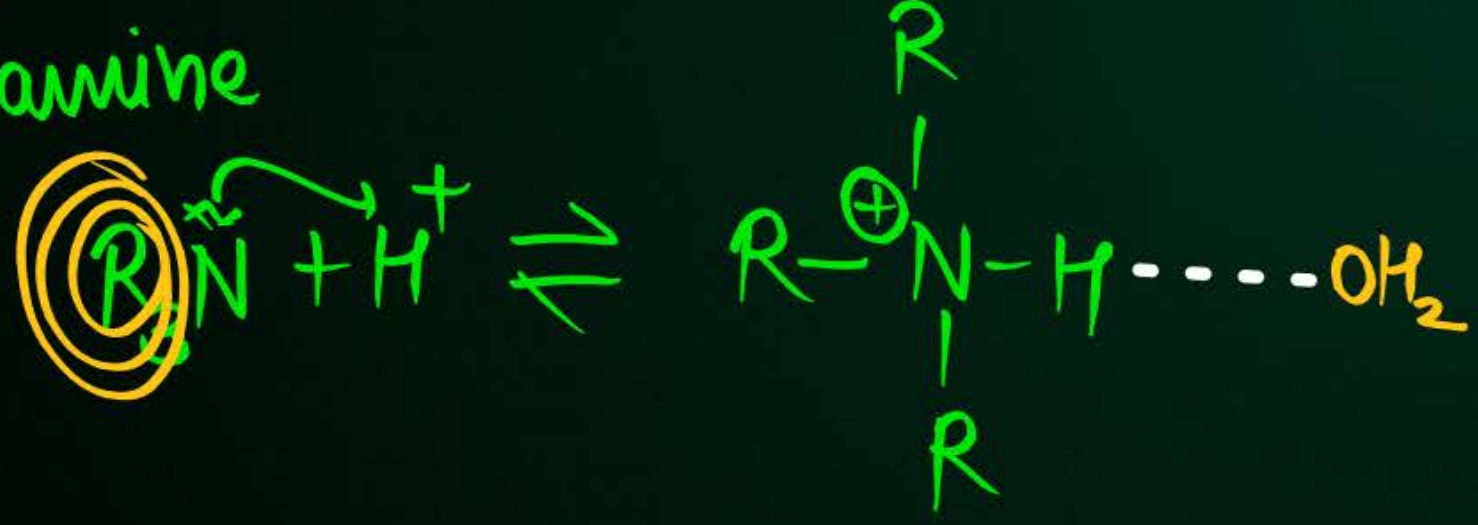
$$R-\ddot{N}H_2 + H^+ \rightleftharpoons R-\overset{\oplus}{N}H_3$$

2° amine



$$R_2\ddot{N}H + H^+ \rightleftharpoons R_2\overset{\oplus}{N}H_2$$

3° amine



$$R_3\ddot{N} + H^+ \rightleftharpoons R_3\overset{\oplus}{N}H$$

Acc^n to Solvation or Hydration

1° > 2° > 3°

Acc^n to +I

3° > 2° > 1°

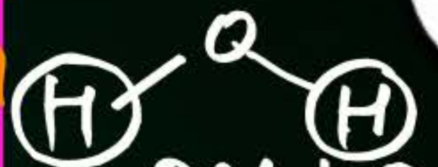
Chamotkar

R = Me

2° > 1° > 3°

R = Et

2° > 3° > 1°



DM ≠ 0

polar

F O N

| | |

H H H

R = Pr, bu - - -

+I domination

3° > 2° > 1°

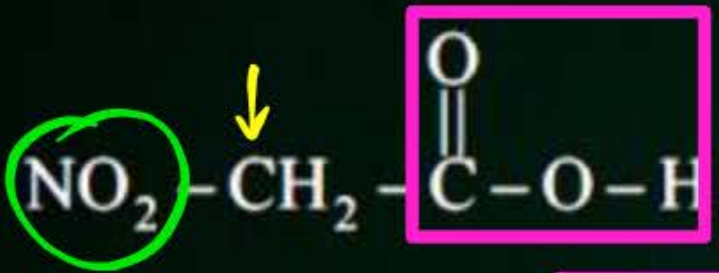
All type of amine in gas phase

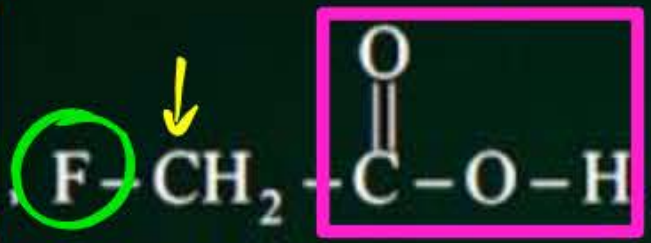
3° > 2° > 1° always

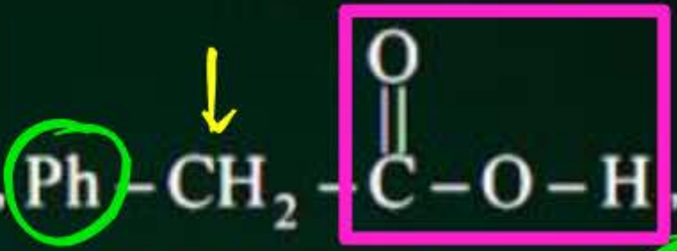
QUESTION

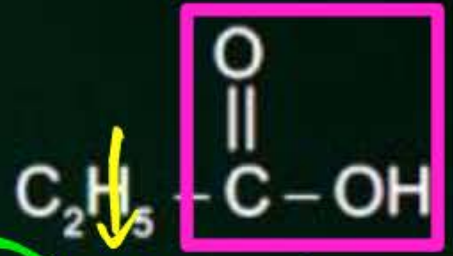
(1 > 2 > 3 > 4)

Write correct order of acidic strength of following compounds:

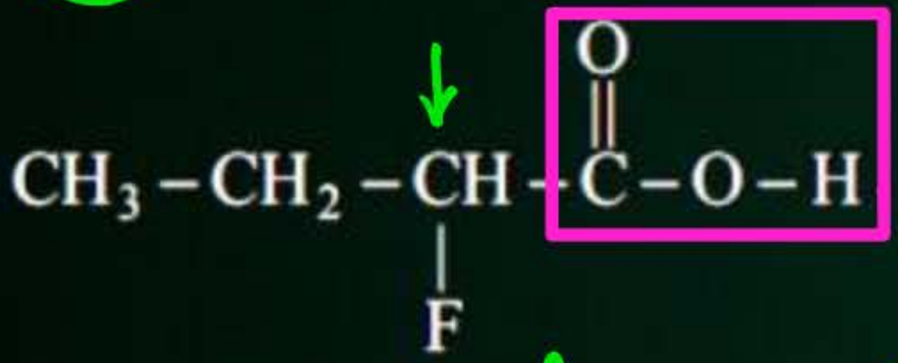
(a)

$NO_2-CH_2-\overset{O}{\overset{\|}{C}}-O-H$

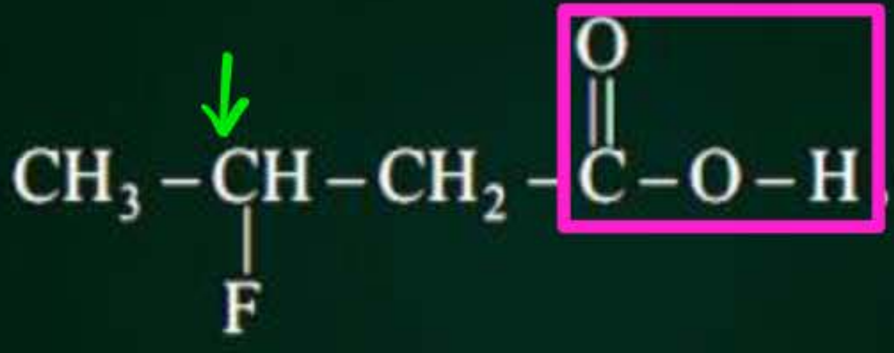

$F-CH_2-\overset{O}{\overset{\|}{C}}-O-H$

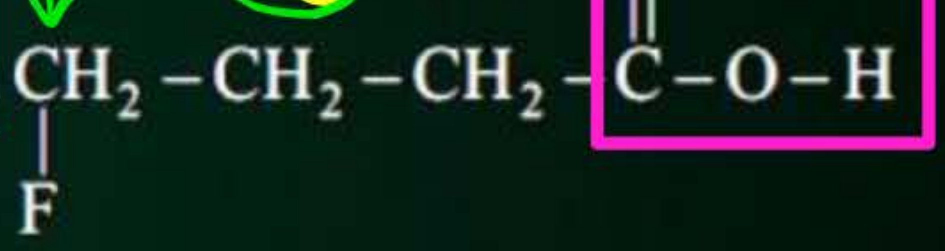

$Ph-CH_2-\overset{O}{\overset{\|}{C}}-O-H$


$C_2H_5-\overset{O}{\overset{\|}{C}}-OH$

CH_3-CH_2

(b)

$CH_3-CH_2-\underset{F}{\underset{|}{CH}}-\overset{O}{\overset{\|}{C}}-O-H$


$CH_3-\underset{F}{\underset{|}{CH}}-CH_2-\overset{O}{\overset{\|}{C}}-O-H$


$\underset{F}{\underset{|}{CH_2}}-CH_2-CH_2-\overset{O}{\overset{\|}{C}}-O-H$

-I Jinta paas utna accha

1 > 2 > 3

QUESTION

Among the following which one is most basic?

(A) NH_3

(B) CH_3NH_2

[✓ (C)] $CH_3CH_2NH_2$

(D) None of these

QUESTION

The most stable carbocation is:

Ⓐ methyl carbocation $\overset{+}{C}H_3$

Ⓑ primary carbocation $R-\overset{\oplus}{C}H_2$

Ⓒ secondary carbocation $R_2\overset{\oplus}{C}H$

[✓ Ⓓ] tertiary carbocation $R_3\overset{\oplus}{C}$

QUESTION

The most stable carbanion is:

[✓ A] methyl carbanion $\overset{\ominus}{C}H_3$

B primary carbanion $R-\overset{\ominus}{C}H_2$

C secondary carbanion $R_2\overset{\ominus}{C}H$

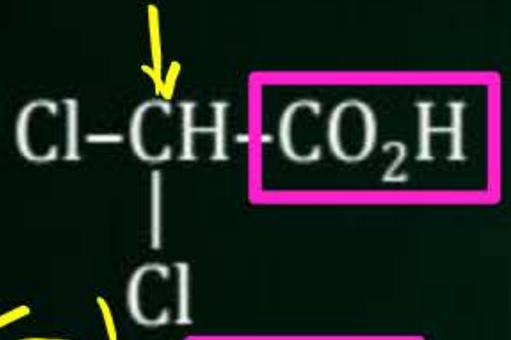
D tertiary carbanion $R_3\overset{\ominus}{C}$

QUESTION

$pK_a \downarrow$ $K_a \uparrow$ A.S ↑

Which of following has lowest pK_a value?

(A) $Cl-CH_2-\boxed{CO_2H}$

(B) 

$Cl-\underset{\underset{Cl}{|}}{CH}-\boxed{CO_2H}$

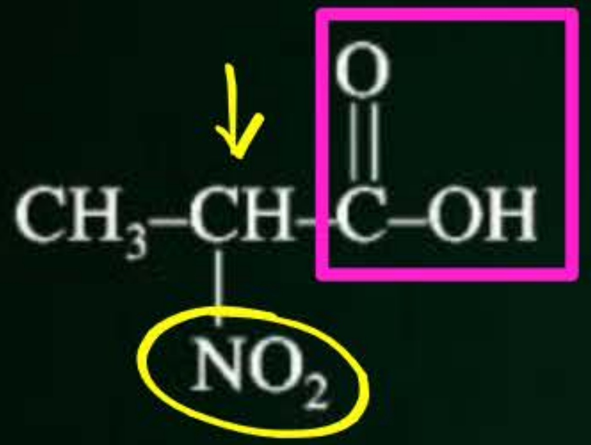
(C) ✓ $Cl_3C-\boxed{CO_2H}$

(D) $CH_3-\boxed{CO_2H}$

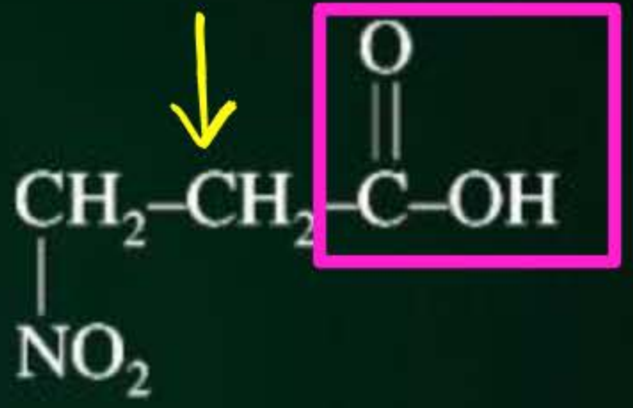
QUESTION

pKa↓ Ka↑ AS↑

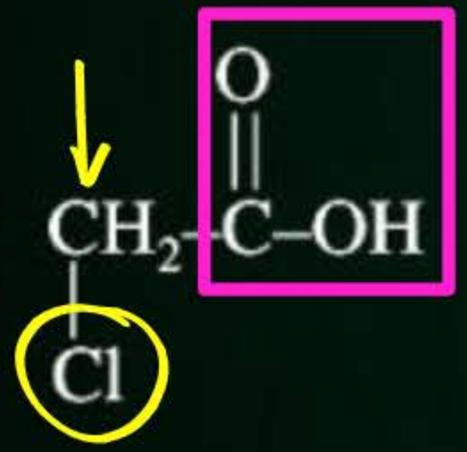
Which of the following acids has lowest pK_a value?

A


$CH_3-\underset{NO_2}{\overset{\downarrow}{CH}}-\boxed{\overset{O}{\overset{\|}{C}}-OH}$

B


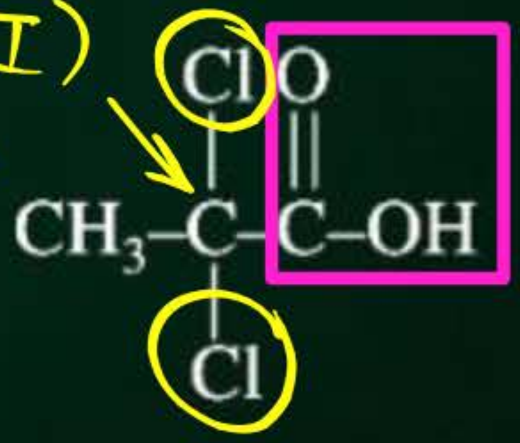
$\underset{NO_2}{CH_2}-\overset{\downarrow}{CH_2}-\boxed{\overset{O}{\overset{\|}{C}}-OH}$

C


$\underset{Cl}{\overset{\downarrow}{CH_2}}-\boxed{\overset{O}{\overset{\|}{C}}-OH}$

✓ D

2(-I)



$CH_3-\underset{Cl}{\overset{Cl}{C}}-\boxed{\overset{O}{\overset{\|}{C}}-OH}$

QUESTION

A.S (Ka) $\underline{II > III > I}$

pKa $\underline{II < III < I}$

For the following acids

$\underbrace{(CH_3)_3C}_{3^\circ R\ +I}\overset{\downarrow}{C}H_2\boxed{CO_2H}$ (I)

$\underbrace{(CH_3)_3}_{-I}\overset{\oplus}{N}\overset{\downarrow}{C}H_2\boxed{CO_2H}$ (II)

$\underset{NO\ I}{H}-\overset{\downarrow}{C}H_2\boxed{COOH}$ (III)

pK_a value will be in order

A I > II > III

B I < II < III

[✓ C] I > III > II

D II > III > I

QUESTION

Place the following in the correct order of acidity.

$\underbrace{CH\equiv C}_{-I}-COOH$; $\underbrace{CH_2=CH}_{-I}-COOH$; $\underbrace{CH_3CH_2}_{+I}COOH$

(I) (II) (III)

A I > II > III ✓

B III > II > I

C II > I > III

D I > III > II

QUESTION

The order of decreasing stability of the anions

$(CH_3)_3C^-$ (I) 3(+R)

$(CH_3)_2CH^-$ (II) 2(+R)

$CH_3CH_2^-$ is: (III) 1(+R)

(A) I > II > III

[✓ (B)] III > II > I

(C) II > I > III

(D) I > II > III

QUESTION

Which of the following acid is strongest?

[✓ A] HCOOH

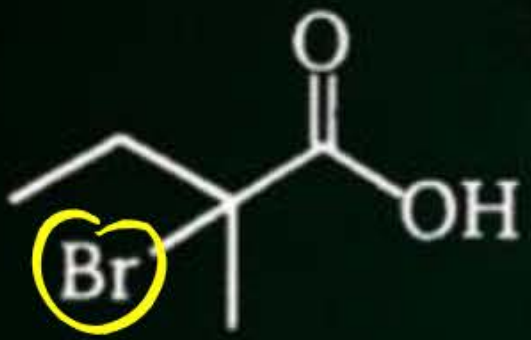
B CH_3COOH

C CH_3CH_2COOH

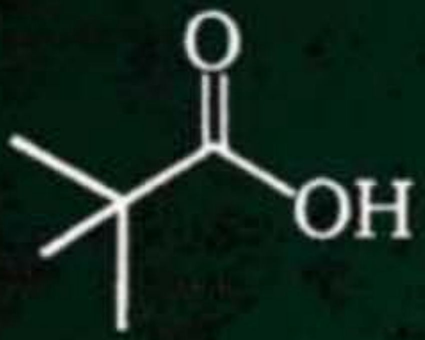
D $CH_3CH_2CH_2COOH$

QUESTION

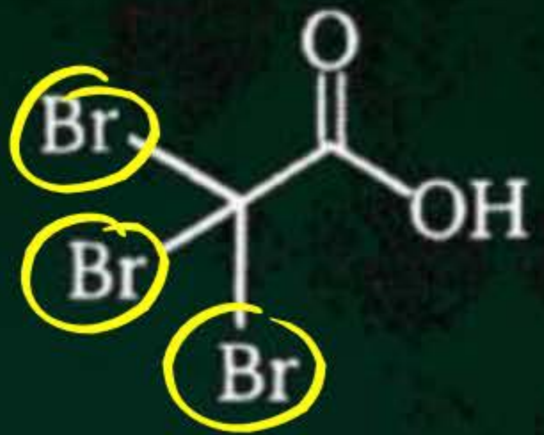
Rank their acidity: most acidic to least acidic



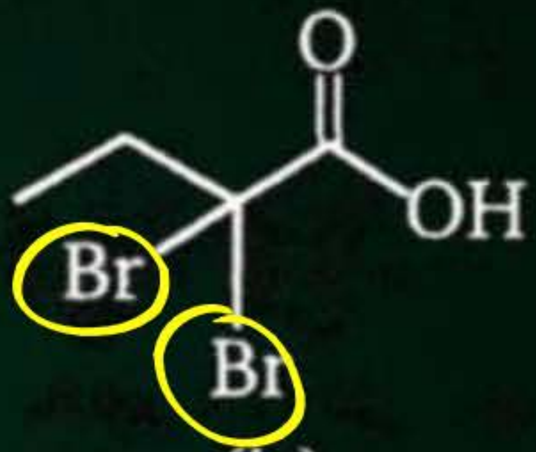
(i)



(ii)



(iii)



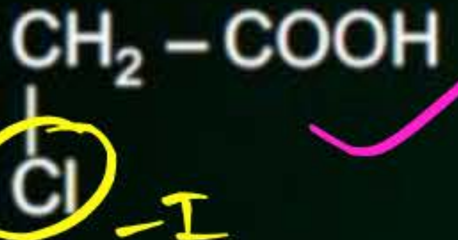
(iv)

III > IV > I > II

QUESTION

$\left(\begin{array}{ll} -I & AS\uparrow \\ +I & AS\downarrow \end{array}\right)$

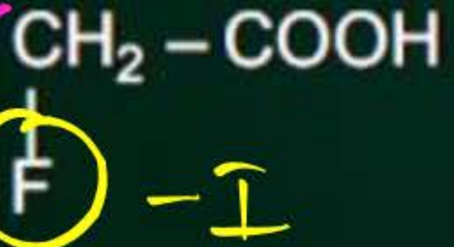
How many of the following are more acidic than $\underbrace{HCOOH}$?

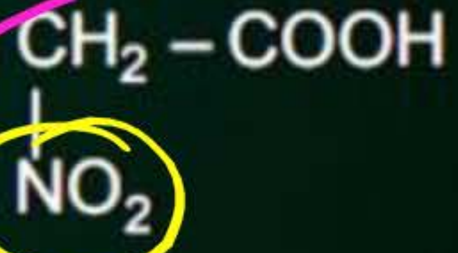
(i)

$\underset{\underset{Cl}{|}}{CH_2}-COOH$ −I ✓

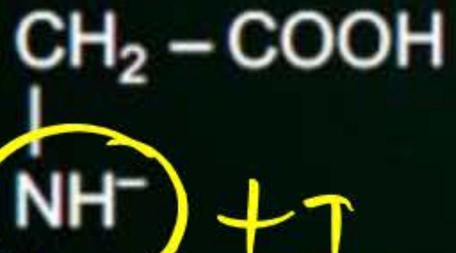
(ii) $\overset{+I}{\underset{\underset{H}{|}}{CH_2}}-COOH$

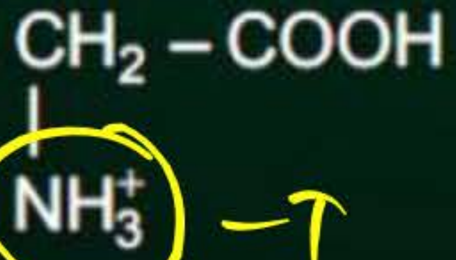
(iii) $\underset{+I}{\overset{-}{O}OC}-CH_2-COOH$

(iv) $\underset{-I}{NC}-CH_2-COOH$ ✓

(v)

$\underset{\underset{F}{|}}{CH_2}-COOH$ −I ✓

(vi)

$\underset{\underset{NO_2}{|}}{CH_2}-COOH$ −I ✓

(vii)

$\underset{\underset{NH^-}{|}}{CH_2}-COOH$ +I

(viii)

$\underset{\underset{NH_3^+}{|}}{CH_2}-COOH$ −I ✓

Ans ⑤

QUESTION

$B > C > A > D$

Which is strongest acid among the following?

(A) $HCOOH$

[✓ (B)] NO_2CH_2COOH

(C) FCH_2COOH

(D) CH_3COOH

QUESTION

Correct order of basic strength of given amines.

[✓ A] $Me_2NH > MeNH_2 > Me_3N > NH_3$
2° 1° 3°
(Protic solvent)

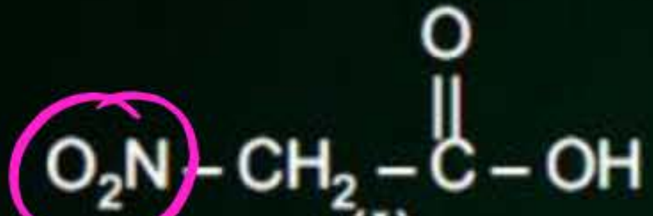
[✓ B] $Et_2NH > Et_3H > EtNH_2 > NH_3$
2° 3° 1°
(Protic solvent)

[✓ C] $Me_3N > Me_2NH > MeNH_2 > NH_3$
(gas phase)

[✓ D] All are correct

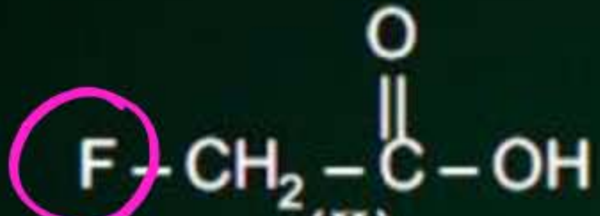
QUESTION

Consider the following compounds



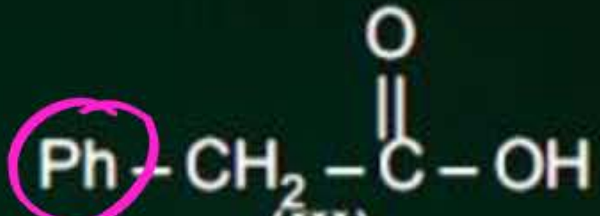
$O_2N-CH_2-\overset{\overset{O}{\|}}{C}-OH$

(I)



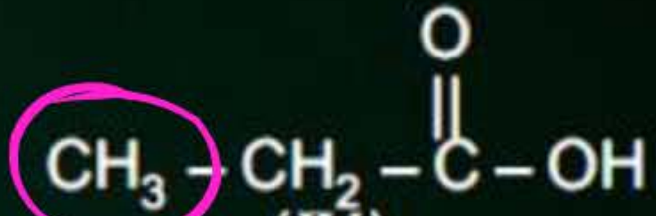
$F-CH_2-\overset{\overset{O}{\|}}{C}-OH$

(II)



$Ph-CH_2-\overset{\overset{O}{\|}}{C}-OH$

(III)



$CH_3-CH_2-\overset{\overset{O}{\|}}{C}-OH$

(IV)

Which statement is incorrect:

Ⓐ I > II > III > IV (Acidic strength order)

[✓ Ⓑ] I is least acidic because of – I effect..

Ⓒ I is most acidic because of – I effect.

Ⓓ IV is least acidic because of +I effect.

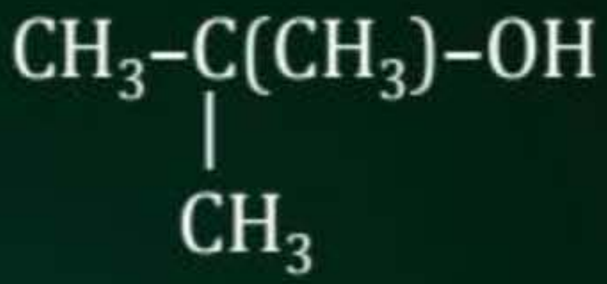
QUESTION

$pH\uparrow [H^+]\downarrow$ A.S $\downarrow$

Maximum value of pH.

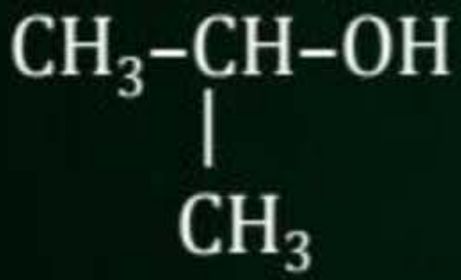
(A) CH_3-CH_2-OH

[✓ (B)] +I



$CH_3-\underset{CH_3}{\underset{|}{C}}(CH_3)-OH$

(C)



$CH_3-\underset{CH_3}{\underset{|}{CH}}-OH$

(D) CH_3-OH

AS $[H^+]$ $D>A>C>B$

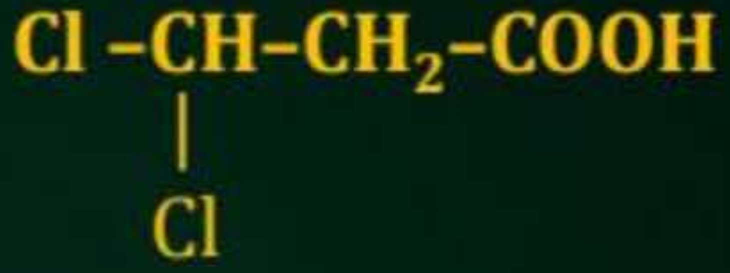
pH $D<A<C<B$

Home Work

QUESTION 01

Arrange in the order of decreasing pK_b.

(P) $F-CH_2CH_2COOH$

(Q) 
$Cl-\underset{\underset{Cl}{|}}{CH}-CH_2-COOH$

(R) $F-CH_2-COOH$

(S) $Br-CH_2-CH_2-COOH$

(A) $Q > S > P > R$

(B) $P > R > S > Q$

(C) $R > Q > P > S$

(D) $S > Q > P > R$

QUESTION 02

Which of the following statements is wrong?

A A tertiary free radical is more stable than a secondary free radical.

B A secondary free radical is more stable than a primary free radical.

C A tertiary carbocation is more stable than a secondary carbocation.

D A primary carbocation is more stable than a secondary carbocation.

QUESTION 03

The most stable carbocation is:

Ⓐ $(CH_3)_3C^{\oplus}$

Ⓑ $(CH_3)_2HC^{\oplus}$

Ⓒ $CH_3CH_2^{\oplus}$

Ⓓ $CH_3^{\oplus}$

QUESTION 04

Which is most basic among the following

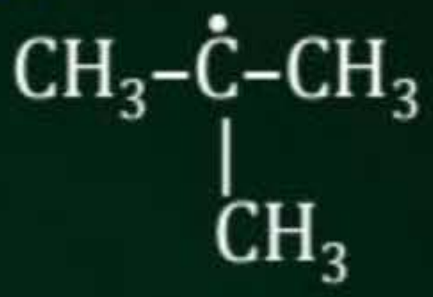
- (A) $CH_3CH_2-NH_2$
- (B) $Cl-CH_2CH_2NH_2$
- (C) $O_2N-CH_2CH_2-NH_2$
- (D) $^{-}O-CH_2CH_2-NH_2$

QUESTION 05

The stability of given free radicals in decreasing order is:

(i) $CH_3-\dot{C}H_2$

(ii) $CH_3-\dot{C}H-CH_3$

(iii) 

$CH_3-\overset{\bullet}{\underset{\displaystyle CH_3}{\underset{|}{C}}}-CH_3$

(iv) $\dot{C}H_3$

(A) iii > iv > i > ii

(B) i > ii > iii > iv

(C) iii > ii > iv > i

(D) iii > ii > i > iv

QUESTION 06 $\underset{(1)}{FCH_2COOH}$ $\underset{(2)}{Cl_2CHCOOH}$ $\underset{(3)}{CH_3COOH}$ $\underset{(4)}{HCOOH}$ $\underset{(5)}{ClCH_2COOH}$

Correct order of acid strength is:

Ⓐ $1 > 5 > 2 > 4 > 3$

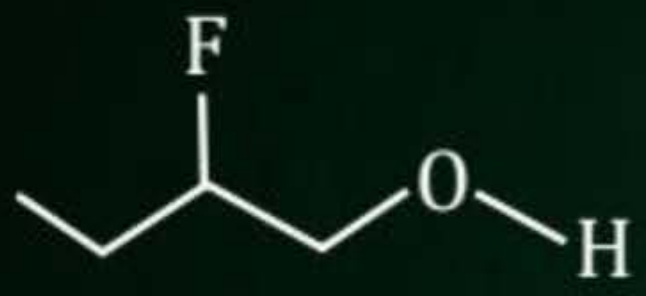
Ⓑ $5 > 1 > 2 > 4 > 3$

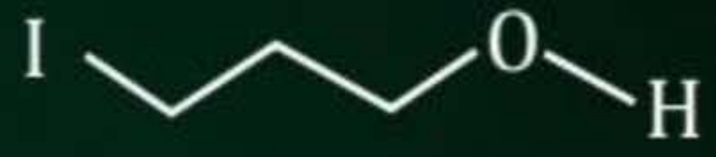
Ⓒ $2 > 1 > 5 > 4 > 3$

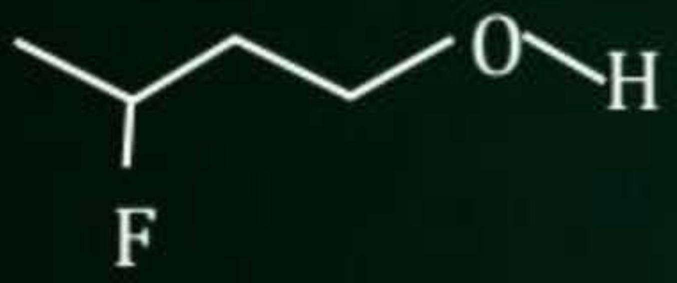
Ⓓ $5 > 2 > 1 > 4 > 3$

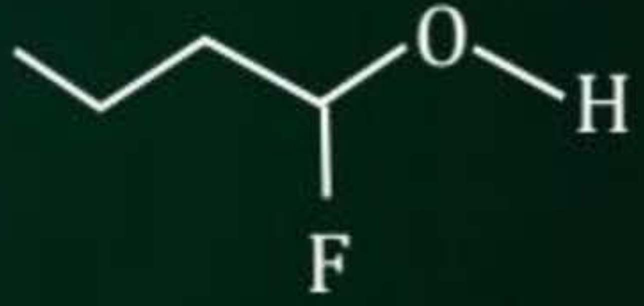
QUESTION 07

In which of the following compounds the hydroxylic proton is most acidic?

A 

B 

C 

D 

QUESTION 08

Which is the decreasing order of acidity in the following compounds?

CH_3CH_2OH(I) CF_3CH_2OH(II)

$CCl_3{-}CH_2OH$(III) $(NO_2)_3C{-}CH_2OH$(IV)

(A) I > II > III > IV

(B) II > I > III > IV

(C) IV > II > I > III

(D) IV > II > III > I

QUESTION 09

The decreasing order of –I effect of the following is:

I. $H_3N^{\oplus}$

II. NO_2

III. CN

IV. COOH

A. I > II > III > IV

B. II > I > III > IV

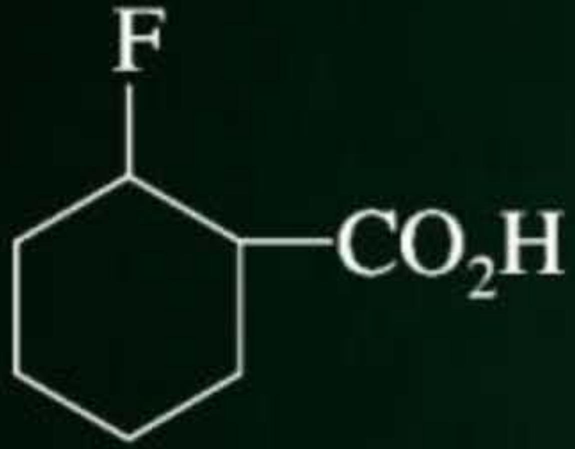
C. I > II > III > IV

D. II > I > IV > III

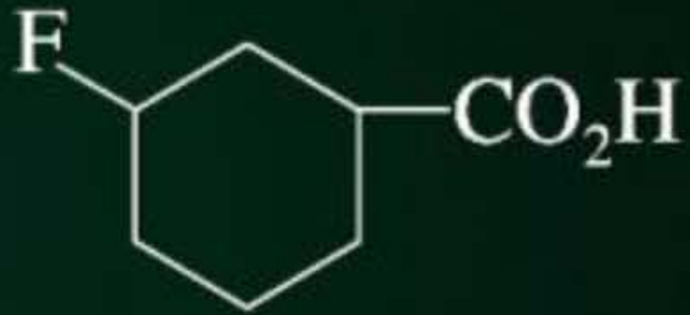
QUESTION 10

Which of the following has highest K_a value?

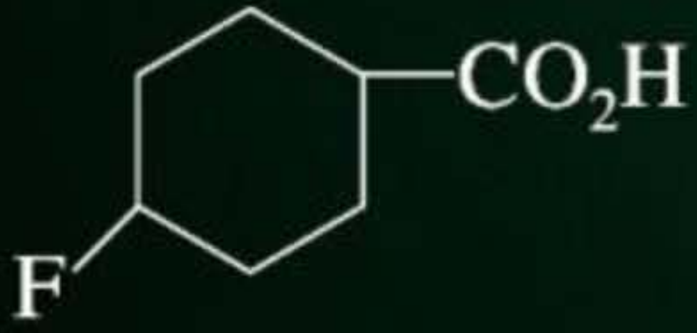
(A)



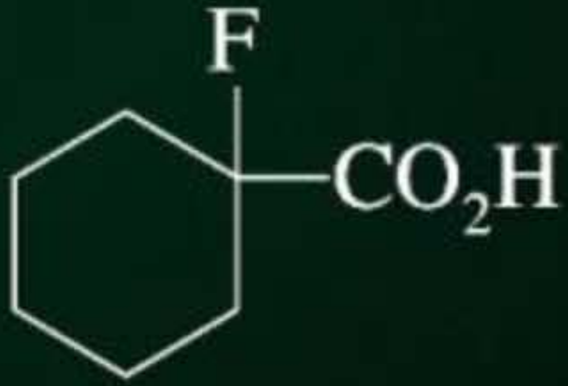
(B)



(C)



(D)



ANSWER KEY

1. C
2. D
3. A
4. D
5. D
6. C
7. D
8. D
9. A
10. D

Home Work From PW Module (Yakeen NEET)

Prarambh: Q 132, 134, 135, 136, 139

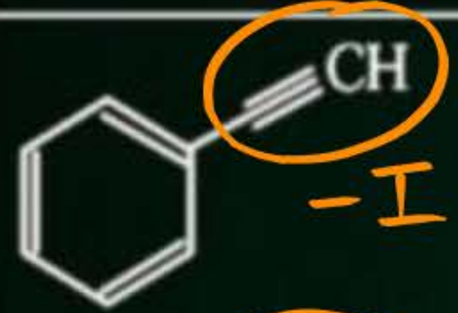
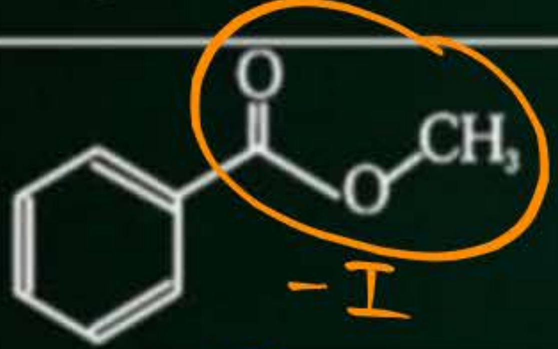
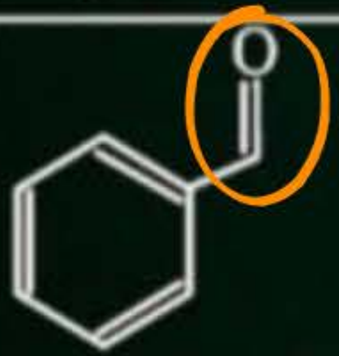
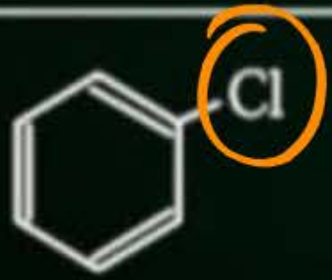
Prabal: Q 03, 28

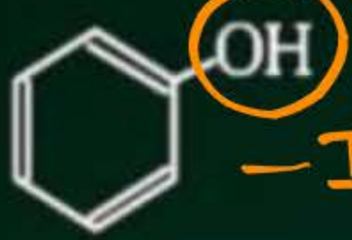
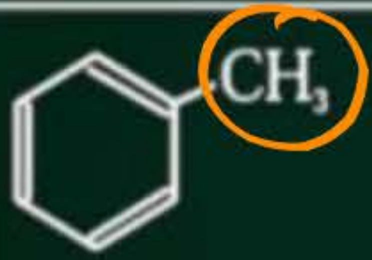
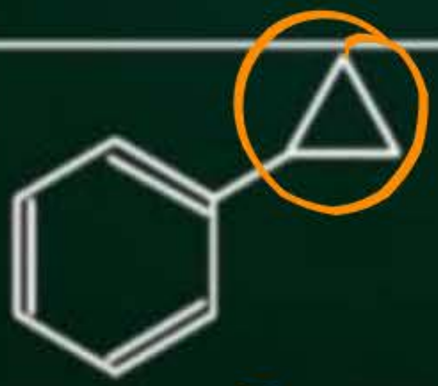
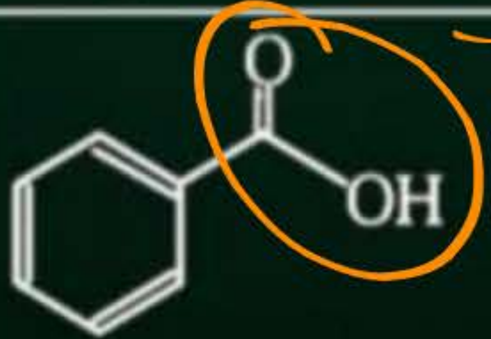
HW discussion

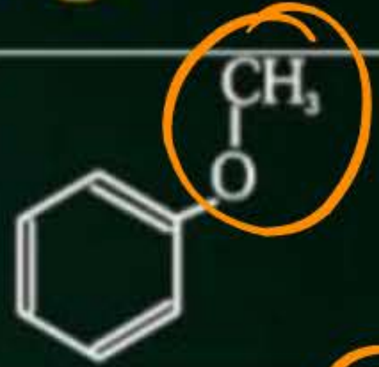
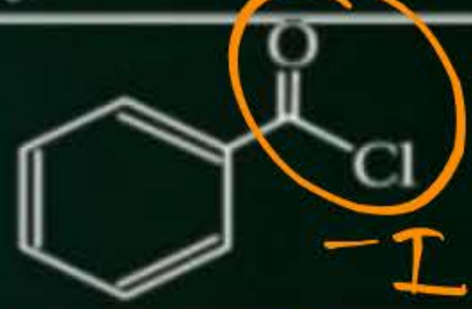
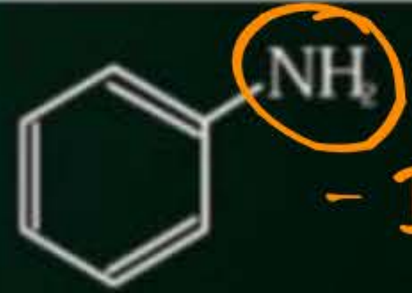
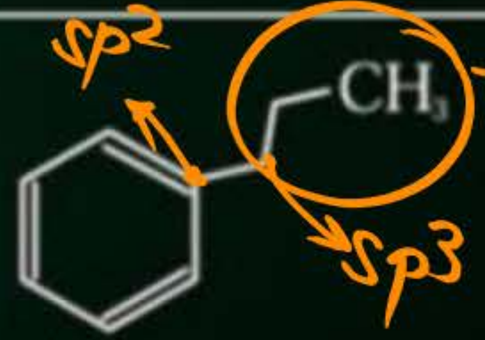
of L-01

QUESTION

Identify inductive effect (–I or +I or not I) attached on ring.

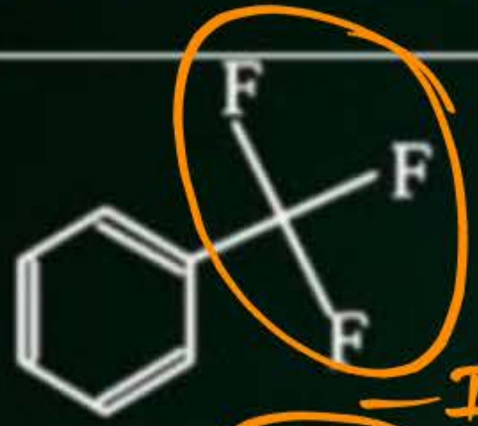
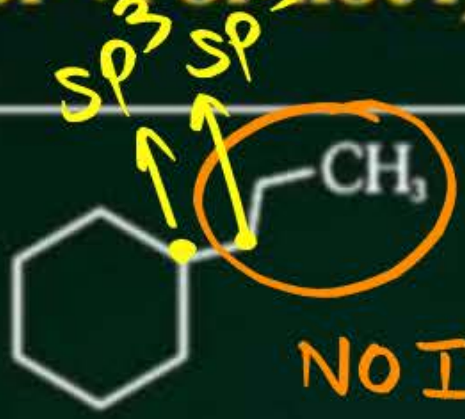
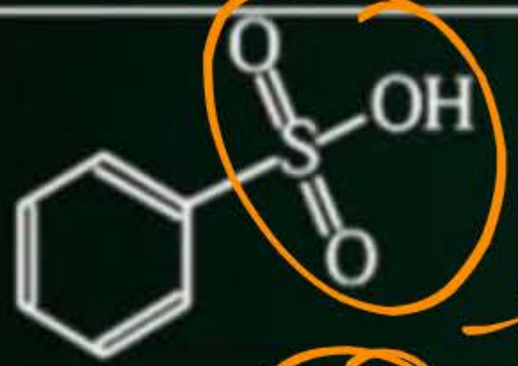
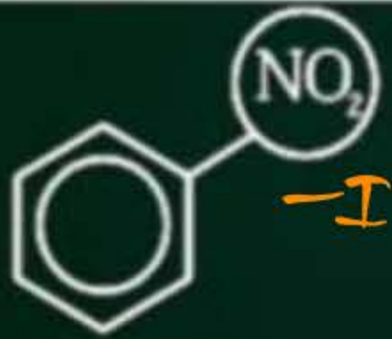
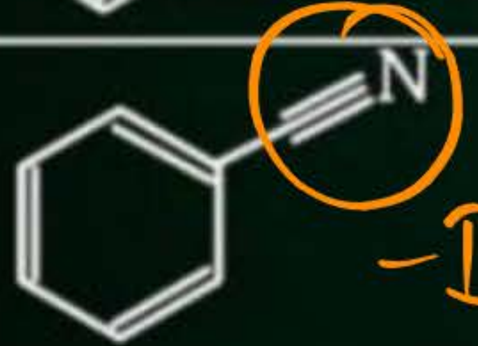
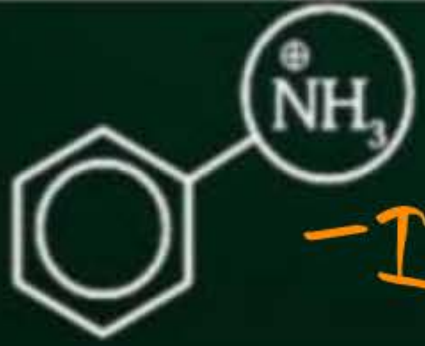
1.	 –I
2.	 –I
3.	 –I
4.	 –I

5.	 –I
6.	 +I
7.	 +I
8.	 –I

9.	 –I
10.	 –I
11.	 –I
12.	 sp^2 sp^3 +I

QUESTION

Identify inductive effect (–I or +I or not I) attached on ring

13.	 −I	16.	 NO I
14.	 −I	17.	 −I
15.	 −I	18.	 −I

$\overset{sp^3}{CH_3}-\overset{sp^3}{CH_3}$

NO I

Thank you!

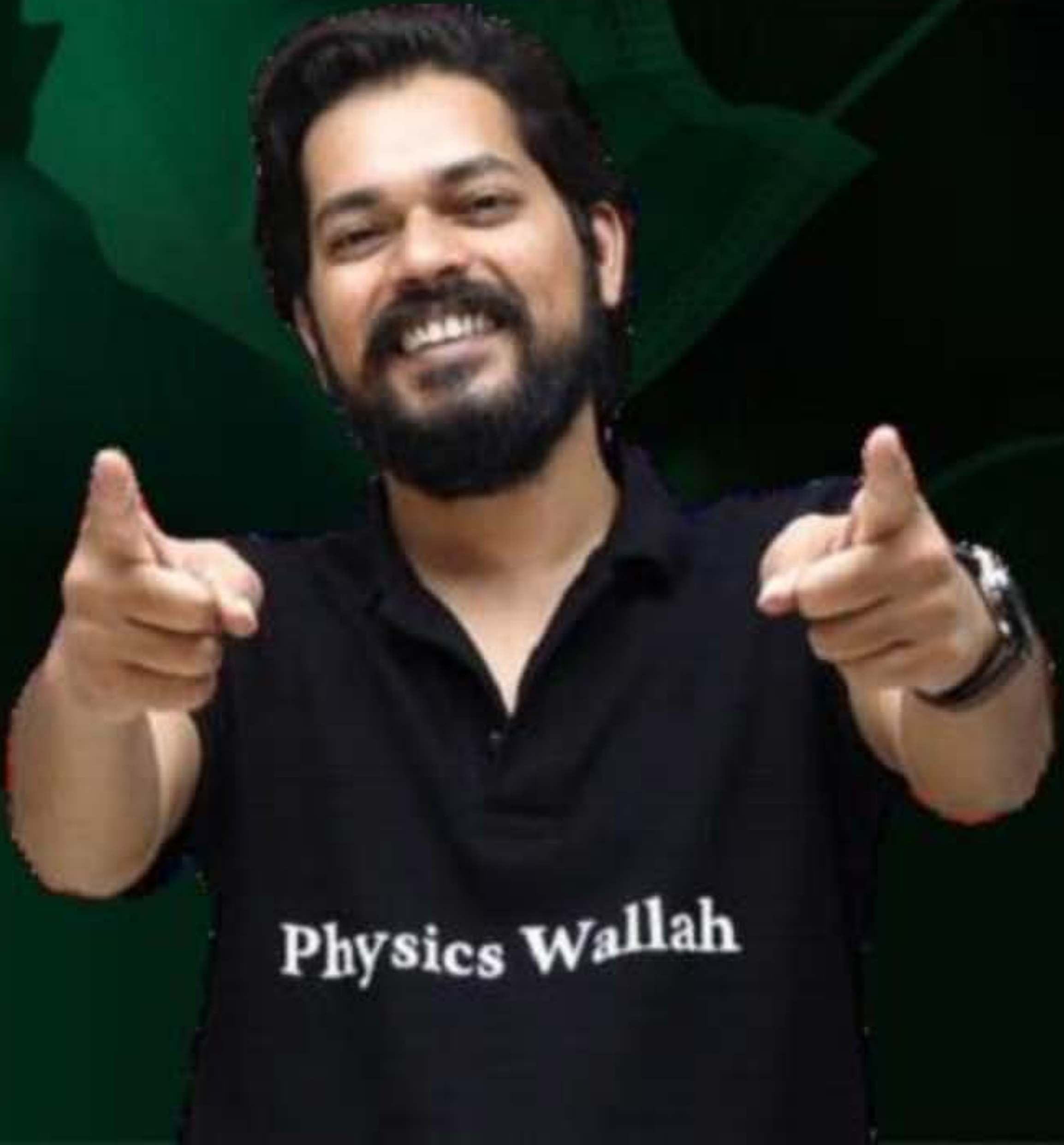
YAKEEN 2.0

FOR NEET 2025

Lecture- 03 | **Organic Chemistry**

Some Basic Principles and Techniques (GOC)

By- Pankaj Sir(POPU MAMA)


Physics Wallah

Topics *to be covered*

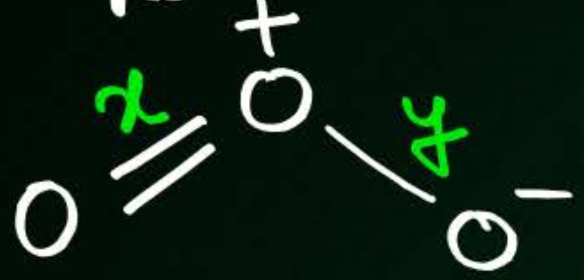
1. Resonance ✓
2. Stability of Resonating Structures ✓
3. Practice

Resonance

Basic

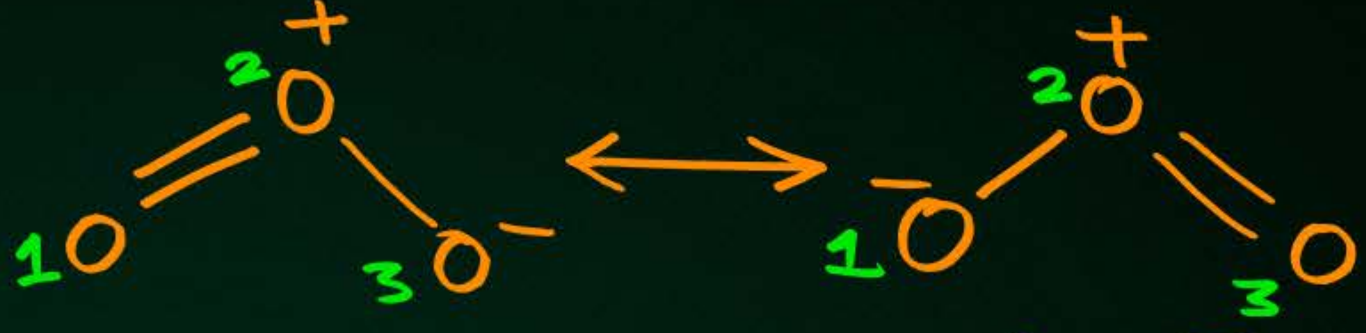
1. When a single Lewis structure cannot explain all the properties of a molecule then we need more than one such structures.
2. These structures are called Resonating structures (or canonical form).
3. R. S. are hypothetical.
4. Resonance hybrid is the real structure.

Lewis structure



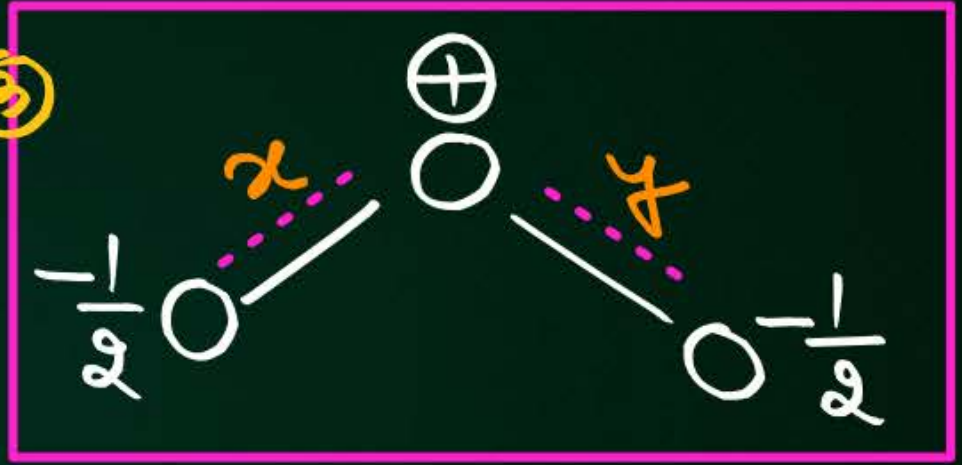
Bond length $\boxed{y > x}$

but experimentally $\boxed{x = y}$



Struc ① Struc ②

struc③


⊕
x
y
$-\frac{1}{2}$
$-\frac{1}{2}$

B·L $x = y$

① & ② are R·S hypo

③ is R·H real

Resonance

(movement of $\pi e^{\ominus}s$)

Definition: Delocalization of π electrons in conjugated system.

Parallel position of 'p' orbital

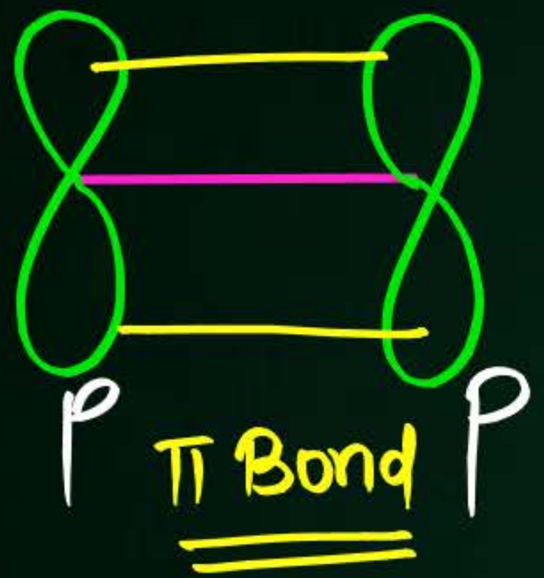
(p p p)

(2, 3, 4 ......)

✓ ✓ ✓

Types of Conjugation

① 2 p-orbitals

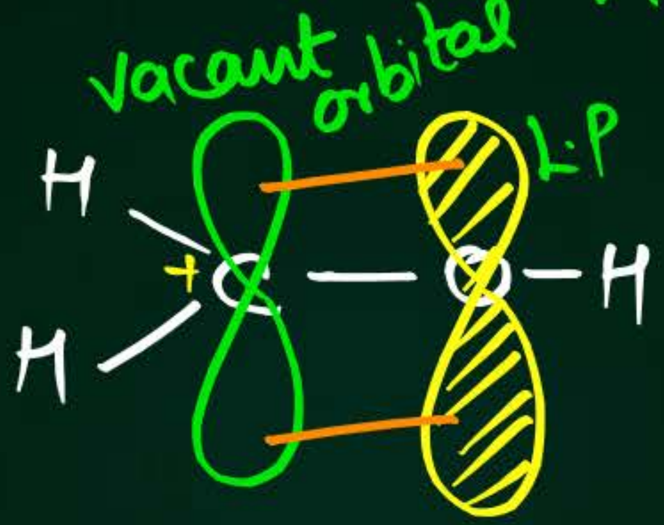


Back Bonding

$CH_2=\overset{+}{O}H \longleftrightarrow \overset{\oplus}{C}H_2-\overset{\times\times}{O}H$

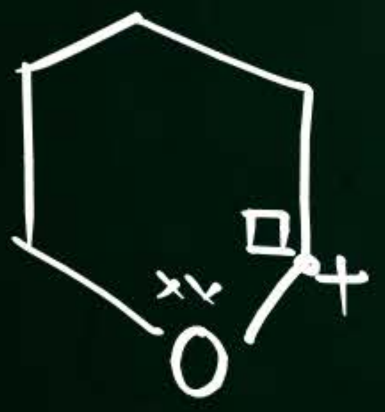
Q. Reso or conju present or not?

A. yes

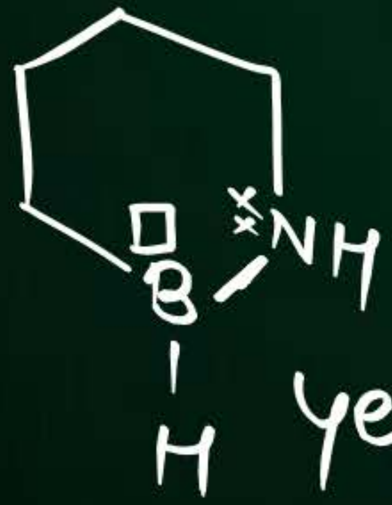

vacant orbital
L.P
H
H
+C
O
H

$H_2\overset{\square}{B}-\overset{\times\times}{O}H$ yes

$H_2\overset{\square}{B}-\overset{\times\times}{N}H_2$ yes



yes

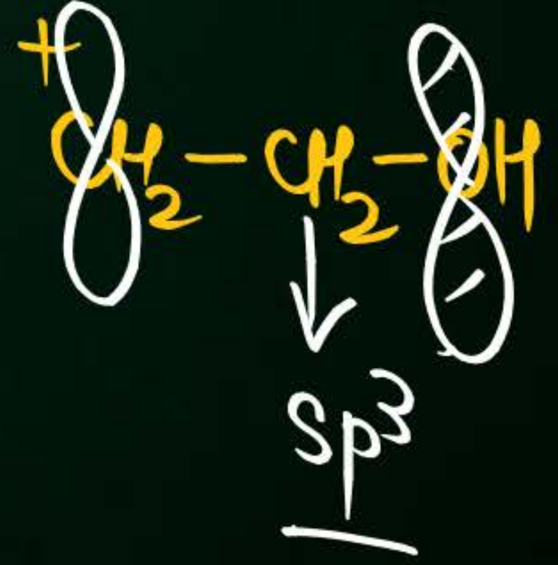


yes

$\overset{\oplus}{C}H_2-\overset{\times\times}{N}H_2$ yes

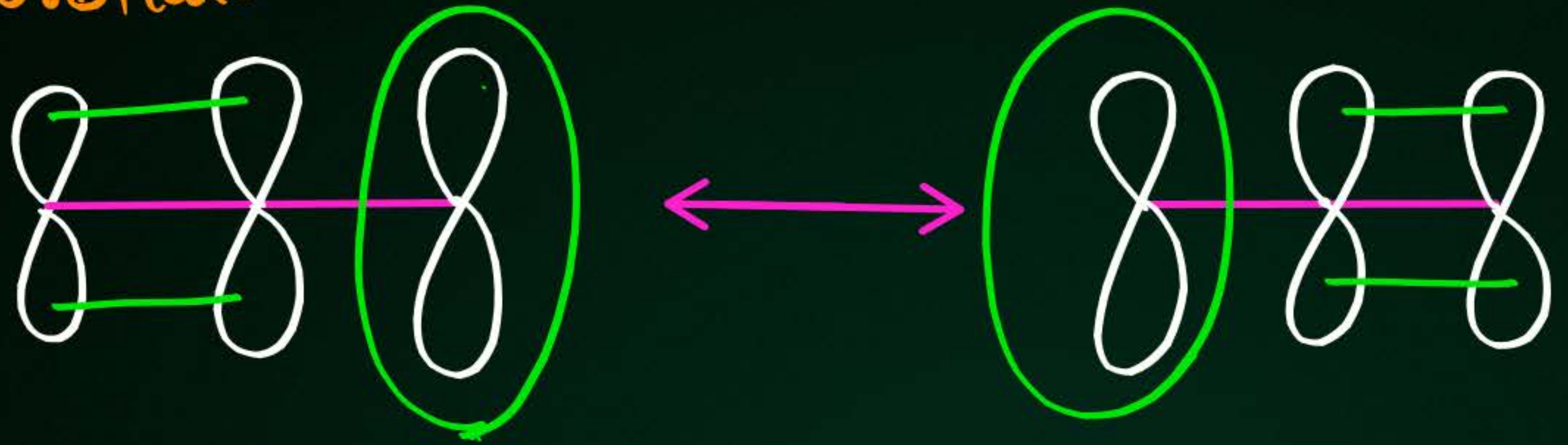
$\overset{\oplus}{C}H_2-\overset{\times\times}{F}$ yes

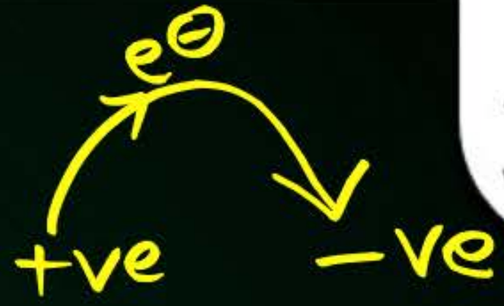
$\overset{+}{C}H_2-\overset{\times\times}{Cl}$ yes


+
CH2–CH2–OH
sp3

NO

(**) ③ 3 'p' orbitals

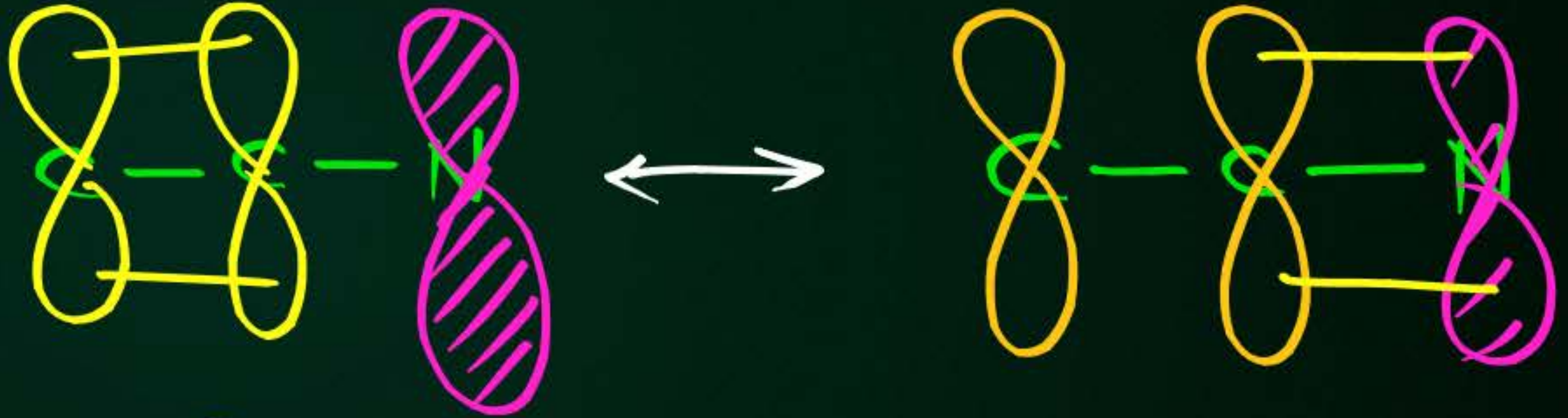


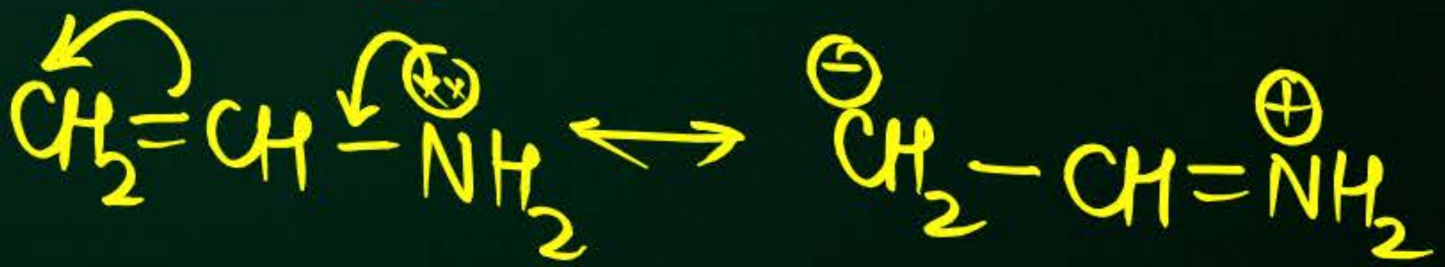


①

$\boxed{CH_2=CH}-\ddot{N}H_2$

$C=C-\ddot{N}$

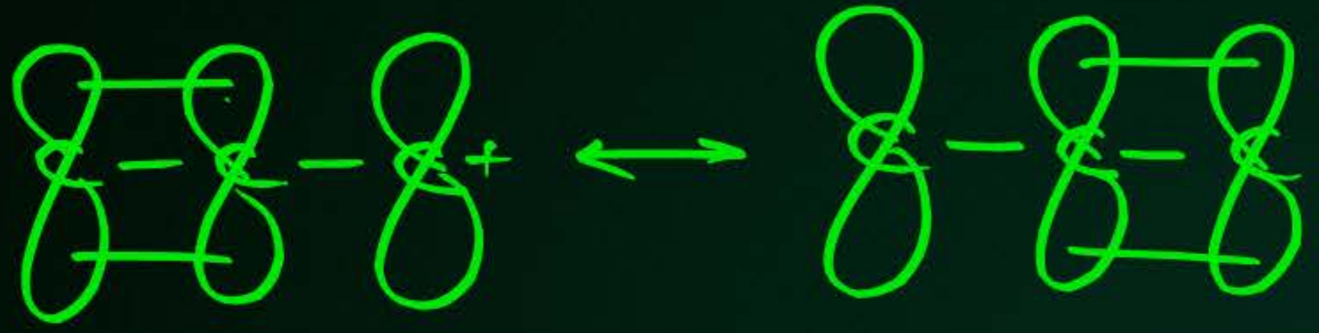




$CH_2=CH-\ddot{N}H_2 \longleftrightarrow \overset{\ominus}{C}H_2-CH=\overset{\oplus}{N}H_2$

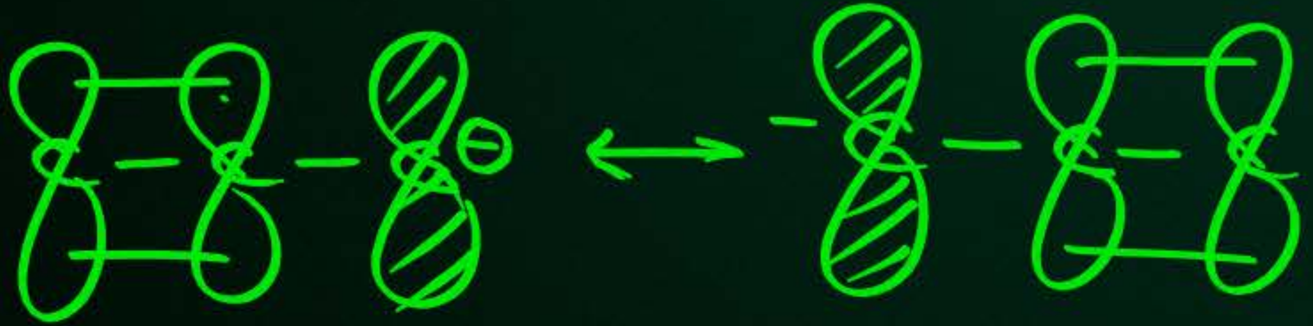
② $CH_2=CH-\overset{\oplus}{C}H_2 \longleftrightarrow \overset{+}{C}H_2-CH=CH_2$

$C=C-\overset{\oplus}{C}$



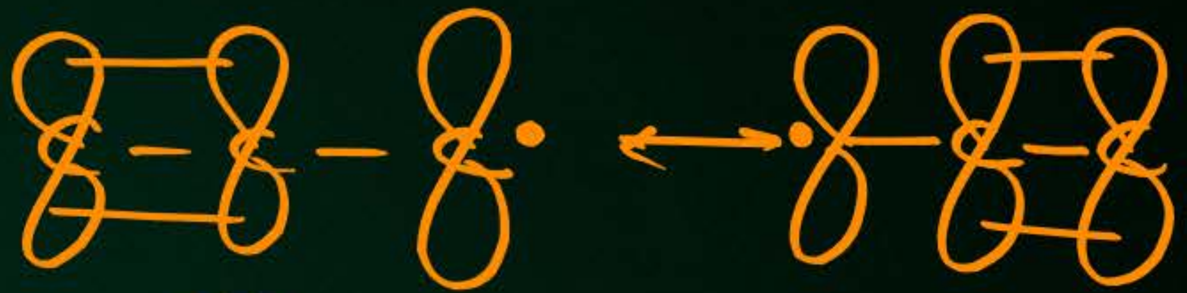
③ $CH_2=CH-\overset{\ominus}{\ddot{C}}H_2 \longleftrightarrow \overset{\ominus}{\ddot{C}}H_2-CH=CH_2$

$C=C-\overset{\ominus}{C}$



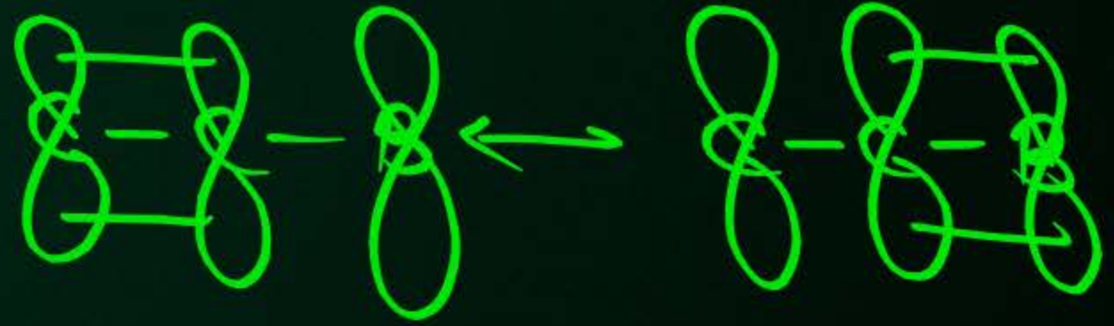
④ $CH_2=CH-\dot{C}H_2 \longleftrightarrow \dot{C}H_2-CH=CH_2$

$C=C-\dot{C}$



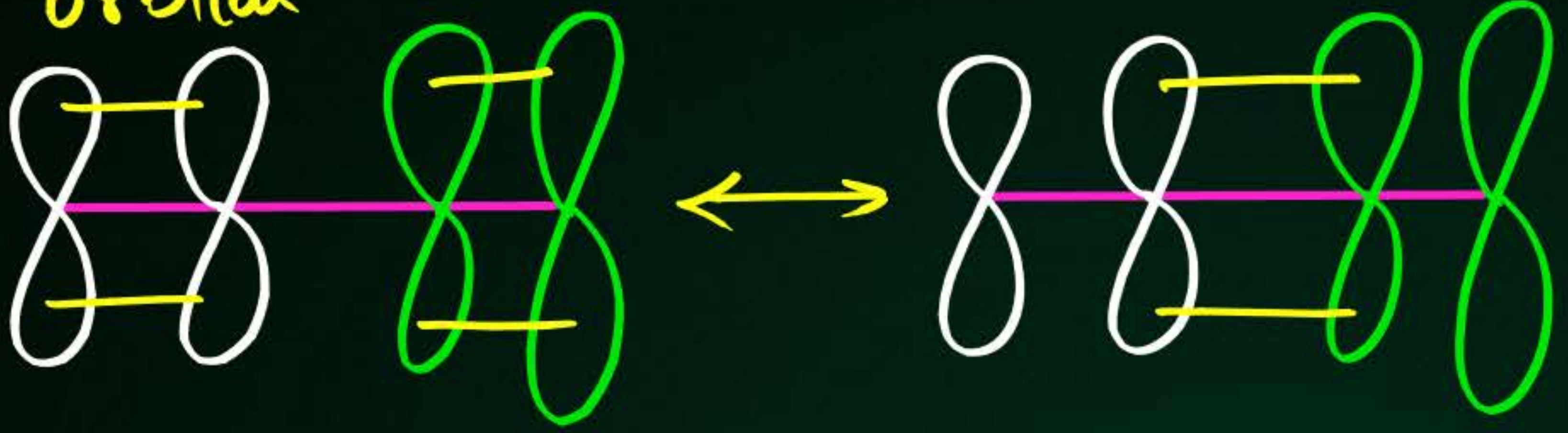
⑤ $CH_2=CH-BH_2 \longleftrightarrow \overset{\oplus}{C}H_2-CH=\overset{\ominus}{B}H_2$

$C=C-B$



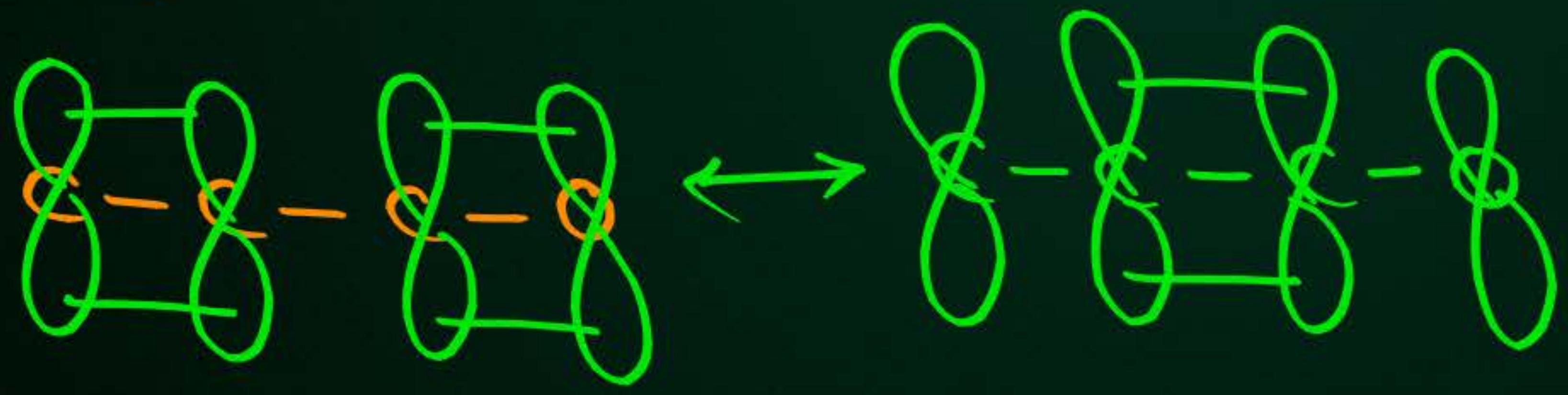
High $e^{\ominus}$ density → Low $e^{\ominus}$ density

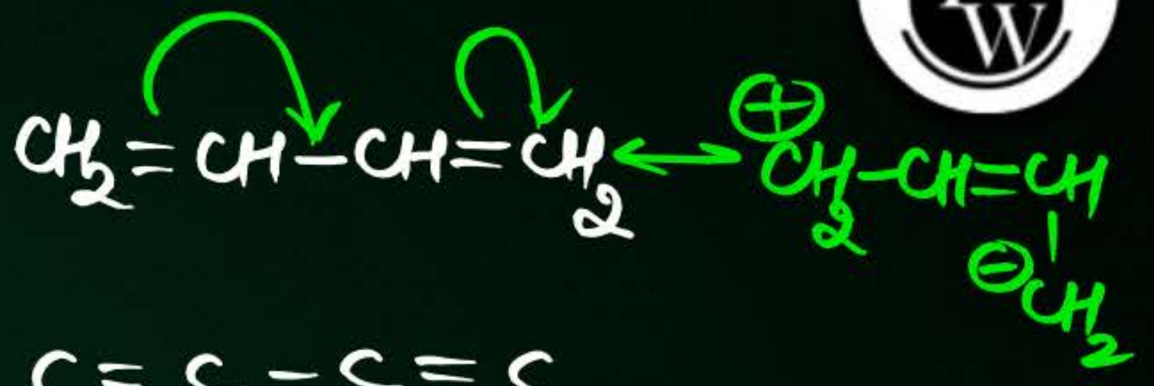
③ 4 'p' orbital



$CH_2=CH-CH=O \longleftrightarrow \overset{\oplus}{C}H_2-CH=CH-\overset{\ominus}{O}$

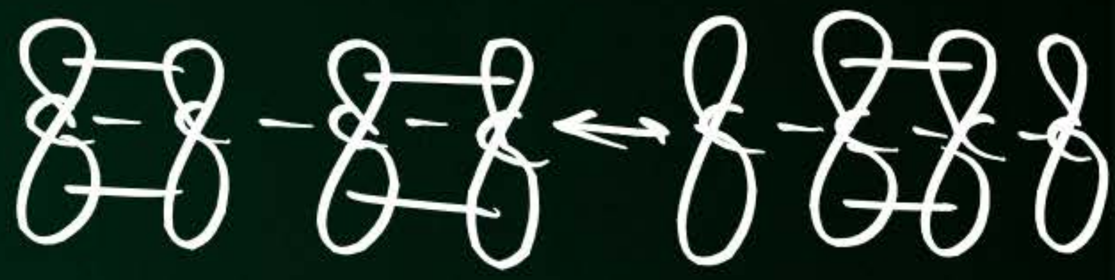
$C=C-C=O$





$CH_2=CH-CH=CH_2 \longleftrightarrow \overset{\oplus}{C}H_2-CH=CH-\overset{\ominus}{C}H_2$

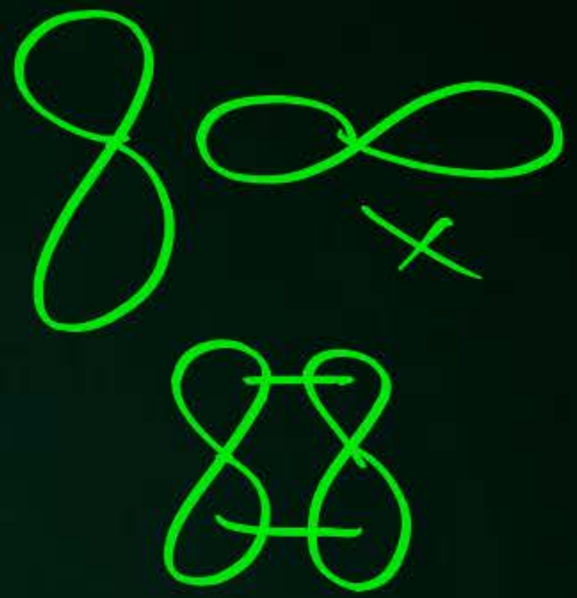
$C=C-C=C$



Condition for Resonance

1. Molecule should be planner. (p orbital $\pi\ \overset{\ominus}{e}s$)
2. Conjugated system.

PPP



d-orbital Resonance (Back bonding)

$\underbrace{p-d \text{ overlap}}$

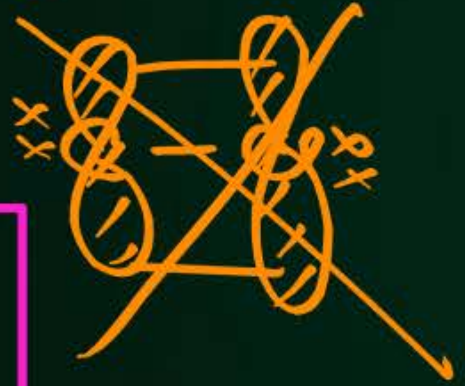
-ve charge density attached directly with atom containing d-orbital.

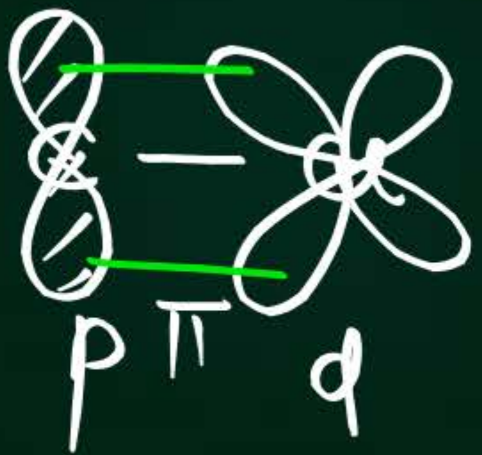
2d ✗
3d ✓
4d ✓
5d ✓

'd'

At NO	13 — 17

$\overset{\ominus}{\ddot{C}}H_2-Cl \longleftrightarrow CH_2=\overset{\ominus}{Cl}$





$\overset{\ominus}{\ddot{C}}H_2-\overset{\square}{S}H$

$\overset{\ominus}{\ddot{C}}H_2-\overset{\oplus}{\underset{\square}{P}}H_3$

OP Points

1. Hypothetical concept ✓
2. Intramolecular process ✓
3. RS are imaginary concept. ✓
4. RH is real. ✓
5. Atom cannot move in resonance. ✓ (only $\pi\ e^{\ominus}$ movement)
6. Total number of paired unpaired electrons remain same.
7. Total number of electrons remain same.
8. Any structure violating the fundamental rule is not accepted as RS.

$$\underset{0\ upe^{\ominus}}{CH_2=CH_2} \not\leftrightarrow \underset{2\ upes^{\ominus}}{\dot{C}H_2-\dot{C}H_2}$$

'N' ke 5 Bond OMG PHK DKHK

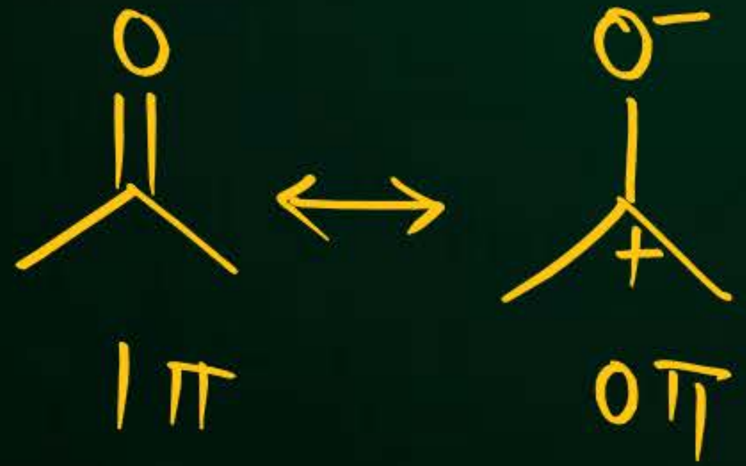
Compare Stability in Pankaj sir's style

1. Neutral R.S > Charged R.S ✓ (octet rule)

$$\underset{①}{CH_2=CH-Cl} \longleftrightarrow \underset{②}{\overset{\ominus}{C}H_2-CH=\overset{\oplus}{Cl}}$$

stability ① > ②

2. Stability of R.S α no. of π bonds



① > ②

Compare Stability in Pankaj sir's style

priority $\ominus$ve > $\oplus$ve

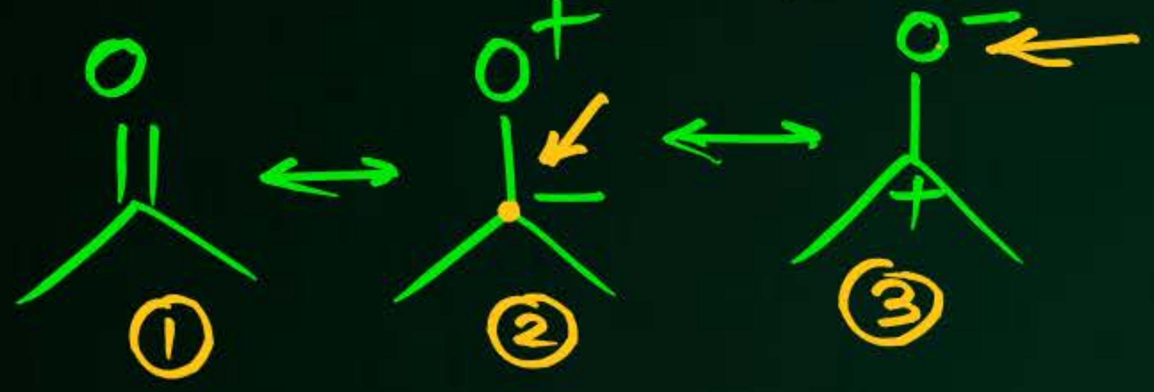
3. Stability of R.S α Stability of Charge

$\oplus$ $C^+ > N^+ > O^+ > F^+$

$\ominus$ stability of -ve charge

L to R $C^{\ominus} < N^{\ominus} < O^{\ominus} < F^{\ominus}$ (e.n)

T to B $F^{\ominus} < Cl^{\ominus} < Br^{\ominus} < I^{\ominus}$ (size)



① > ③ > ②

Compare Stability in Pankaj sir's style

4. Charge separating R.S are less stable.

⊕ & ⊖ door door toh Kam stable

$CH_2=CH-CH=O$

$CH_2=CH-\overset{+}{C}H-\overset{-}{O}$

1π paas paas

$\overset{+}{C}H_2-CH=CH-\overset{-}{O}$

1π
door door

① > ② > ③

Compare Stability in Pankaj sir's style

5. Like charges on adjacent position are least stable.

$+ \; +$ paas toh kam stable

$- \; -$ paas

$\ddot{} \; -$

①

$CH_2=CH-CH=CH-NH_2$

②

$CH_2=CH-\overset{\downarrow}{\overset{-}{C}}H-\overset{\downarrow}{\overset{+}{C}}H-NH_2$

1π

③

$CH_2=CH-\overset{\downarrow}{\overset{+}{C}}H-\overset{\downarrow}{\overset{-}{C}}H \leftrightarrow -\ddot{N}H_2$

1π

① > ② > ③

QUESTION

Energy

$RH < RS$

Which of the following statement is incorrect?

[✓ **A**] Resonating structures are real & have real existence.

(Same sakal ke)

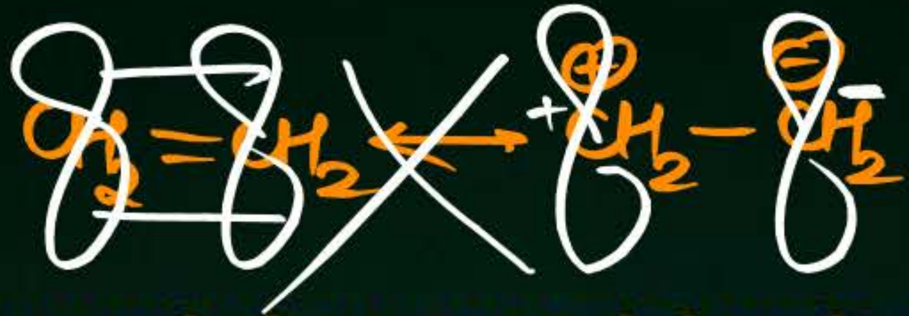
B Equivalent contributing structures make resonance hybrid very stable.

$CH_2=CH-\overset{\oplus}{C}H_2 \longleftrightarrow \overset{\oplus}{C}H_2-CH=CH_2$

C Contributing structures are hypothetical having no real existence.

D Contributing structures are less stable than the resonance hybrid.

QUESTION


$CH_2=CH_2 \leftrightarrow \overset{+}{C}H_2-\overset{-}{C}H_2$

2P Reso

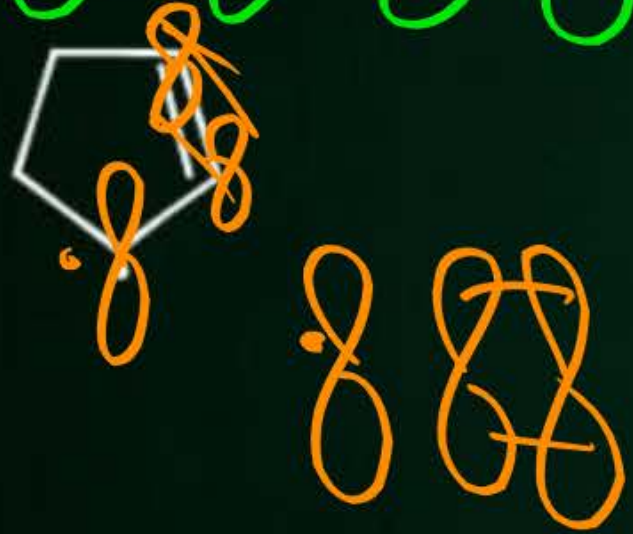
Back bonding

Which of the following compounds have not delocalized electrons?

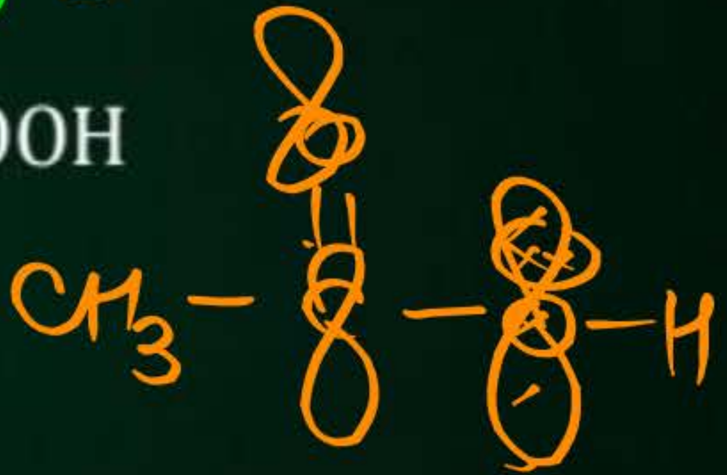
(A) $CH_2=CH-C\equiv CH$

(B) $CH_2=C=CH_2$

(C)



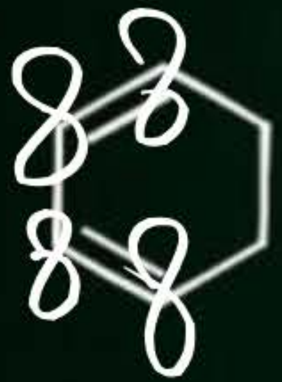
(D) CH_3-COOH



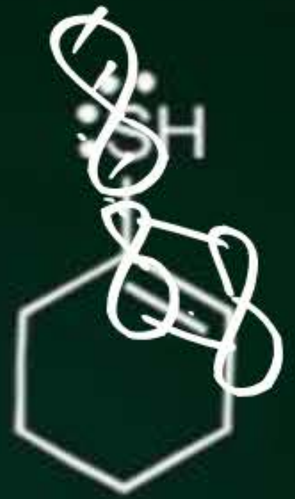
QUESTION

Which of the following species have conjugated system?

(A)



(B)

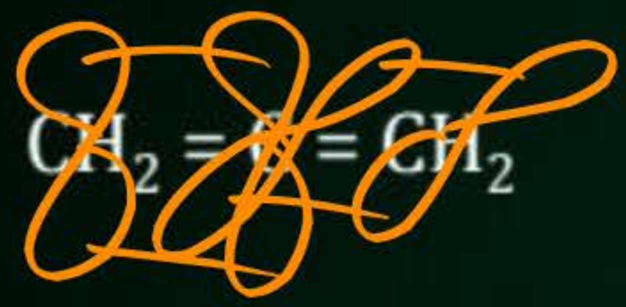


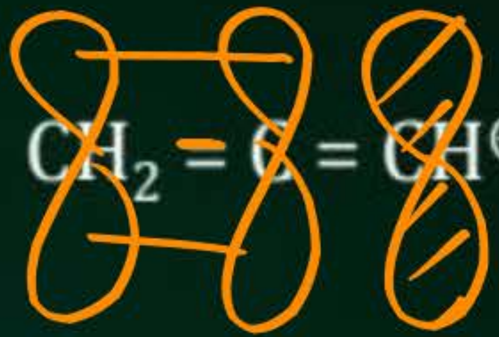
(C) $CH_2=C=CH-NH_2$

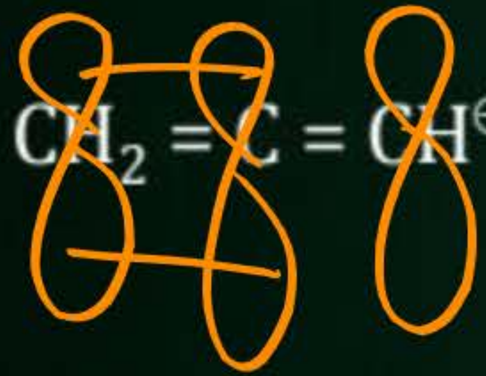
[✓ (D)] All of these

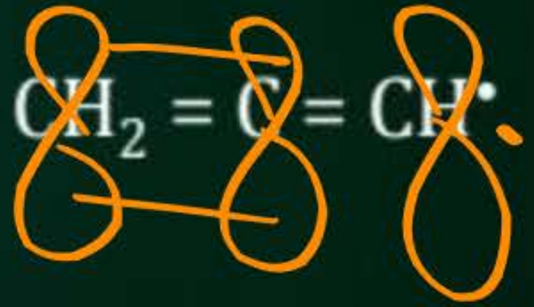
QUESTION

In which of the following resonance is not possible?

[✓ (A)] 
$CH_2=C=CH_2$

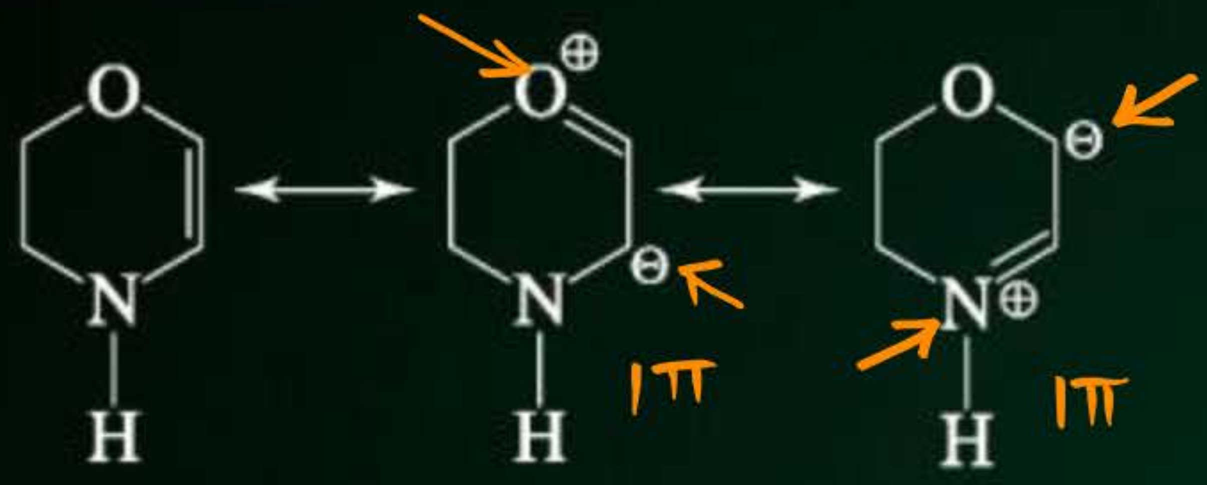
(B) 
$CH_2=C=CH^{\ominus}$

(C) 
$CH_2=C=CH^{\oplus}$

(D) 
$CH_2=C=CH^{\bullet}$

QUESTION

I > III > II



(I) (II) (III)

$\overset{+}{C} > \underline{\overset{+}{N}} > \overset{+}{O} > \overset{+}{F}$

The least stable canonical structure among these is:

A I

[✓ B] II

C III

D all are equally stable

QUESTION

more stable → more Contributing

(I) $CH_3{-}O{-}CH{=}CH{-}CH{=}CH_2$

(II) $CH_3{-}O{-}\overset{\oplus}{C}H{-}CH{=}CH{-}\overset{\oplus}{C}H_2$

1π

(III) $CH_3{-}\overset{\oplus}{O}{=}CH{-}CH{=}CH_2{-}\overset{\oplus}{C}H_2$

2π

among these three canonical structures (through more are possible) what would be their relative contribution in the hybrid:

A I > II > III

B III > II > I

[✓ C] I > III > II

D III > I > II

QUESTION

The most stable resonating structure is:

A $H_2N-\overset{\oplus}{C}H-CH=CH-OCH_3$ 1π

[✓ B] $H_2\overset{\oplus}{N}=CH-CH=CH-OCH_3$ 2π

C $H_2N-CH=CH-CH=\overset{\oplus}{O}CH_3$ 2π

D $H_2\overset{\oplus}{N}=CH-\overset{\oplus}{C}H=\overset{\oplus}{O}CH_3$ 2π

QUESTION

The correct stability order of the following resonance structures is:

$H_2C=\overset{+}{N}=\overset{-}{N}$

(I)

2π

$H_2\overset{+}{C}-N=\overset{-}{N}$

(II)

1π

$H_2\overset{-}{C}-\overset{+}{N}\equiv N$

(III)

2π

$H_2\overset{-}{C}-N=\overset{+}{N}$

(IV)

1π

A (I) > (II) > (IV) > (III)

[✓ **B**] (I) > (III) > (II) > (IV)

C (II) > (I) > (III) > (IV)

D (III) > (I) > (IV) > (II)

QUESTION

Which of the following resonating structure is most stable?

(A) $CH_3-\underset{\cdot\cdot}{\ddot{O}}-CH=CH-\overset{\oplus}{C}H_2$ 1π

(B) $CH_3-\underset{\cdot\cdot}{\ddot{O}}-\overset{\oplus}{C}H_2-CH=CH_2$ 1π

(C) $CH_3-\underset{\cdot\cdot}{\ddot{O}}-\overset{\oplus}{C}H_2-\overset{\ominus}{C}H-\overset{\oplus}{C}H_2$

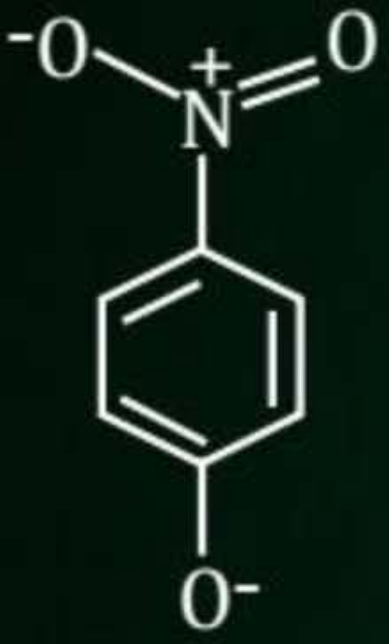
0π

[✓ (D)] $CH_3-\overset{\oplus}{O}=CH-CH=CH_2$

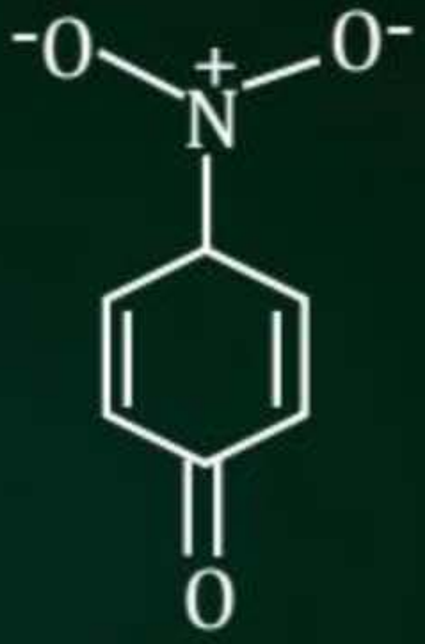
2π

QUESTION The most unlikely representation of resonance structures of p-nitrophenoxide ion is:

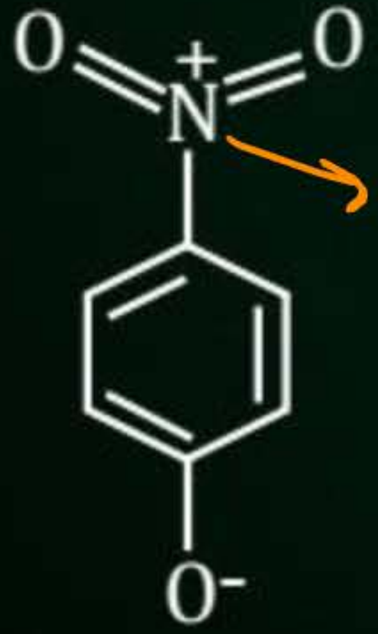
Ⓐ



Ⓑ

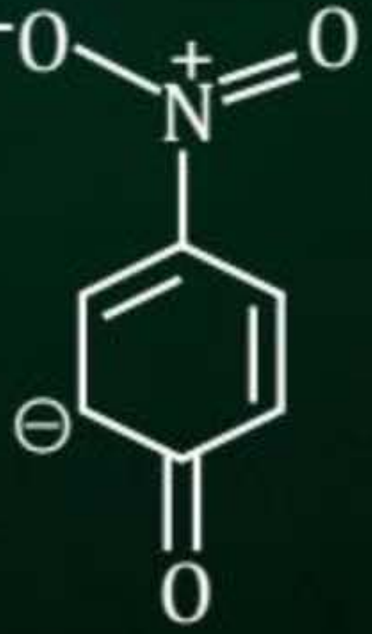


✓ Ⓒ



5 Bond
OMG
PMK
DKHK

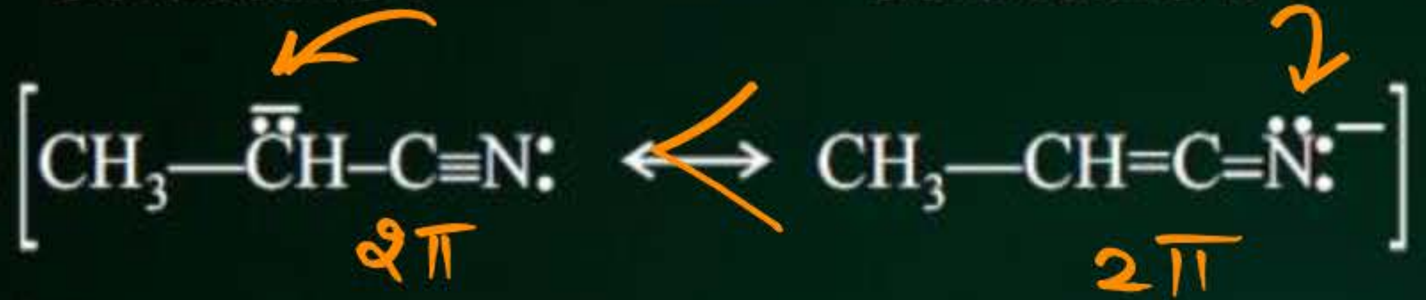
Ⓓ



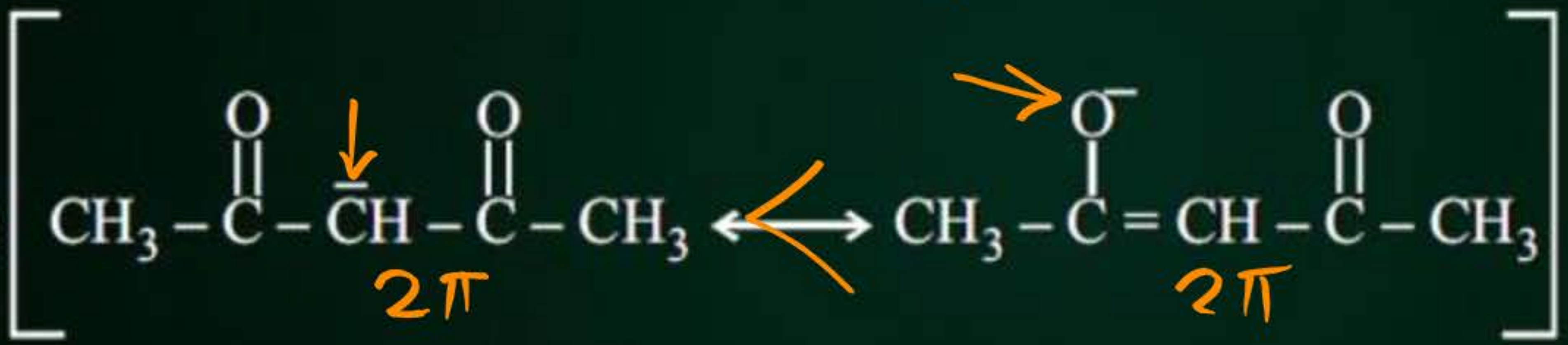
QUESTION

In each of the following pairs of resonating structures which resonating structure is more stable?

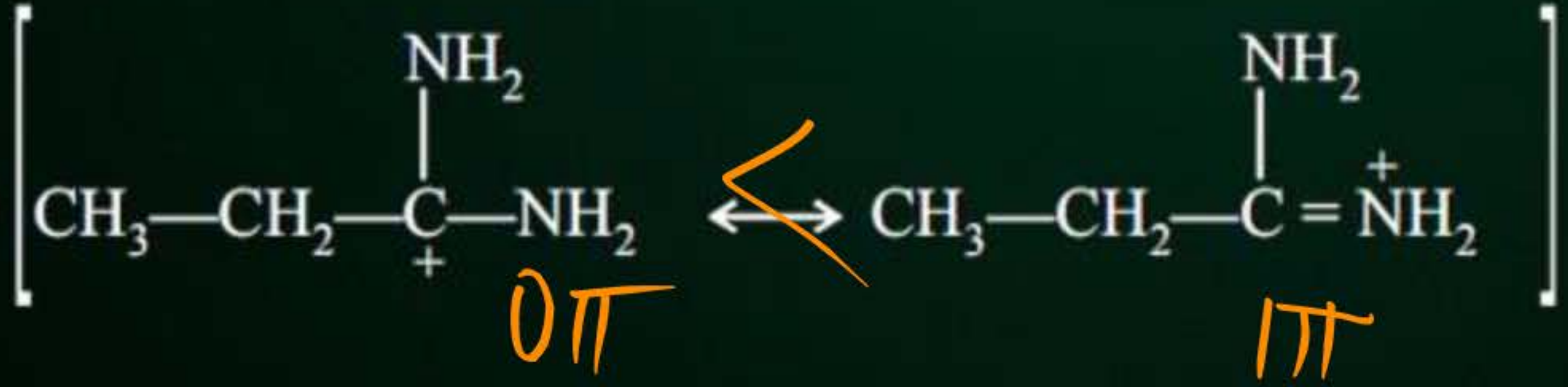
Structure I **Structure II**

(a) 

$$\left[CH_3-\underset{2\pi}{\ddot{\bar{C}}H}-C\equiv N: \longleftrightarrow CH_3-\underset{2\pi}{CH=C}=\ddot{N}:^-\right]$$

(b) 

$$\left[CH_3-\overset{O}{\overset{\|}{C}}-\underset{2\pi}{\bar{C}H}-\overset{O}{\overset{\|}{C}}-CH_3 \longleftrightarrow CH_3-\overset{O^-}{\overset{|}{C}}=\underset{2\pi}{CH}-\overset{O}{\overset{\|}{C}}-CH_3\right]$$

(c) 

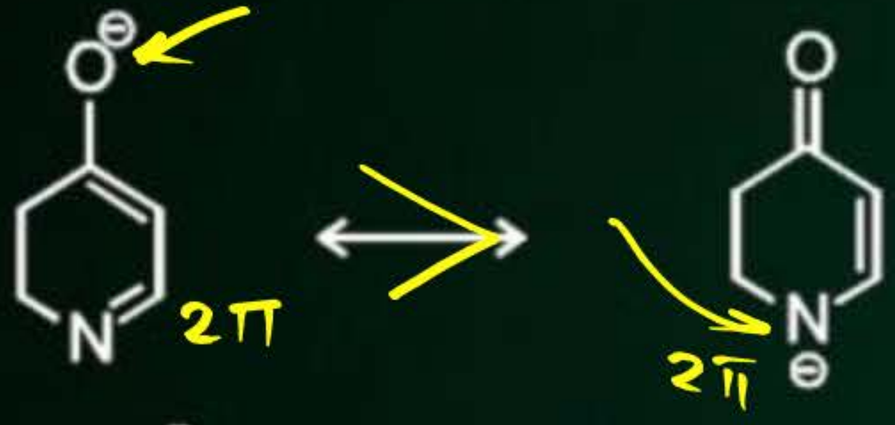
$$\left[CH_3-CH_2-\underset{0\pi}{\underset{+}{\overset{NH_2}{\overset{|}{C}}}}-NH_2 \longleftrightarrow CH_3-CH_2-\underset{1\pi}{\overset{NH_2}{\overset{|}{C}}=\overset{+}{N}H_2}\right]$$

QUESTION

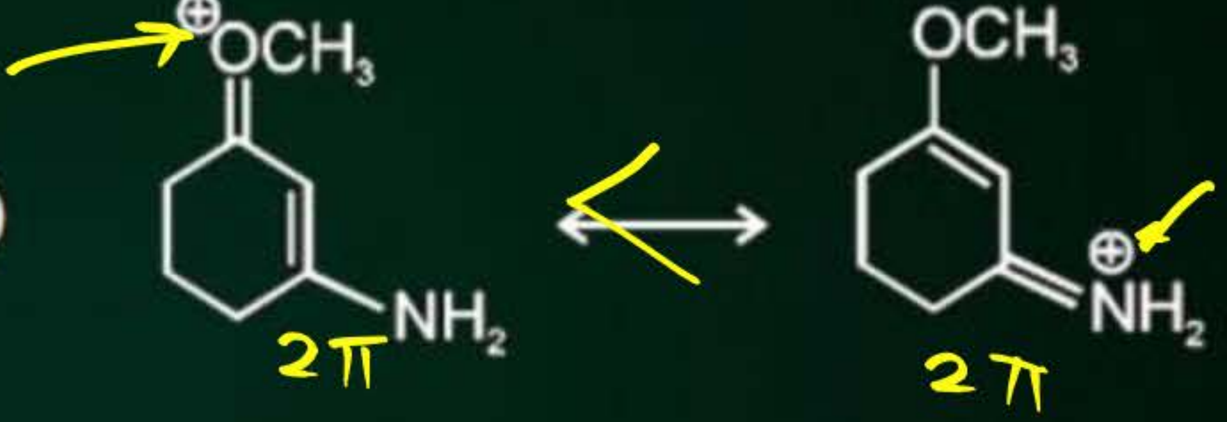
Write the stability order of following resonating structures:

I II I II

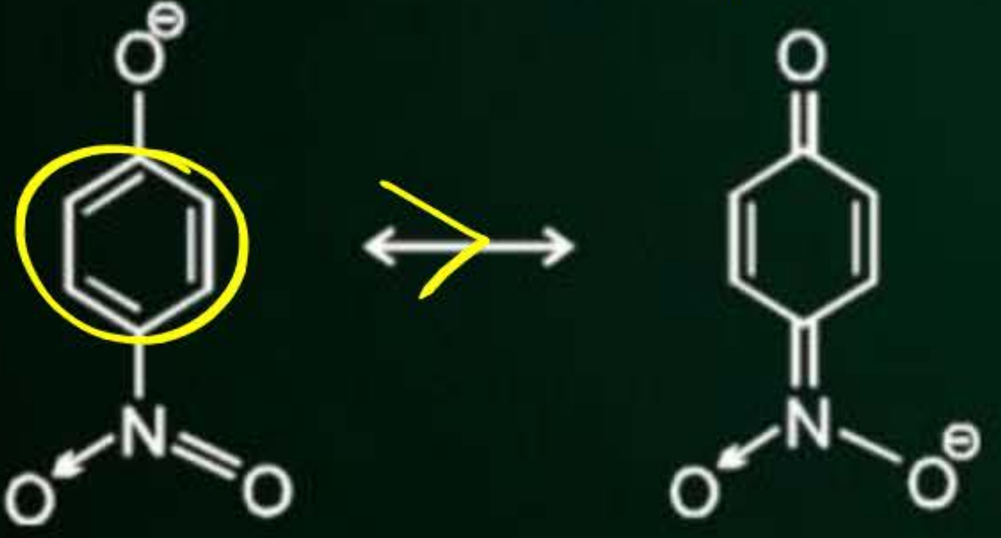
(P)



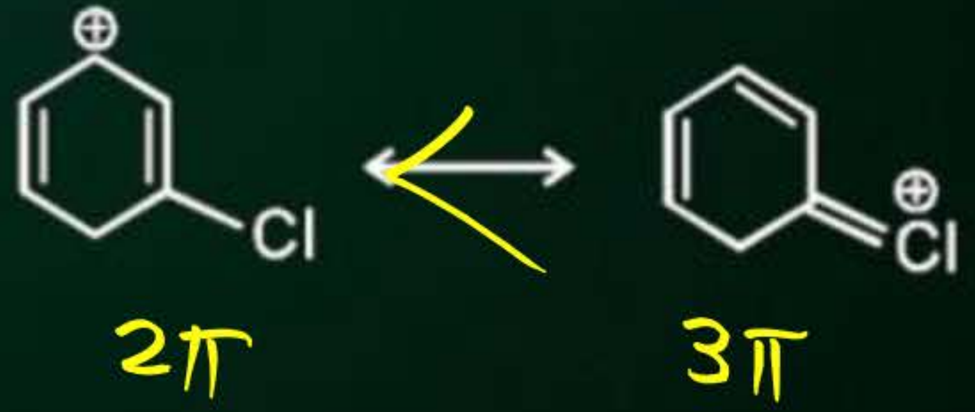
(Q)



(R)



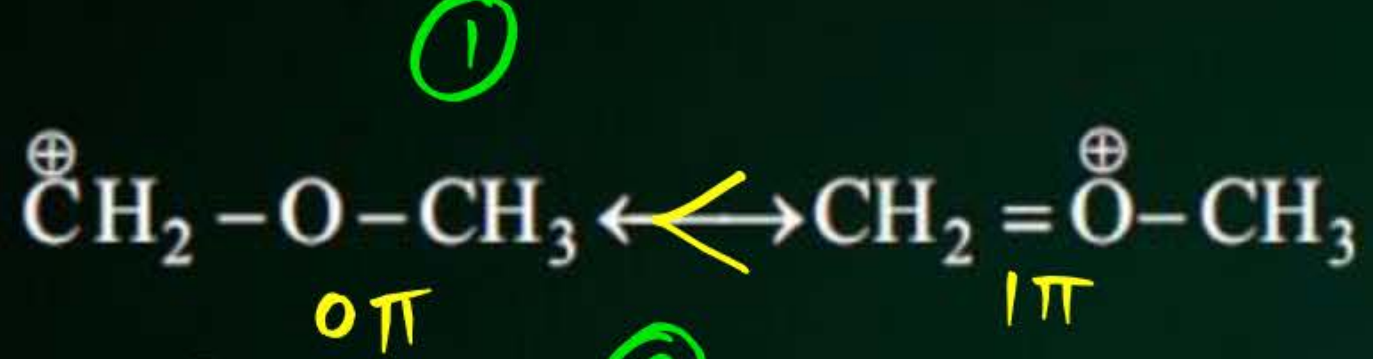
(S)



QUESTION

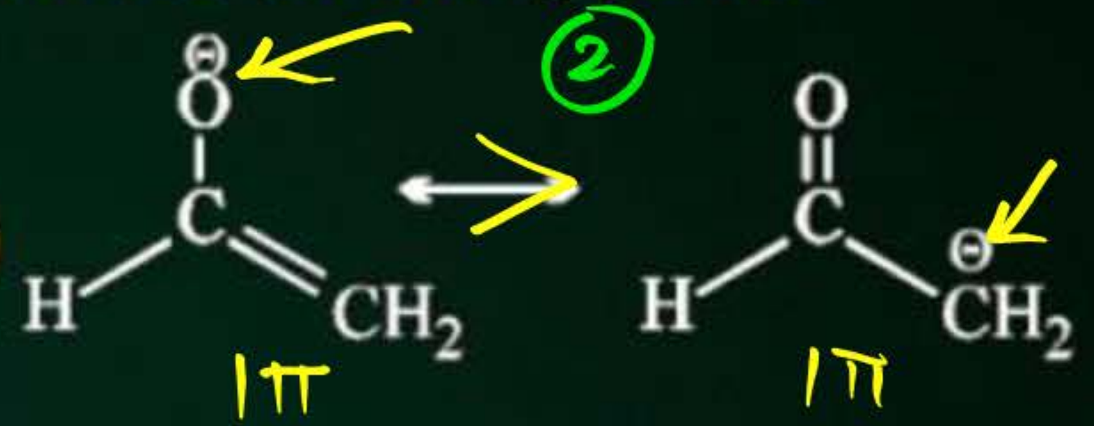
Identify less stable canonical structure in each of the following pairs:

(a)

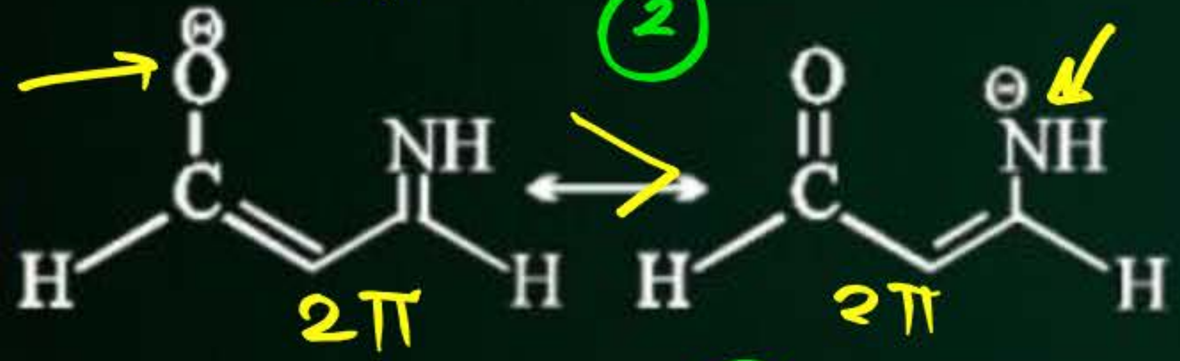


$\overset{\oplus}{C}H_2-O-CH_3 \longleftrightarrow CH_2=\overset{\oplus}{\ddot{O}}-CH_3$

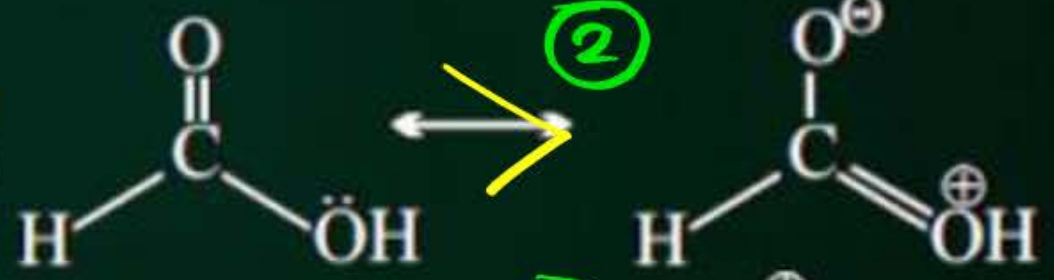
(b)



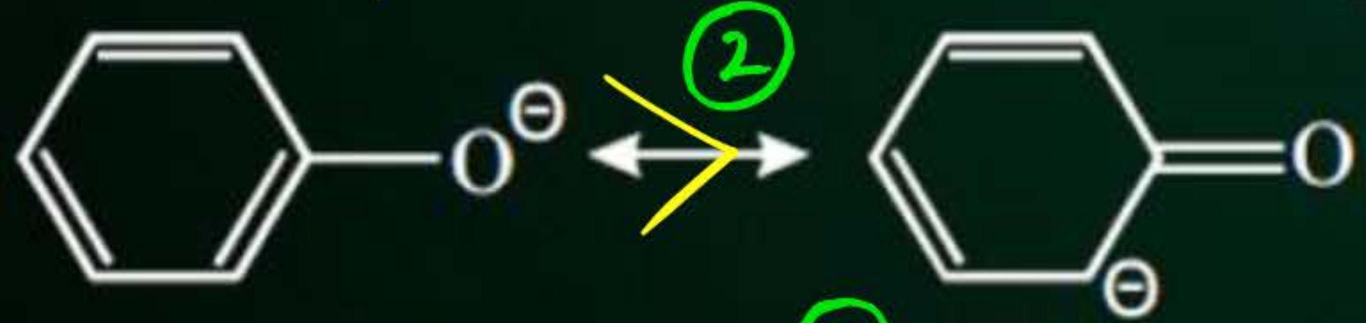
(c)



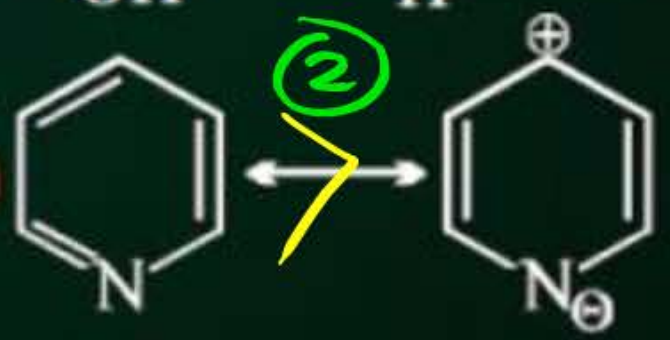
(d)



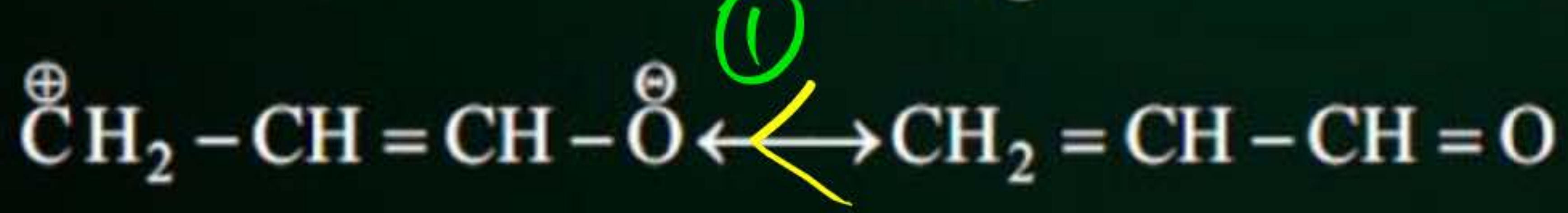
(e)



(f)



(g)



$\overset{\oplus}{C}H_2-CH=CH-\overset{\ominus}{\ddot{O}} \longleftrightarrow CH_2=CH-CH=O$

QUESTION

I > IV> III> II

The correct stability order of the following resonating structures is:

$CH_2=C=O$ (I)

$H_2\overset{-}{C}-\overset{+}{C}=O$ (II) 1π

$H_2C=\overset{+}{C}-\overset{-}{O}$ (III) 1π

$H_2\overset{-}{C}-C\equiv\overset{+}{O}$ (IV) 2π

(A) (IV)> (I)> (III) > (II)

(B) (II) > (IV) > (I)> (III)

(C) (III) > (II) > (IV) > (I)

[✓ (D) (I) > (IV) > (III) > (II)]

QUESTION

In which of the following first resonating structure is more stable than the second?

(A) $\overset{\ominus}{C}H_2-CH=O \overset{<}{\longleftrightarrow} CH_2=CH-O^{\ominus}$

1π 1π

(B) $\overset{\oplus}{C}H_2-O-CH_3 \overset{<}{\longleftrightarrow} CH_2=\overset{\oplus}{O}-CH_3$

0π 1π

✓ (C) $CH_2=CH-NH_2 \overset{>}{\longleftrightarrow} \overset{\ominus}{C}H_2-CH=\overset{\oplus}{N}H_2$

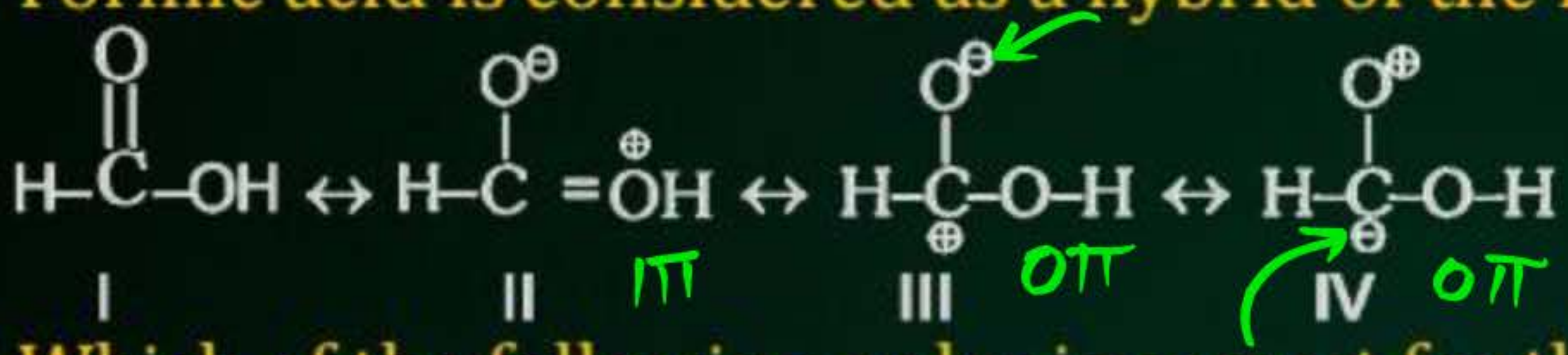
(D) $\overset{\oplus}{O}-CH=CH_2 \overset{<}{\longleftrightarrow} O=CH-\overset{\oplus}{C}H_2$

1π 1π

QUESTION

I > II > III > IV

Formic acid is considered as a hybrid of the four structures.



$$H-\overset{\overset{O}{\|}}{C}-OH \leftrightarrow H-\overset{\overset{O^{\ominus}}{|}}{C}=\overset{\oplus}{O}H \leftrightarrow H-\underset{\oplus}{\overset{\overset{O^{\ominus}}{|}}{C}}-O-H \leftrightarrow H-\underset{\ominus}{\overset{\overset{O^{\oplus}}{|}}{C}}-O-H$$

Which of the following order is correct for the stability of four contributing structures?

Ⓐ [✓ I > II > III > IV]

Ⓑ I > II > IV > III

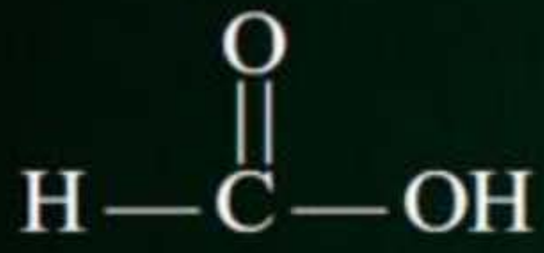
Ⓒ I > III > II > IV

Ⓓ I > IV > III > II

QUESTION

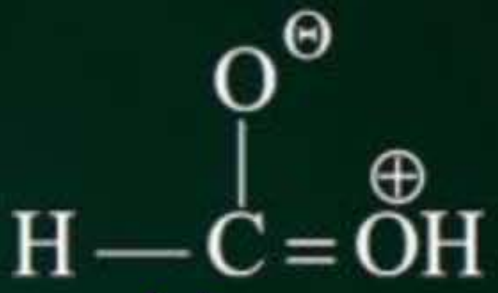
Which of the following resonating structures are least contributing structures of hybrid?

A



$H-\overset{\overset{O}{\|}}{C}-OH$

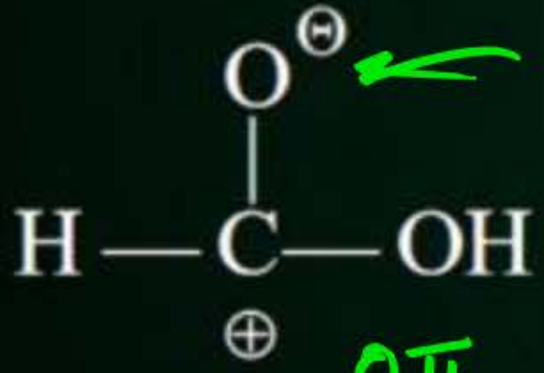
B



$H-\overset{\overset{O^{\ominus}}{|}}{C}=\overset{\oplus}{O}H$

1π

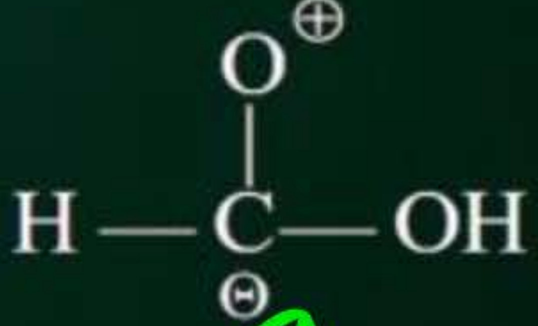
C



$H-\underset{\oplus}{\overset{\overset{O^{\ominus}}{|}}{C}}-OH$

0π

✓ **D**



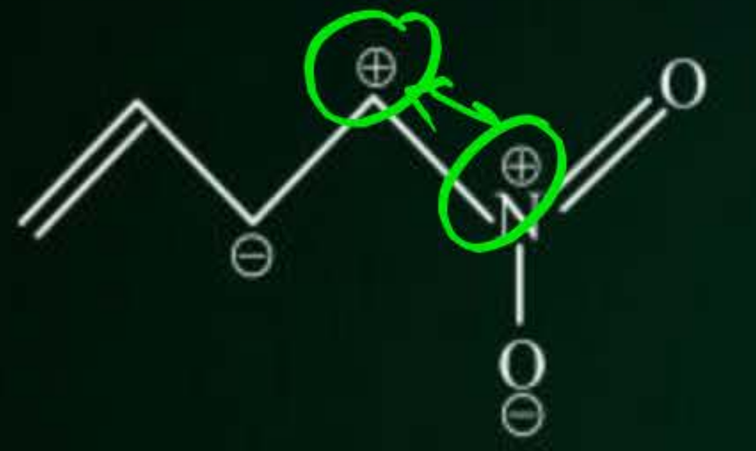
$H-\underset{\ominus}{\overset{\overset{O^{\oplus}}{|}}{C}}-OH$

0π

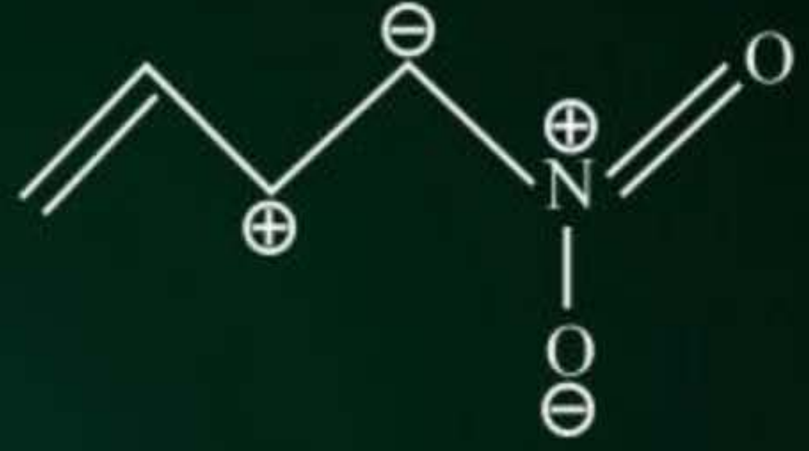
QUESTION

Among the following, the least stable resonance structure is:

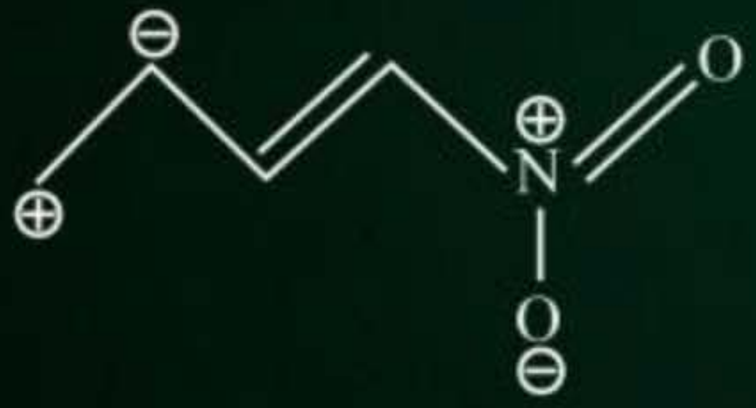
(A) ✓



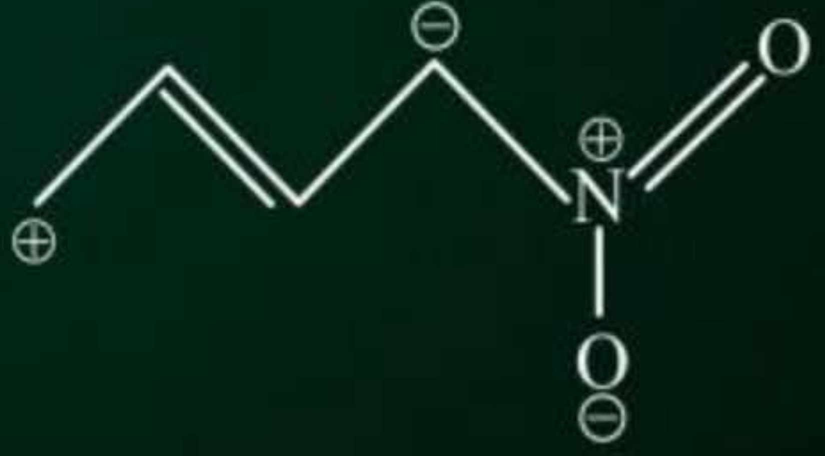
(B)



(C)



(D)



QUESTION

Which of the following is least stable?

A $CH_3-\overset{\oplus}{O}=CH-\underset{\ominus}{C}H-HC=CH_2$ 2π

B $CH_3-\overset{\oplus}{O}=CH-CH=HC-\overset{\ominus}{C}H_2$ 2π

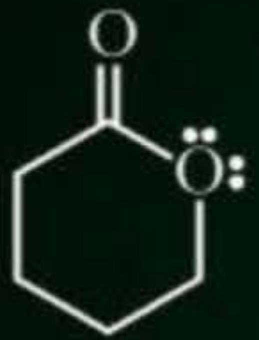
C $CH_3-\ddot{O}-\overset{\oplus}{C}H-\overset{\ominus}{C}H-HC=CH_2$ 1π

D ✓ $CH_3-\ddot{O}-CH=CH-H\overset{\oplus}{C}-\overset{\ominus}{C}H_2$ 1π

QUESTION

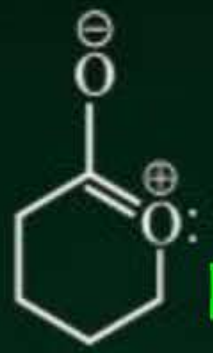
Stability order of the following resonating structure will be

(i)



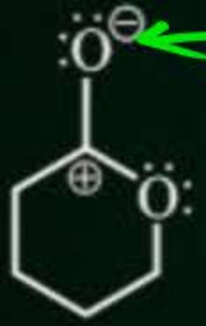
i > ii > iii > iv ✓

(ii)



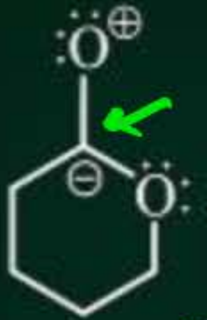
1π

(iii)



0π

(iv)



0π

[✓ A] i > ii > iii > iv

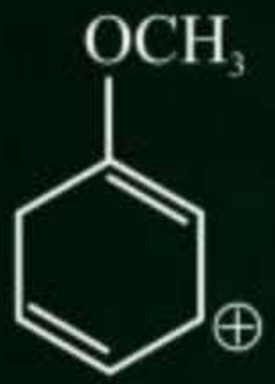
B ii > i > iii > iv

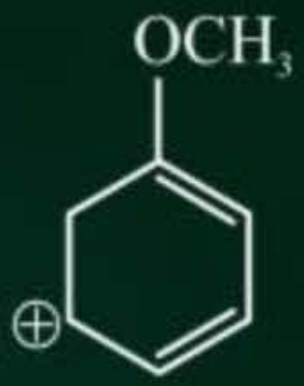
C iii > ii > i > iv

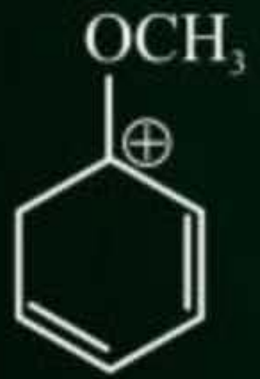
D i > iii > ii > iv

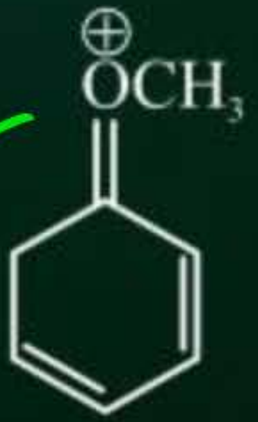
QUESTION

Which of the following resonance structure contributes the most to the resonance hybrid?

A

2π

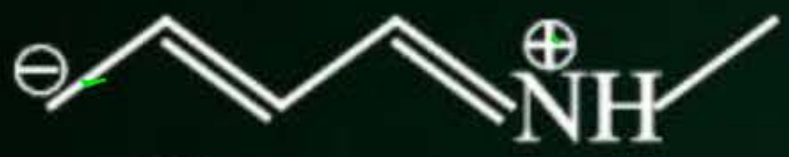
B

2π

C

2π

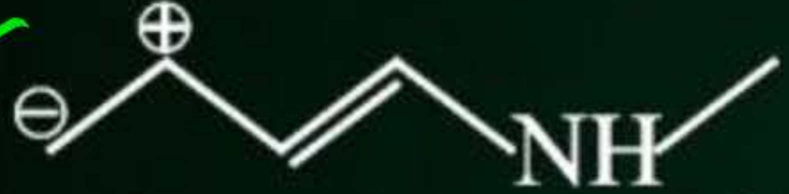
[✓ D]

3π

QUESTION

which of the following structure is least stable?

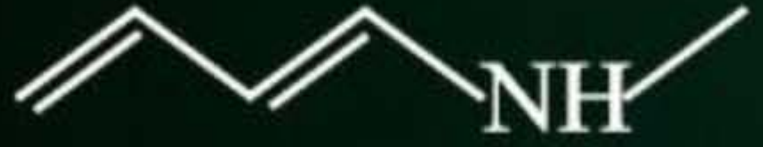
A


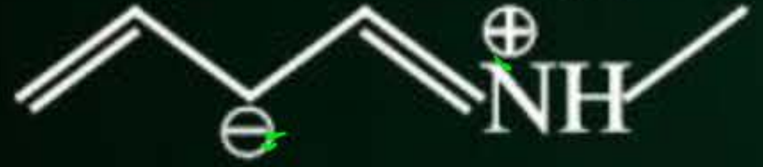
2π

B


1π

C > D > A > B

C


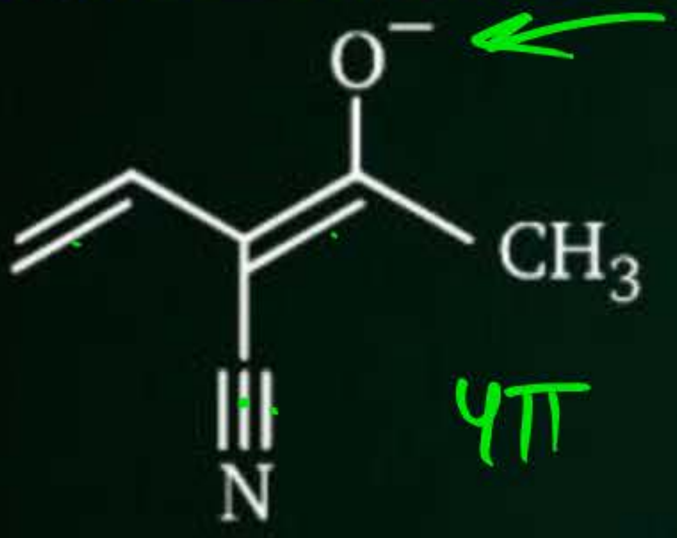
D


2π

QUESTION

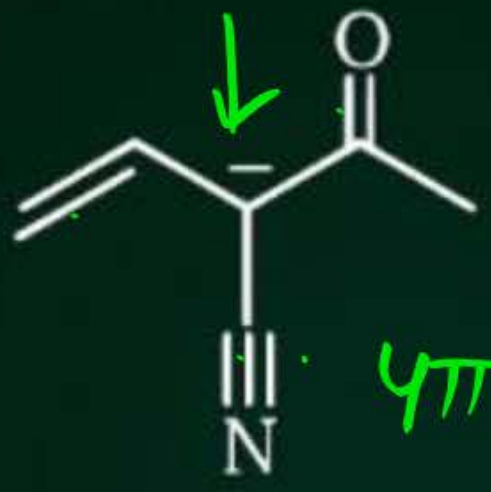
Compare relative stability of the following resonating structure.

(p)



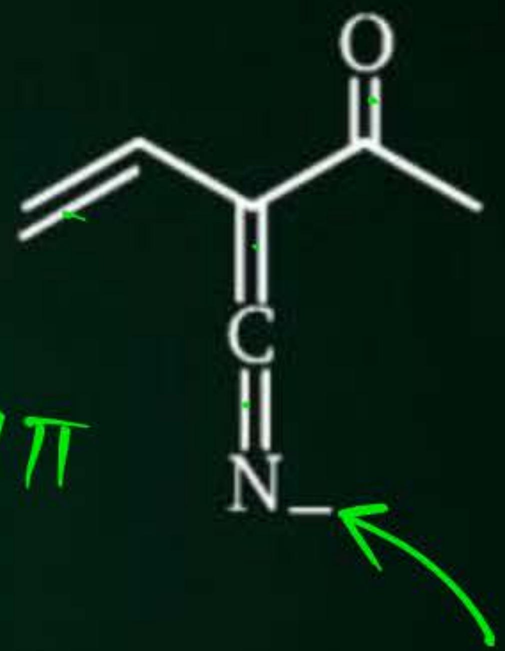
4π

(q)



4π

(r)



4π

A $p > q > r$

B $q > p > r$

C $q > r > p$

[✓ **D**] $p > r > q$

Home Work

QUESTION 01

Resonance involves:

- **A** Delocalization of π-electrons along a conjugated system.
- **B** Delocalization of lone pair along a conjugated system.
- **C** Declocalization of negative charge along a conjugated system.
- **D** All are correct.

QUESTION 02

Arrange the following resonating structure according to their contribution towards resonance hybrid?

(a) $CH_2 = \overset{\oplus}{N} = \overset{\ominus}{N}$ (b) $\overset{\ominus}{C}H_2 - N = \overset{\oplus}{N}$ (c) $\overset{\oplus}{C}H_2 - \ddot{N} = \overset{\ominus}{N}$ (d) $\overset{\ominus}{C}H_2 - \overset{\oplus}{N} \equiv \ddot{N}$

A $a > d > c > b$

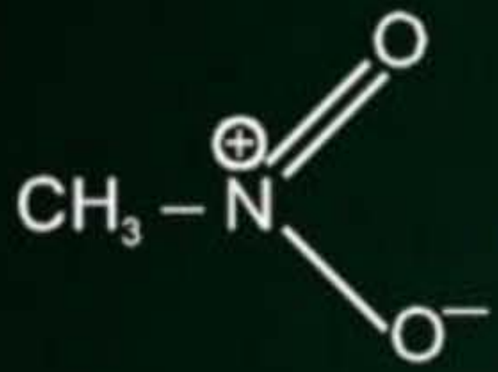
B $b > a > c > d$

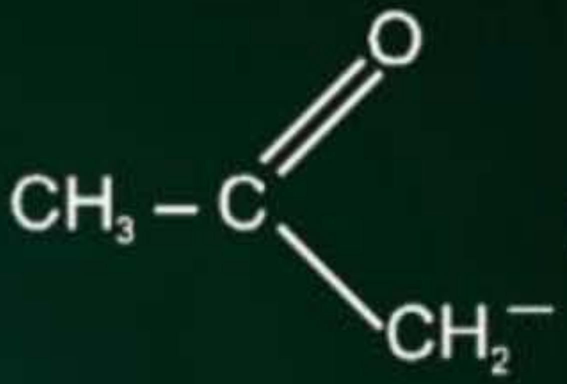
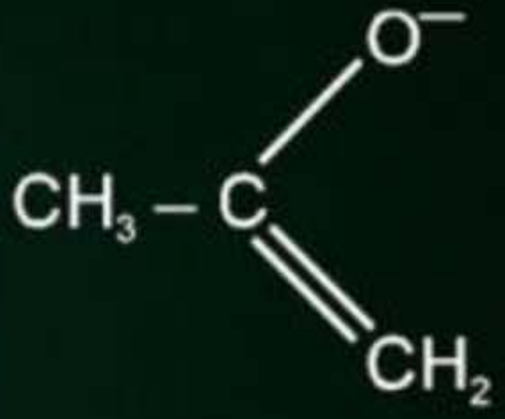
C $a > c > b > d$

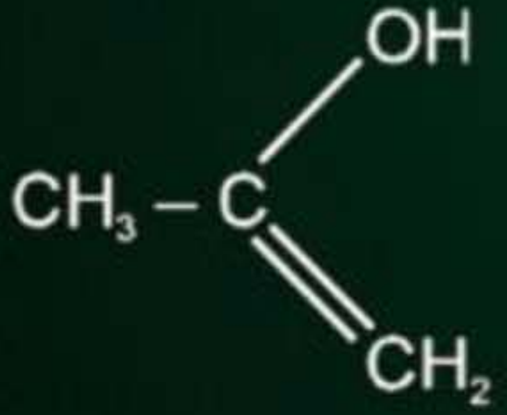
D $d > a > b > c$

QUESTION 03

Which of the following structures are resonance structures?

(A)  & $CH_3{-}O{-}N{=}O$

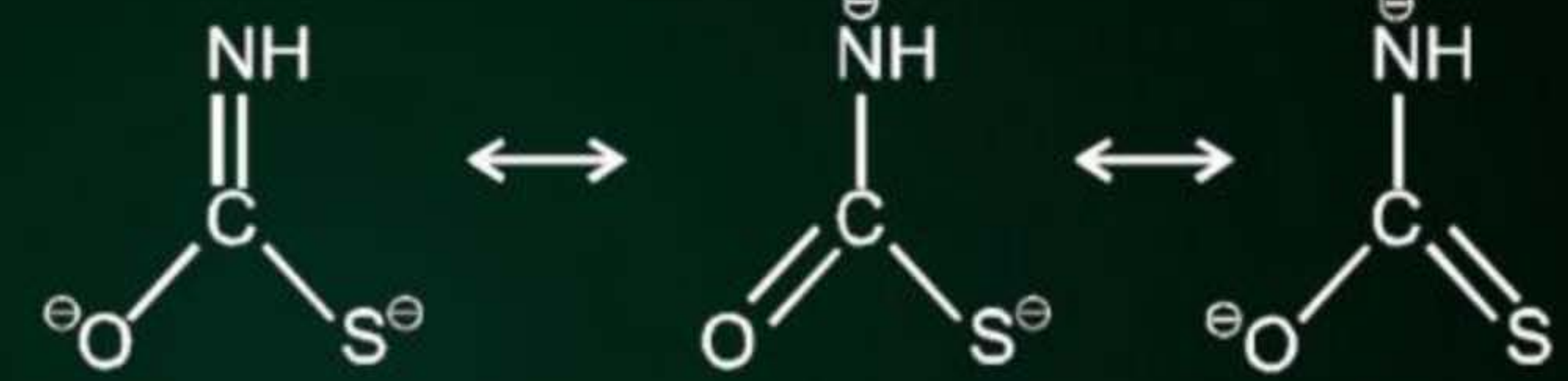
(B)  & 

(C) $(CH_3)_2CO$ & 

(D) $CH_3{-}CH{=}CH{-}CH_3$ & $CH_3{-}CH_2{-}CH{=}CH_2$

QUESTION 04

Stability order of the following species is:

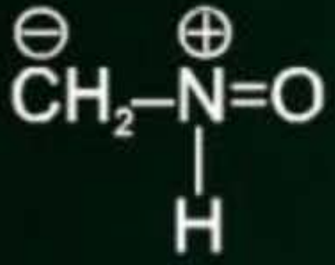

NH
C
O
S
NH
C
O
S
NH
C
O
S

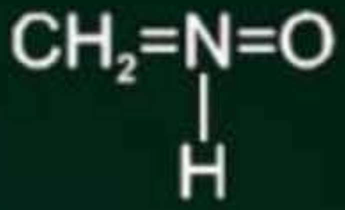
(I) (II) (III)

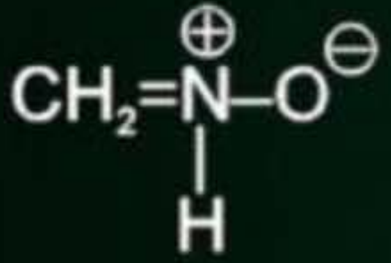
- **A** I > II > III
- **B** III > I > II
- **C** III > II > I
- **D** I > III > II

QUESTION 05

Which of the following is not acceptable as resonating structure?

(A) 
$\overset{\ominus}{C}H_2-\underset{\underset{H}{|}}{\overset{\oplus}{N}}=O$

(B) 
$CH_2=\underset{\underset{H}{|}}{N}=O$

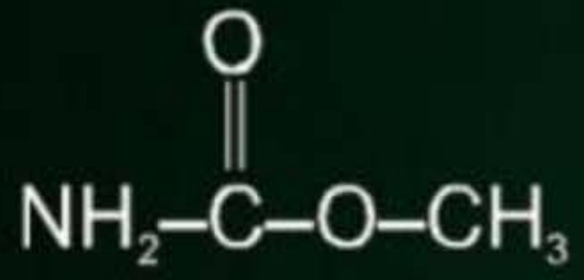
(C) 
$CH_2=\underset{\underset{H}{|}}{\overset{\oplus}{N}}-O^{\ominus}$

(D) None of these

QUESTION 06

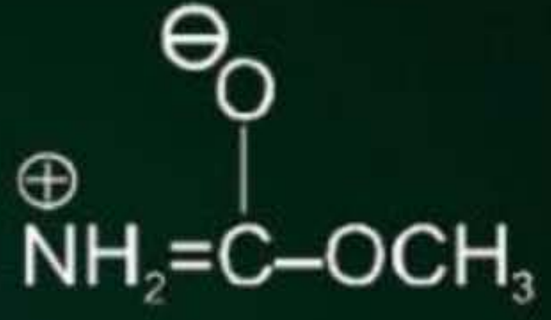
Which one of the following is least stable resonating structure?

(A)



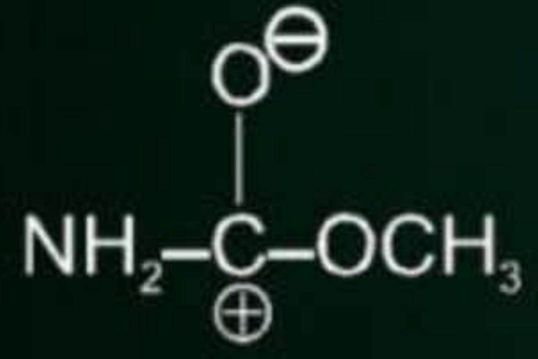
$NH_2-\overset{\overset{O}{\|}}{C}-O-CH_3$

(B)



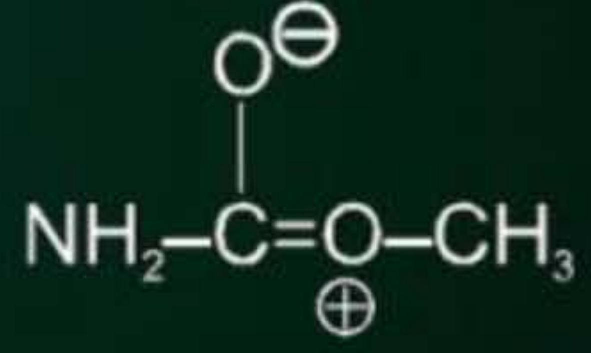
$\overset{\oplus}{N}H_2=\overset{\overset{\ominus O}{|}}{C}-OCH_3$

(C)



$NH_2-\underset{\oplus}{\overset{\overset{O^{\ominus}}{|}}{C}}-OCH_3$

(D)



$NH_2-\overset{\overset{O^{\ominus}}{|}}{C}=\underset{\oplus}{O}-CH_3$

QUESTION 07

Which of the following resonating structure of 1-Methoxy-1,3-butadiene is most stable?

(A) $\overset{\ominus}{C}H_2 - CH = CH - CH = \overset{\oplus}{O} - CH_3$

(B) $CH_2 = CH - \overset{\ominus}{C}H - CH = \overset{\oplus}{O} - CH_3$

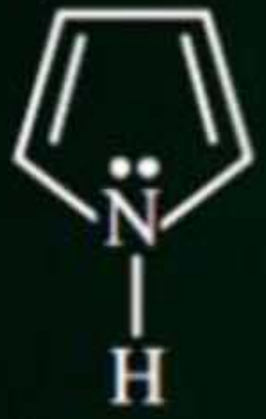
(C) $CH_2 = CH - \overset{\oplus}{C}H - \overset{\ominus}{C}H - O - CH_3$

(D) $CH_2 = CH - \overset{\ominus}{C}H - \overset{\oplus}{C}H - O - CH_3$

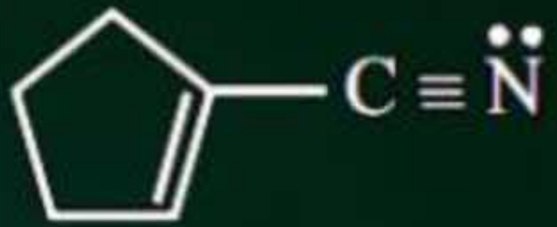
QUESTION 08

In which case lone pair indicated is not involved in resonance?

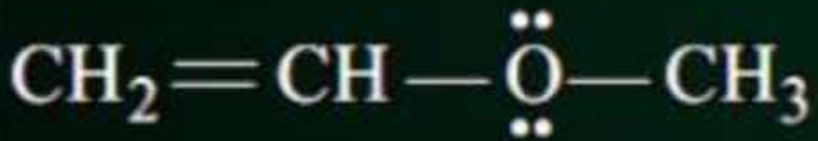
A



B

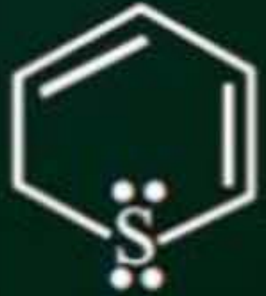


C



$CH_2{=}CH-\ddot{\underset{\cdot\cdot}{O}}-CH_3$

D



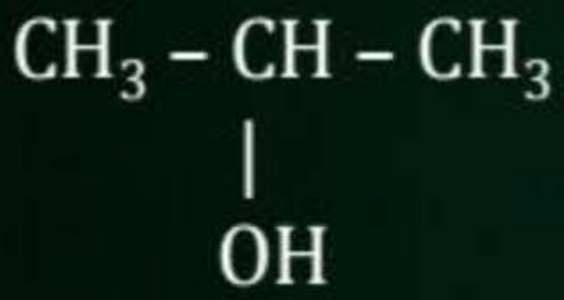
QUESTION 09

In which of the following delocalization of π-electron is possible?

(A) $CH_2 = CH - CH_2 - CHO$

(B) $CH_2 = CH - CH = O$

(C)



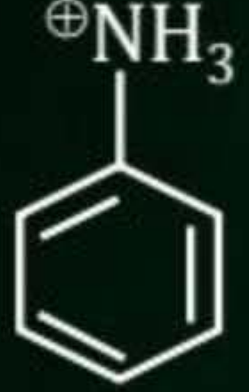
$CH_3 - \underset{\underset{OH}{|}}{CH} - CH_3$

(D) $CH_2 = CH - CH_2 - CH = CH_2$

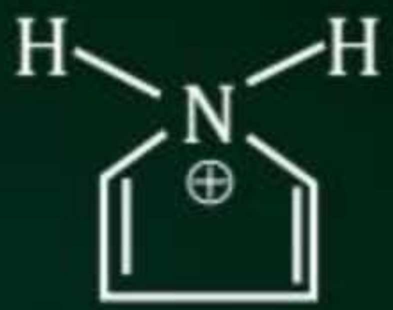
QUESTION 10

In which of the following delocalization of positive charge is possible?

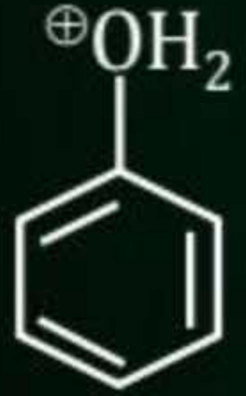
A



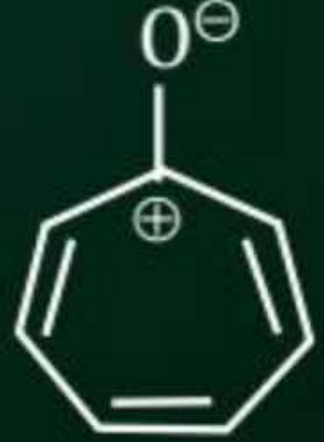
B



C



D



ANSWER KEY

1. D
2. A
3. B
4. A
5. B
6. C
7. B
8. B
9. B
10. D

Home Work From PW Module (Yakeen NEET)

Prarambh: Q 142, 143

Parikshit: Q 16, 17, 18, 19

Thankyou'.

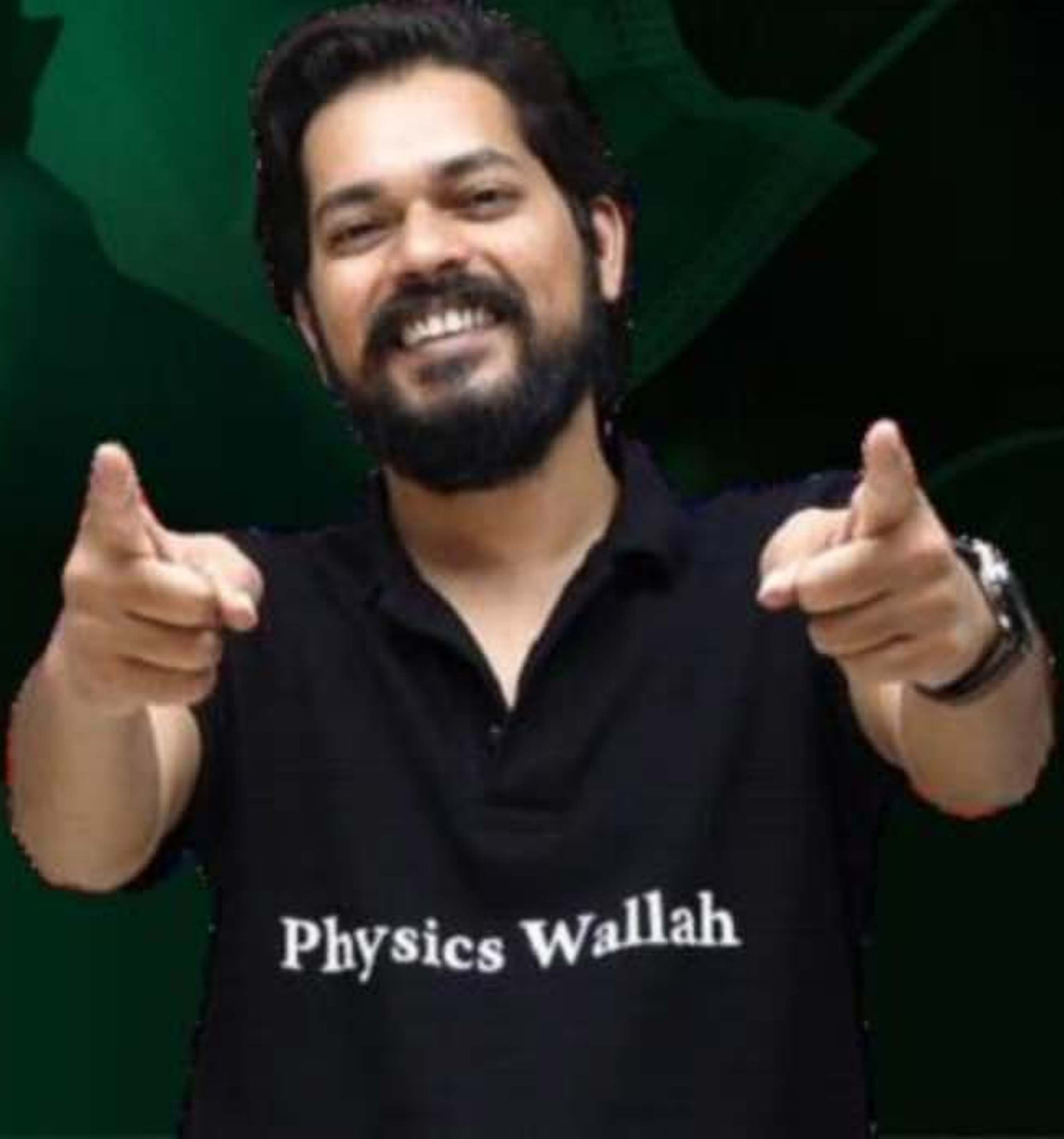
YAKEEN 2.0

FOR NEET 2025

Lecture- 04 | **Organic Chemistry**

Some Basic Principles and Techniques (GOC)

By- Pankaj Sir(POPU MAMA)


Physics Wallah

Topics *to be covered*

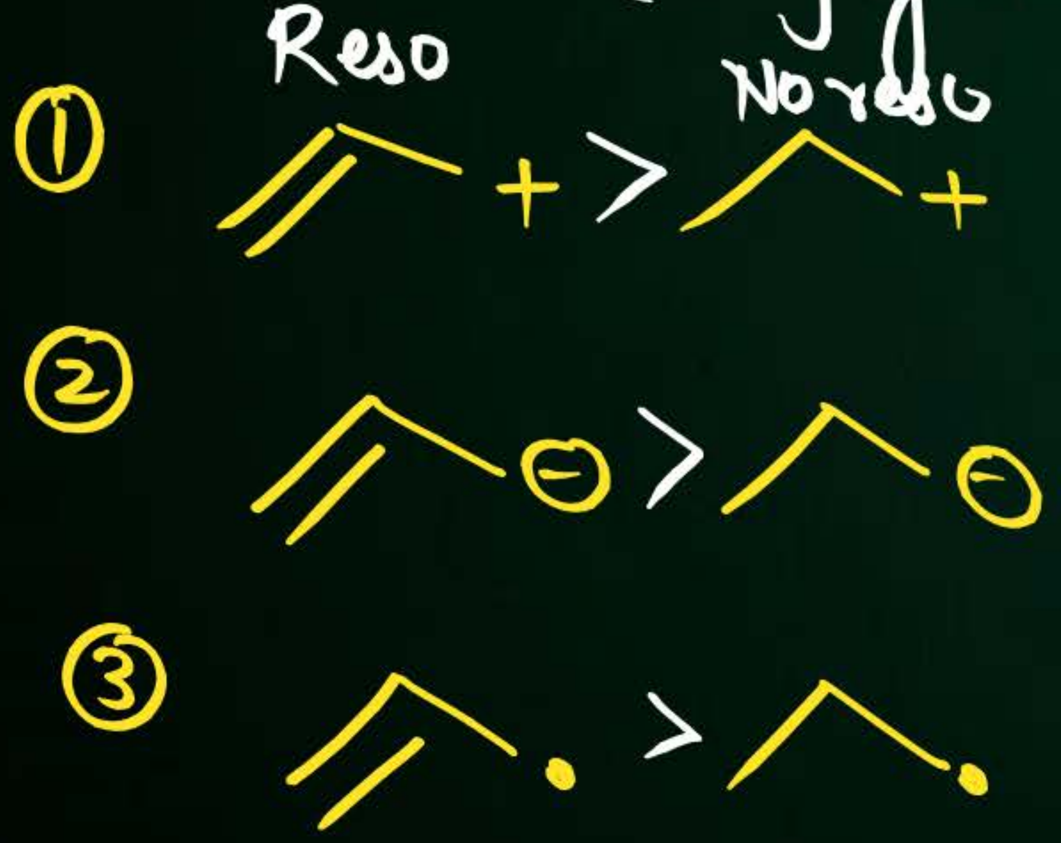
1. Application of Resonance ✓
2. Mesomeric Effect (+M/-M) ✓
3. Practice

Application of resonance

1. Stability of intermediates

$\overset{+}{C}\ |\ \overset{-}{C}\ |\ \dot{C}$

Stability ∝ resonance
(Conjugation)

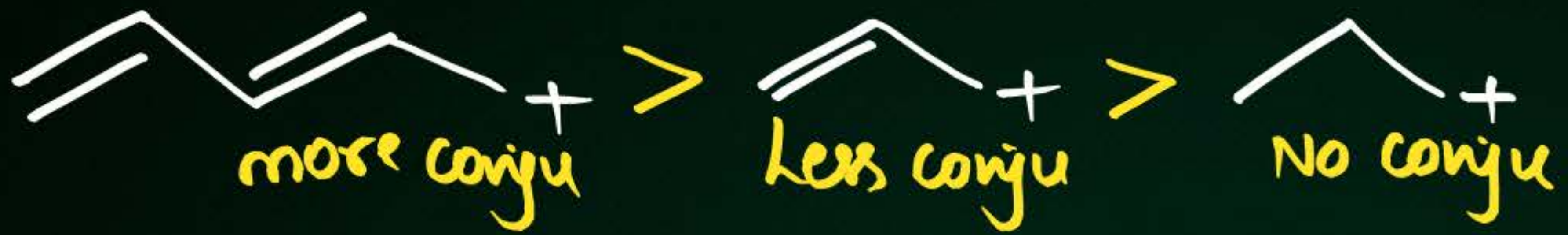


$$\overset{\curvearrowright}{CH_2=CH}-\overset{\oplus}{C}H_2 \longleftrightarrow \overset{\oplus}{C}H_2-CH=CH_2$$

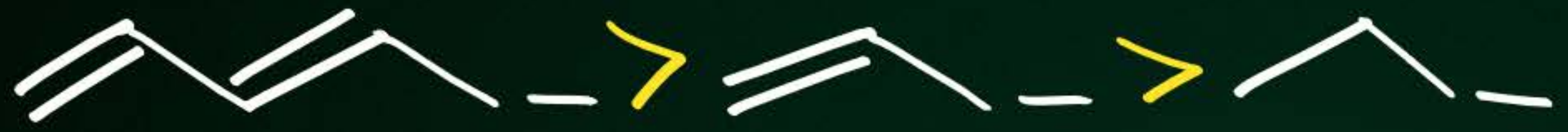
$$^{+\frac{1}{2}}CH_2\overset{---}{=}CH\overset{---}{=}\underset{+\frac{1}{2}}{CH_2}$$

Due to resonance
charge distribution occurs
Stability ↑es

④


more conju
Less conju
No conju

⑤



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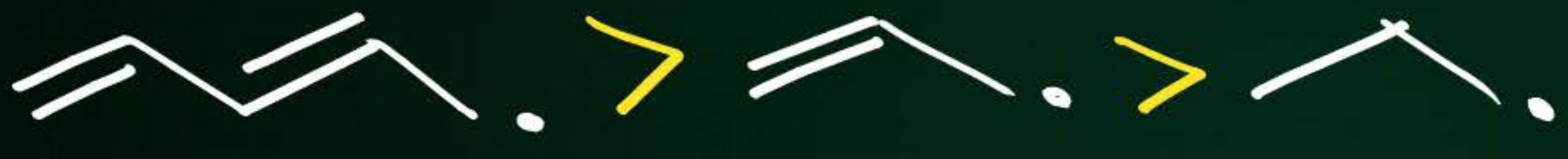

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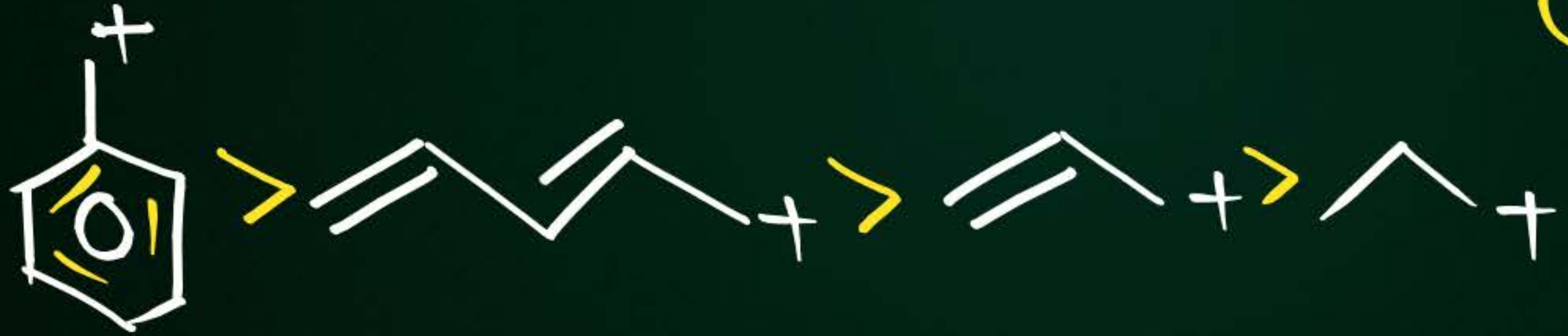
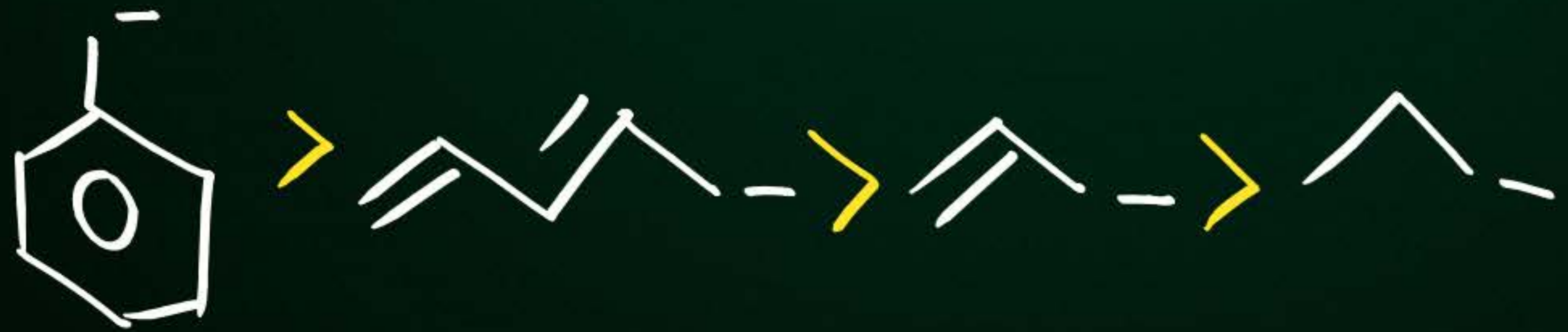
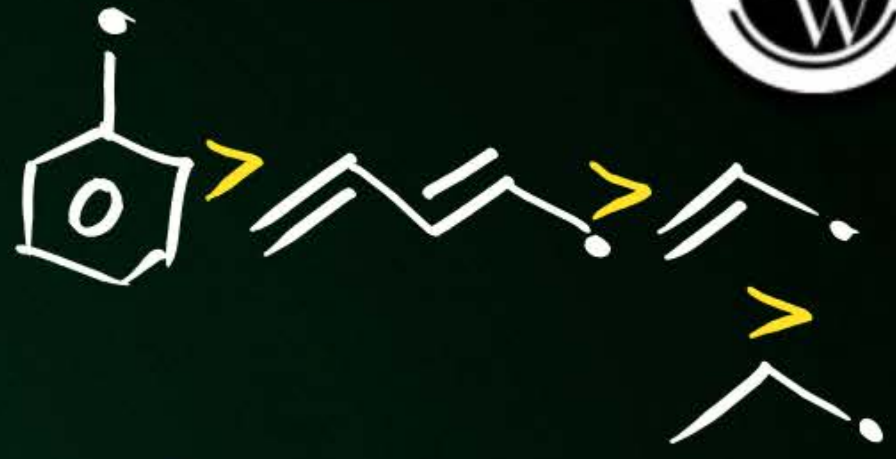


⑧



⑨



⑩ $Ph_3\overset{+}{C} > Ph_2\overset{+}{C}H > Ph\overset{+}{C}H_2$

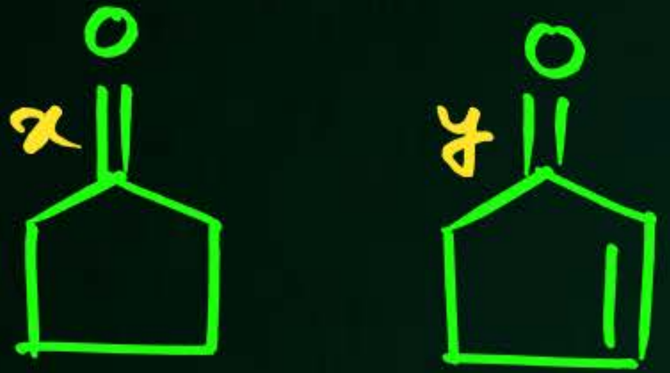
⑪ $Ph_3\bar{C} > Ph_2\bar{C}H > Ph\bar{C}H_2$

⑫ $Ph_3\dot{C} > Ph_2\dot{C}H > Ph\dot{C}H_2$

Application of resonance

2. Bond length

due to reso, partial double bond charac generate BL↑

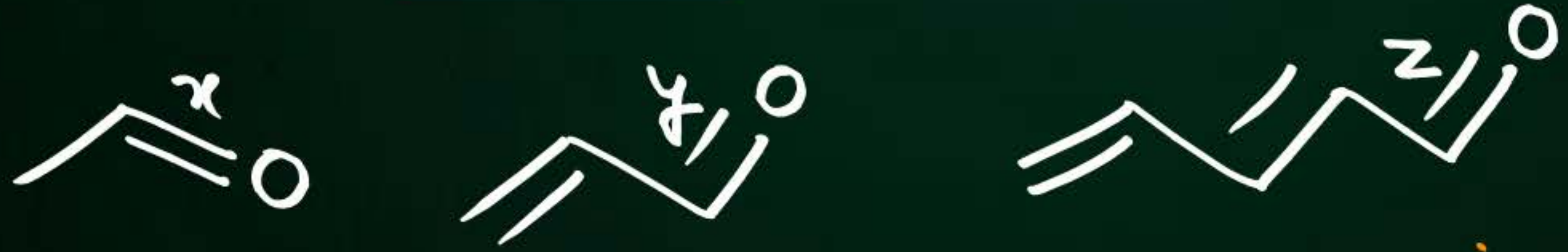


B·E $\equiv \; > \; = \; > \; \overset{\cdots}{-} \; > \; -$

B·L $\equiv \; < \; = \; < \; \overset{\cdots}{-} \; < \; -$

Bond length $\boxed{x < y}$

Q

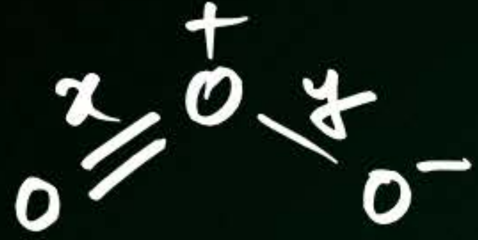


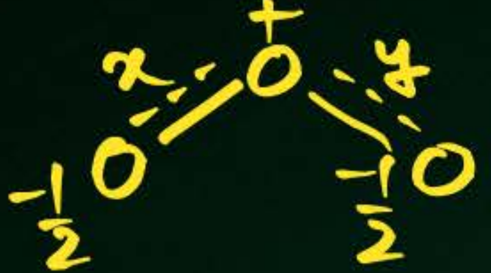
Less conju

more conju

B·L $x < y < z$

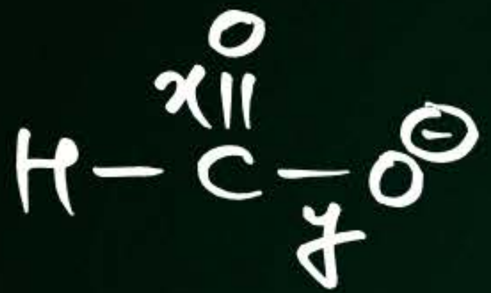
Q①





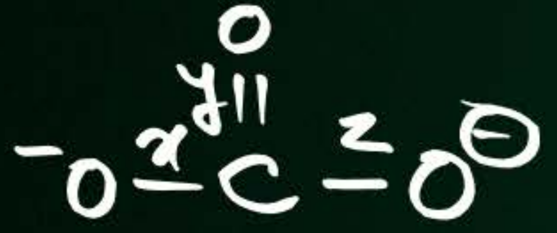
$x=y$

②



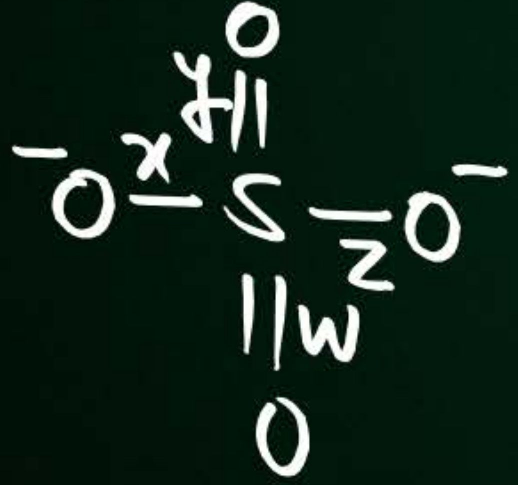
$x=y$

③



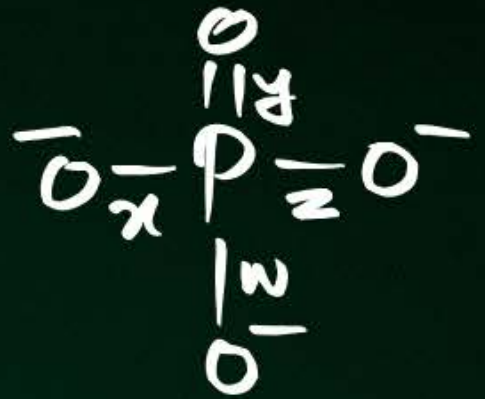
$x=y=z$

④



$x=y=z=w$

⑤

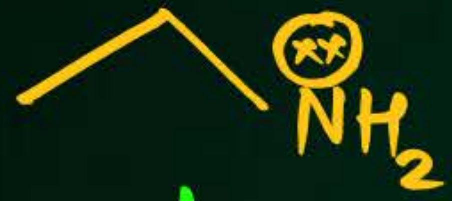


$x=y=z=w$

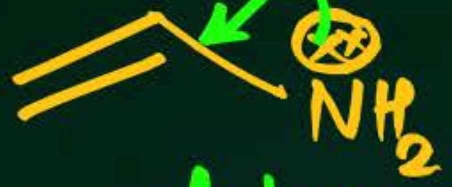
Localized & Delocalized lone pairs

L.P does not parti in conju

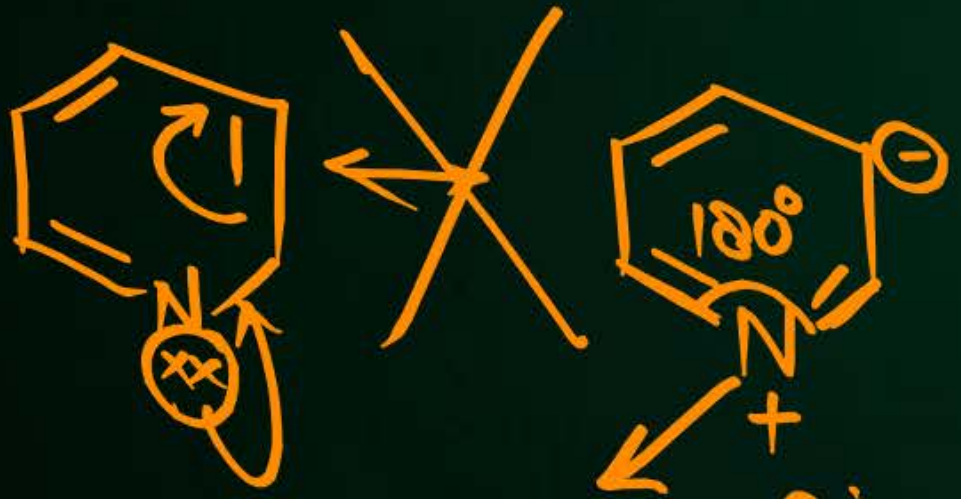
parti in conju



Loca



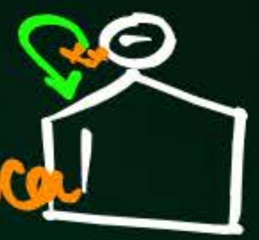
deloca



sp Ring tut Jayegi

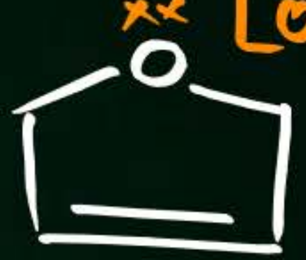
Q find Loca & deloca L.P

①



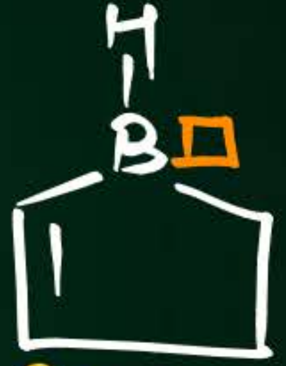
deloca

②



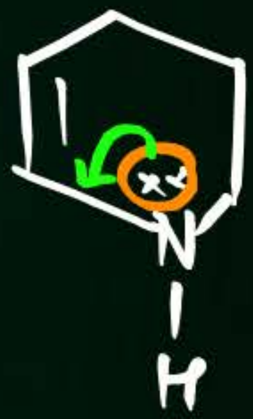
Loca

③ ✗



conju ✓

④



deloca

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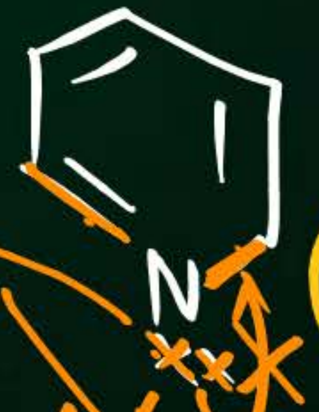
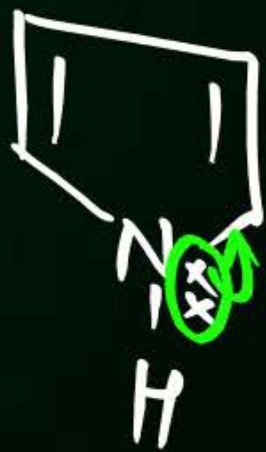


sp²

Loca

~~deloca~~

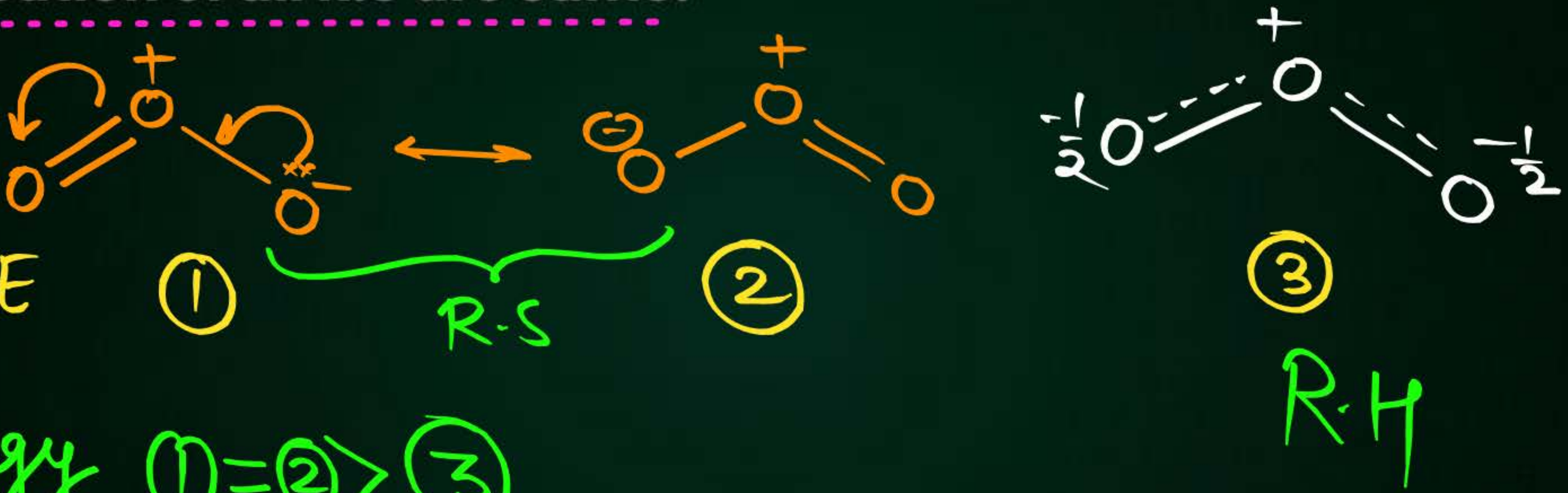
⑥



deloca

Equivalent Resonance

1. When P.E of all R.S are equal then R.S are called equivalent R.S.
2. Contribution of all R.S are same.

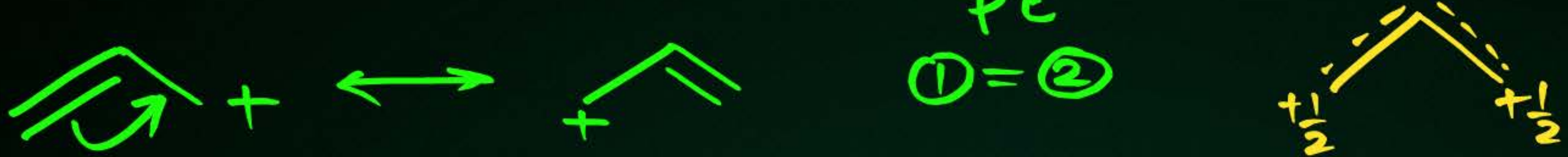

+
+
⊖
+
$-\frac{1}{2}$
$-\frac{1}{2}$
①
R.S
②
③
R.H

Potential energy PE

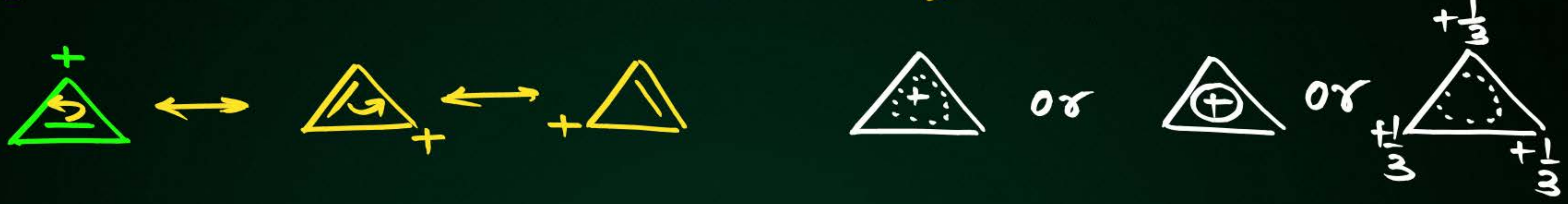
Energy ①=②>③

stability ①=②<③

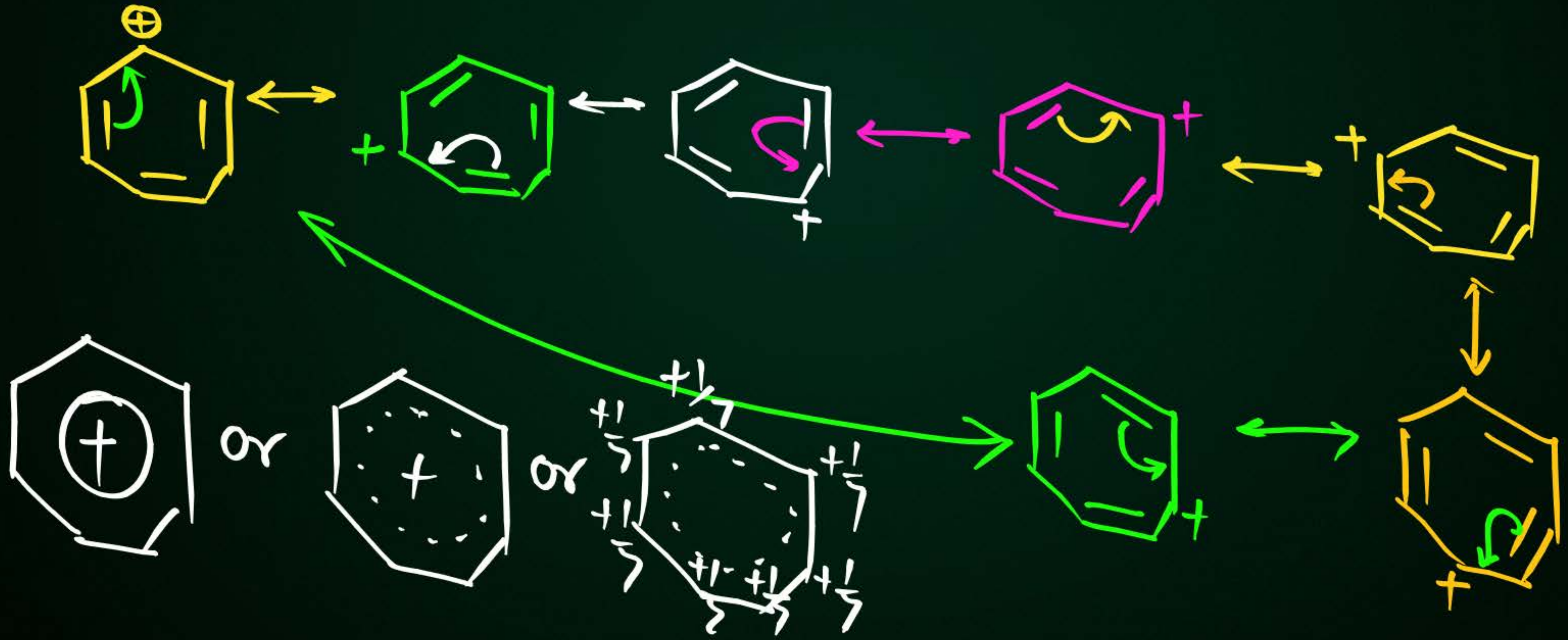
①



②


+
+
+
+
or
or
+1/3
+1/3
+1/3

③

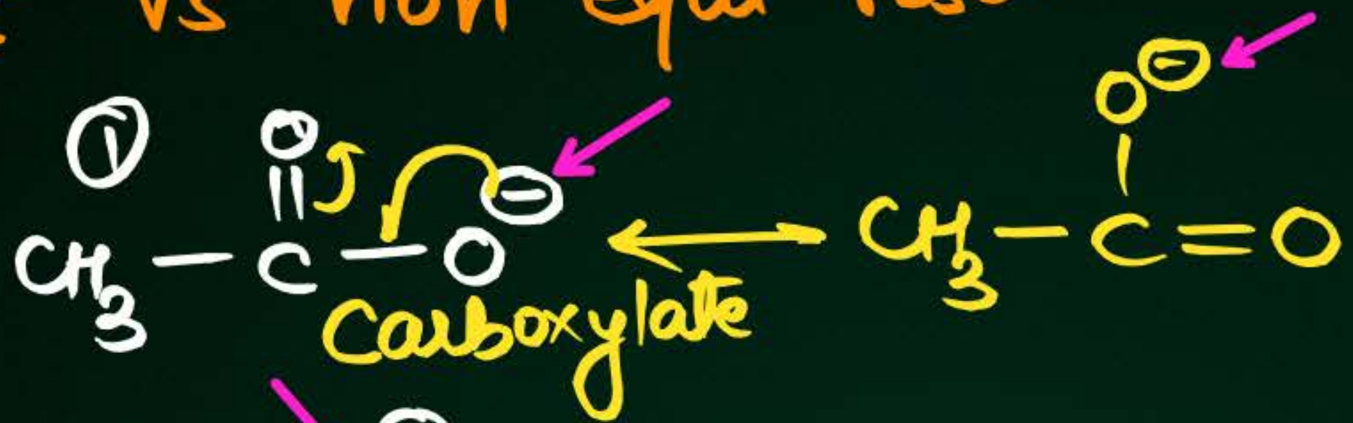

⊕
+
+
+
+
+
+
or
or
+1/7
+1/7
+1/7
+1/7
+1/7
+1/7
+1/7

Equivalent vs non equi reso.

quality

Eq reso

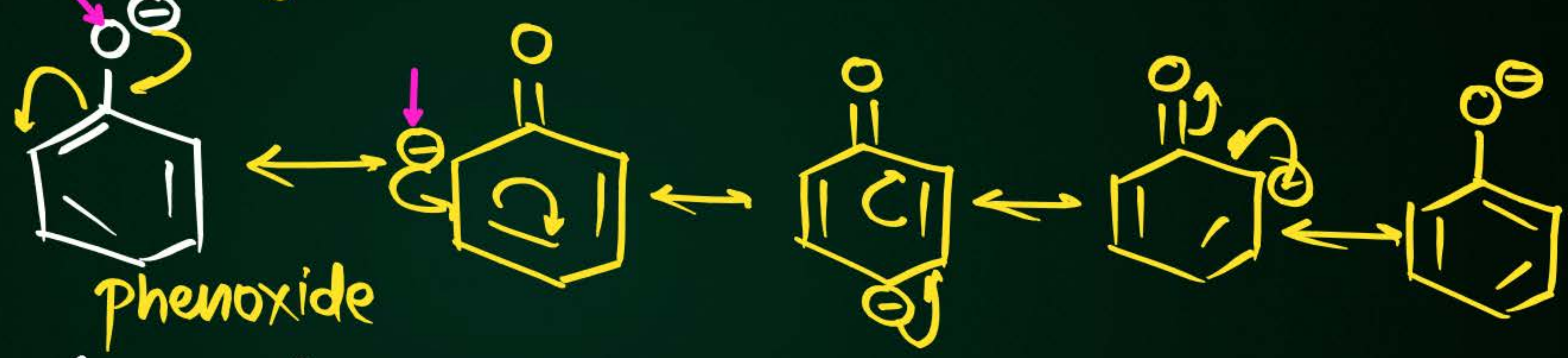
①



$CH_3-C(=O)-O^{\ominus} \longleftrightarrow CH_3-C(-O^{\ominus})=O$
Carboxylate

Non equi

②



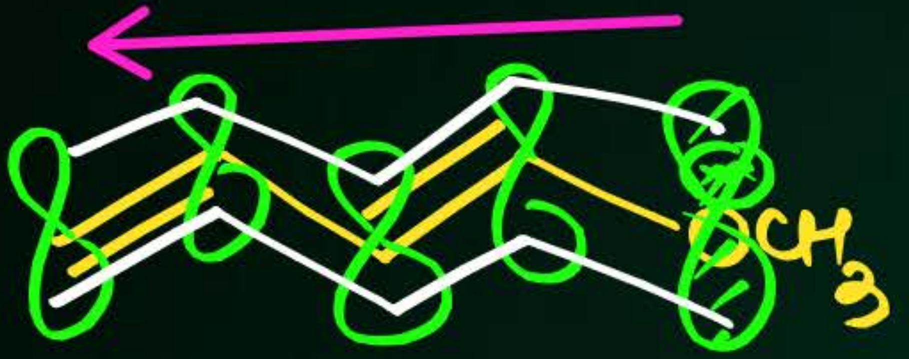
Eq reso dominates over non equi

Stability of anion ① > ②

Extended & Cross Conjugation

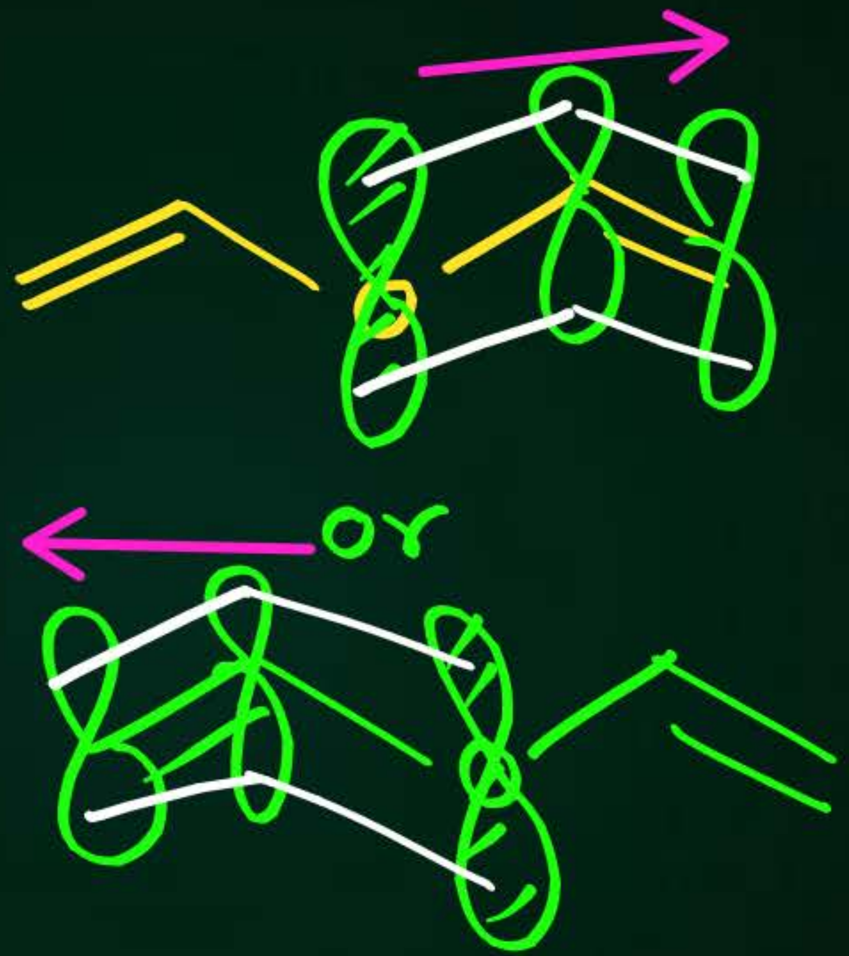
ek saans main

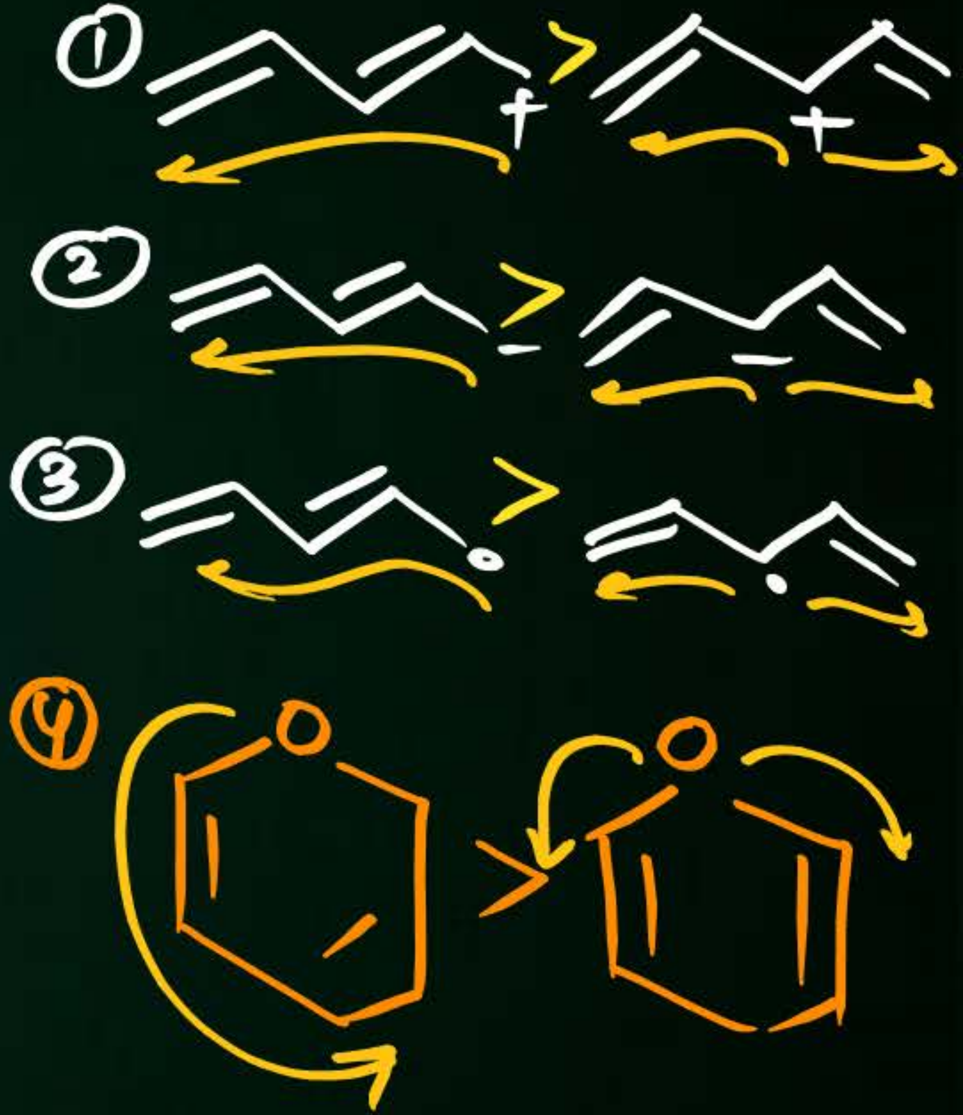
do alag alag saanso main



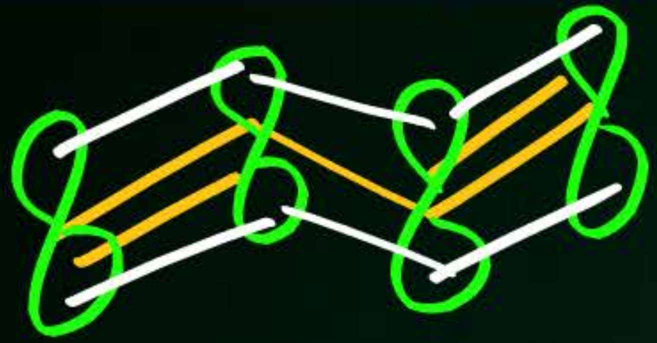
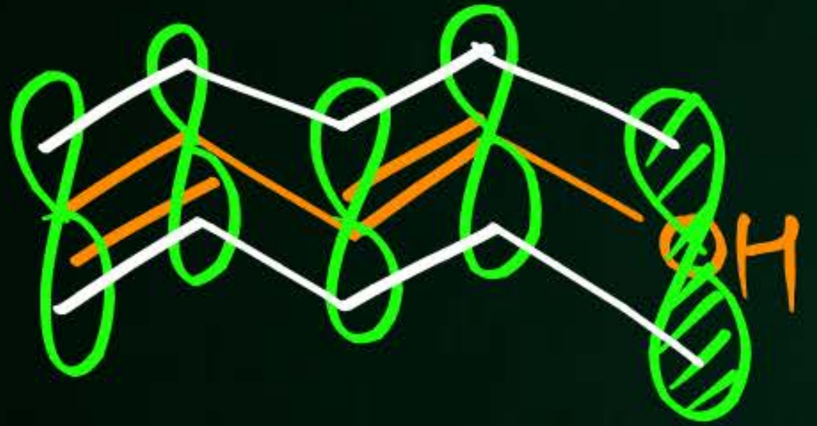
Priority Ext > cross

① > ②





Resonance v/s Mesomeric Effect

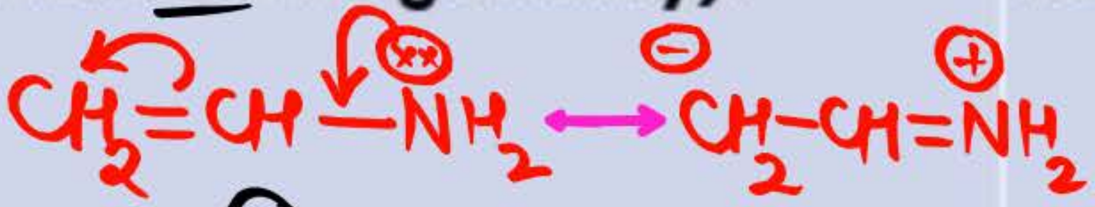
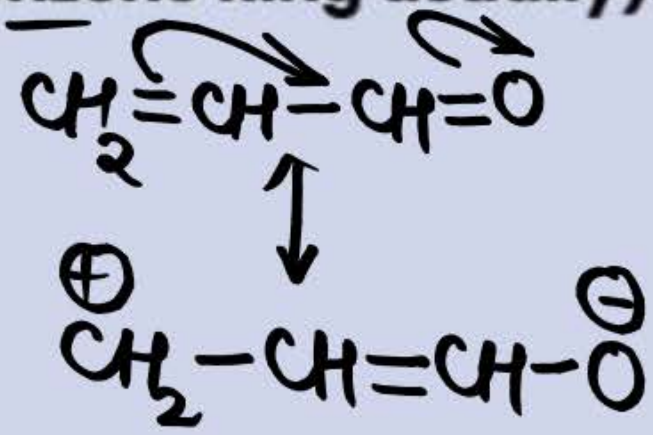
	Reso	Mesomerism
	yes	NO
	yes	Yes

Kis Group ya atom ki vajah se resonance ana Mesomerism Kahlata hai.

① All resonance effect are mesomeric effect. (T/[✓ F])

② All mesomeric effect are resonance effect. ([✓ T]/F)

Mesomeric Effect

Definition	✓ +M Effect	✓ -M Effect
1. Permanent effect. ✓ 2. Operate to π bond. ✓ 3. Distance Independent effect. ✓ 4. Actual Charge Develop. ✓	Ⓛ·Ⓟ If an atom or group donate P orbital e⁻s to conjugated system (like double bond or Benzene Ring usually).  $CH_2=CH-\overset{\times\times}{N}H_2 \longleftrightarrow \overset{\ominus}{C}H_2-CH=\overset{\oplus}{N}H_2$ $-\overset{\times\times}{N}H_2$ +M Group	$\pi \overset{\ominus}{e}s$ If an atom or group withdraw P orbital e⁻s to conjugated system (like double bond or Benzene Ring usually).  $CH_2=CH-CH=O$ $\updownarrow$ $\overset{\oplus}{C}H_2-CH=CH-\overset{\ominus}{O}$ $-CH=O$ −M Group

Identification of +M and −M groups

$\longleftarrow$ $-\overset{\times\times}{N}H_2$ (L·P)

$\longrightarrow$ $-CH=O$ (π Bond)

1^{st} atom ke paas → L·P +M

1^{st} " " " → π Bond −M

QUESTION

Mesomeric effect involves the delocalisation of:

A protons

B sigma electrons

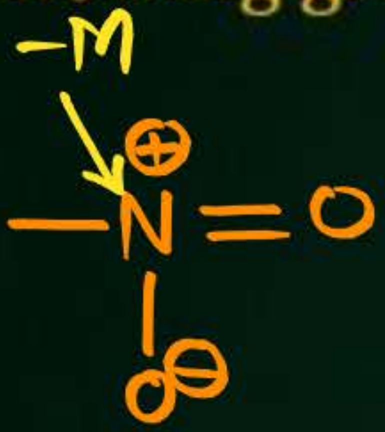
[✓ C pi electrons]

D none of these

QUESTION

Which of the following group show –M and –I effect?

(A) ✓ $-NO_2$



$-\overset{\oplus}{N}(=O)-O^{\ominus}$

(B) $-\overset{\times\times}{N}H_2$ +M –I

(C) $-\overset{\times\times}{O}H$ +M –I

(D) $-\overset{\times\times}{F}$ +M –I

QUESTION

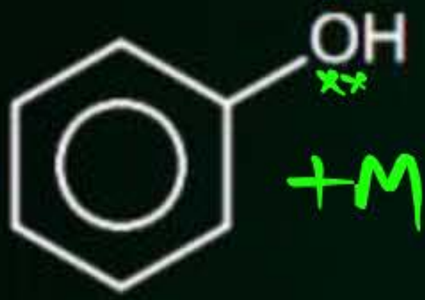
Match the column I with column II.

Column I	Column II
(Group attached with benzene ring)	(Effect shown by the group)
(A) $-NO_2$ $\substack{-M\\-I}$ (P,S)	(P) – M effect
(B) $-\overset{\times\times}{O}^-$ $\substack{+M\\+I}$ (Q,R)	(Q) + M effect
(C) $-\overset{\times\times}{O}-CH_3$ $\substack{+M\\-I}$ (Q,S)	(R) + I effect
(D) $-C\equiv N$ $\substack{-M\\-I}$ (P,S)	(S) – I effect

QUESTION

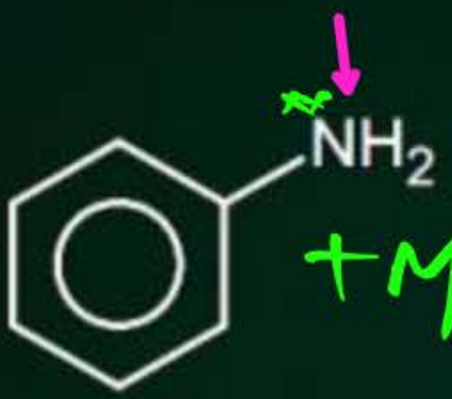
X = number of (+M) group attached with phenyl ring, so the value of X is: =4

✓ (a)



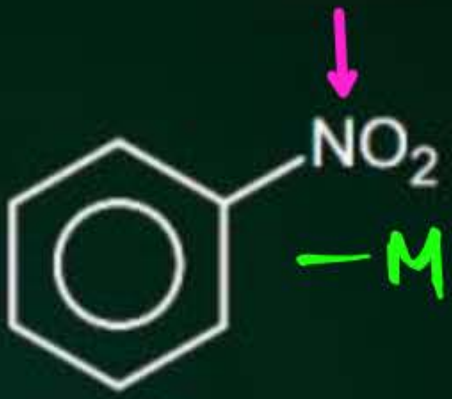
+M

✓ (b)



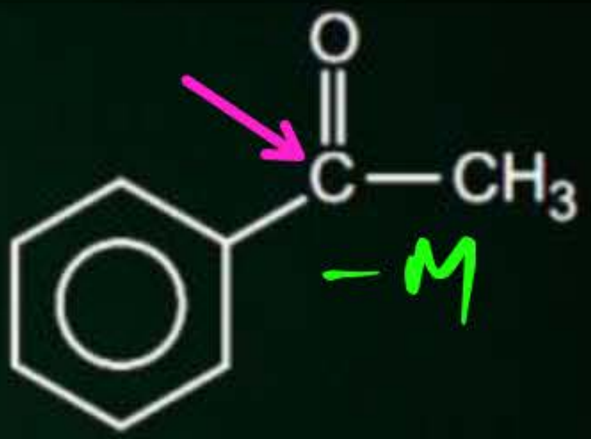
+M

(c)



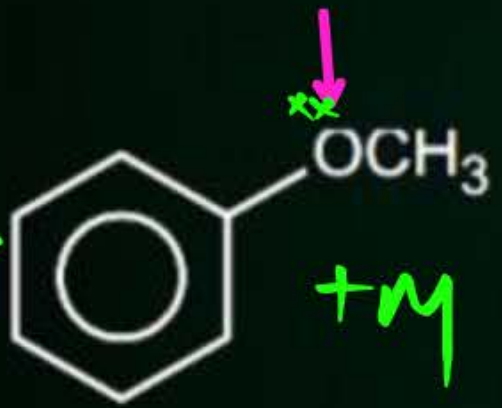
−M

(d)



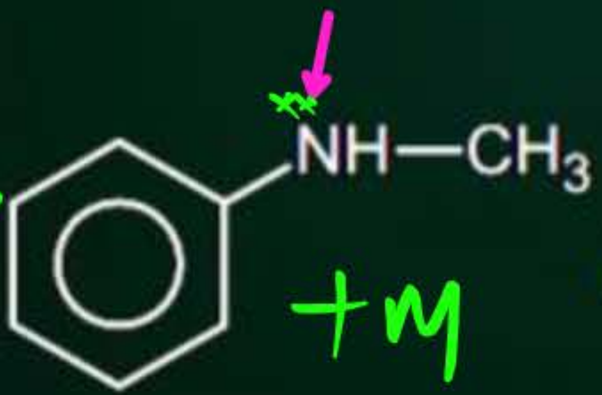
−M

✓ (e)



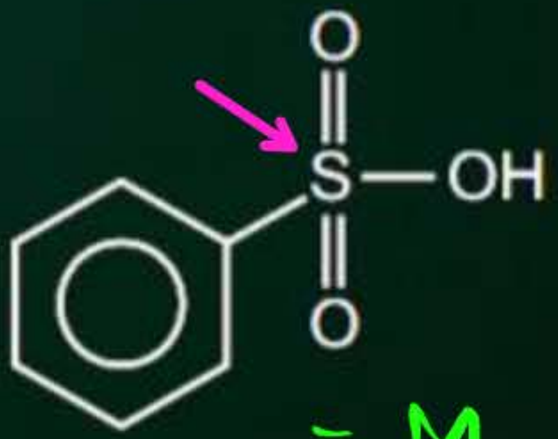
+M

✓ (f)



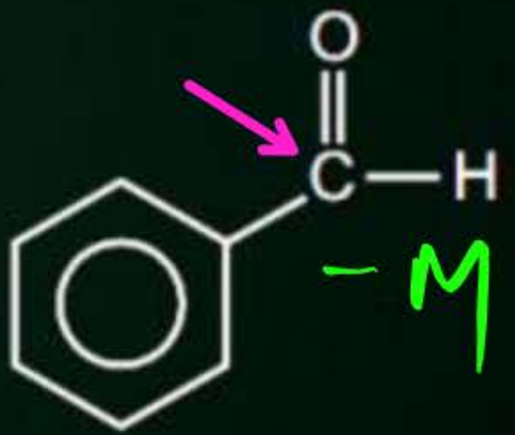
+M

(g)



−M

(h)

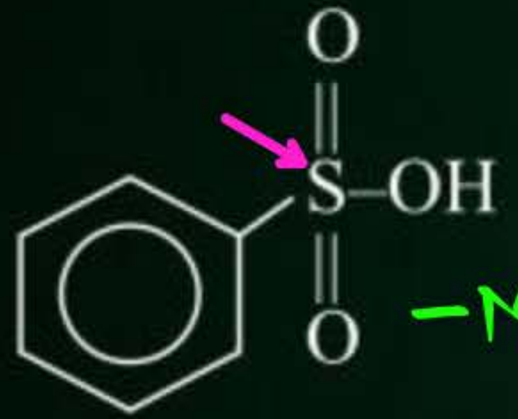


−M

QUESTION

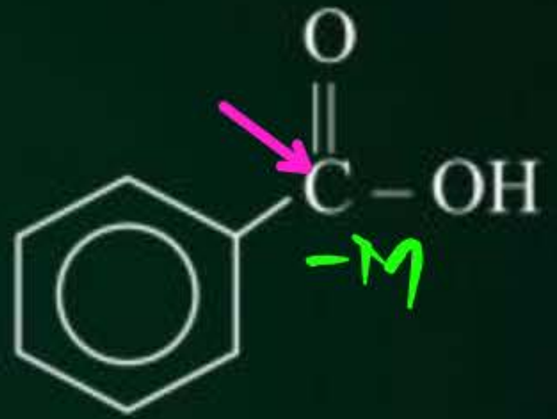
Which of the following group has (+M) effect?

(A)



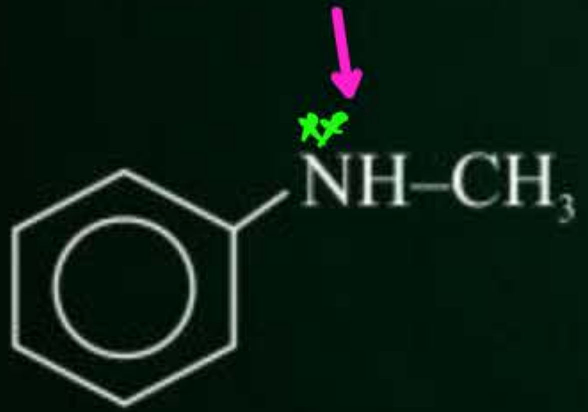
−M

(B)

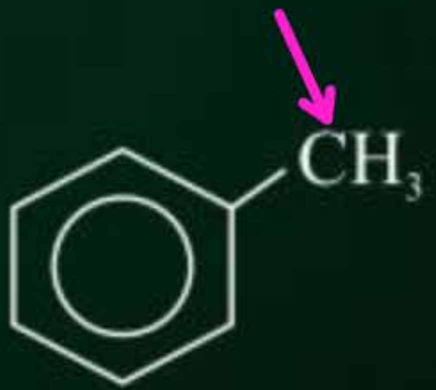


−M

[✓ (C)]



(D)



QUESTION

Which of the following will show a +M effect (Positive Mesomeric effect)

(i) $-CH_3$ ✗

[✓ (ii)] $-\ddot{C}l$ +M

[✓ (iii)] $-\ddot{N}H_2$ +M

[✓ (iv)] $-\ddot{O}H$ +M

[✓ (v)] $-\ddot{O}CH_3$ +M

(vi) $-\underset{\substack{| \\ H}}{C}=O$ −M

(vii) $-CN$ −M
$(-C\equiv N)$

(A) i, ii, iii

(B) ii, iii, iv, v, vi

[✓ (C)] ii, iii, iv, v

(D) ii, iii, iv

QUESTION

Which of the following group shows (+M effect) when attached to Benzene?

$-\overset{+}{N}=O$
$\quad\; |$
$\quad\; O^-$

A $-NO_2$ $\quad -M$

[✓ B] $-\overset{**}{N}H_2$

C $-\overset{\oplus}{N}H_3$ $\quad \times$

D $-CHO$

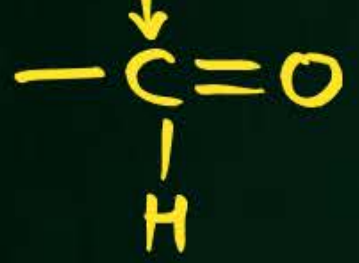
$-\underset{\underset{H}{|}}{C}=O$

$-M$

QUESTION

Which of the following groups can exert both +M and –I effect?

A $-CHO$



$$-\overset{\downarrow}{\underset{H}{\underset{|}{C}}}=O$$

−M
−I

B $-NO_2$

−M
−I

[✓ **C**] $-\overset{\times\times}{Cl}$

+M
−I

D $-CH_3$

+I

QUESTION

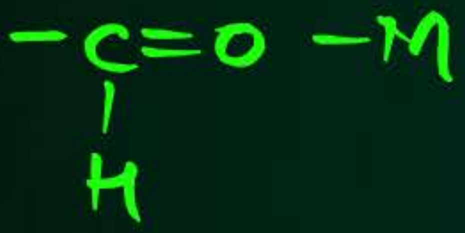
−M

How many of the following are electron withdrawing groups through resonance when attached with benzene nucleus?

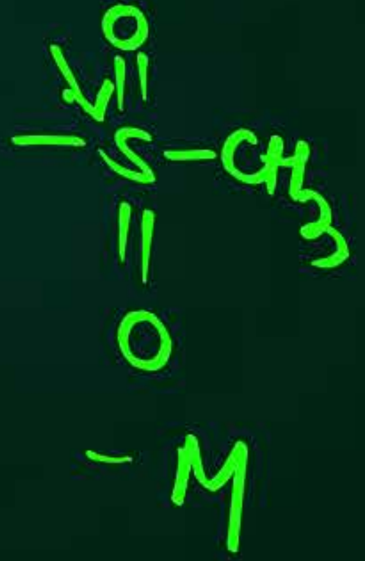
$-\overset{O}{\overset{\|}{C}}-OH$ $\quad -\overset{O}{\overset{\|}{C}}-NHCH_3 \quad -\overset{O}{\overset{\|}{C}}-Cl \quad -C\equiv N$

✓ (a) $-COOH$ −M ✓ (b) $-CONHCH_3$ −M ✓ (c) $-COCl$ −M ✓ (d) $-CN$ −M

(e) $-\ddot{O}-CH=CH_2$ +M ✓ (f) $-CHO$ ✓ (g) $-SO_2CH_3$ ✓ (h) $-COO^-$



$-\underset{H}{\underset{|}{C}}=O$ −M



$-\overset{O}{\overset{\|}{\underset{O}{\underset{\|}{S}}}}-CH_3$

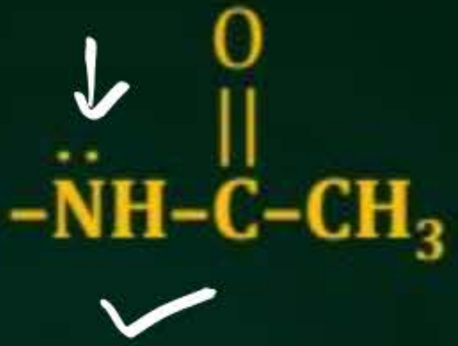
−M

$-\overset{O}{\overset{\|}{C}}-O^{\ominus}$ −M

QUESTION

How many of the following are '+M' groups?

$\underset{\checkmark}{-\overset{\downarrow}{\ddot{N}}H_2}$, $\underset{\checkmark}{-\overset{\downarrow}{\ddot{N}}R_2}$, $\underset{\checkmark}{-\underset{\cdot\cdot}{\overset{\downarrow}{\ddot{O}}}CH_3}$, $\underset{\checkmark}{-\underset{\cdot\cdot}{\overset{\downarrow}{\ddot{S}}}H}$, $-\overset{\oplus}{N}H_3$, $-NO_2$,



$\underset{\checkmark}{-\overset{\downarrow}{\ddot{N}}H}-\overset{\overset{\large O}{||}}{C}-CH_3$

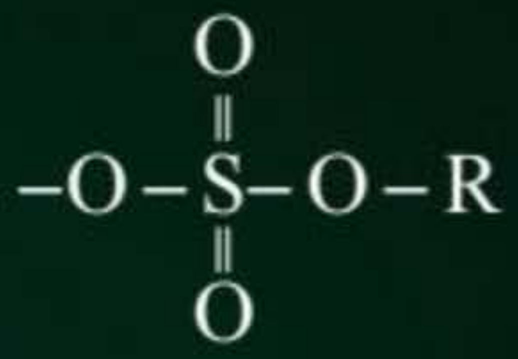
Home Work

QUESTION 01

Which of the following group show –M effect?

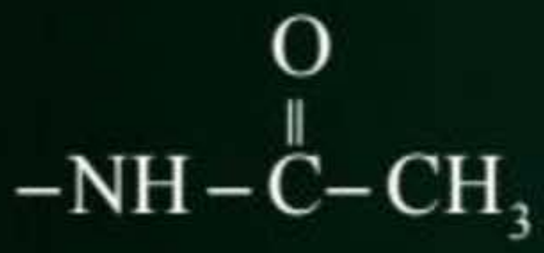
A $-NO_2$

B



$$-O-\overset{\overset{O}{\|}}{\underset{\underset{O}{\|}}{S}}-O-R$$

C



$$-NH-\overset{\overset{O}{\|}}{C}-CH_3$$

D $-Cl$

QUESTION 02

Arrange the following groups in order of decreasing –*M* directing strength.

$-\overset{+}{N}R_3$, $-CN$, $-NO_2$, $-COOH$

- **A** $-\overset{+}{N}R_3 > -NO_2 > -CN > -COOH$
- **B** $-COOH > -CN > -NO_2 > -\overset{+}{N}R_3$
- **C** $-CN > -NO_2 > -COOH > -\overset{+}{N}R_3$
- **D** $-NO_2 > -CN > -\overset{+}{N}R_3 > -COOH$

QUESTION 03

Which of the following have both +M & –I effect?

(A) $-NO_2$

(B) $-Cl$

(C) -COOH

(D) $-CH_3$

QUESTION 04

Which of the pair of group have overall electron eithdrawing effect when attached to a phenyl ring?

A $-Cl, -NO_2$

B $-NO_2, -OH$

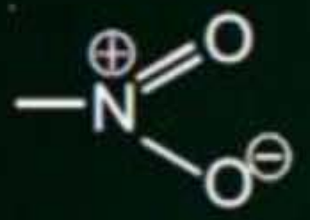
C $-NO, -OCH_3$

D $-CN, -NH_2$

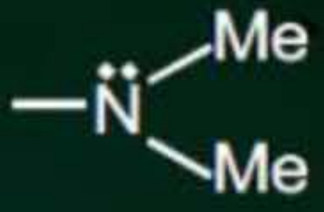
QUESTION 05

Which of the following group will have the strongest electron donating Mesomeric effect?

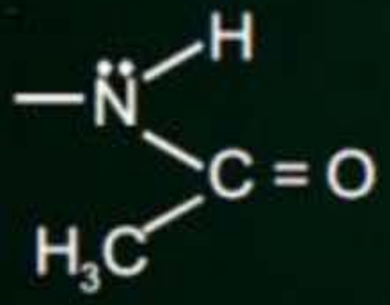
A



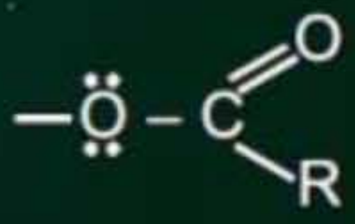
B



C



D



QUESTION 06

Which is correct?

A $-CD_3 > -CH_3$ (+I–effect)

B $-\overset{\oplus}{N}H_3$ (Shows –M and –I effect)

C $-F > -Cl$ (Net electron withdrawing nature for benezne ring)

D All

QUESTION 07

Which of the following group(s) show +M effect?

A $-\bar{C}H_2$

B $-NHCOR$

C $-O^-$

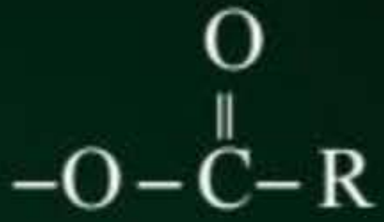
D All of these

QUESTION 08

Which of the following group show +M > –I effect?

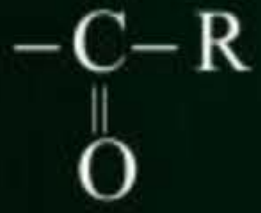
A –F

B



$-O-\overset{\overset{O}{\|}}{C}-R$

C



$-\underset{\underset{O}{\|}}{C}-R$

D $-COOH$

QUESTION 09

+ M and +I both effects are shown by:

(A) $-\ddot{\underset{\cdot\cdot}{O}}H$

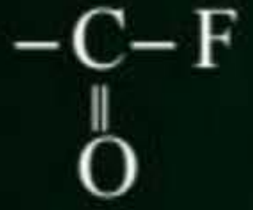
(B) $-\ddot{N}HCH_3$

(C) $-O^{\ominus}$

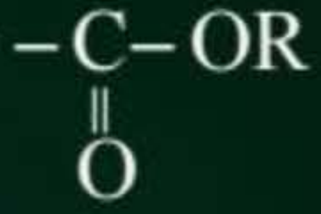
(D) $-C(CH_3)_3$

QUESTION 10

Which of the following group show +M and –I effect?

A 

$-\underset{\underset{O}{\|}}{C}-F$

B 

$-\underset{\underset{O}{\|}}{C}-OR$

C $-O^{\ominus}$

D $-OH$

ANSWER KEY

1. A
2. A
3. B
4. A
5. B
6. A
7. D
8. B
9. C
10. D

Home Work From PW Module (Yakeen NEET)

Prabal: Q 30

Parikshit: Q 04

Home Work

discussion of L-02

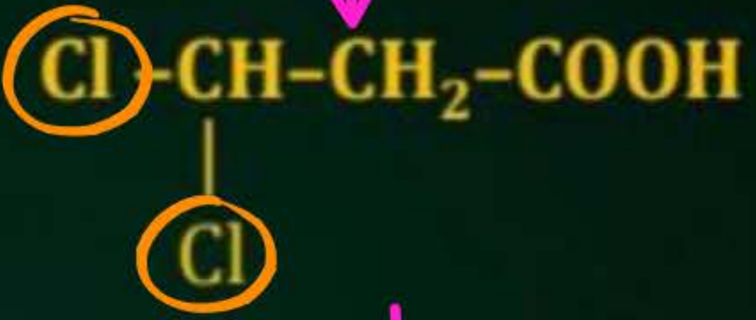
QUESTION 01

PKb↑ PKa↓ Ka↑ AS↑

Arrange in the order of decreasing pK_b.

(P) $F-CH_2CH_2COOH$

(Q)



$Cl-\underset{\underset{Cl}{|}}{CH}-CH_2-COOH$

(R) $F-CH_2-COOH$

(S) $Br-CH_2-CH_2-COOH$

(A) $Q > S > P > R$

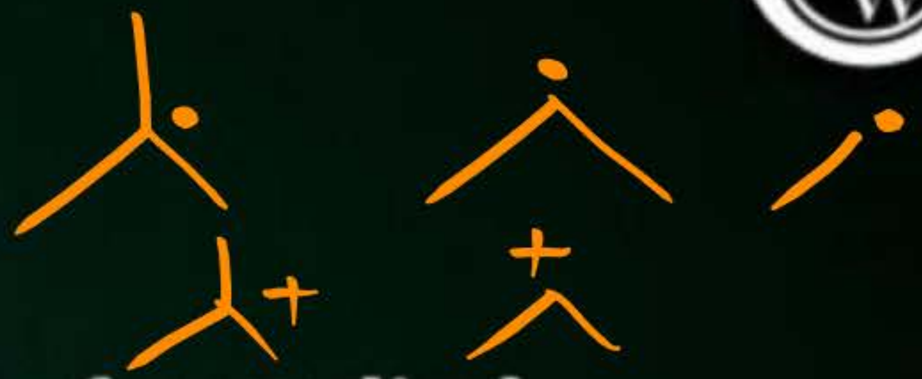
(B) $P > R > S > Q$

[✓ (C)] $R > Q > P > S$

(D) $S > Q > P > R$

QUESTION 02

Which of the following statements is wrong?



A) A tertiary free radical is more stable than a secondary free radical.

B) A secondary free radical is more stable than a primary free radical.

C) A tertiary carbocation is more stable than a secondary carbocation.

[✓ D)] A primary carbocation is more stable than a secondary carbocation.

QUESTION 03

The most stable carbocation is:

[✓ A] $(CH_3)_3C^{\oplus}$

B $(CH_3)_2HC^{\oplus}$

C $CH_3CH_2^{\oplus}$

D $CH_3^{\oplus}$

QUESTION 04

Which is most basic among the following

$BS \propto +I \propto \frac{1}{-I}$

(A) $CH_3CH_2{-}\overset{\times\times}{N}H_2$

(B) $Cl{-}CH_2CH_2\ddot{N}H_2$

(C) $O_2N{-}CH_2CH_2{-}\ddot{N}H_2$

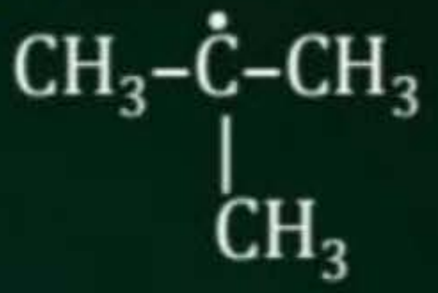
[✓ (D)] $^{-}O{-}CH_2CH_2{-}\ddot{N}H_2$

$[D > A > B > C]$

QUESTION 05

The stability of given free radicals in decreasing order is:

(i) $CH_3-\dot{C}H_2$ (ii) $CH_3-\dot{C}H-CH_3$ (iii)



$CH_3-\overset{\bullet}{\underset{CH_3}{\underset{|}{C}}}-CH_3$ (iv) $\dot{C}H_3$

+I ↑

Stability ↑

A iii > iv > i > ii

B i > ii > iii > iv

C iii > ii > iv > i

[✓ D] iii > ii > i > iv

QUESTION 06

FCH_2COOH	$Cl_2CHCOOH$	CH_3COOH	$HCOOH$	$ClCH_2COOH$
(1)	(2)	(3)	(4)	(5)

Correct order of acid strength is:

2 > ① > ⑤ > ④ > ③

A) $1 > 5 > 2 > 4 > 3$

B) $5 > 1 > 2 > 4 > 3$

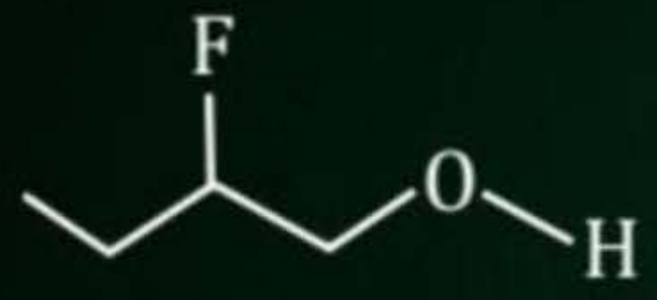
[✓ C)] $2 > 1 > 5 > 4 > 3$

D) $5 > 2 > 1 > 4 > 3$

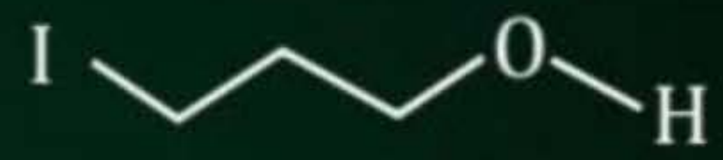
QUESTION 07

In which of the following compounds the hydroxylic proton is most acidic?

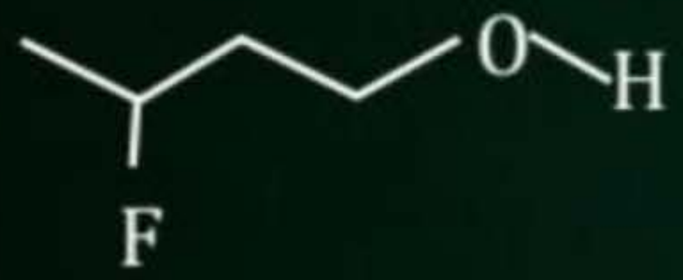
(A)



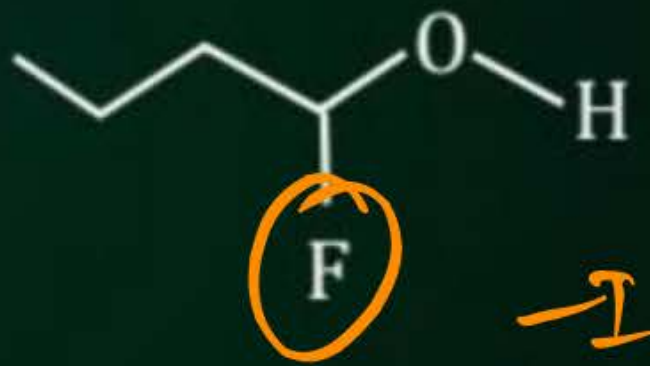
(B)



(C)



(D) ✓



$-I$ pass Maza

QUESTION 08

Which is the decreasing order of acidity in the following compounds?

$\overset{\downarrow}{C}H_3\overset{\downarrow}{C}H_2OH$(I)

$\overset{\downarrow}{C}\underline{F_3}\overset{\downarrow}{C}H_2OH$(II)

$\overset{\downarrow}{C}\underline{Cl_3}-\overset{\downarrow}{C}H_2OH$(III)

$(\underline{NO_2})_3\overset{\downarrow}{C}-\overset{\downarrow}{C}H_2OH$(IV)

(A) I > II > III > IV

(B) II > I > III > IV

(C) IV > II > I > III

[✓ (D)] IV > II > III > I

QUESTION 09

The decreasing order of –I effect of the following is:

I. $H_3N^{\oplus}$

II. NO_2

III. CN

IV. COOH

[✓ A] I > II > III > IV

B II > I > III > IV

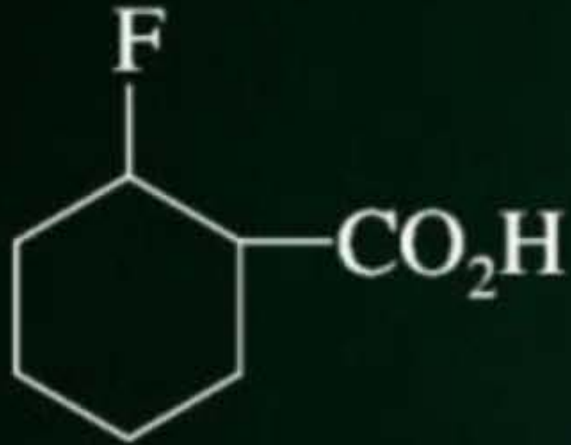
[✓ C] I > II > III > IV

D II > I > IV > III

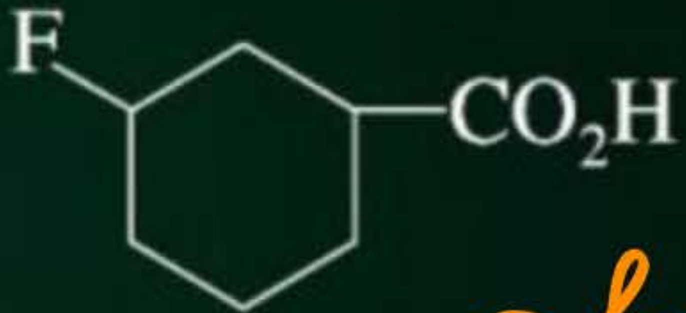
QUESTION 10

Which of the following has highest K_a value?

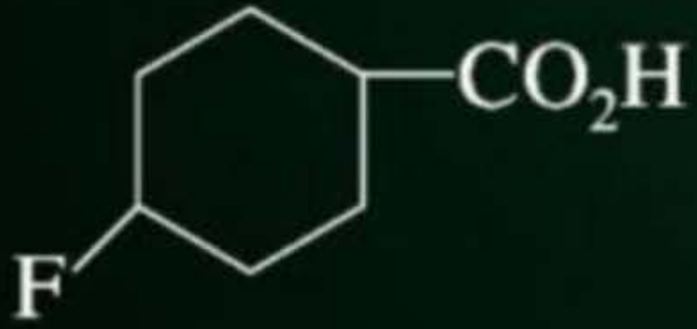
(A)



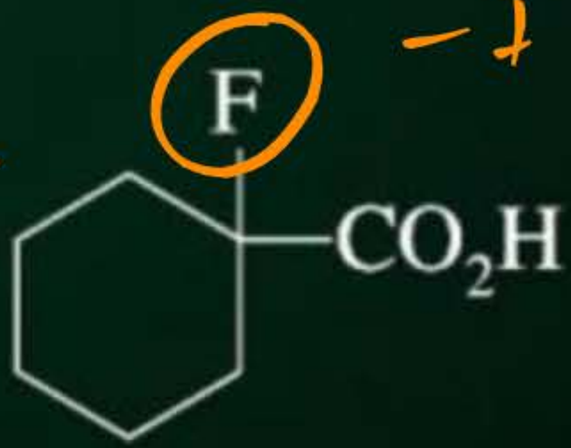
(B)



(C)



[✓ D]



-I paas maza

ANSWER KEY

1. C
2. D
3. A
4. D
5. D
6. C
7. D
8. D
9. A
10. D

Home Work

discussion of L-03

QUESTION 01

Resonance involves:

- **A** Delocalization of π-electrons along a conjugated system.
- **B** Delocalization of lone pair along a conjugated system.
- **C** Declocalization of negative charge along a conjugated system.
- **D** [✓ All are correct.]

QUESTION 02

Arrange the following resonating structure according to their contribution towards resonance hybrid?

(a) $CH_2 = \overset{\oplus}{N} \underset{2\pi}{=} \overset{\overset{\swarrow}{\ominus}}{N}$ (b) $\overset{\overset{\swarrow}{\ominus}}{C}H_2 - N \underset{1\pi}{=} \overset{\oplus}{N}$ (c) $\overset{\oplus}{C}H_2 - \ddot{N} \underset{1\pi}{=} \overset{\overset{\swarrow}{\ominus}}{N}$ (d) $\overset{\overset{\downarrow}{\ominus}}{C}H_2 - \overset{\oplus}{N} \underset{2\pi}{\equiv} \ddot{N}$

[✓ A] a > d > c > b

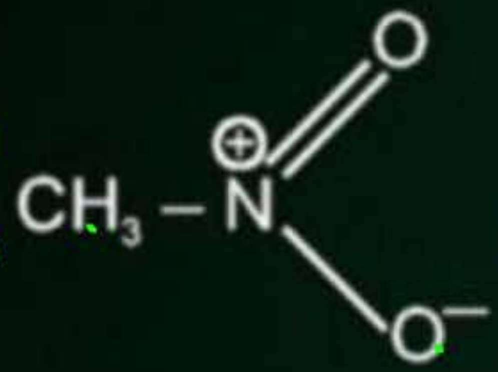
B b > a > c > d

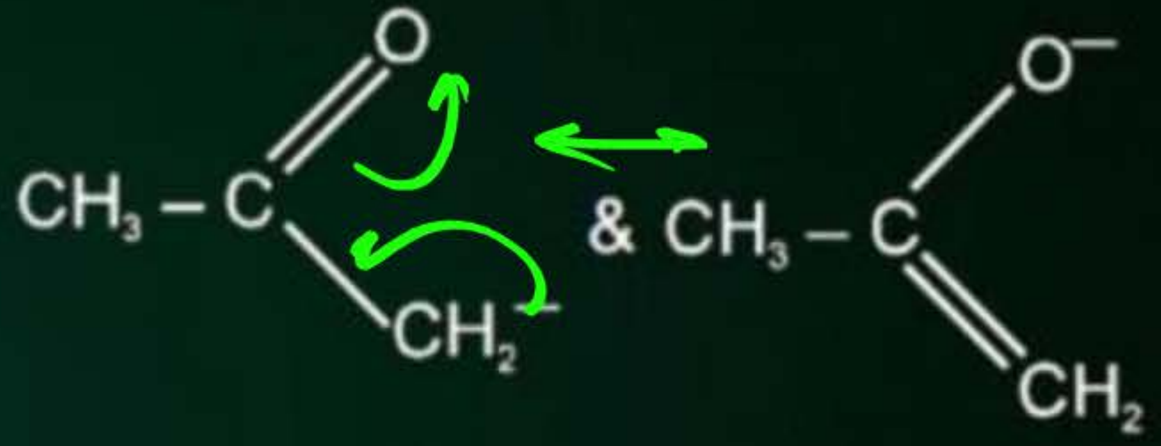
C a > c > b > d

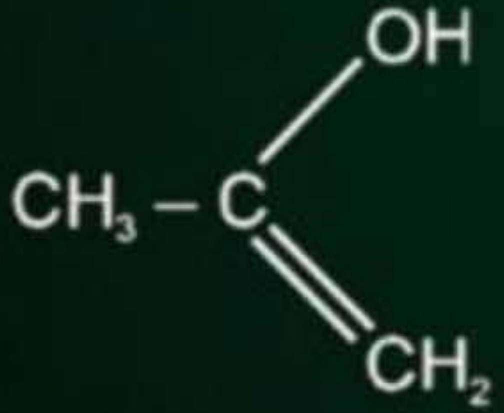
D d > a > b > c

QUESTION 03

Which of the following structures are resonance structures?

(A)  & $CH_3-O-N=O$

(B) 

(C) $(CH_3)_2CO$ & 

(D) $CH_3-CH=CH-CH_3$ & $CH_3-CH_2-CH=CH_2$

QUESTION 04

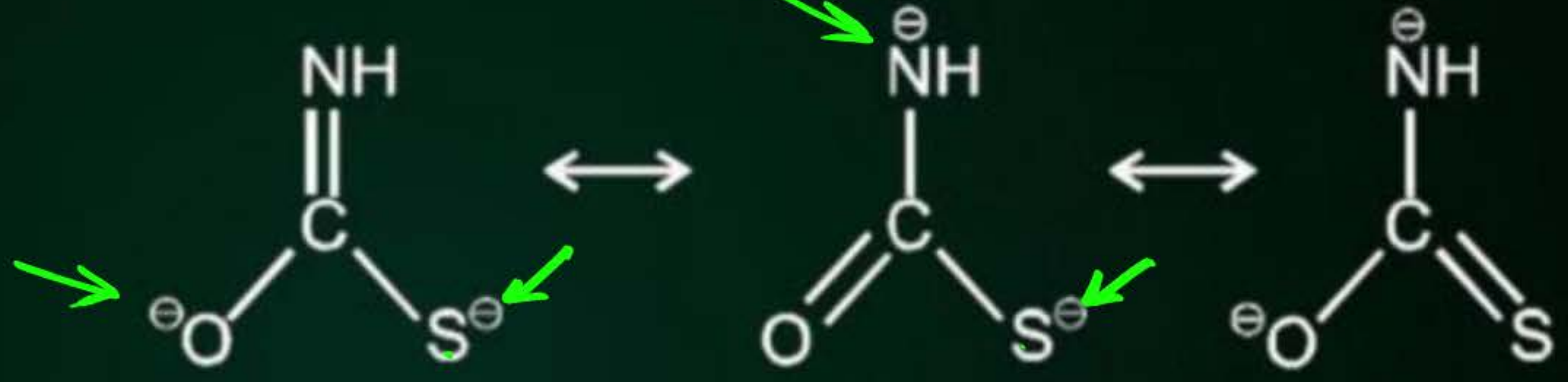
Stability order of the following species is:

[✓ A] I > II > III

B III > I > II

C III > II > I

D I > III > II


NH
C
O
S
$\ominus$
$\overset{\ominus}{N}H$
$\longleftrightarrow$

(I) (II) (III)

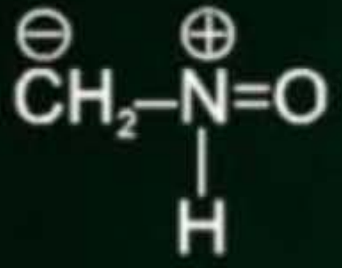
1π 1π 1π

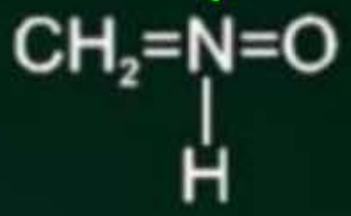
Stability of

$\overset{\ominus}{N} < \overset{\ominus}{O} < \overset{\ominus}{S}$

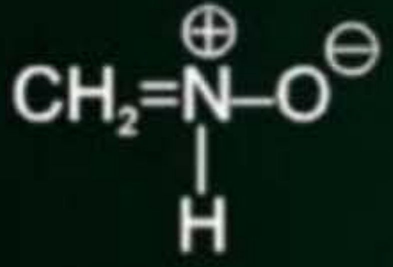
QUESTION 05

Which of the following is not acceptable as resonating structure?

A 
$\overset{\ominus}{C}H_2-\underset{\underset{H}{|}}{\overset{\oplus}{N}}=O$

B 
$CH_2=\underset{\underset{H}{|}}{N}=O$

5 Bond
omg
PHK

C 
$CH_2=\underset{\underset{H}{|}}{\overset{\oplus}{N}}-O^{\ominus}$

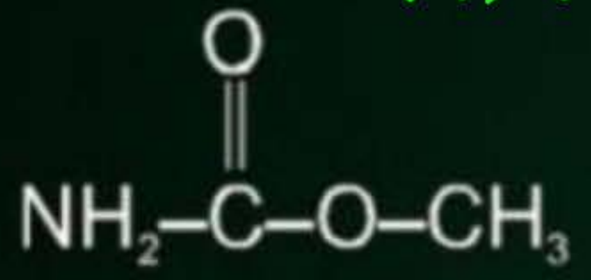
D None of these

QUESTION 06

Which one of the following is least stable resonating structure?

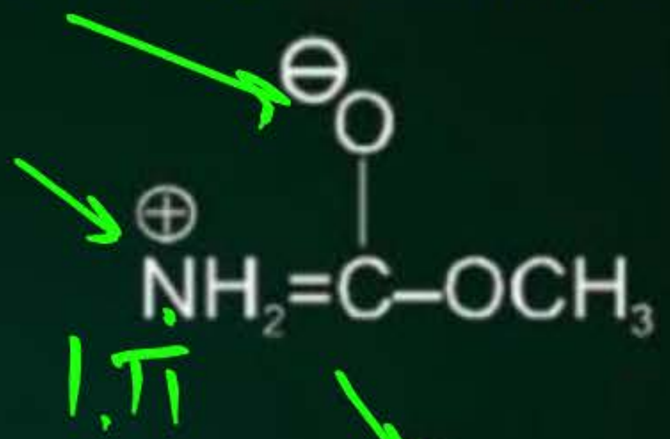
A>B>D>C

A



$NH_2-\overset{\overset{O}{\|}}{C}-O-CH_3$

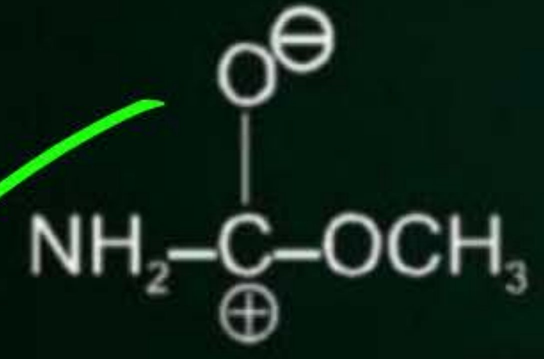
B



$\overset{\oplus}{N}H_2=\overset{\overset{\ominus}{O}}{\overset{|}{C}}-OCH_3$

1.π

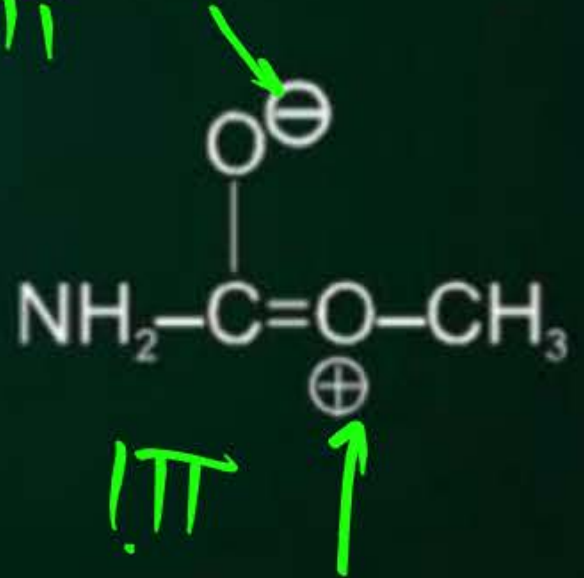
[✓ C]



$NH_2-\underset{\oplus}{\overset{\overset{O^{\ominus}}{|}}{C}}-OCH_3$

0π

D



$NH_2-\overset{\overset{O^{\ominus}}{|}}{C}=\underset{\oplus}{O}-CH_3$

1π

QUESTION 07

Which of the following resonating structure of 1-Methoxy-1,3-butadiene is most stable?

door

(A) $\overset{\ominus}{C}H_2 - CH = CH - CH = \overset{\oplus}{O} - CH_3$ 2π

paas

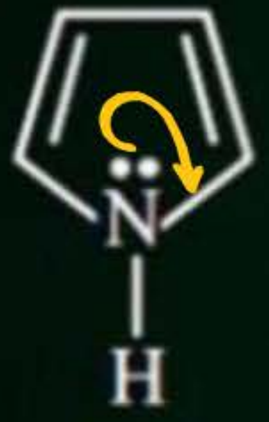
(B) ✓ $CH_2 = CH - \overset{\ominus}{C}H - CH = \overset{\oplus}{O} - CH_3$ 2π

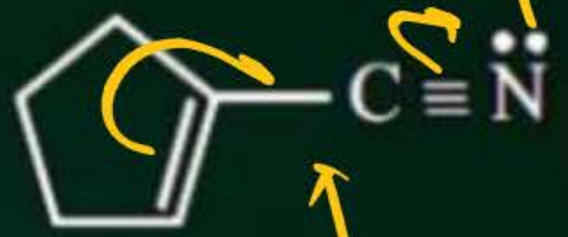
(C) $CH_2 = CH - \overset{\oplus}{C}H - \overset{\ominus}{C}H - O - CH_3$ 1π

(D) $CH_2 = CH - \overset{\ominus}{C}H - \overset{\oplus}{C}H - O - CH_3$ 1π

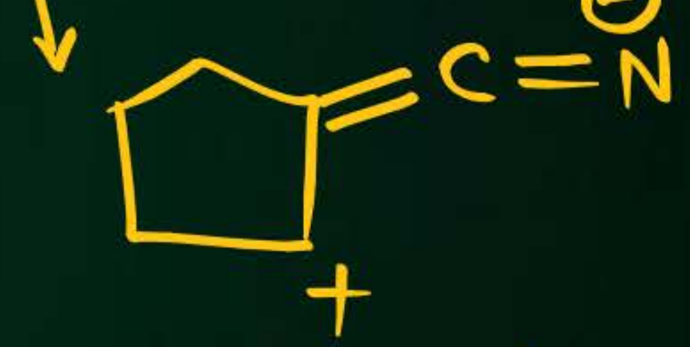
QUESTION 08

In which case lone pair indicated is not involved in resonance?

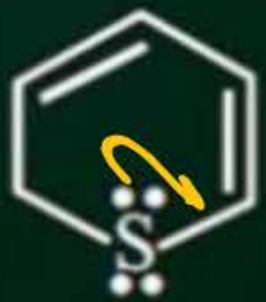
A


B


Not reso



C
$CH_2=CH-\ddot{\underset{..}{O}}-CH_3$

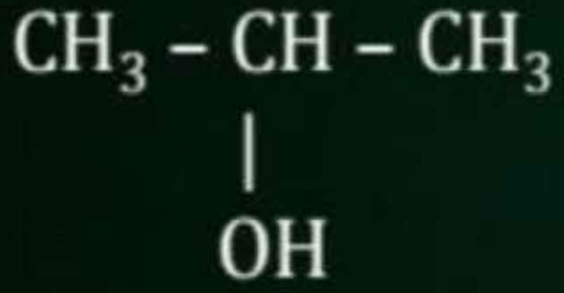
D


QUESTION 09

In which of the following delocalization of π-electron is possible?

(A) ✗ $CH_2 = CH - CH_2 - CHO$

✓ (B) $CH_2 = CH - CH = O$

(C) ✗ 

$CH_3 - \underset{\displaystyle OH}{\underset{|}{CH}} - CH_3$

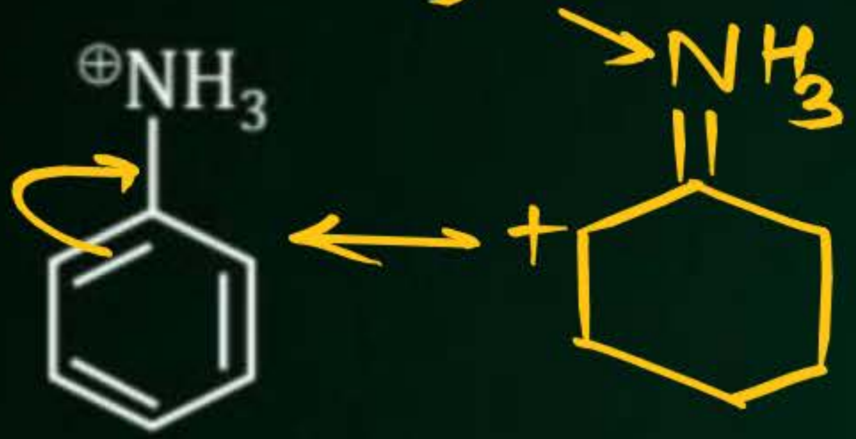
(D) ✗ $CH_2 = CH - CH_2 - CH = CH_2$

QUESTION 10

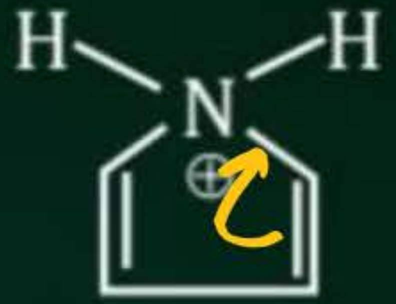
In which of the following delocalization of positive charge is possible?

5 Bond only PHK

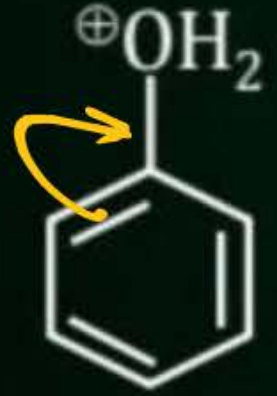
A



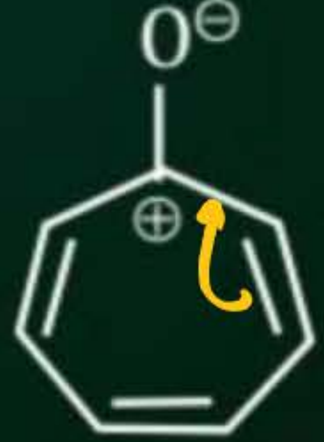
B



C



D



Thank you!

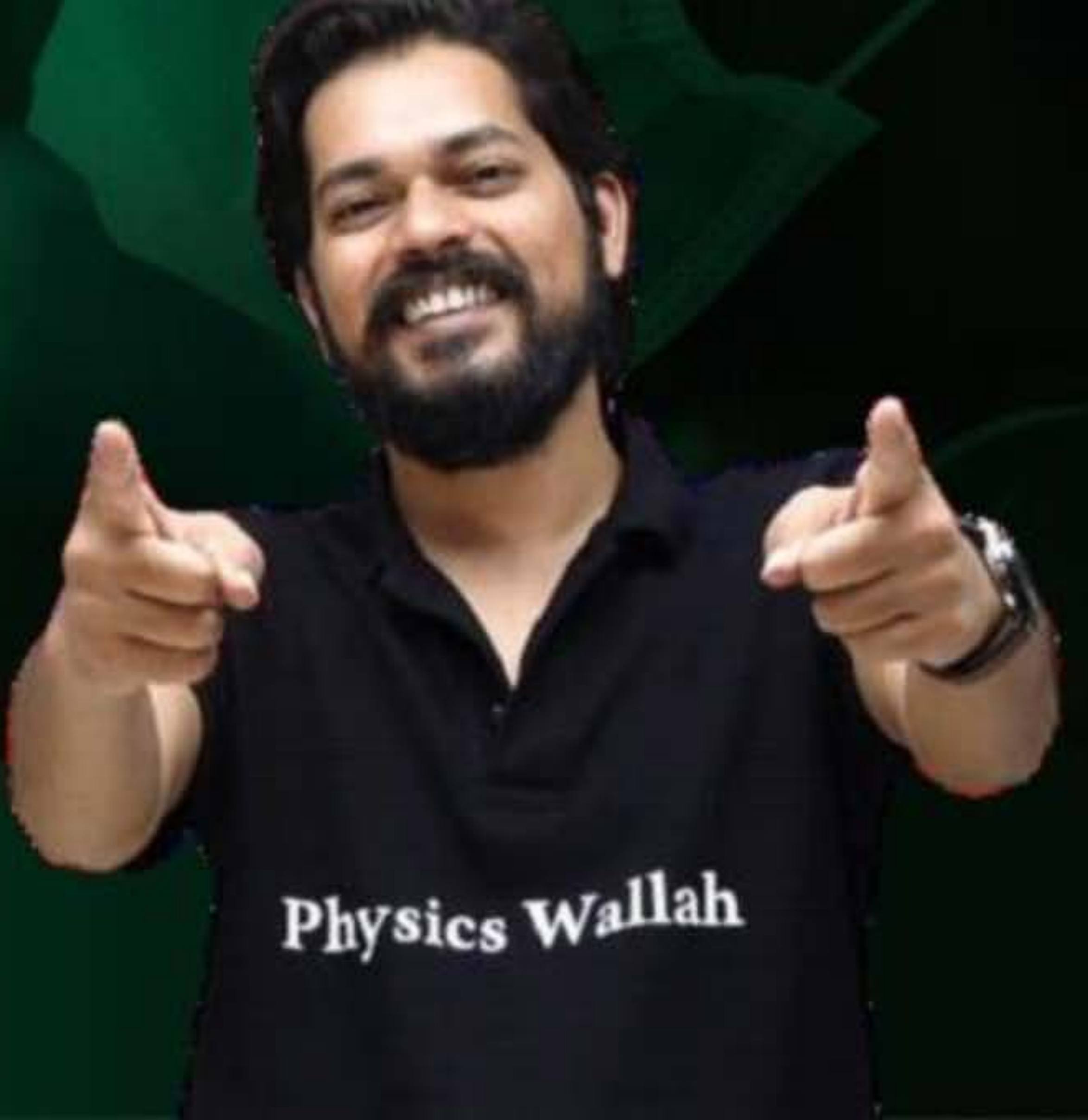
YAKEEN 2.0

FOR NEET 2025

Lecture- 05 | **Organic Chemistry**

Some Basic Principles and Techniques (GOC)

By- Pankaj Sir(POPU MAMA)


Physics Wallah

Topics *to be covered*

1. Comparison of Mesomeric Effect (+M/-M) ✓
2. Applications of Mesomeric Effect ✓
3. Practice

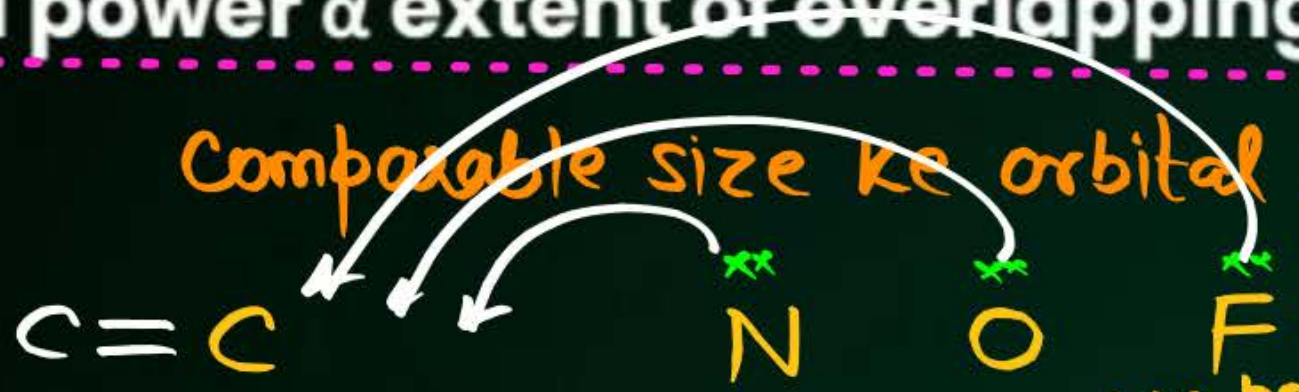
Comparison Power of +M Groups

(Charge dominates)

+M $\boxed{-\overset{\ominus}{N}H > -\overset{\ominus}{O} > -NH_2 > -OH > -F}$

1. +M power α extent of overlapping.

Comparable size ke orbital over lapping mast hoti hai.

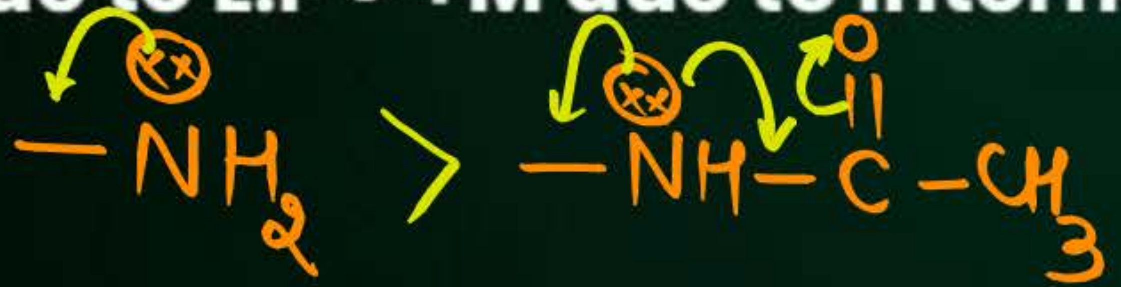


Size C > N > O > F

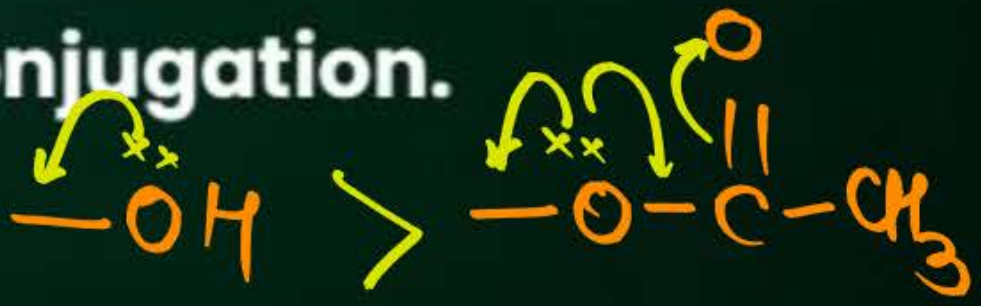
+M power

$\boxed{NH_2 > OH > F}$

2. +M due to L.P > +M due to L.P with internal conjugation.



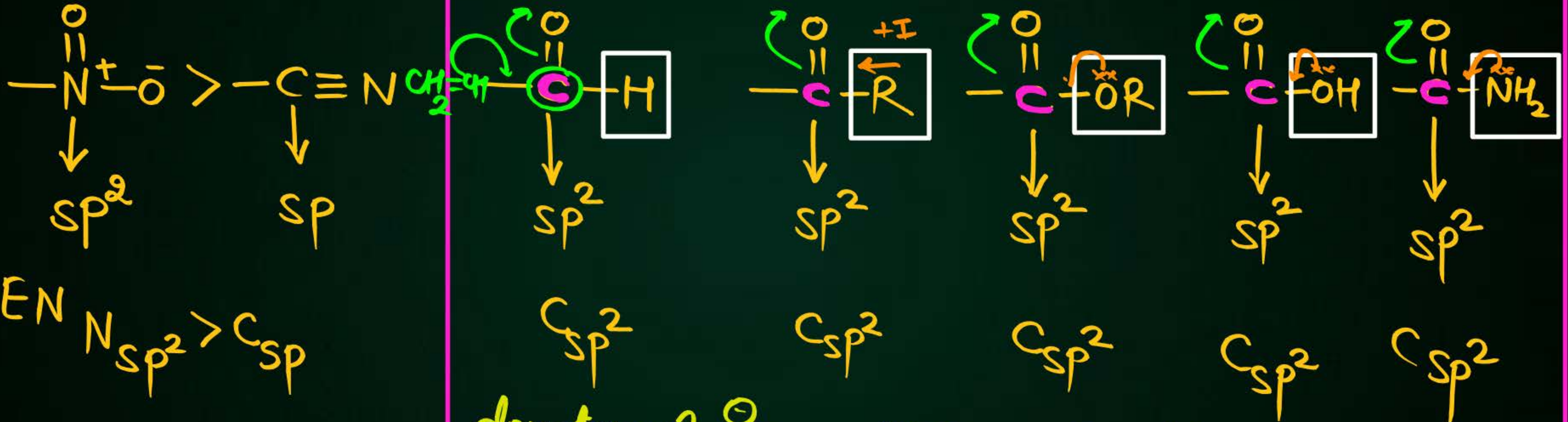
$-NH_2 > -NH-\overset{O}{\overset{\|}{C}}-CH_3$



$-OH > -O-\overset{O}{\overset{\|}{C}}-CH_3$

Comparison Power of -M Groups

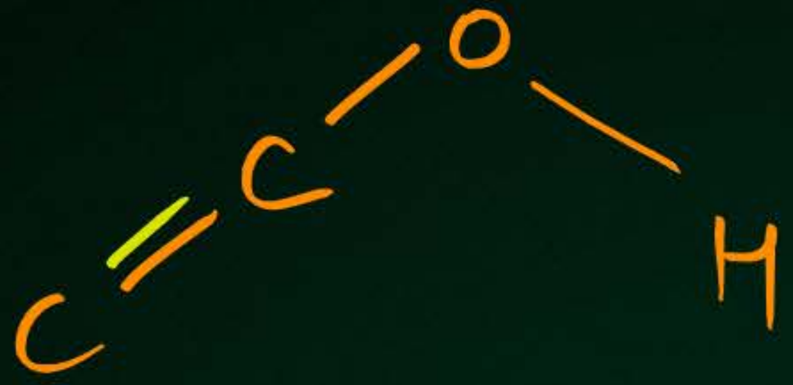
$-NO_2 > -CN > -CHO > -COR > -COOR > -COOH > -CONH_2$

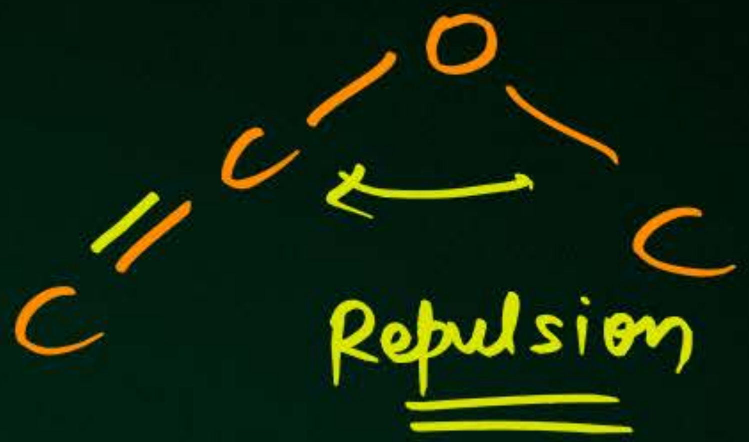

$-\overset{+}{N}(=O)-\bar{O}$
>
$-C\equiv N$
$CH_2=CH-$
$-C(=O)-H$
+I
$-C(=O)-R$
$-C(=O)-\ddot{O}R$
$-C(=O)-\ddot{O}H$
$-C(=O)-\ddot{N}H_2$
sp^2
sp
sp^2
sp^2
sp^2
sp^2
sp^2
C_{sp^2}
C_{sp^2}
C_{sp^2}
C_{sp^2}
C_{sp^2}

EN $N_{sp^2} > C_{sp}$

donation of $\overset{\ominus}{e}s$ $-NH_2 > -OH > -OR > -R > -H$

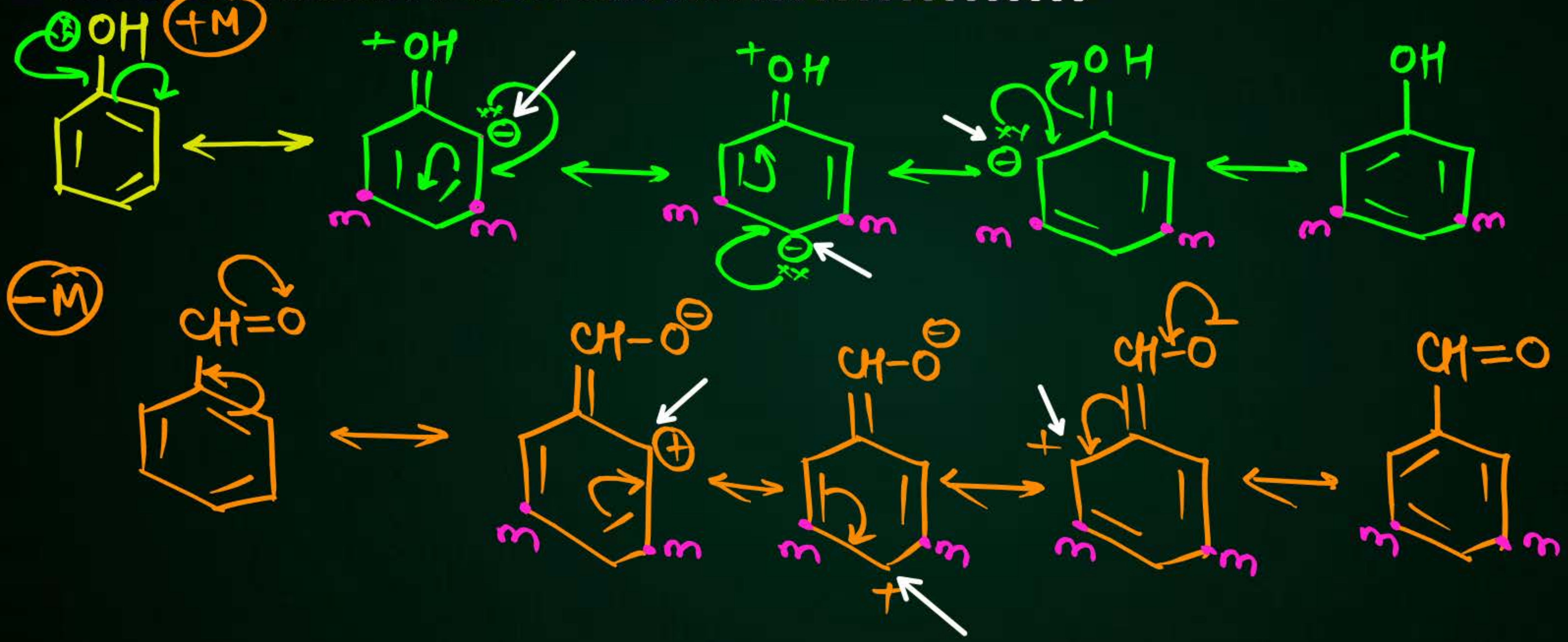
withdrawing power of $-C=O \propto \frac{1}{\text{donation}}$


C
C
O
H


C
C
O
C
Repulsion

OP Points

1. M effect does not operate on meta position.



OH
+M
$^{+}$OH
m
OH
−M
CH=O
CH–O$^{\ominus}$
+
CH=O

2. Effects

A. $M > I$

$\boxed{+M} > \boxed{+I}$: $-\overset{\ominus}{O}$, $\overset{\ominus}{N}H$, $-\bar{C}H_2$

$\boxed{-M} > \boxed{-I}$: $-NO_2$, $-CN$, $-CHO$, $-COR$, $-COOR$, $-COOH$, $-CONH_2$

M → Actual $e^{\ominus}s$

I → Tendency $e^{\ominus}s$

Extent of overlap ↑

B. $+M > -I$ ✓ ✓

$\boxed{2^{nd}\text{ period}}$ except halogen

$-\ddot{N}H_2$ $\quad$ $-\ddot{O}H$ $\quad$ $-\ddot{O}COCH_3$

$-\ddot{N}HR$ $\quad$ $-\ddot{O}R$

$-\ddot{N}R_2$ $\quad$ $-\ddot{N}HCOCH_3$

Size $\quad$ Ⓒ $\quad \underline{N} \quad O$

C. -I > +M $\underbrace{\text{Chameleon Groups}}_{\text{Halogens}}$

F, Cl, Br, I

In Halogens

① If only -I operates

-I power $-F > -Cl > -Br > -I$

② If both +M & -I operates ÷

$\boxed{-I > +M}$

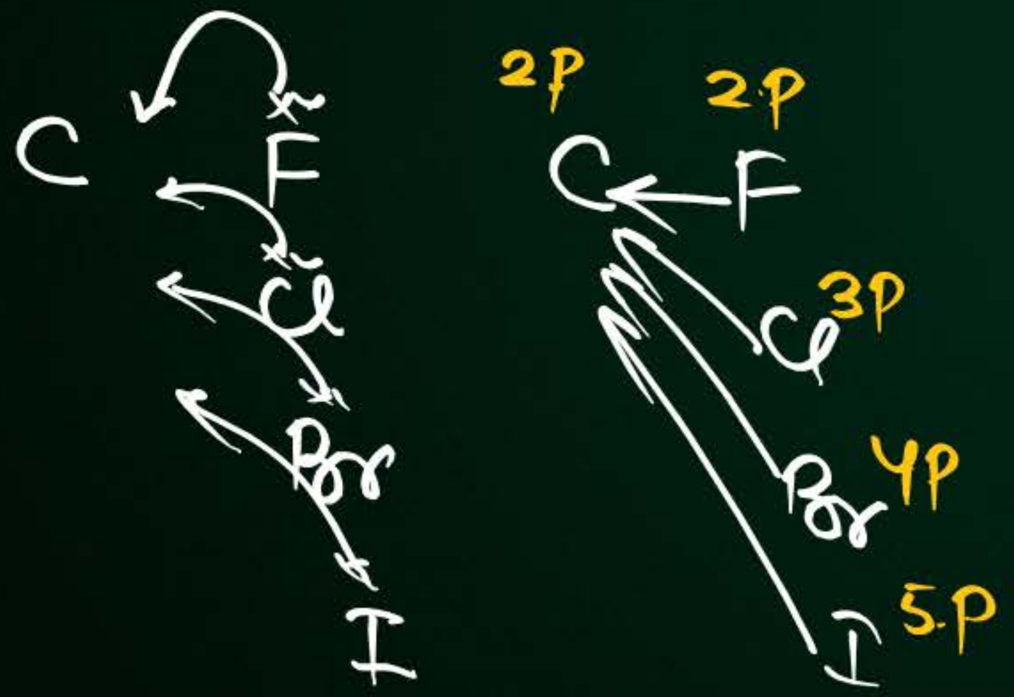
LP donation

$\boxed{+M \text{ power}}$ $-F > -Cl > -Br > -I$

$\boxed{-I \text{ power}}$ $-F > -Cl > -Br > -I$

ewg

-I series

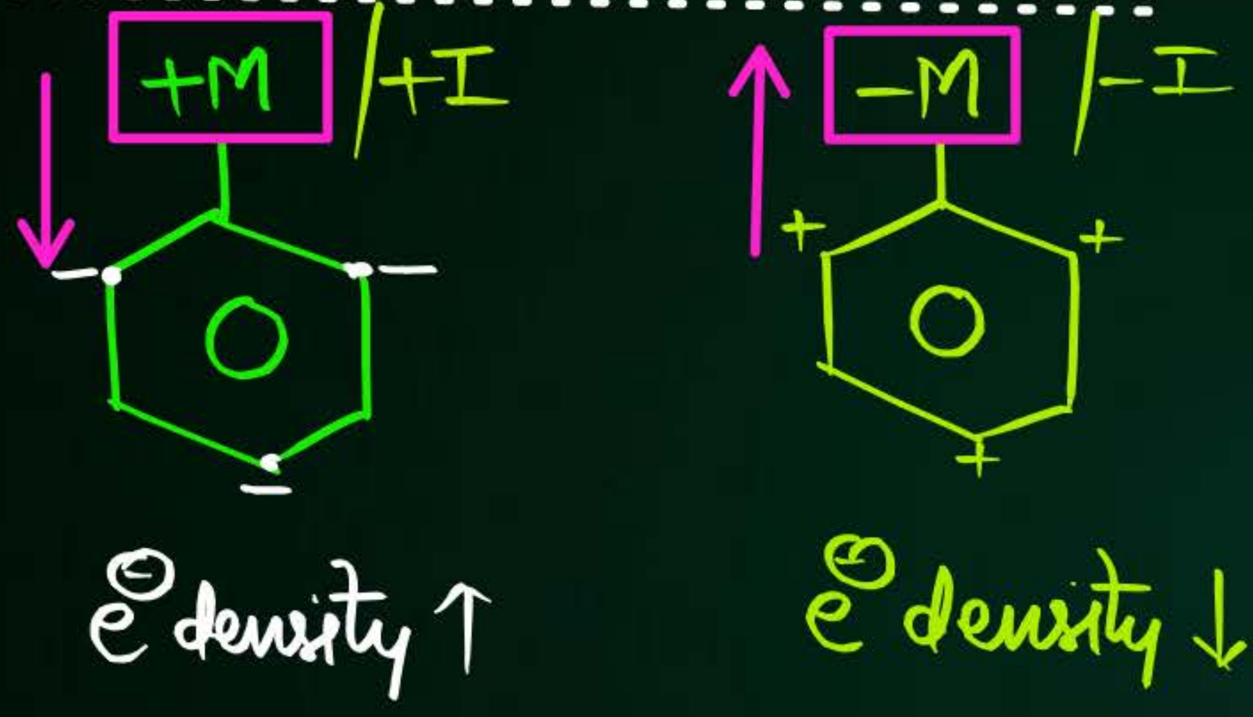

C
F
Cl
Br
I
2P
2P
C
F
Cl
3P
Br
4P
I
5P

sall withdrawing Nature

// $\boxed{F < Cl < Br < I}$

Application of Mesomeric effect

1. Electron density in benzene ring



$e^{\ominus}$ density ↑

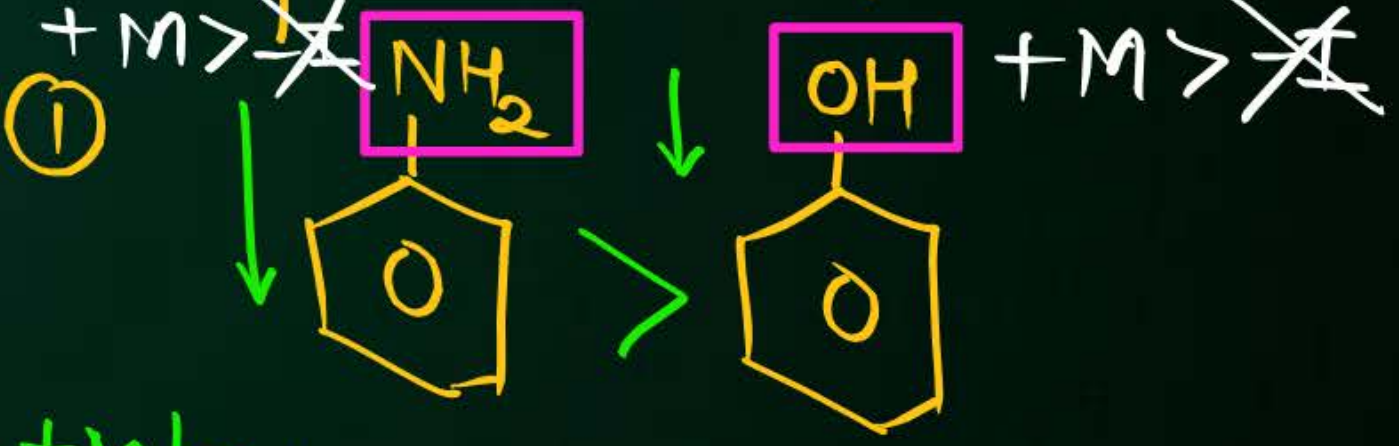
$e^{\ominus}$ density ↓

Sawal karne ke liye dominating effect

$$\left[e^{\ominus} \text{density} \propto \text{edg} \propto \frac{1}{\text{ewg}} \right]$$

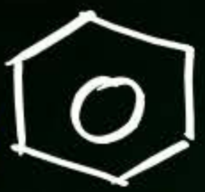
Q Compare $e^{\ominus}$ density

①


$+M > \cancel{I}$
NH_2
OH
$+M > \cancel{I}$
>

+M power $-NH_2 > -OH$

Q compare $e^{\ominus}$ density

①


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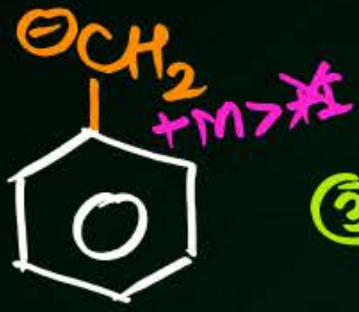

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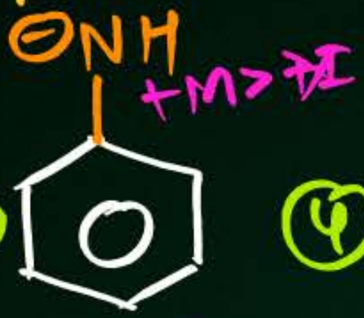

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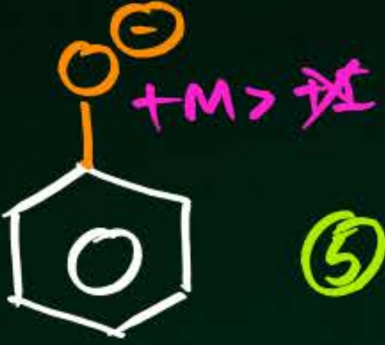

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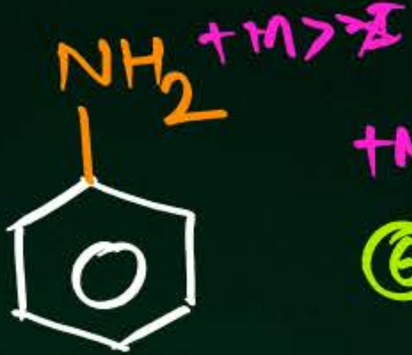

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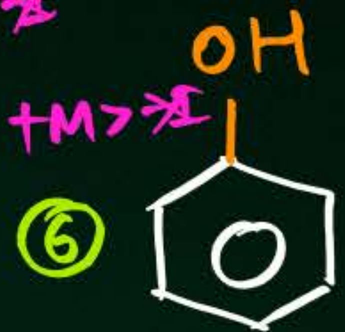

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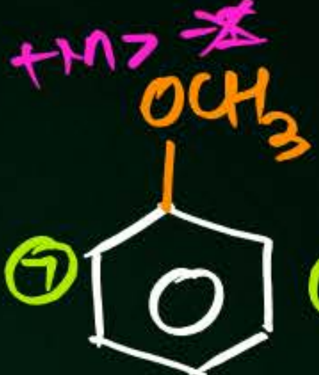

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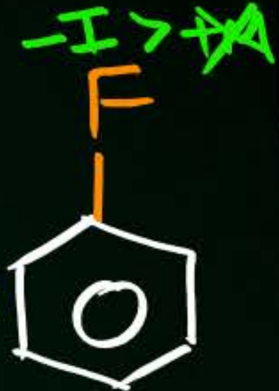

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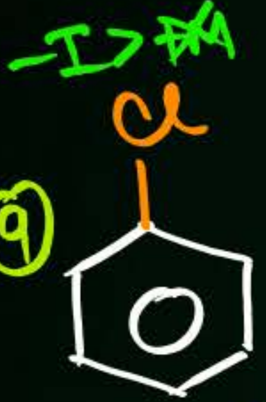

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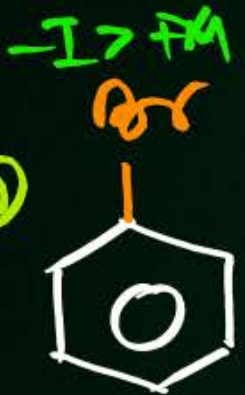

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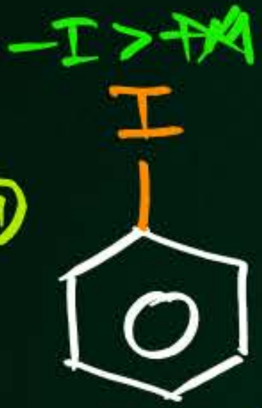

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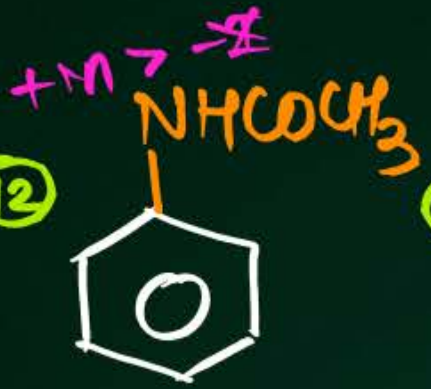

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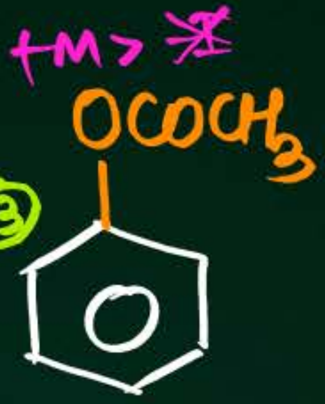

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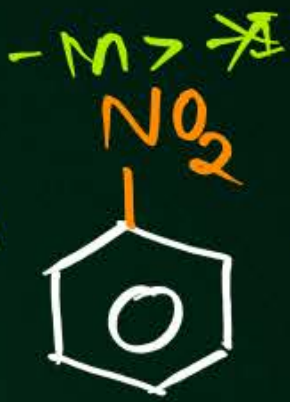

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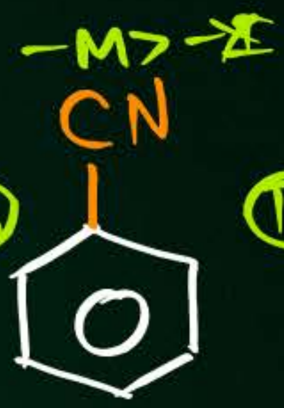

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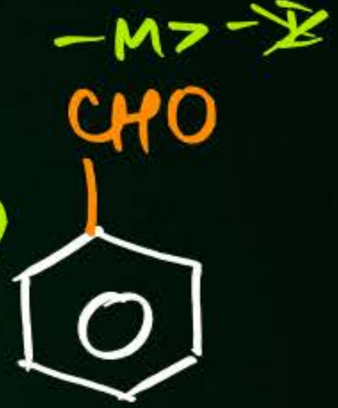

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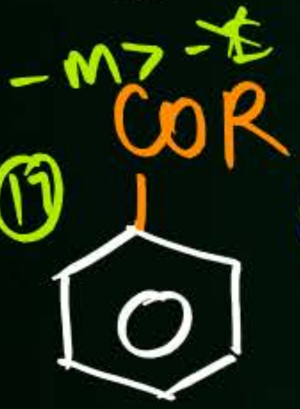

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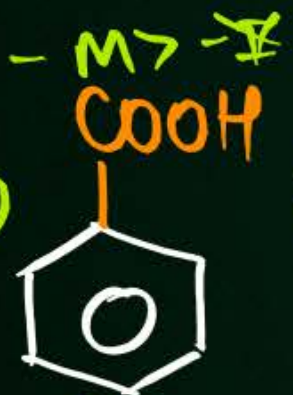

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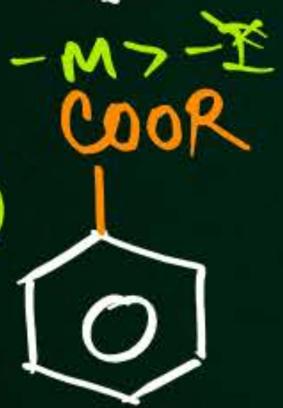

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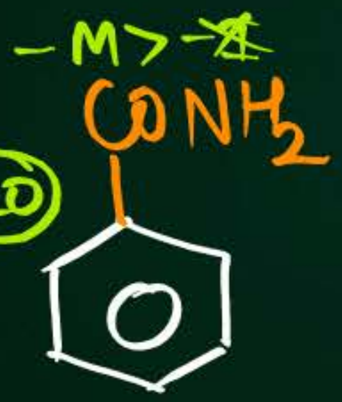


-M power

$-NO_2 > -CN > CHO > COR > COOR > COOH > CONH_2$

+M power $-\overset{\ominus}{C}H_2 > -\overset{\ominus}{N}H > -\overset{\ominus}{O} > -NH_2 > -OH > -OCH_3 > NHCOCH_3 > OCOCH_3$

-I power $F > Cl > Br > I$

$2 > 3 > 4 > 5 > 6 > 7 > 12 > 13 > 1 > 11 > 10 > 9 > 8 > 20 > 18 > 19 > 17 > 16 > 15 > 14$

Application of Mesomeric effect

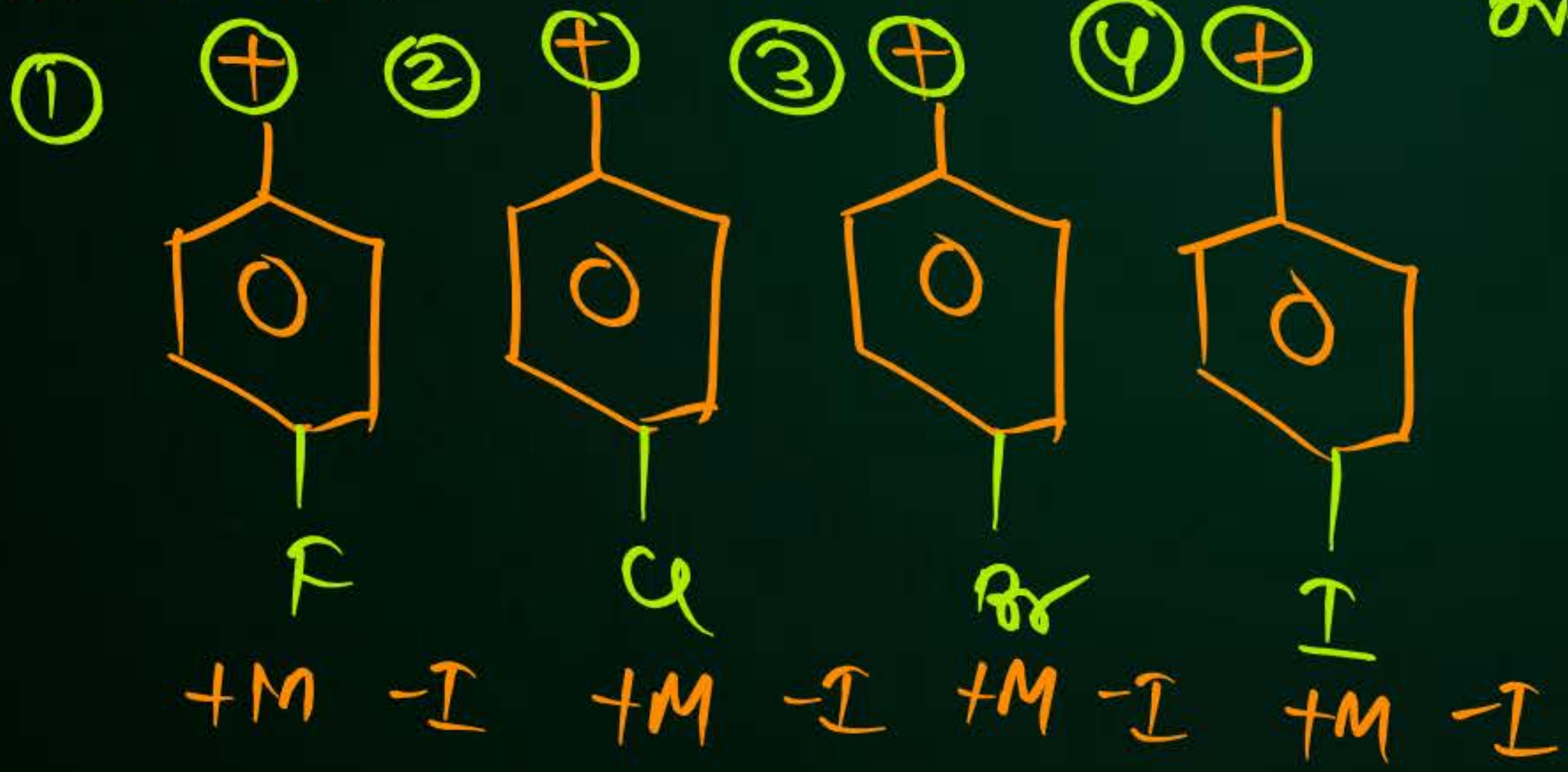
$\overset{+}{C} \mid \overset{-}{C} \mid \overset{\bullet}{C}$

2. Stability of intermediates

stability of $\overset{\oplus}{C}$ or $\overset{\bullet}{C}$ $\propto +M, +I \propto \frac{1}{-M, -I}$

stability of $\overset{\ominus}{C} \propto -M, -I \propto \frac{1}{+M, +I}$

Q compare stability



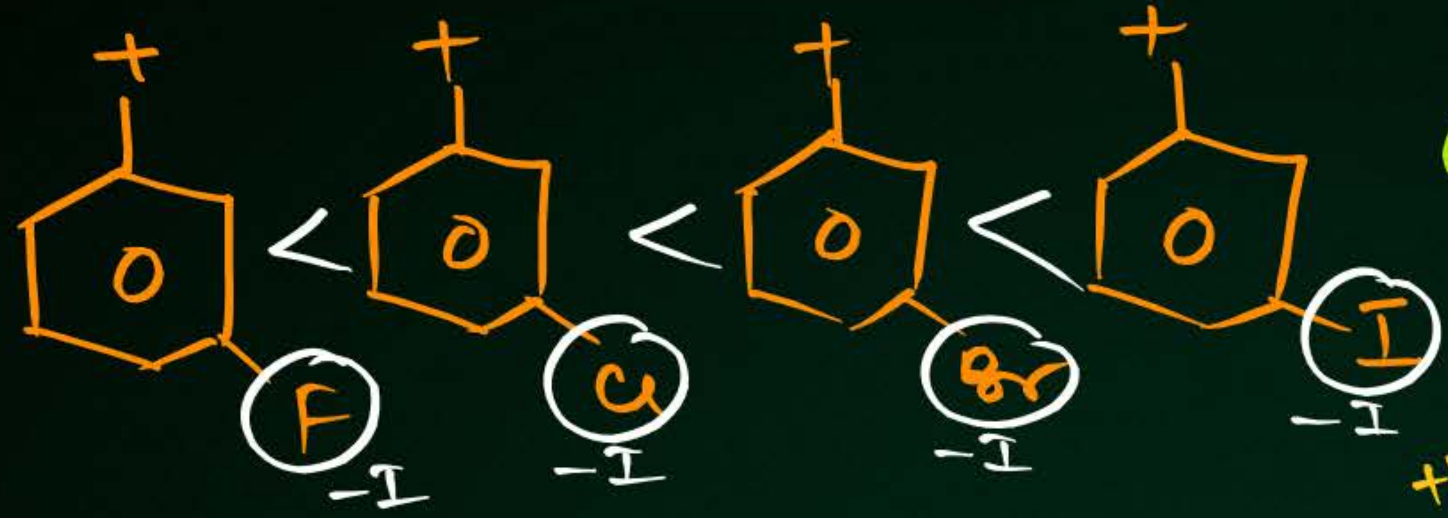
overall withdrawing power

F < Cl < Br < I

① > ② > ③ > ④

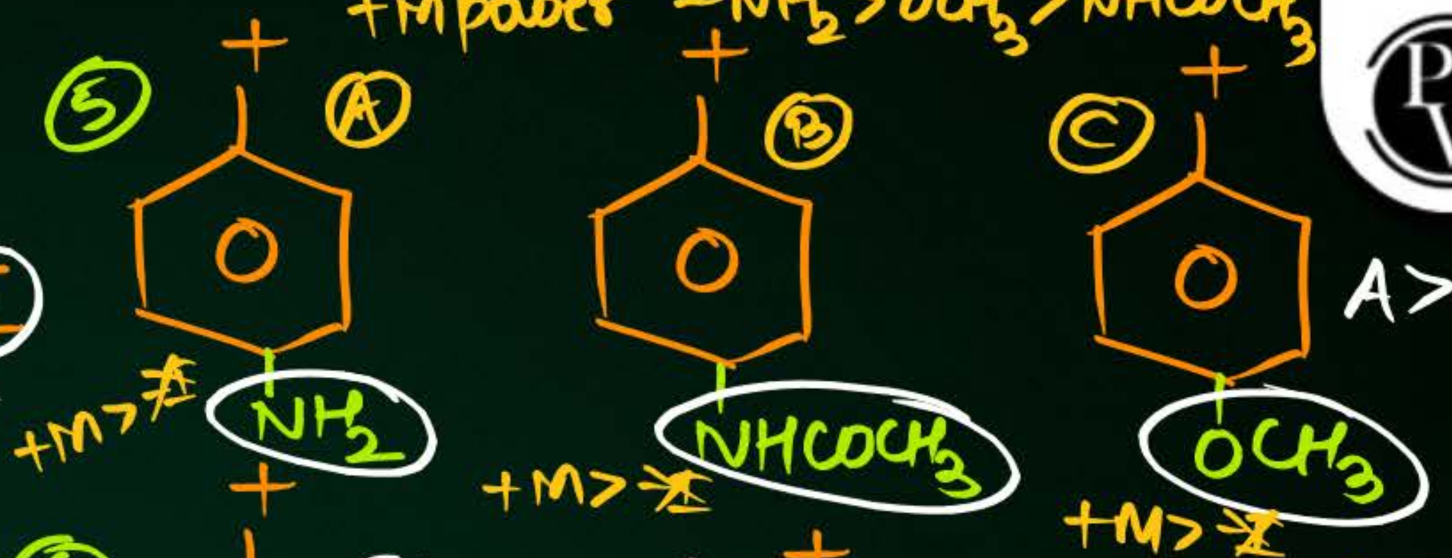
+M power $-NH_2 > OCH_3 > NHCOCH_3$

Q/②



+
F
−I
<
Cl
−I
<
Br
−I
<
I
−I

⑤

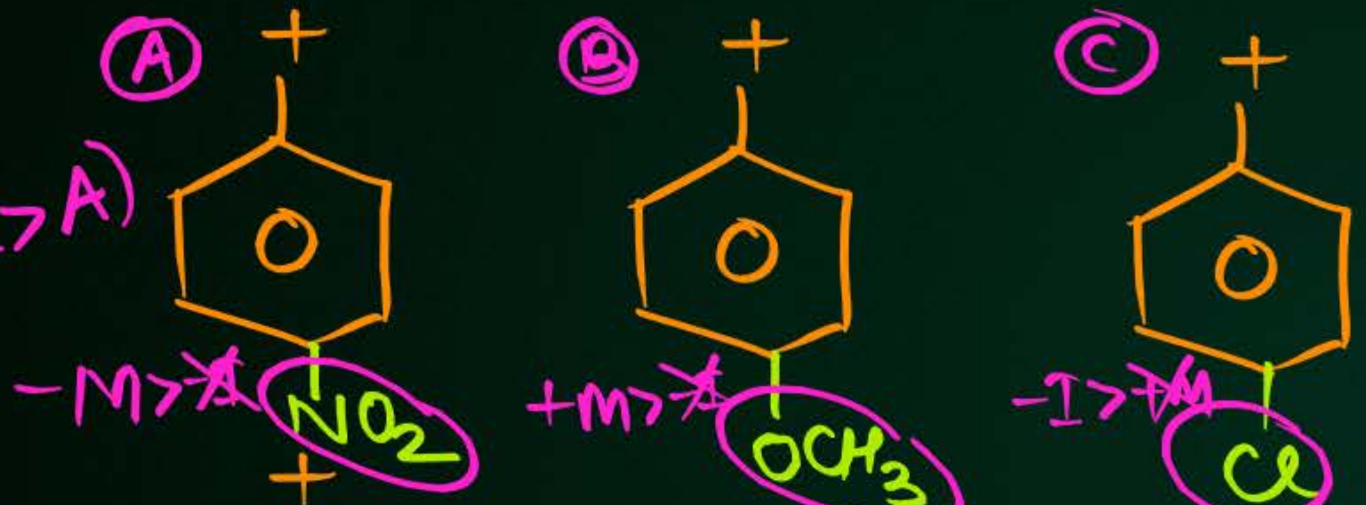


Ⓐ
+
NH_2
$+M > \cancel{I}$
Ⓑ
+
$NHCOCH_3$
$+M > \cancel{I}$
Ⓒ
+
OCH_3
$+M > \cancel{I}$

A>C>B

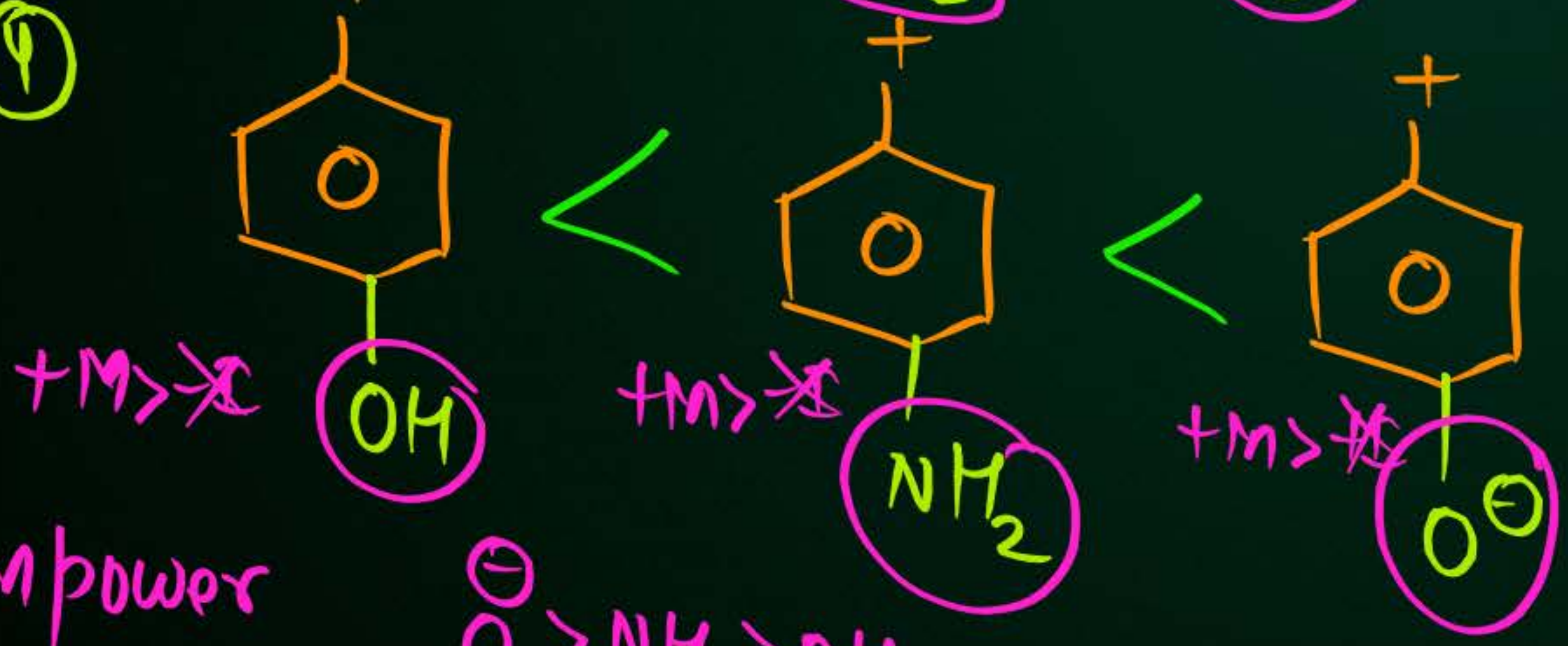
③

(B>C>A)



Ⓐ
+
NO_2
$-M > \cancel{I}$
Ⓑ
+
OCH_3
$+M > \cancel{I}$
Ⓒ
+
Cl
$-I > \cancel{+M}$

④

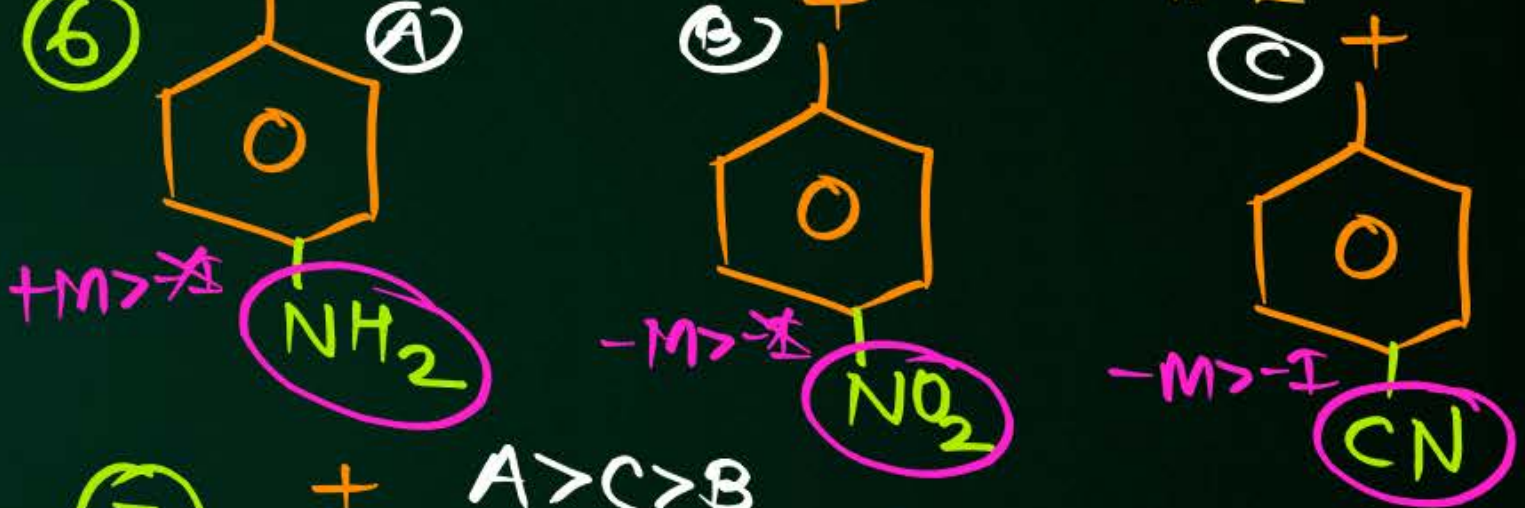


+
OH
$+M > \cancel{I}$
<
+
NH_2
$+M > \cancel{I}$
<
+
$O^{\ominus}$
$+M > \cancel{I}$

+M power

$O^{\ominus} > NH_2 > OH$

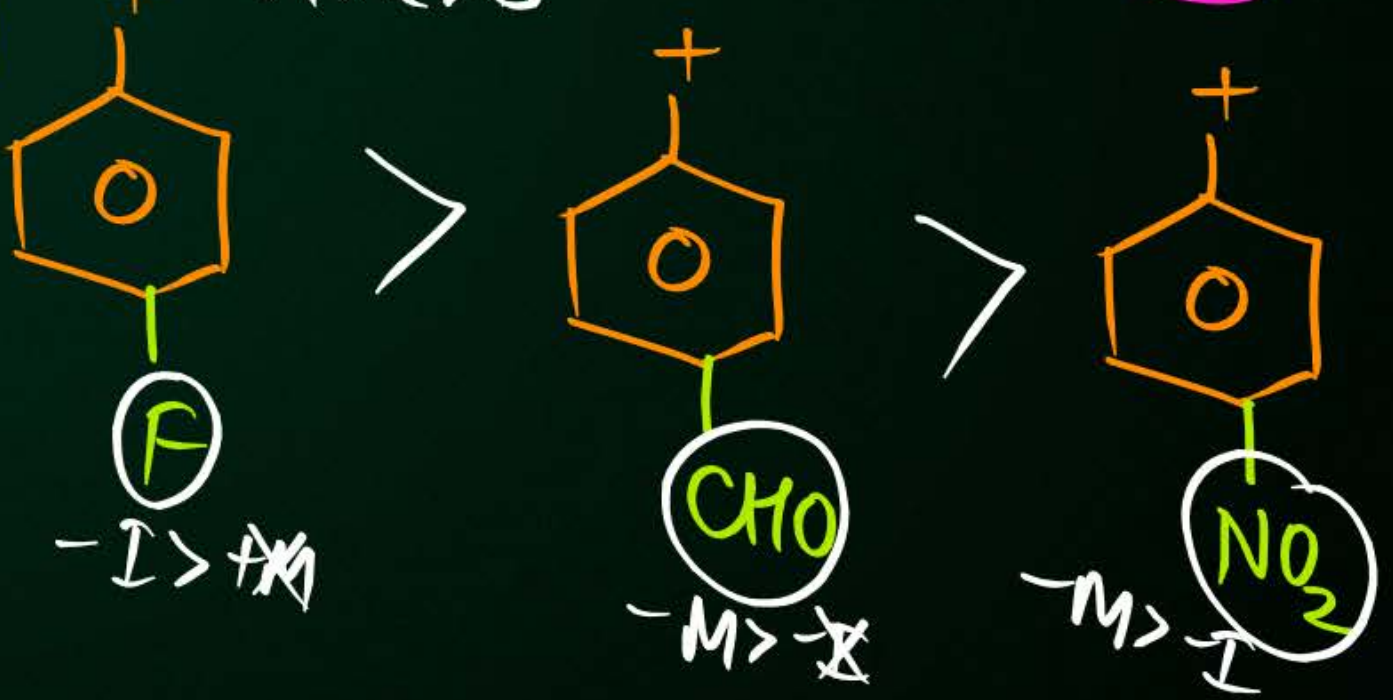
⑥



Ⓐ
+
NH_2
$+M > \cancel{I}$
Ⓑ
+
NO_2
$-M > \cancel{I}$
Ⓒ
+
CN
$-M > -I$

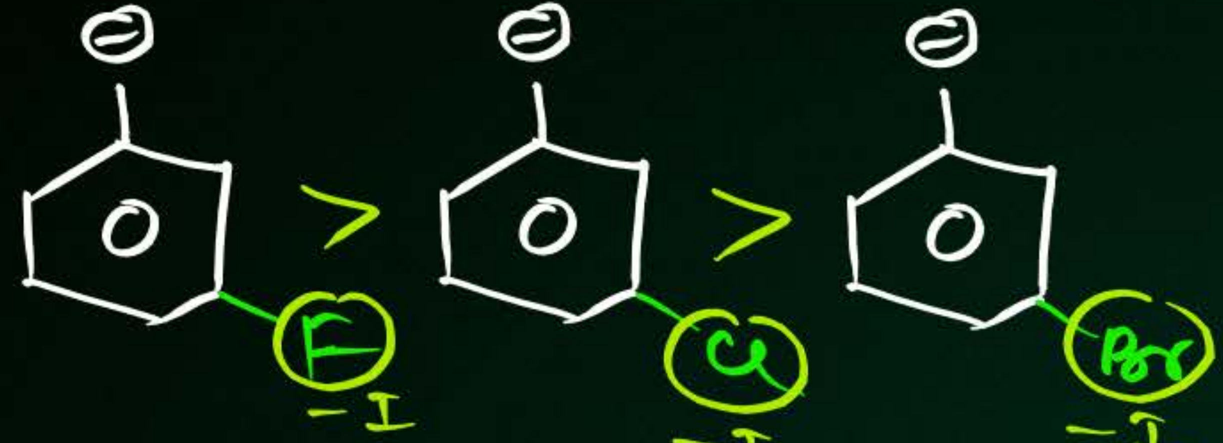
A>C>B

⑦

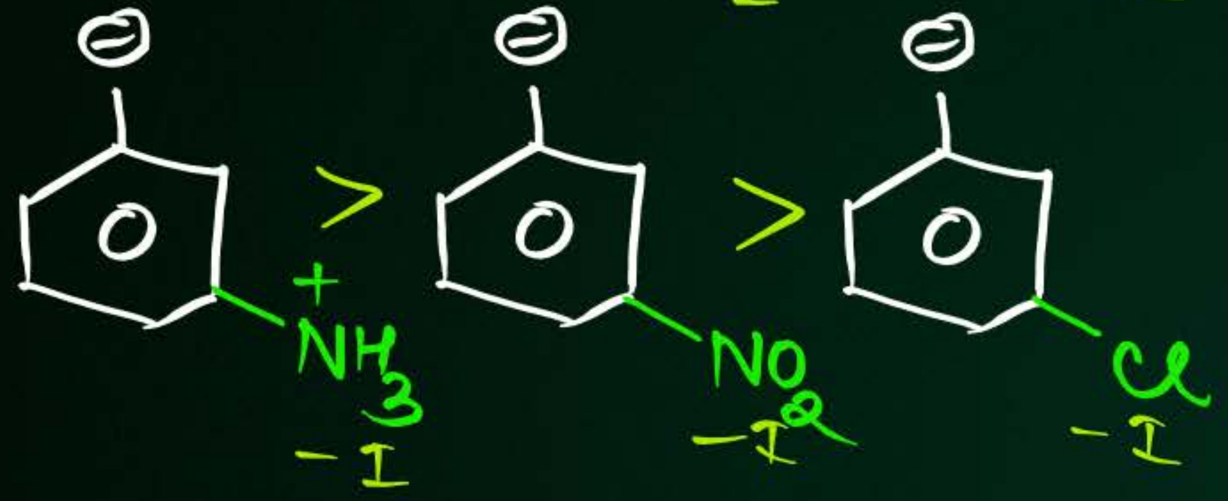


+
F
$-I > \cancel{+M}$
>
+
CHO
$-M > \cancel{I}$
>
+
NO_2
$-M > I$

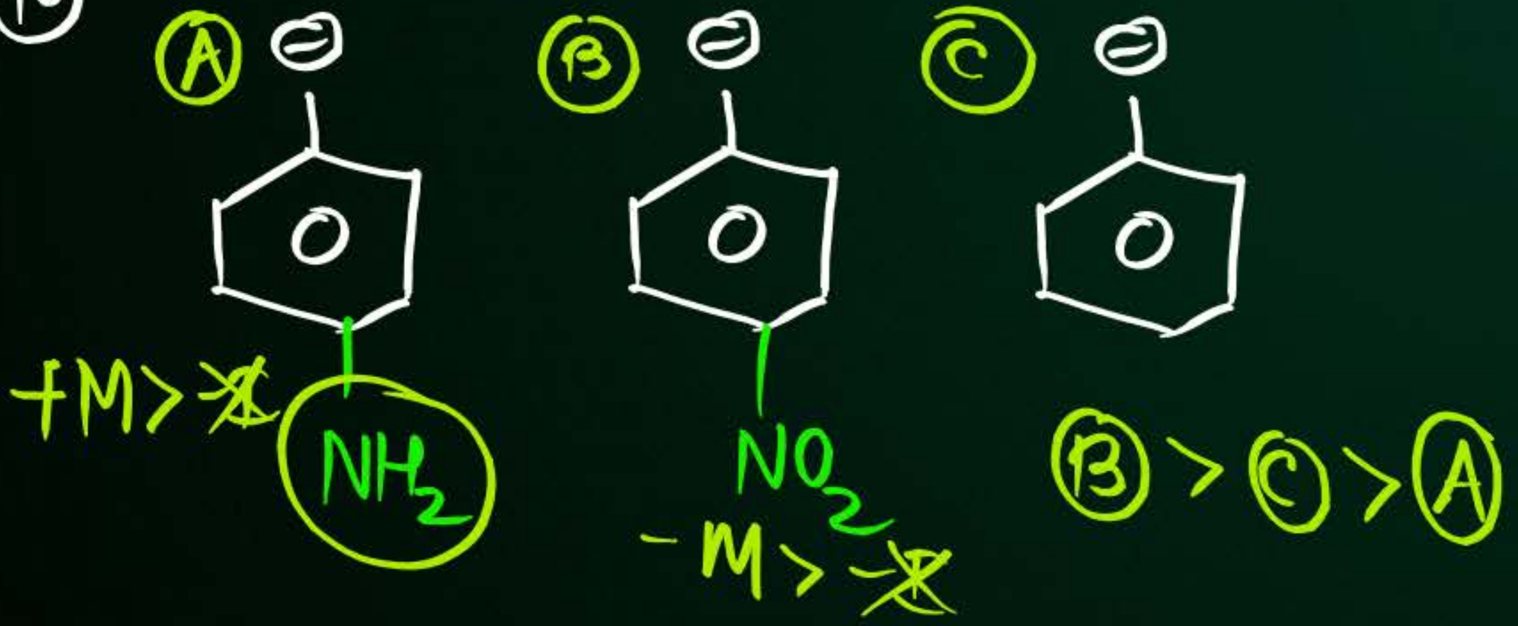
⑧


⊖
O
>
⊖
O
>
⊖
O
F
-I
Cl
-I
Br
-I

⑨

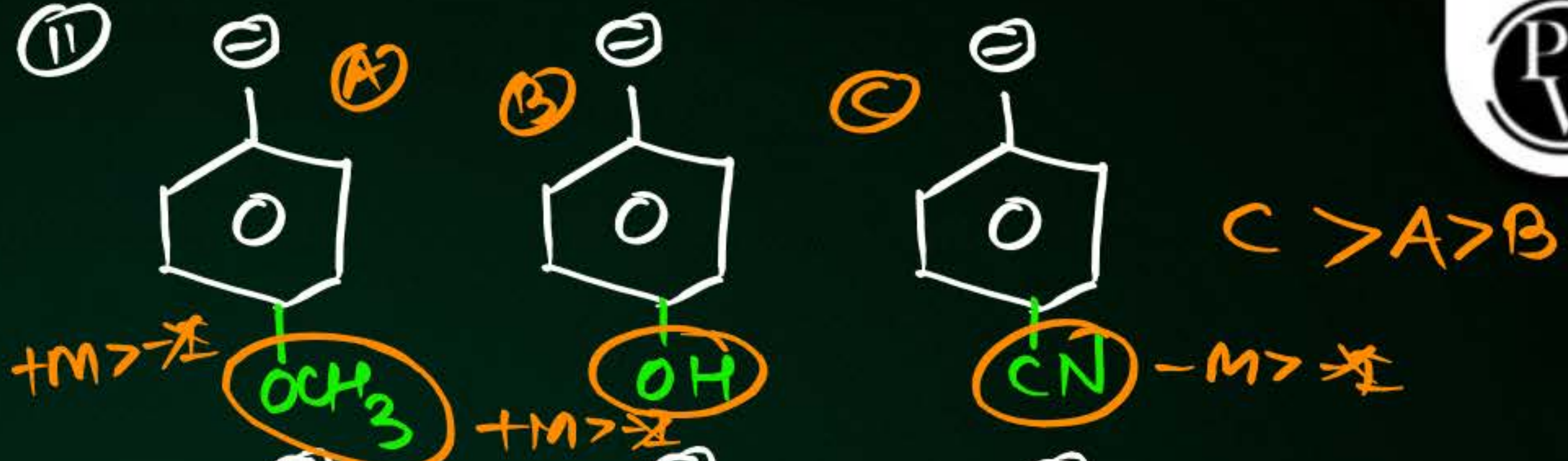

⊖
O
>
⊖
O
>
⊖
O
$\overset{+}{N}H_3$
-I
NO_2
-I
Cl
-I

⑩


Ⓐ
⊖
O
+M > ~~I~~
NH_2
Ⓑ
⊖
O
NO_2
-M > ~~I~~
Ⓒ
⊖
O

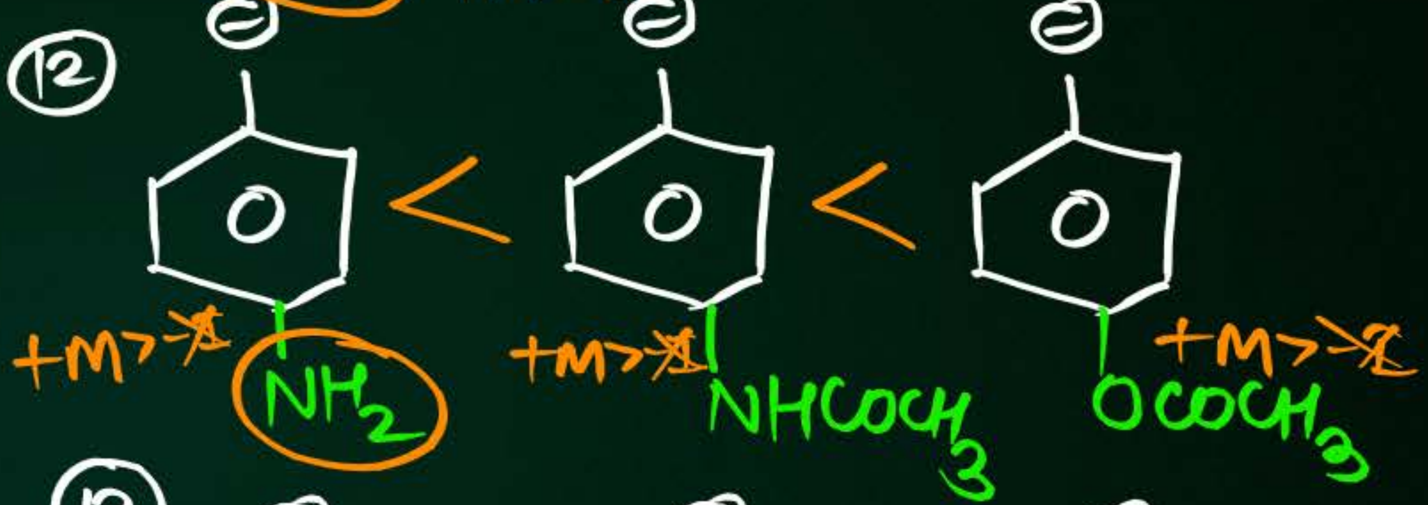
Ⓑ > Ⓒ > Ⓐ

⑪

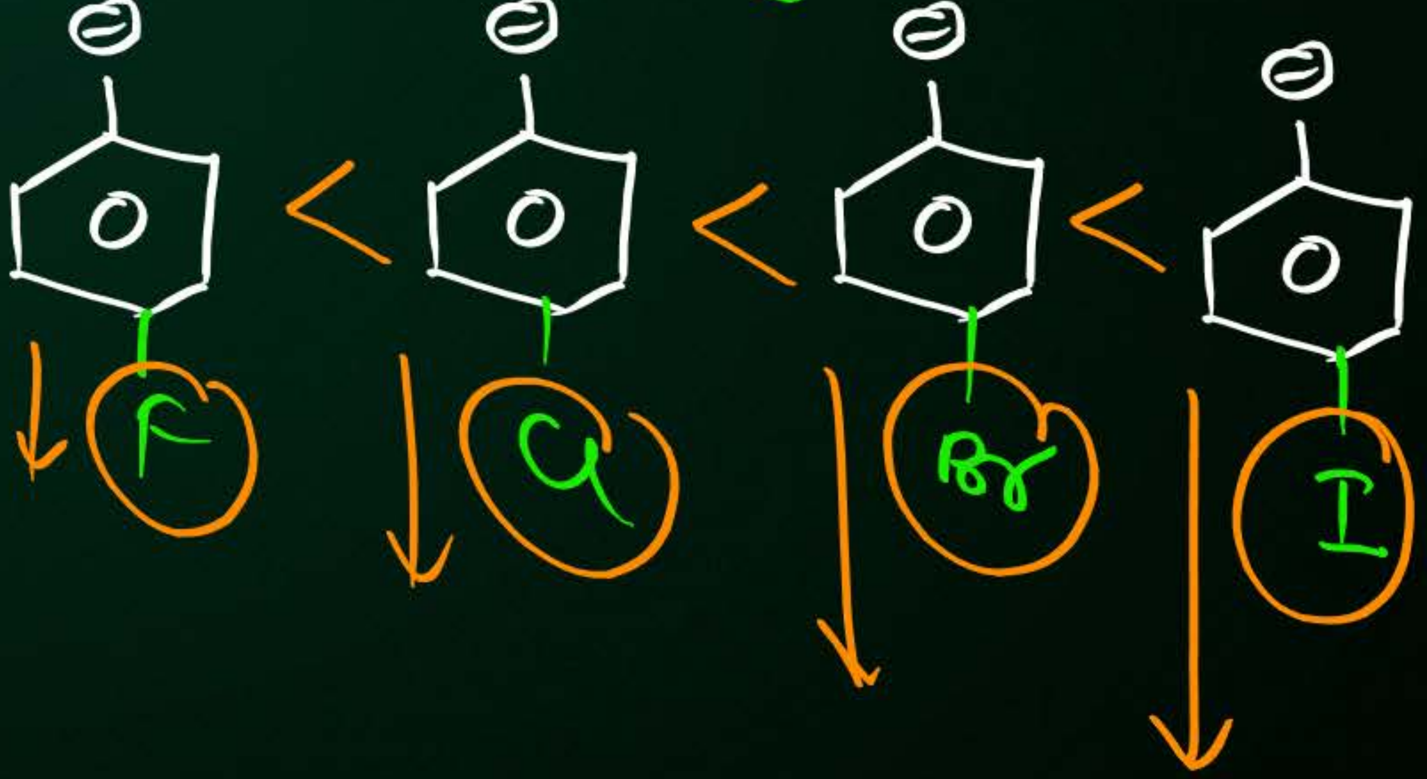

Ⓐ
⊖
O
+M > ~~I~~
OCH_3
Ⓑ
⊖
O
OH
+M > ~~I~~
Ⓒ
⊖
O
CN
-M > ~~I~~

C > A > B

⑫


⊖
O
<
⊖
O
<
⊖
O
+M > ~~I~~
NH_2
+M > ~~I~~
$NHCOCH_3$
+M > ~~I~~
$OCOCH_3$

⑬


⊖
O
<
⊖
O
<
⊖
O
<
⊖
O
F
Cl
Br
I

QUESTION

Arrange the following groups in the increasing order of +M:

(i) –I, –Cl, –F, –Br

(ii) $-NH_2$, –OH, $-O^{\ominus}$

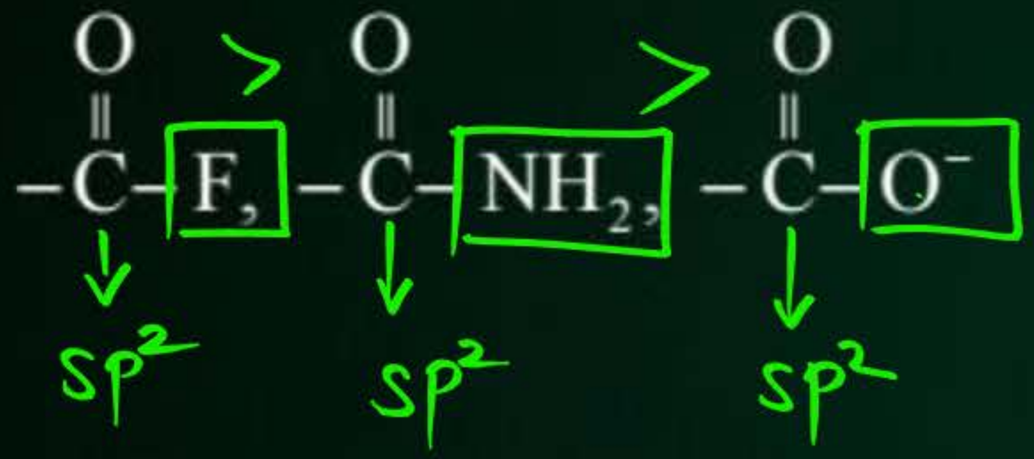
F > Cl > Br > I

$\overset{\ominus}{O}$ > NH_2 > OH

QUESTION

Arrange the following groups in the increasing order of –M:

(i) $-NO_2$, $-COOR$, $-CHO$, $-CN$, $-COR$ $-NO_2 > -CN > -CHO > -COR > -COOR$



(ii) $$-\underset{\downarrow \atop sp^2}{\overset{O}{\overset{\|}{C}}}-\boxed{F,} \;>\; -\underset{\downarrow \atop sp^2}{\overset{O}{\overset{\|}{C}}}-\boxed{NH_2,} \;>\; -\underset{\downarrow \atop sp^2}{\overset{O}{\overset{\|}{C}}}-\boxed{O^-}$$

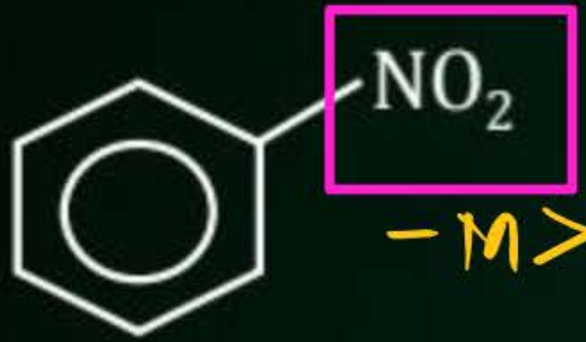
donation power $\overset{\ominus}{O} > NH_2 > F$ $\overset{\ominus}{O} < NH_2 < F$

$-M$ power $\propto \dfrac{1}{\text{donation}}$

QUESTION

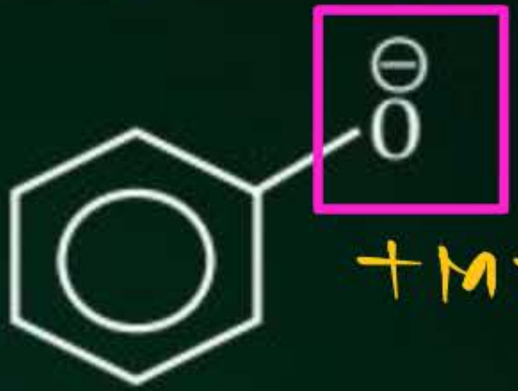
In which of the following molecules π-electron density in ring is maximum?

A



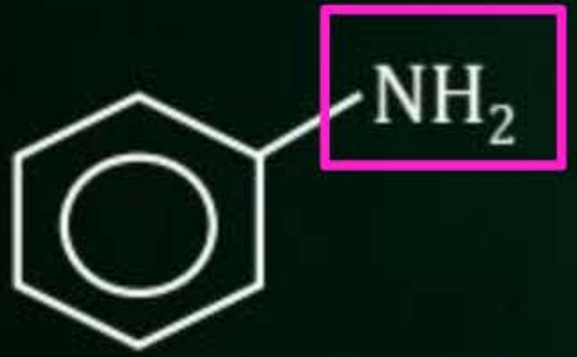
$-M > \cancel{-I}$

B ✓


$\overset{\ominus}{O}$

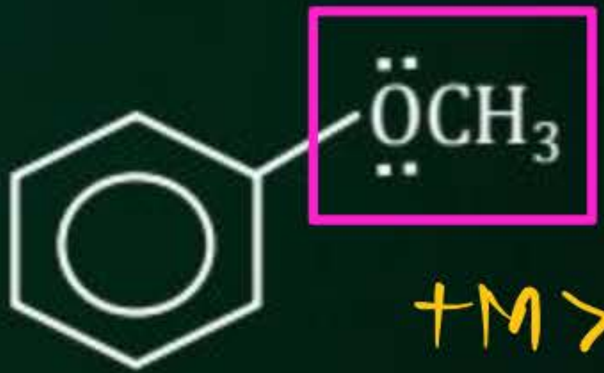
$+M > \cancel{+I}$

C



$+M > \cancel{-I}$

D



$+M > \cancel{-I}$

+M power ÷ $-\overset{\ominus}{O} > -NH_2 > -OCH_3$

$\boxed{B > C > D > A}$

QUESTION

Arrange the following groups in order of decreasing +M effect.

i. $-\bar{O}$

ii $-\ddot{N}H_2$

iii. $-\ddot{O}H$

iv $-\ddot{N}HCOCH_3$

i > ii > iii > iv

[✓ A] i > ii > iii > iv

B iv > iii > ii > i

C i > iii > ii > iv

D i > iv > iii > ii

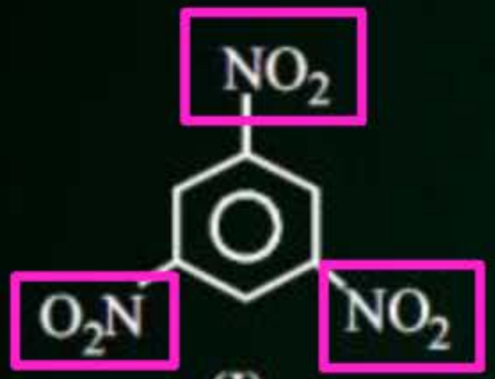
QUESTION

II > III > IV > I

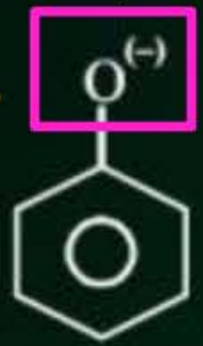
Consider the following species.

$-M > \cancel{-I}$

$+M > \cancel{-I}$ ↓

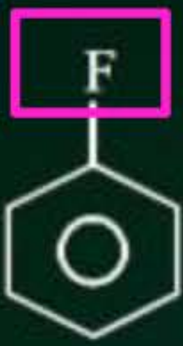


(I)



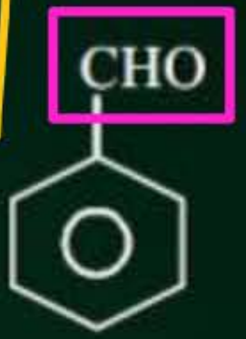
(II)

$-I > \cancel{+M}$ ↑



(III)

↑ $-M > \cancel{-I}$



(IV)

Correct order of π e–density inside the benzene ring is:

(A) I > II > IV > III

[✓ (B)] II > III > IV > I

(C) III > II > IV > I

(D) II > IV > III > I

No H.W clear your backlog

←

revise GOC from L01 to L05

atleast 2 times in 2 days

Thank you!!

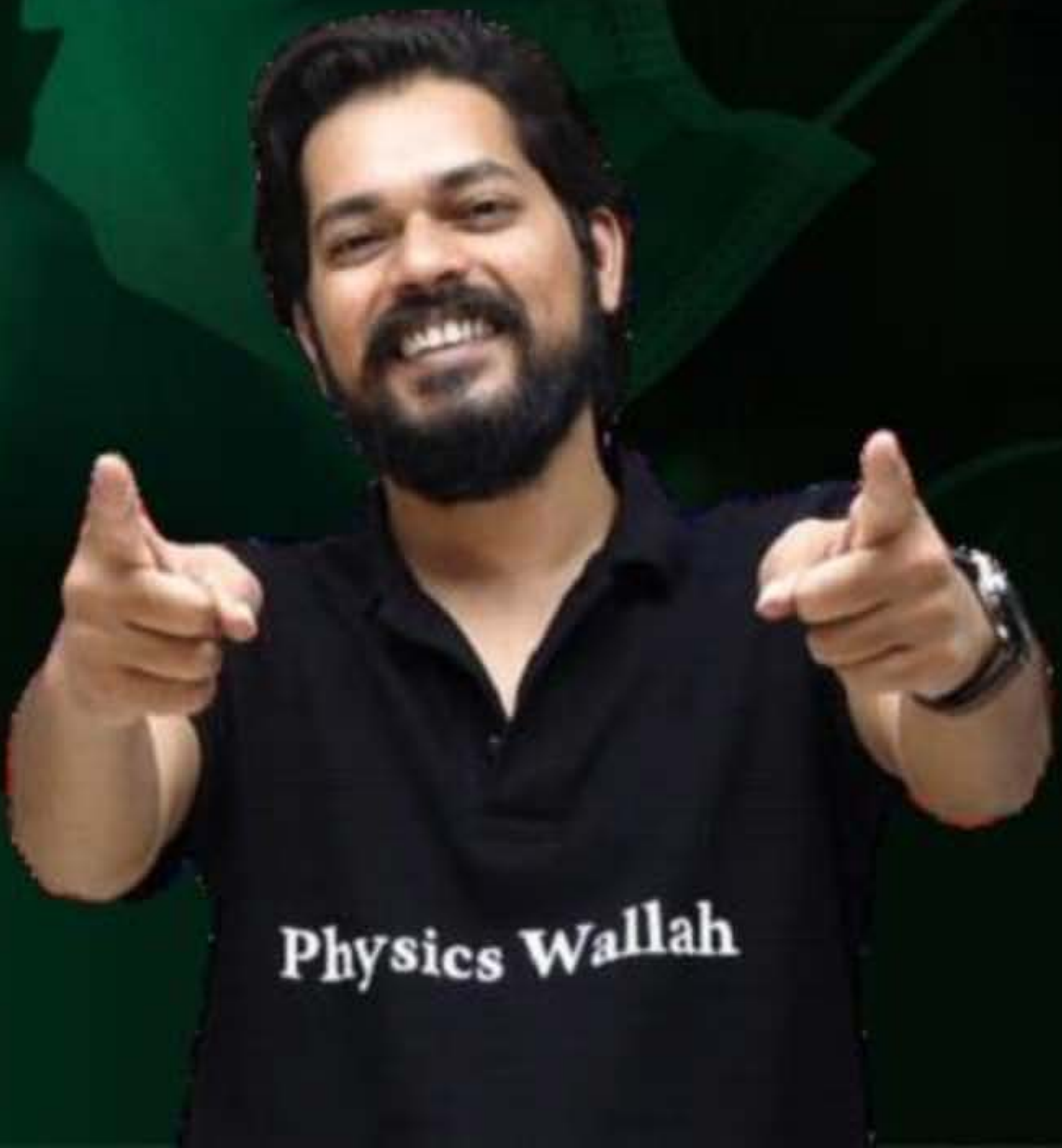
YAKEEN 2.0

FOR NEET 2025

Lecture- 06 Organic Chemistry

Some Basic Principles and Techniques (GOC)

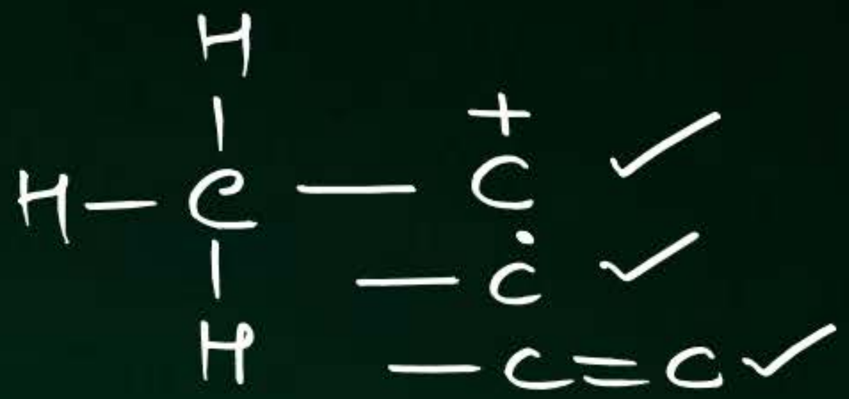
By- Pankaj Sir(POPU MAMA)


Physics Wallah

Topics *to be covered*

1. Hyperconjugation ✓
2. Applications of Hyperconjugation ✓
3. Practice

Hyperconjugation



Definition: It involves delocalization of σ electrons of C—H bond of an alkyl group directly attached to an atom of unsaturated system or to an atom with an unshared p orbital.

C=C

vacant 'p' C^+

$\dot{C}$ free radical

Half filled 'p'

1. Hyperconjugation is a permanent effect.
2. Also Known as **No Bond Resonance** or **Baker-Nathan Effect.**

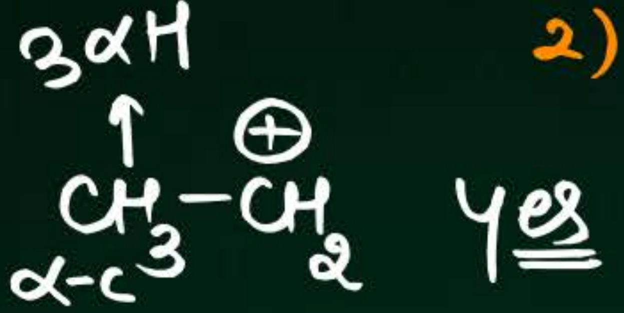
Case 01 Carbocation

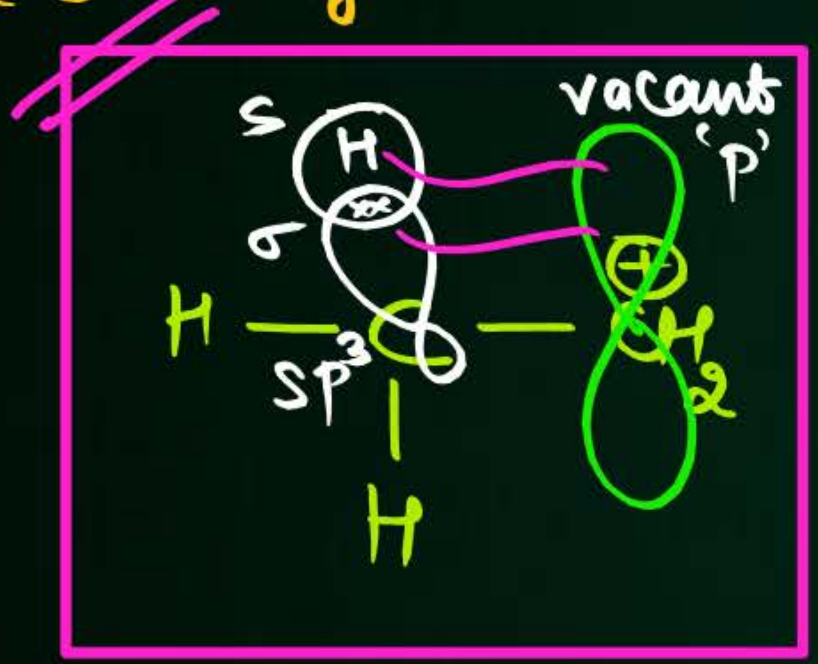
Condition :- 1) α-C should be sp^3

2) α-H (atleast 1)

Isovalent Hyper

No. of Bonds are equal in all H.C.S & original struc

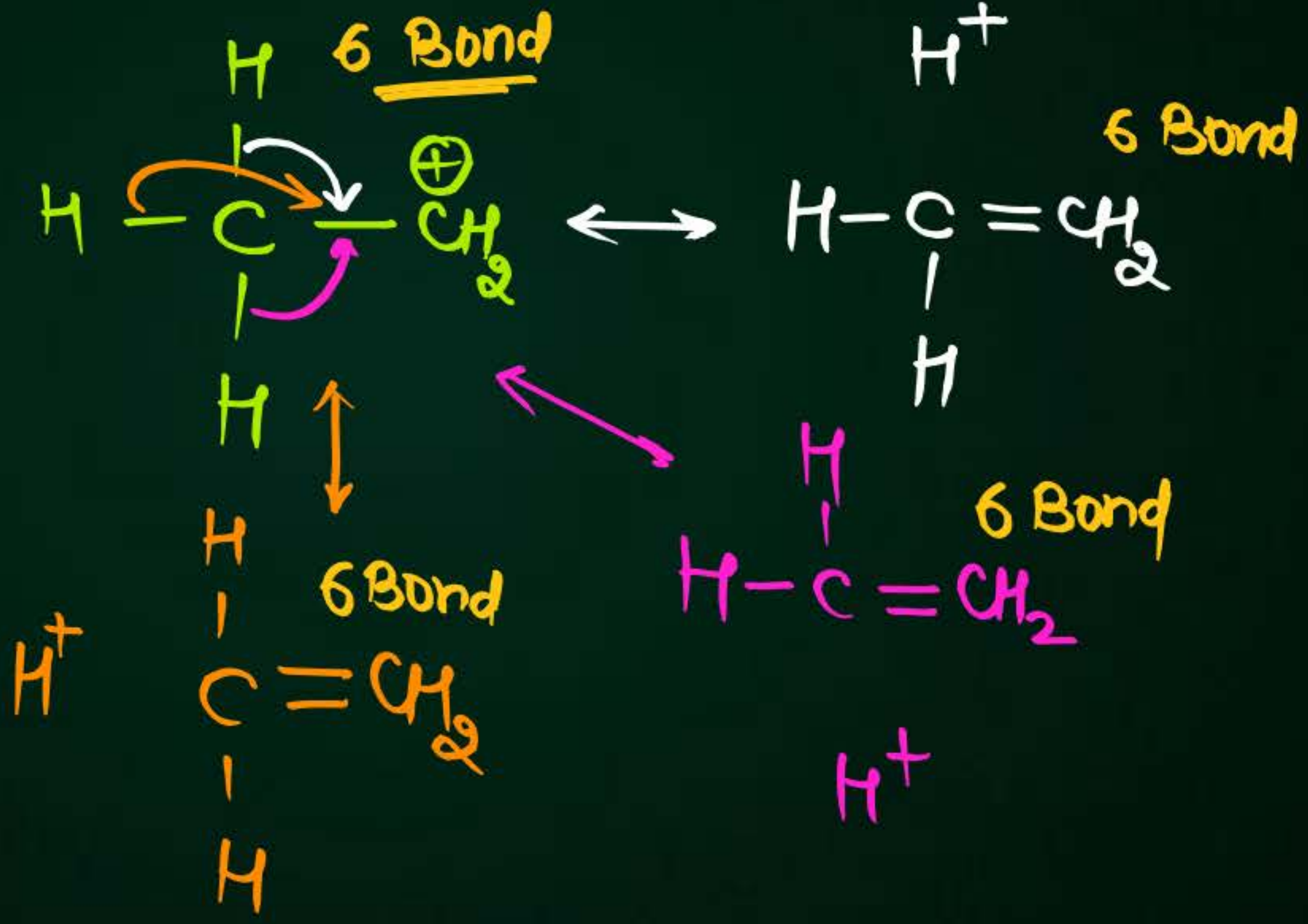

3αH
$CH_3-\overset{\oplus}{C}H_2$
α-C
Yes


s
H
σ
vacant 'p'
H
sp^3
C
$\oplus$
CH_2
H

σ - p overlap

↙ α-C sp^3-s

↓ Vacant

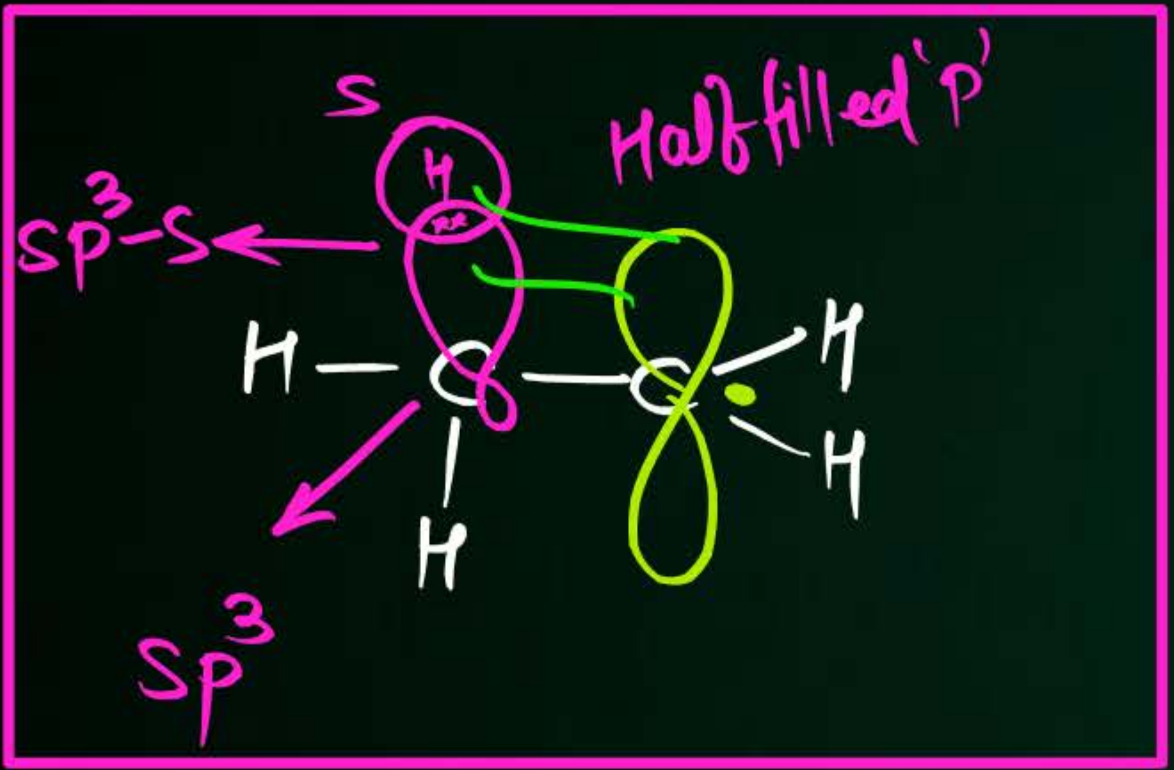

6 Bond
H
C
$\oplus$
CH_2
H
H
H^+
6 Bond
$H-C=CH_2$
H
H^+
H
6Bond
$C=CH_2$
H
H
6 Bond
$H-C=CH_2$
H^+

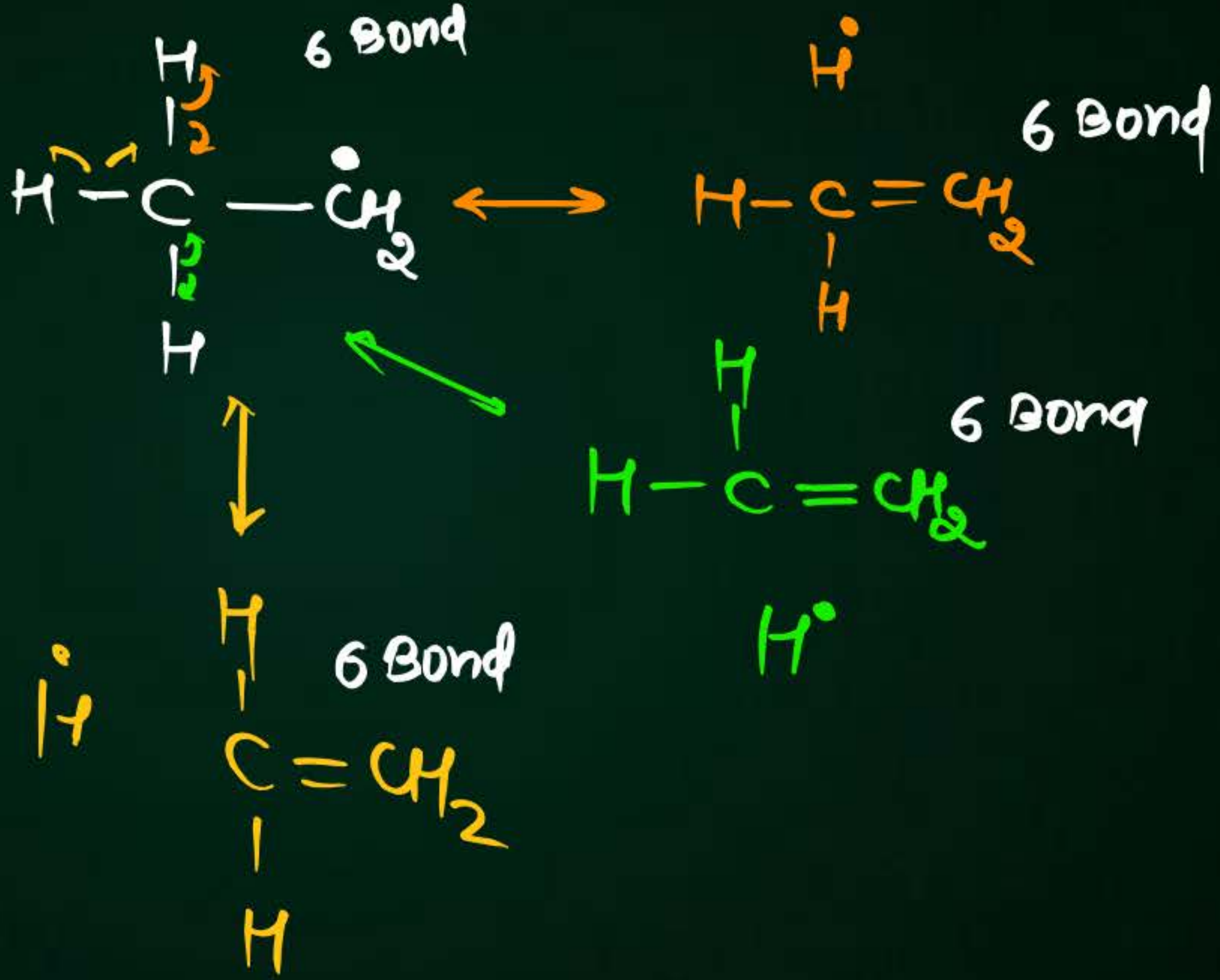
Case 02 Free Radical

Isovalent Hyper

Cond^n → ① α-C → sp^3

② α-H (atleast 1)


s
Half filled 'p'
sp^3-s
H
H
H
H
H
sp^3


6 Bond
$H-\overset{H}{\underset{H}{C}}-\dot{C}H_2$
$H^\bullet$ $H-\underset{H}{C}=CH_2$
6 Bond
$\overset{H}{H-C}=CH_2$
$H^\bullet$
6 Bond
$H^\bullet$ $\overset{H}{\underset{H}{C}}=CH_2$
6 Bond

σ – p overlapping

↓ sp^3-s α-C

↓ Half filled 'p'

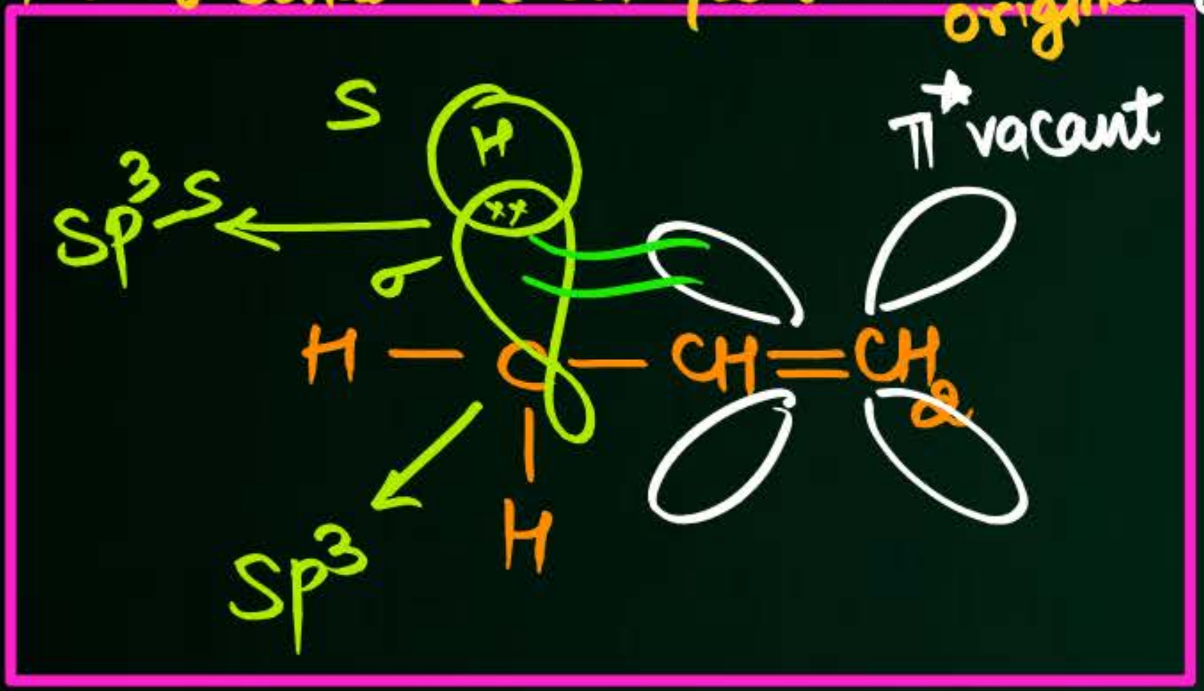
Case 03 Alkenes | Benzene

Cond^n:- 1) α-C sp^3
2) α-H (atleast 1)

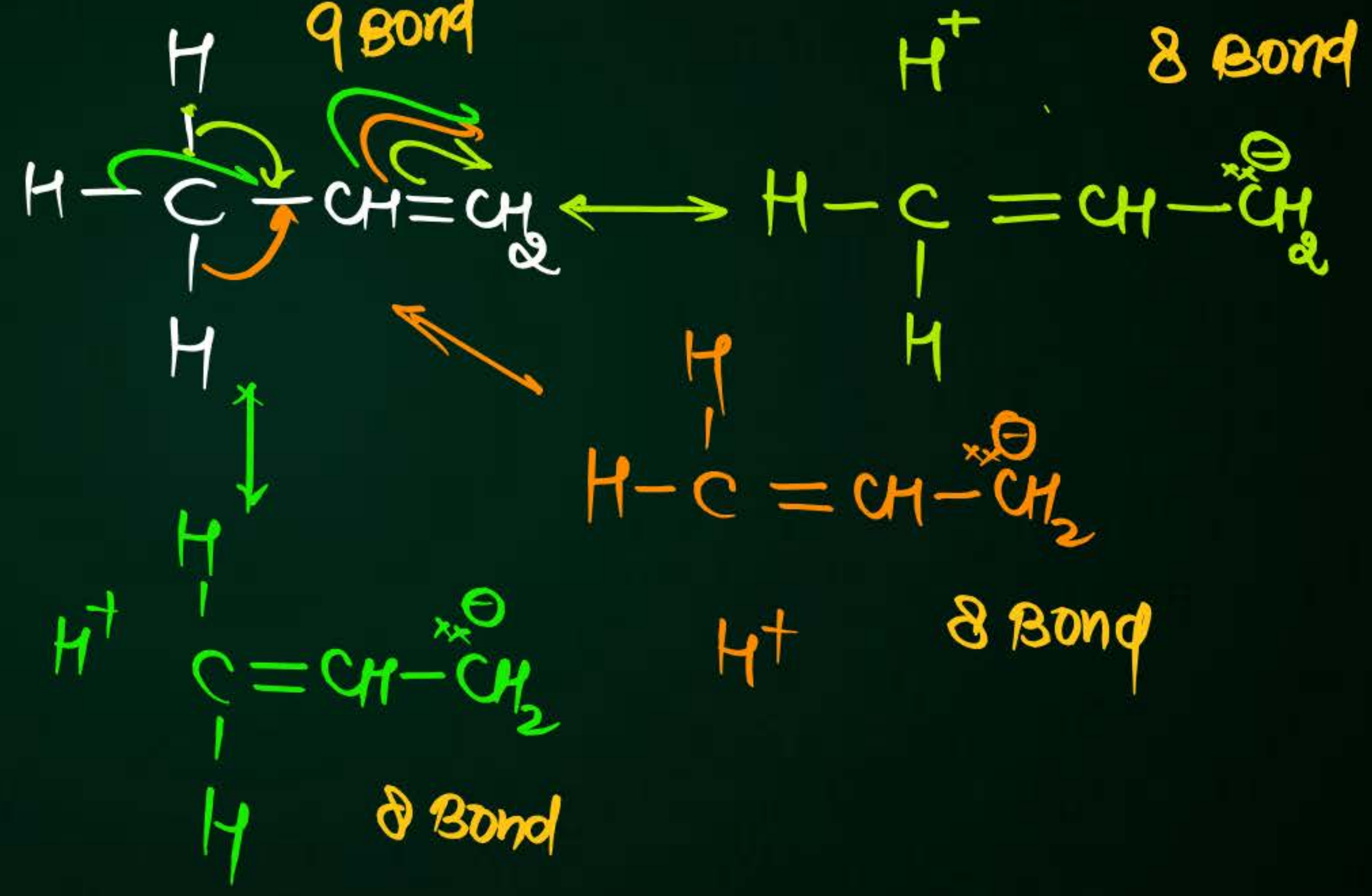
Sacrificial Hyper

3αH
$CH_3-\boxed{CH=CH_2}$ Yes
αC
sp^3

No. of bonds are unequal in HCS & original

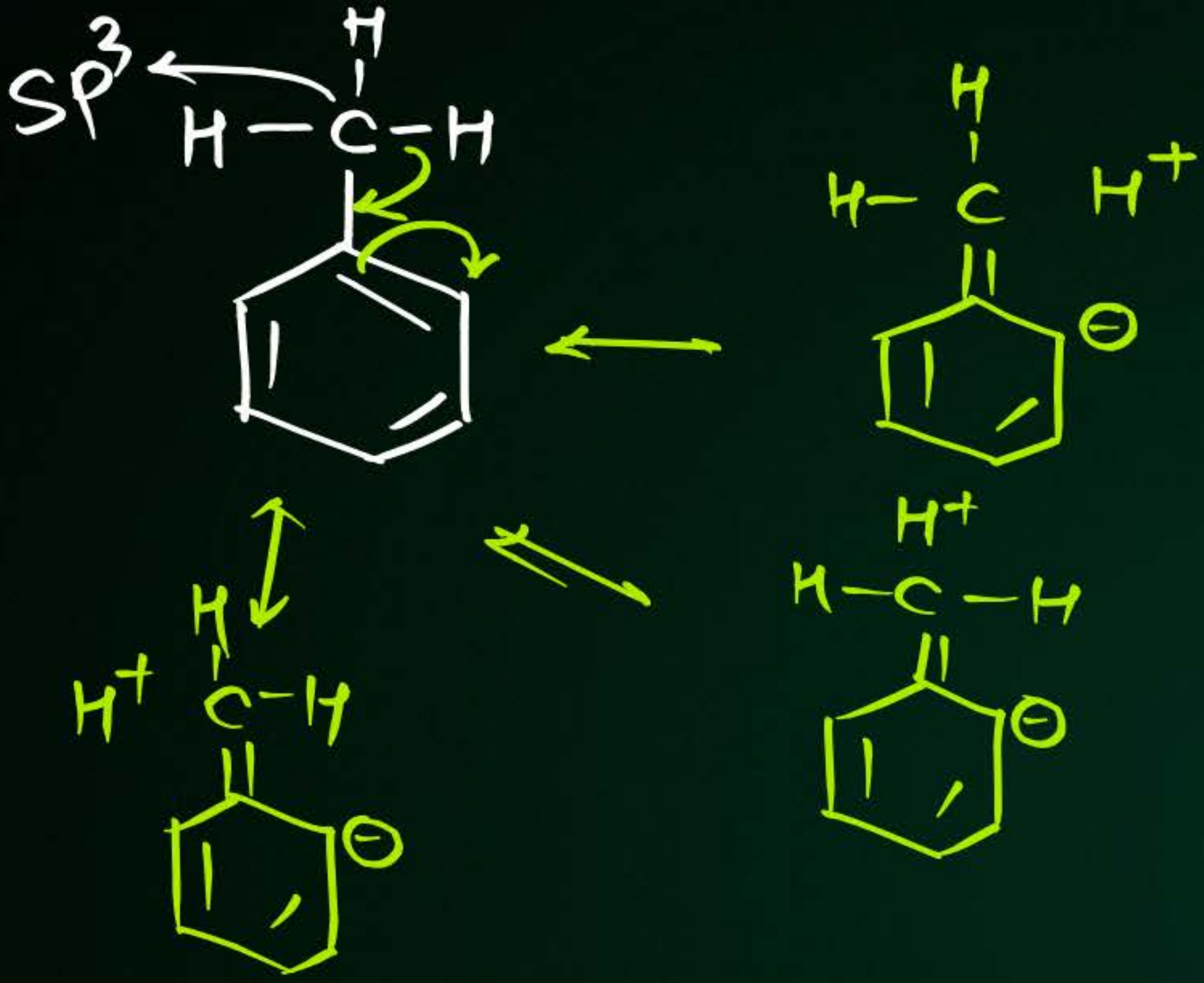


S
H
sp^3-s
σ
H – C – CH=CH$_2$
H
π* vacant
sp^3



9 Bond
8 Bond
8 Bond
8 Bond
H$^+$
H$^+$
H$^+$

$\sigma - \pi^*$
↓ ↓
α-C vacant
sp^3-S (alkene)


Sp3
H
H–C–H
H+
⊖

OP Points

✓
$CH_3-\boxed{CH=CH_2}$

$CH_3-\boxed{CH=O}$
×

$CH_3-\boxed{C\equiv N}$
×

$CH_3-\boxed{C\equiv CH}$
×

1. CO, CN cannot show hyper due to high energy of π^* orbital.
   & $C\equiv C$

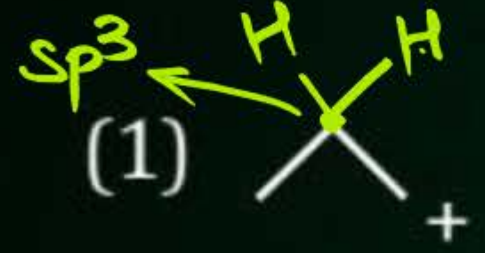
2. Hyper conjugative structures (Involving C–H bond breaking)
   = No. of α-H

3. Hyper conjugative structure = No. of α-H + 1
   (original struc)

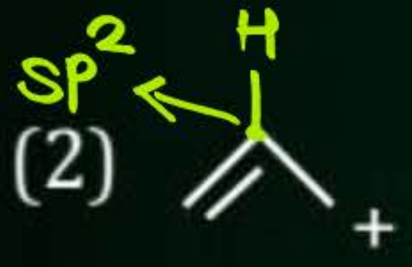
QUESTION

No. of α-H

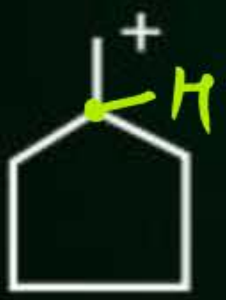
Find total number of hyper conjugative structure (Involving C–H bond breaking).

(1)


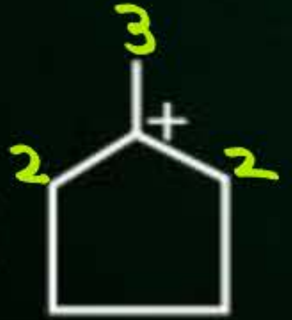
②

(2)


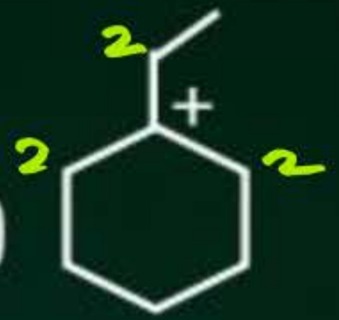
⓪

(3)


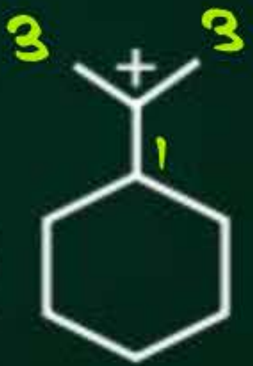
①

(4)


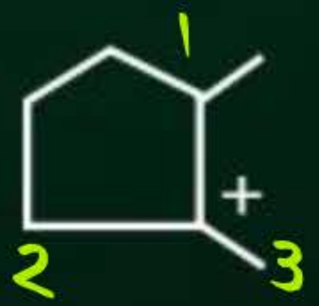
⑦

(5)


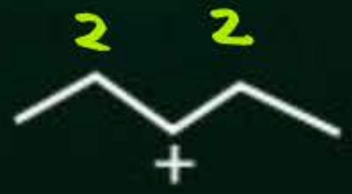
⑥

(6)


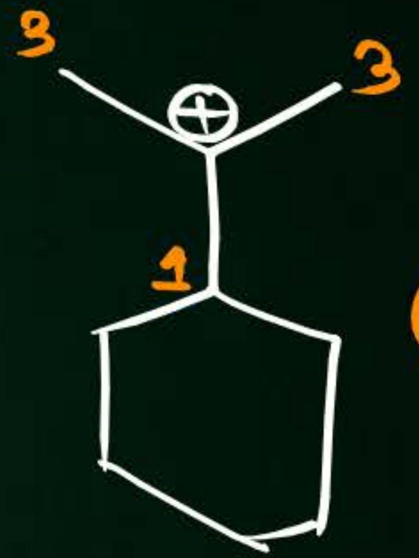
⑦

(7)


⑥

(8)


④

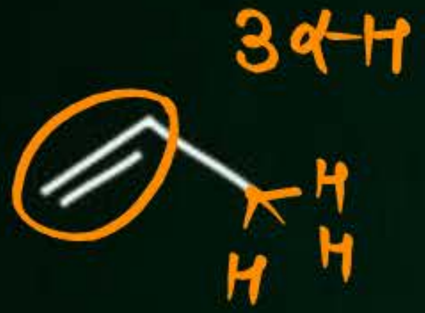
⑨


⑦

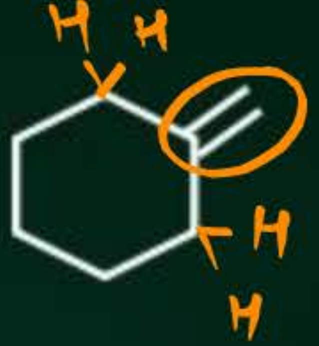
QUESTION

Find total number of hyper conjugative structure (Involving C–H bond breaking).

(1)

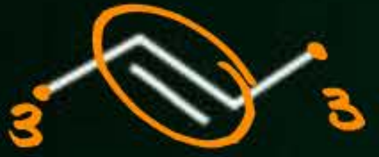


(2)



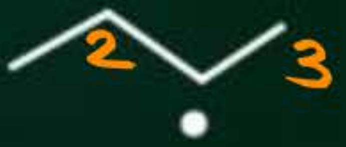
4αH

(3)



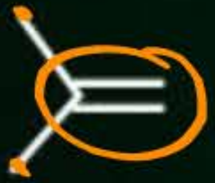
⑥

(4)



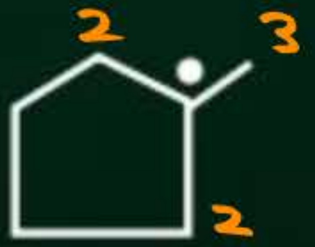
⑤

(5)



⑥

(6)



⑦

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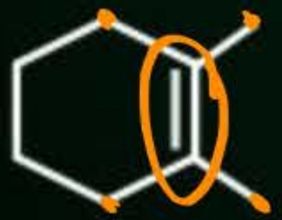
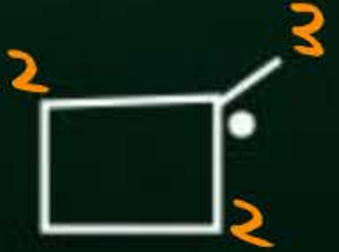


⑩

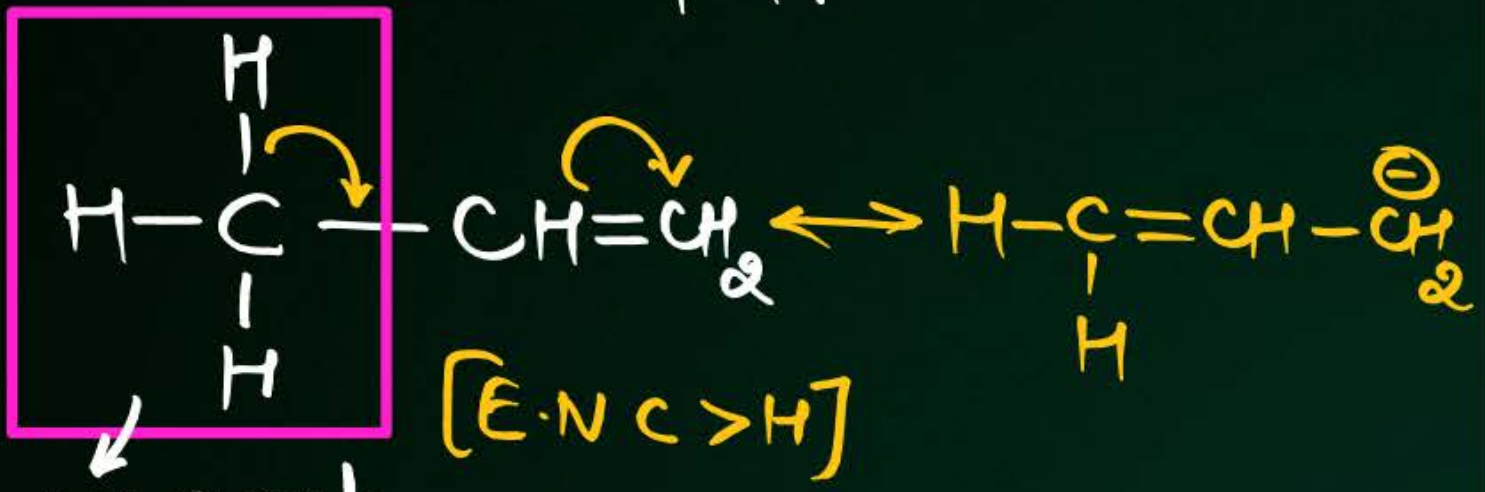
(8)



⑦

Hyperconjugation effect

+H


H
H−C−CH=CH₂ ⟷ H−C=CH−CH₂⊖
H
H
[E.N C > H]

+H group

$-CH_3$ +H

$-CH_2Cl$ +H

$-CHCl_2$ +H

$-CCl_3$ −H

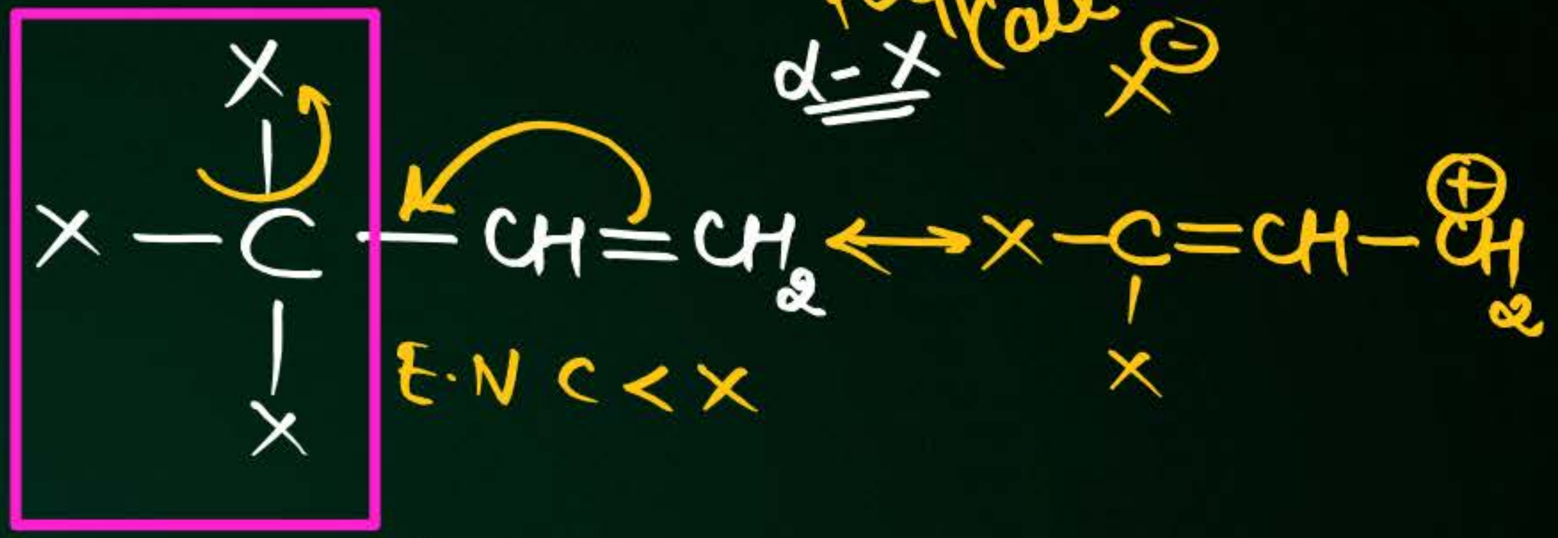
−H (Reverse Hyper)

αC sp3

(all Halogen)

α-X

$X^{\ominus}$


X
X−C−CH=CH₂ ⟷ X−C=CH−CH₂⊕
X
X
E.N C < X

−H group

+H power $\propto$ No of α-H

① $-CH_3 > -CH_2-CH_3 > -\underset{\underset{CH_3}{|}}{CH}-CH_3$

3αH 2αH 1αH

$$\boxed{\underset{(M)}{R} > H > I}$$

② $-CH_3 > -CD_3 > -CT_3$

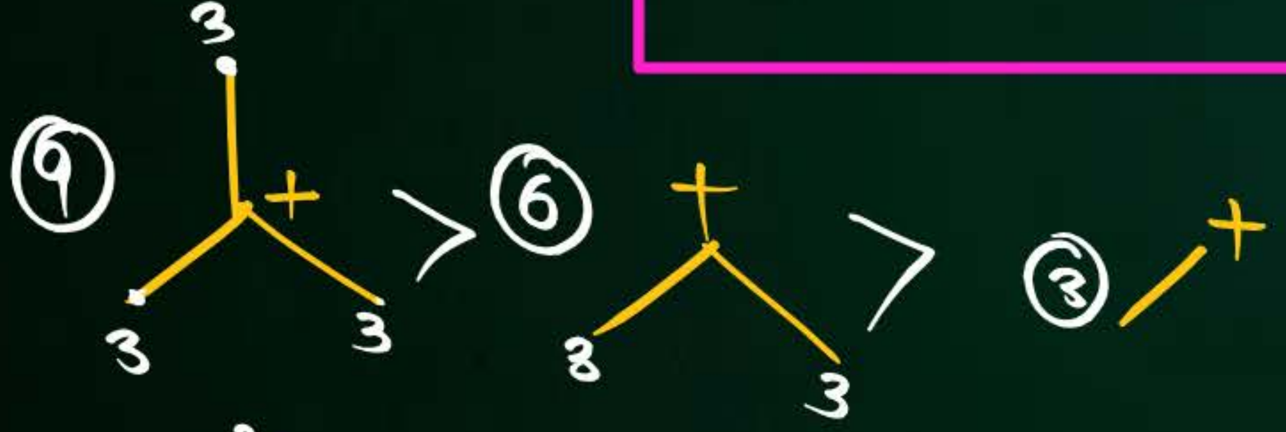
BE↓ +H↑

Applications of Hyperconjugation

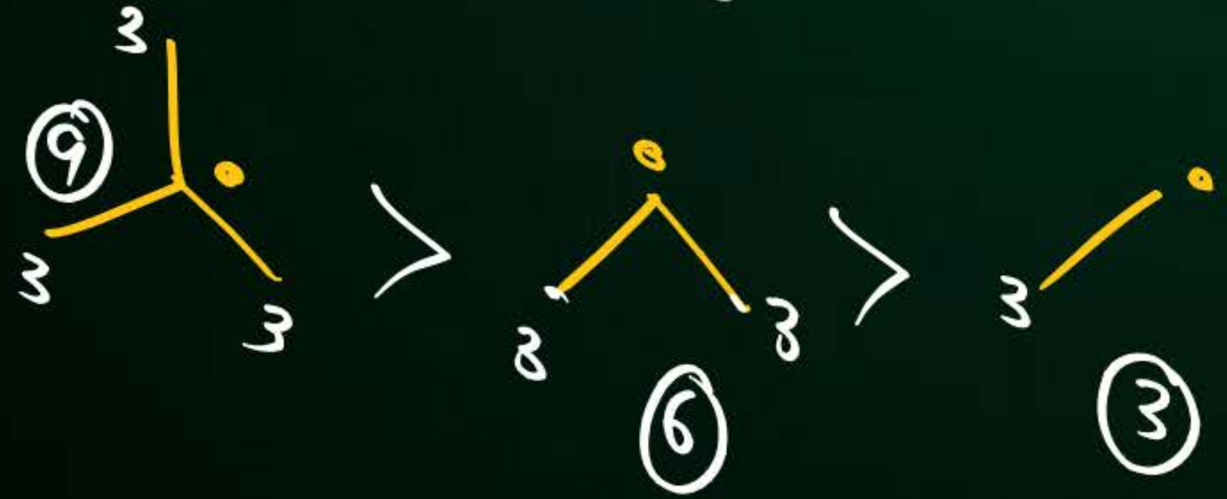
1. To compare stability of Carbocations, Free radicals and Alkenes.

$\text{stability} \propto +H \propto \frac{1}{-H}$

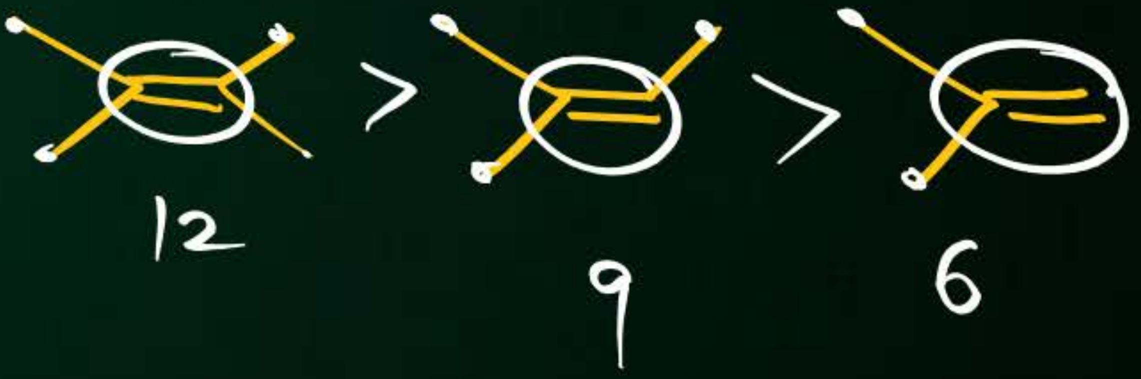
1)

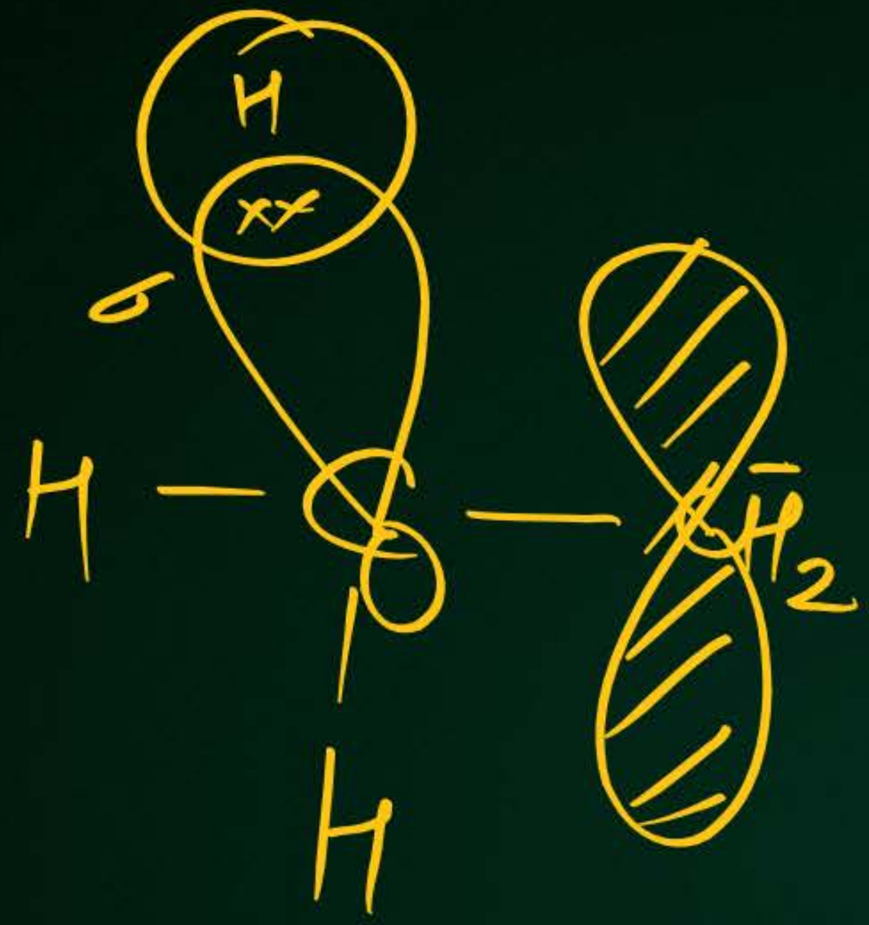


2)



3)




H
xx
σ
H
C
$\bar{C}H_2$
H

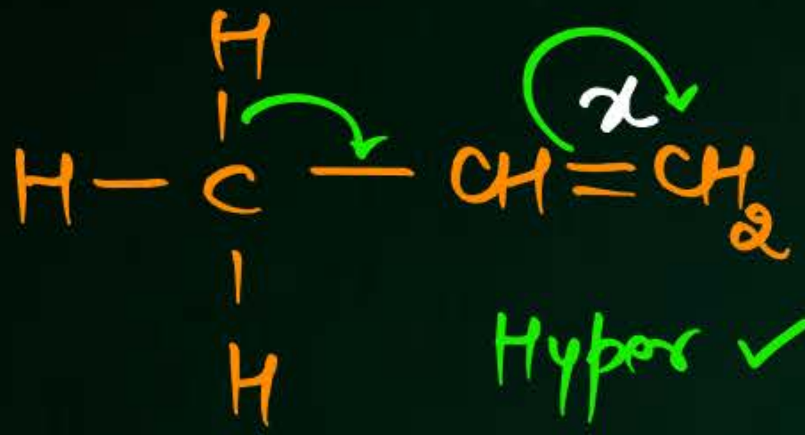
P ~~P^*~~

π π^*

2. Bond length

B.L $\equiv < = < \cdots < -$

Q ①



$H-\overset{H}{\underset{H}{C}}-CH\overset{x}{=}CH_2$

Hyper ✓

$CH_2\overset{y}{=}CH_2$

Hyper ×

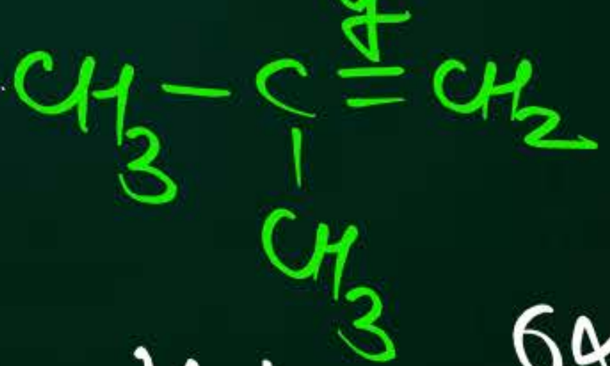
Bond length $x > y$

②

$CH_3-CH\overset{x}{=}CH_2$

Hyper

B.L $x < y$ 3αH



$CH_3-\underset{CH_3}{C}\overset{y}{=}CH_2$

Hyper 6αH

+H ↑ C=C ki tendency partial double ke taraf Jane ki jyada hogi

③ $CH_3-CH\overset{x}{=}CH_2$

Hyper

$H\ddot{O}-CH\overset{y}{=}CH_2$

Mesomeric

(M > H)

B.L $y > x$

QUESTION (AIIMS 2019, 25 May)

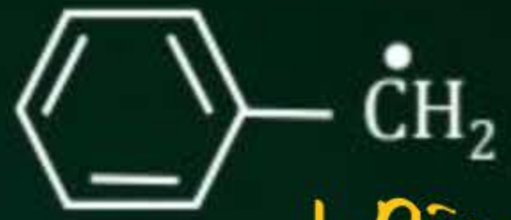
R > H > I

The most stable free radical is:

B > A > B > C

A $CH_3-\dot{C}H-CH_3$

⑥ αH

B 

1 Ring reso

C $\dot{C}H_2-CH(CH_3)_2$

1 αH

D $\dot{C}H_2-CH_3$

3 αH

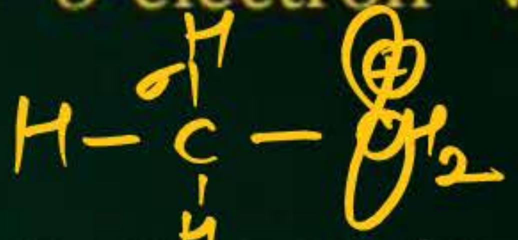
QUESTION

$H_3C-CH=CH_2$

$\sigma-\pi^*$

Assertion: Stability of alkene is governed by hyperconjugation. ✓

Reason: Hyperconjugation involves delocalization of σ-electron with sp^2 hybridized orbitals. ✗



$H-\overset{\overset{H}{|}}{\underset{\underset{H}{|}}{C}}-\overset{\oplus}{C}H_2$

A If both assertion and reason are true and the reason is the correct explanation of the assertion.

B If both assertion and reason are true but reason is not the correct explanation of the assertion.

C If Assertion is true but reason is false. ✓

D If assertion is false but reason is true.

QUESTION

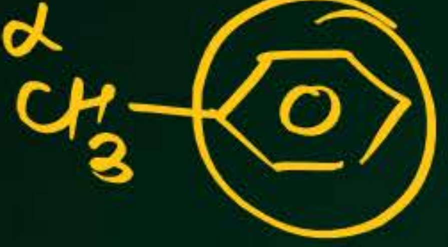
Hyperconjugation involves overlap of the following orbitals:

- Ⓐ σ-σ ✗
- Ⓑ [✓ σ-p]
- Ⓒ p-p ✗
- Ⓓ π-π ✗

QUESTION

Which of the following group has the maximum hyperconjugation effect when attached to benzene ring?

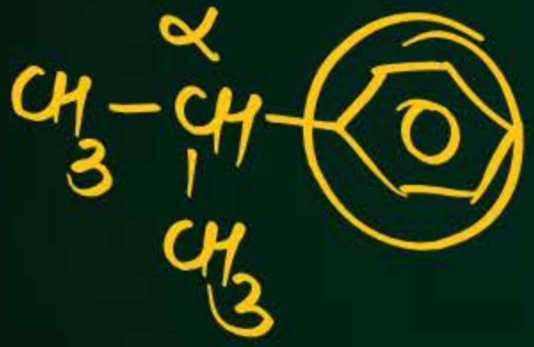
(A) ✓ CH_3- 3αH



(B) $CH_3\overset{\alpha}{C}H_2-$

2αH

(C) $(CH_3)_2\overset{\checkmark}{C}H-$ 1αH



(D) $(CH_3)_3\overset{\alpha}{C}-$

0αH

QUESTION In which molecule or ion hyperconjugation effect is observed and write the number of hyper conjugable hydrogen atoms?

(a) $C_6H_5-CH=CH_2$

0 αH

(b) $CH_3-CH_2-CH=CH_2$

2 αH

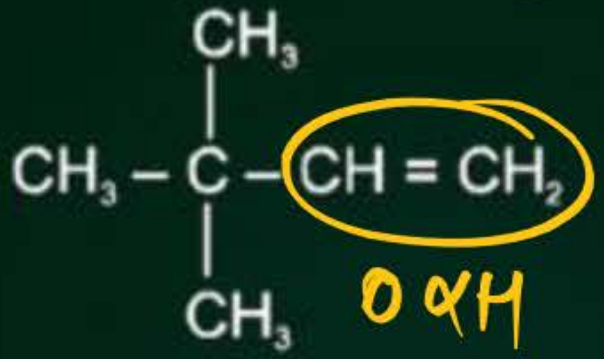
(c) $CH_2=CH_2$

0 αH

(d) $CH_3-\overset{\ominus}{C}H_2$

No Hyper

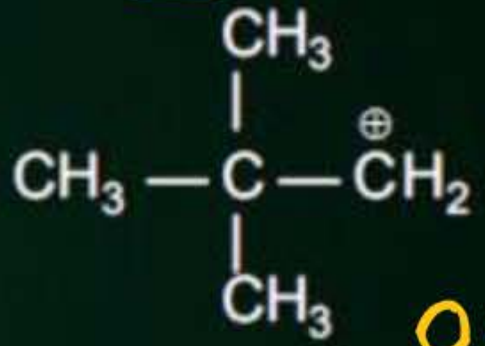
(e)



$CH_3-\underset{CH_3}{\overset{CH_3}{C}}-CH=CH_2$

0 αH

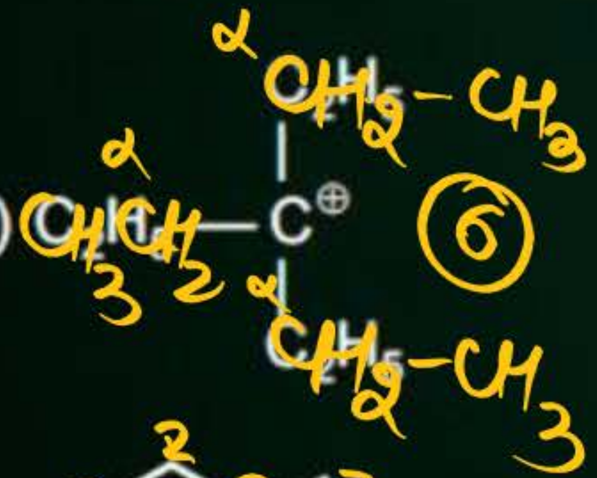
(f)



$CH_3-\underset{CH_3}{\overset{CH_3}{C}}-\overset{\oplus}{C}H_2$

0 αH

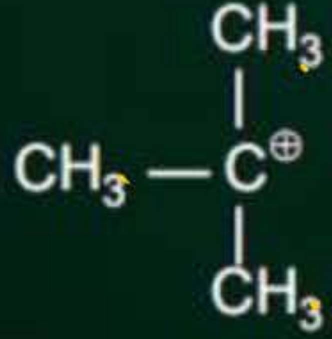
(g)



$C_2H_5-\underset{C_2H_5}{\overset{C_2H_5}{C^{\oplus}}}$

⑥

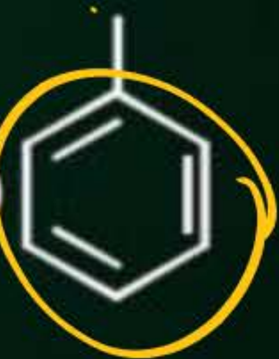
(h)



$CH_3-\underset{CH_3}{\overset{CH_3}{C^{\oplus}}}$

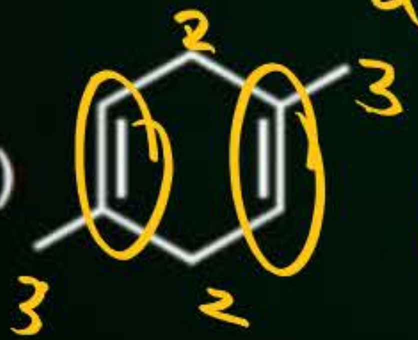
⑨

(i)



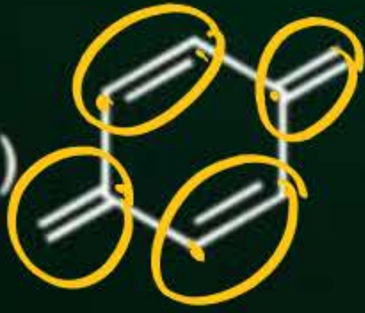
③

(j)



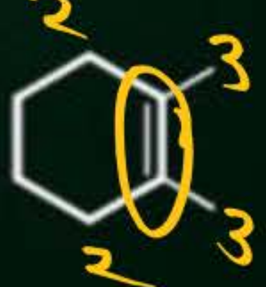
⑩

(k)



NO 'H'

(l)

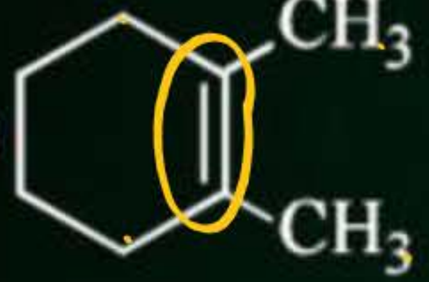


⑩

QUESTION

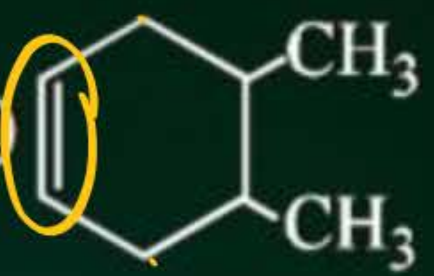
Write decreasing order of stability of following alkene.

(i) (a)



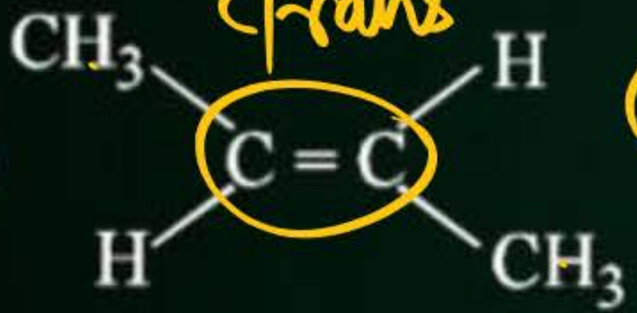
⑩ > ④

(b)



(ii) (a)

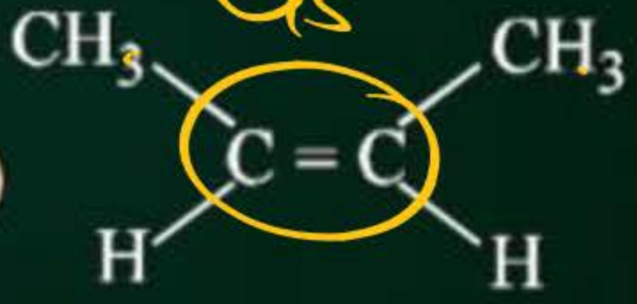
Trans



⑥ >

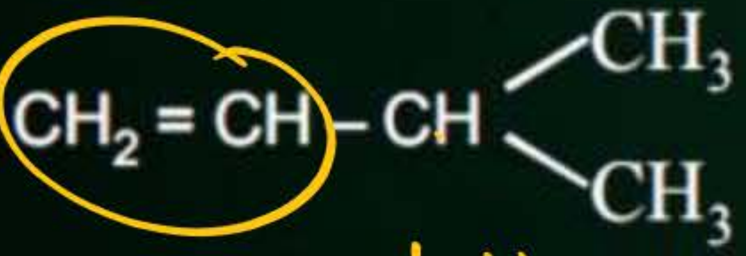
(b)

cis



⑥

(iii) (a)

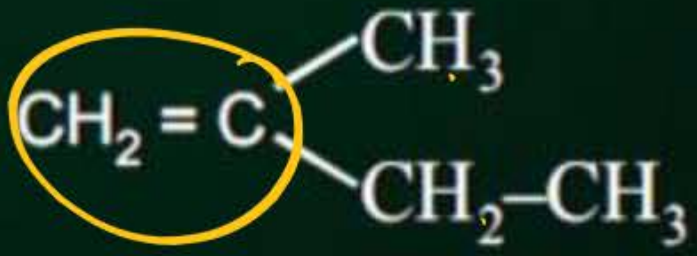


$CH_2=CH-CH(CH_3)_2$

1 α H

<

(b)



$CH_2=C(CH_3)-CH_2-CH_3$

⑤

QUESTION

In hyperconjugation there is overlap between:

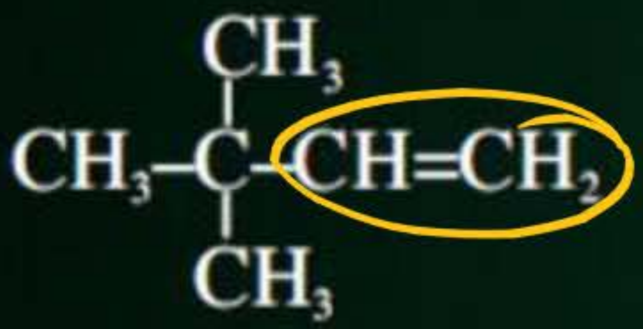
- A p- and π-orbitals
- B 2π-orbitals
- C d-and-π-orbital
- [✓ D] σ-and p-orbitals

QUESTION

Which of the following molecule has longest C = C bond length?

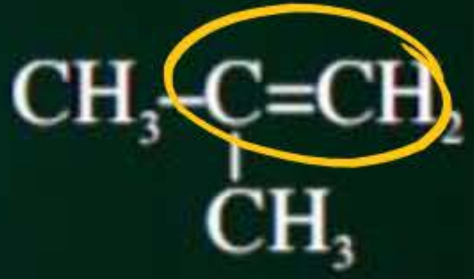
A $CH_2=C=CH_2$ Reso × Hypcl ×

B $CH_3-CH=CH_2$ 3αH

C 

$CH_3-C(CH_3)_2-CH=CH_2$

0αH

[✓ D] 

$CH_3-C(CH_3)=CH_2$

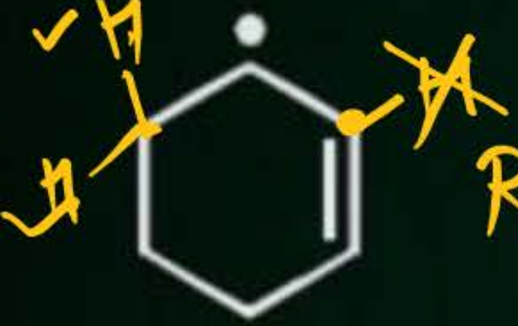
6αH

QUESTION

The most stable free radical is ________

R > H > I

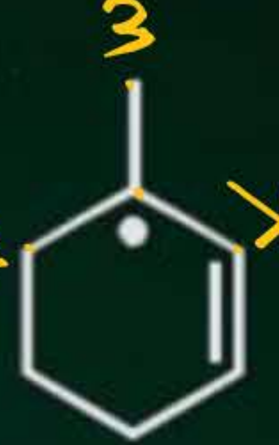
A



Reso ✓

2αH

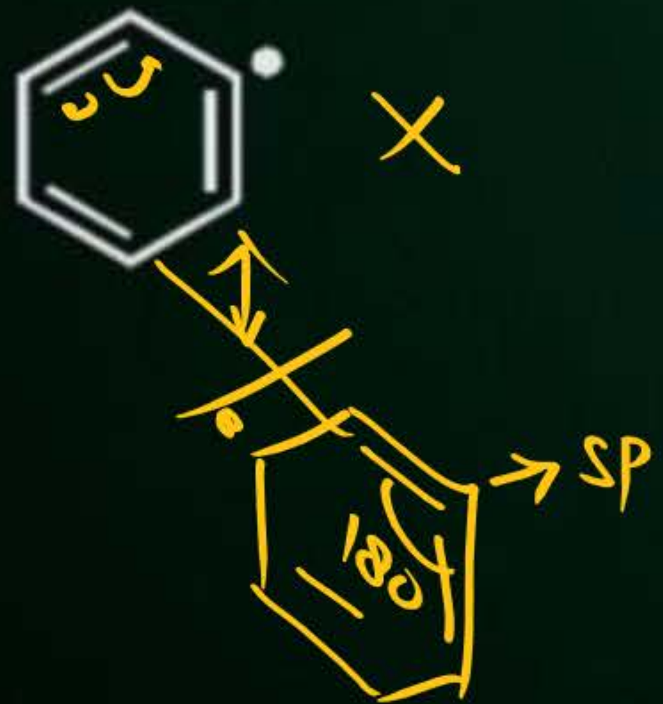
✓ **B**



Reso

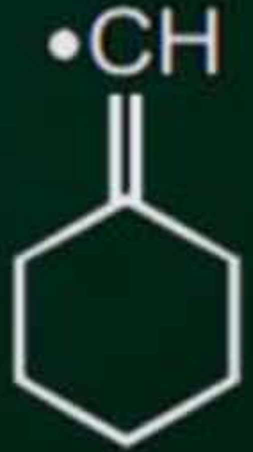
⑤

C



✕

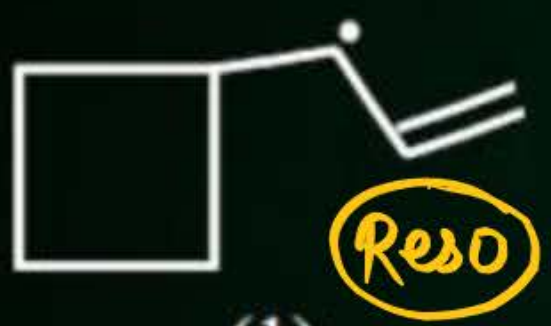
D



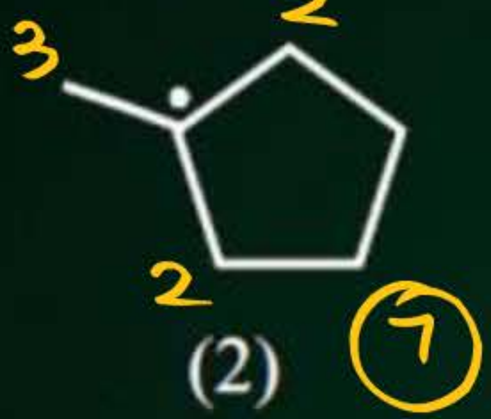
✕

QUESTION

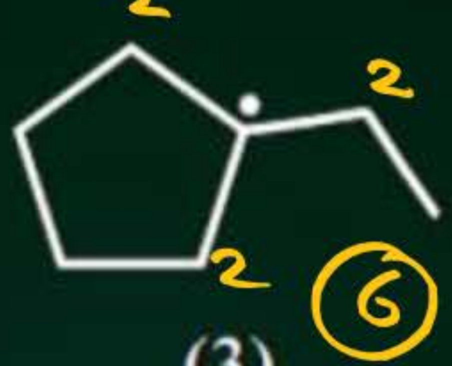
Rank the following free radicals in increasing order of their stabilities:



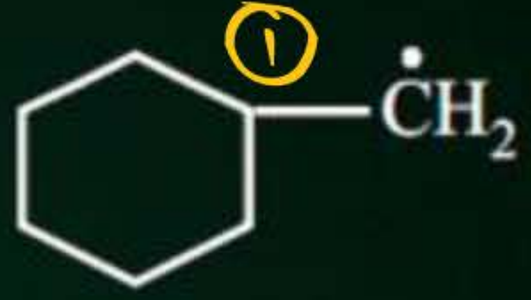
(1)



(2)



(3)



(4)

[✓ A] $4 < 3 < 2 < \underline{1}$

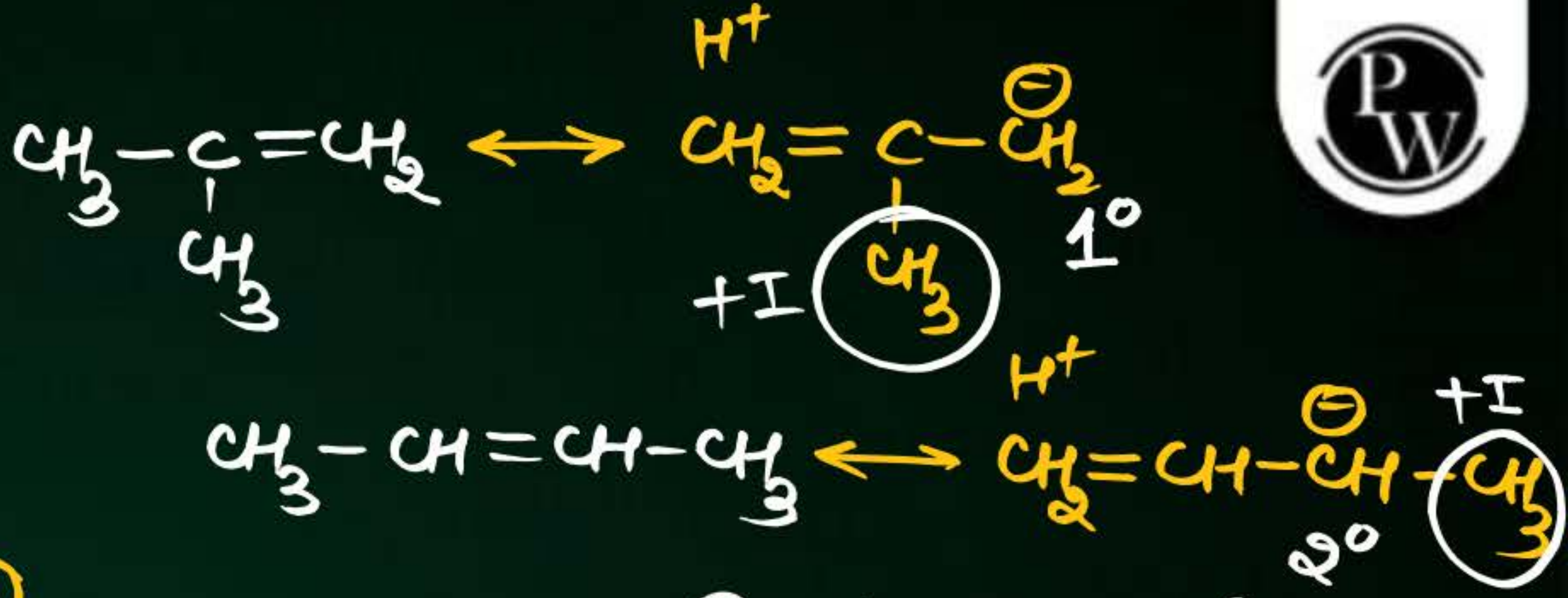
B $4 < 1 < 2 < 3$

C $4 < 2 < 3 < \underline{1}$

D $3 < 4 < 2 < \underline{1}$

QUESTION

$\cancel{R} > H > I$

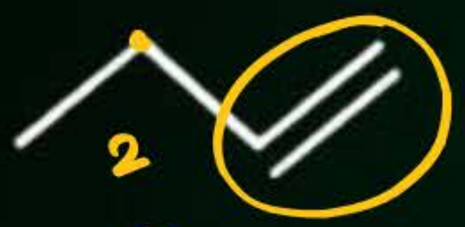


$$CH_3-\underset{CH_3}{\underset{|}{C}}=CH_2 \longleftrightarrow \overset{H^+}{CH_2}=\underset{+I\ CH_3}{\underset{|}{C}}-\overset{\ominus}{CH_2}\ 1^\circ$$

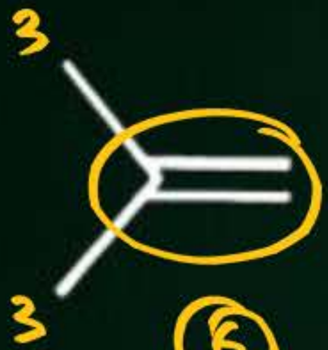
$$CH_3-CH=CH-CH_3 \longleftrightarrow \overset{H^+}{CH_2}=CH-\underset{2^\circ}{\overset{\ominus}{CH}}-\overset{+I}{CH_3}$$

Carbanion $1^\circ > 2^\circ$

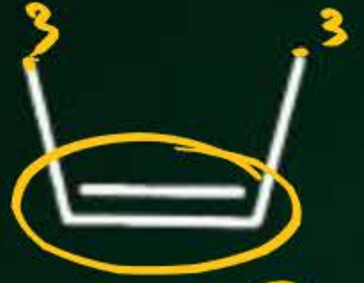
The stability order of isomer of butene is:



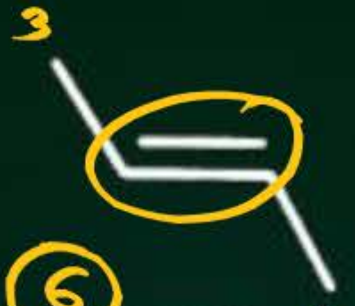
② (I)



(II) ⑥



(III) ⑥
cis



⑥ (IV)
Trans

4.I (T>C)

A ✓ II > IV > III > I

B IV > II > III > I

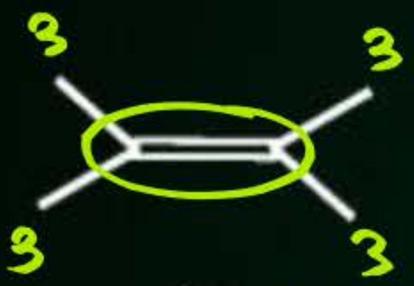
C II > III $\cancel{>}$ IV > I

D III > $\cancel{IV}$ > II > I

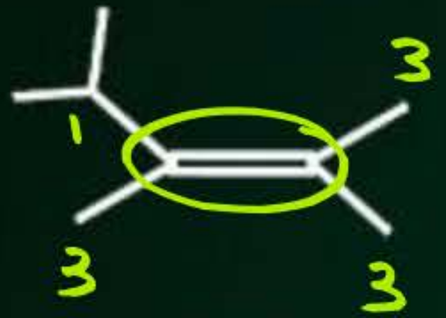
QUESTION

i > ii > iii > iv > v

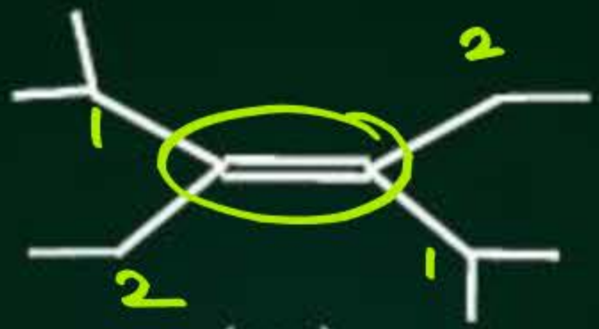
Give the relative stability of the following compound



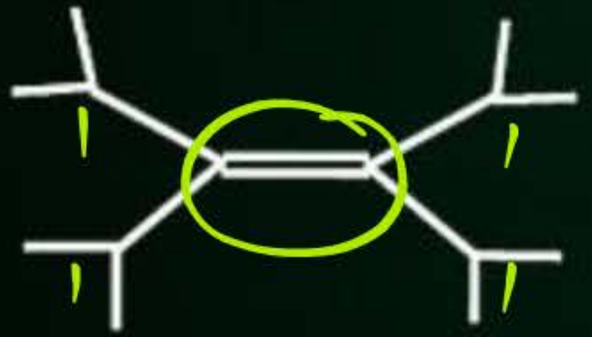
(i) ⑫



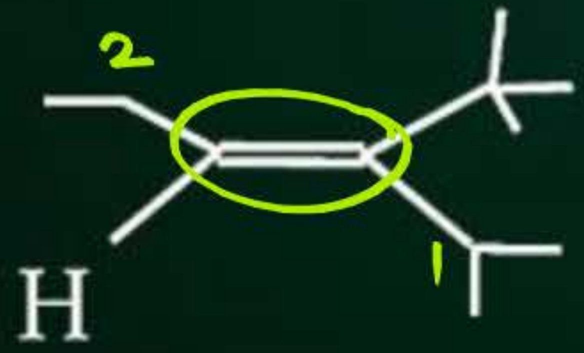
⑩ (ii)



(iii) ⑥



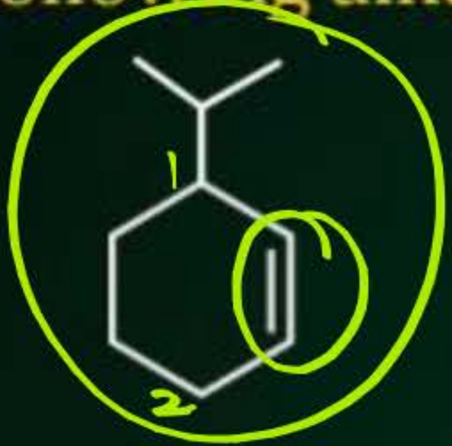
(iv) ④



(v) ③

QUESTION

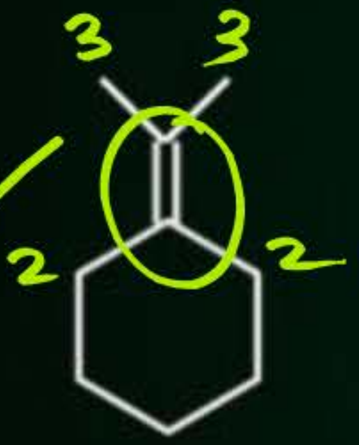
How many of the following alkenes are more stable than?



3αH

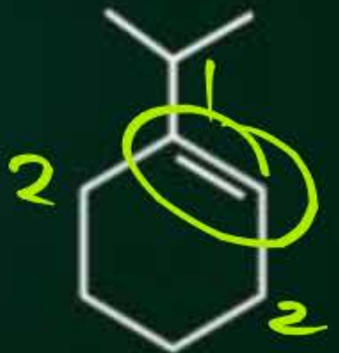
Ans :- ④

A



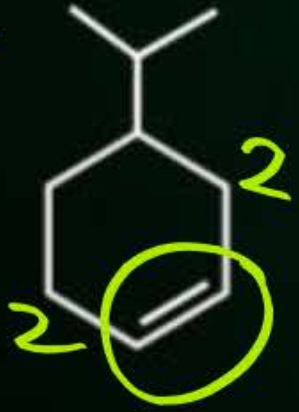
⑩

B



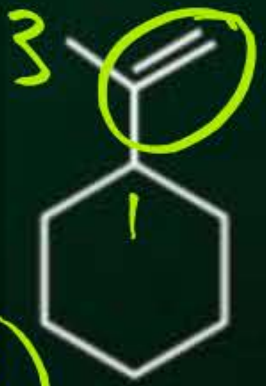
⑤

C



④

D

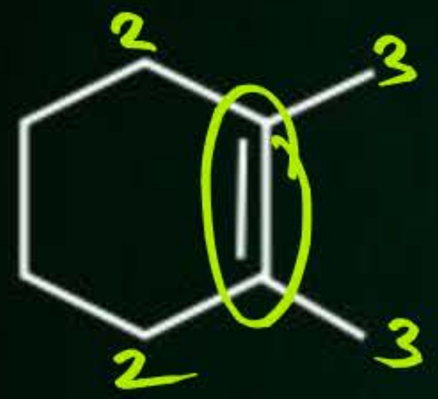


④

QUESTION

Which of the following alkenes will show maximum number of hyperconjugation forms?

✓ **A**

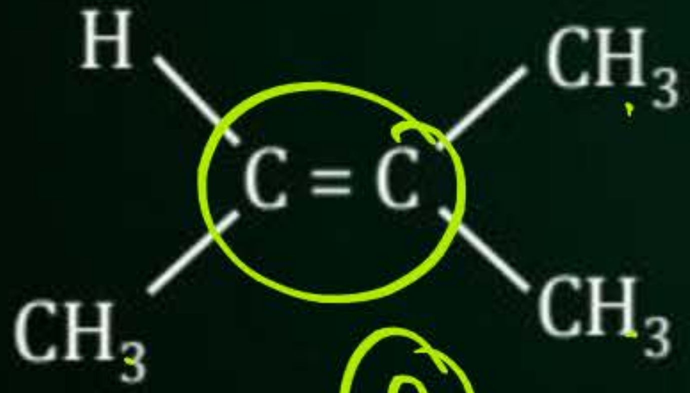


10

B $CH_3-CH=CH-CH_3$

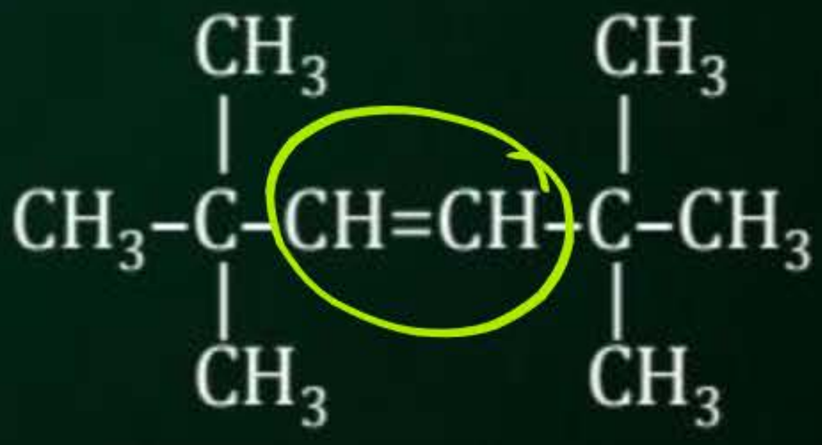
6

C



9

D

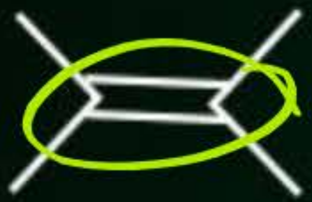


$$CH_3-\underset{CH_3}{\overset{CH_3}{C}}-CH=CH-\underset{CH_3}{\overset{CH_3}{C}}-CH_3$$

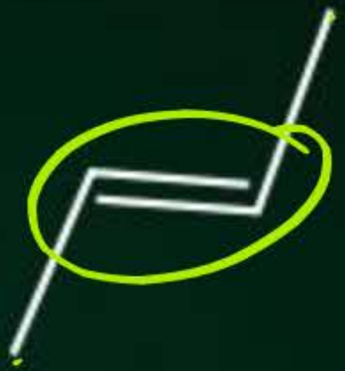
0

QUESTION

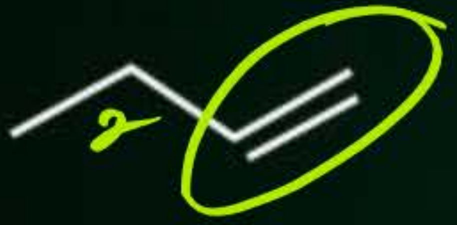
In which of the following alkene hyperconjugation does not take place?

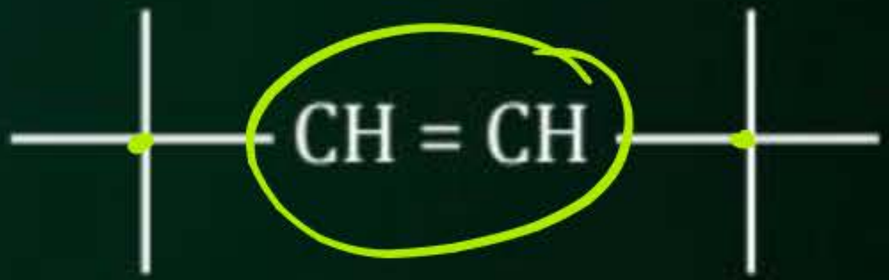
A


12

B


6

C


[✓ D]


0

Home Work

QUESTION 01

Hyperconjugation phenomenon is possible in:

(A) $H_2C = CH_2$

(B) $CH_3CH_2{-}CH{=}CH_2$

(C) $C_6H_5CH{=}CH_2$

(D) $(CH_3)_3C{-}CH{=}CH_2$

QUESTION 02

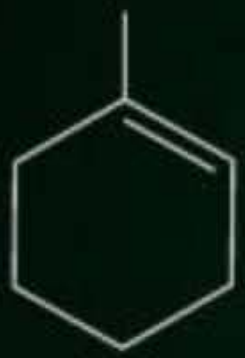
Assertion: 2,3-Dimethylbut-2-ene is more stable than but-2-ene.
Reason: Six hyperconjugation structures can be written for 2, 3-dimethylbut-2-ene while but-2-ene has twelve.

- A Both Assertion and Reason are correct and Reason is the correct explanation for Assertion.
- B Both Assertion and Reason are correct but Reason is not the correct explanation for Assertion.
- C Assertion is correct but Reason is incorrect.
- D Both Assertion and Reason are incorrect.

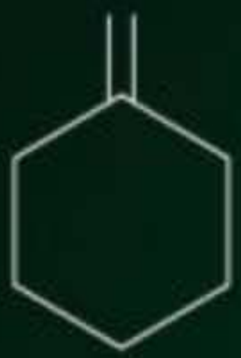
QUESTION 03

Compare stability of alkenes of the following:

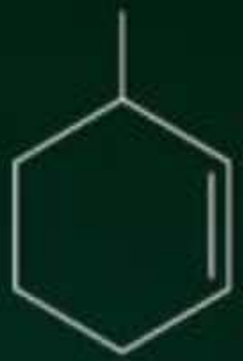
(i)



(ii)



(iii)



A i > ii > iii

B iii > ii > i

C ii > i > iii

D ii > iii > i

QUESTION 04

Among the following alkenes:

1-Butene; cis-2-Butene; trans-2-Butene

I II III

The decreasing order of stability is:

(A) III > II > I

(B) III > I > II

(C) I > II > III

(D) II > I > III

QUESTION 05

Considering the following alkenes:

$CH_3CH_2CH=CH_2$,
But–1–ene
(I)

$(CH_3)_2C=C(CH_3)_2$,
2,3 – Dimethyl but – 2 – ene
(II)

$(CH_3)_2C=CHCH_3$,
2 – Methyl but – 2 – ene
(III)

$(CH_3)_2C=CH_2$
2 – Methyl propene
(IV)

The correct decreasing order of stability is:

A I > II > III > IV

B II > III > IV > I

C IV > III > II > I

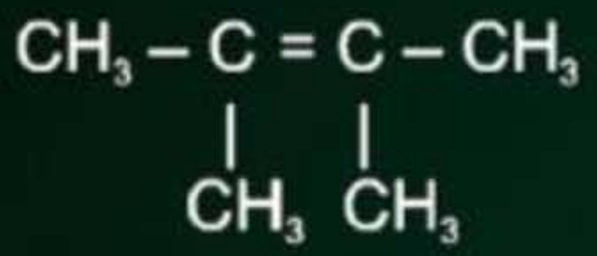
D III > IV > I > II

QUESTION 06

Stability of π-bond in following alkenes in the increasing order is:

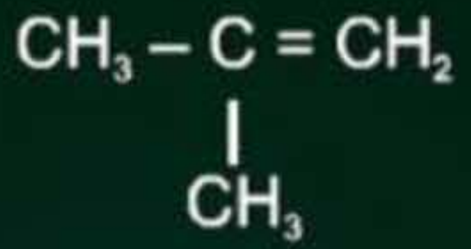
$CH_3-CH=CH-CH_3$

(I)



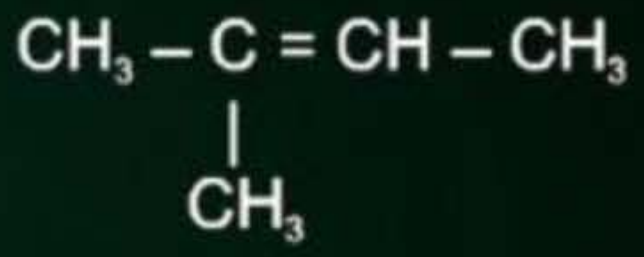
$CH_3-\underset{CH_3}{\underset{|}{C}}=\underset{CH_3}{\underset{|}{C}}-CH_3$

(II)



$CH_3-\underset{CH_3}{\underset{|}{C}}=CH_2$

(III)



$CH_3-\underset{CH_3}{\underset{|}{C}}=CH-CH_3$

(IV)

(A) I < III < IV < II

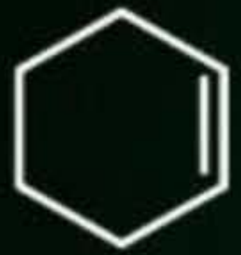
(B) I < II < III < IV

(C) IV < III < II < I

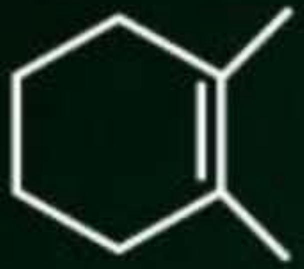
(D) II < III < IV < I

QUESTION 07

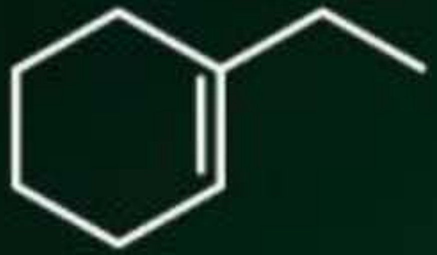
Arrange the following in increasing order of stability:



(I)



(II)



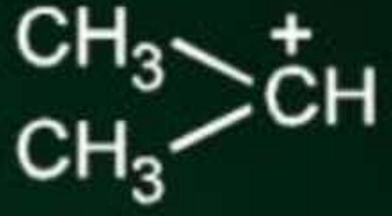
(III)

- **A** I < II < III
- **B** II < I < III
- **C** I < III < II
- **D** II < III < I

QUESTION 08

Which of the following cannot exhibit hyperconjugation?

Ⓐ $CH_3\dot{C}H_2$

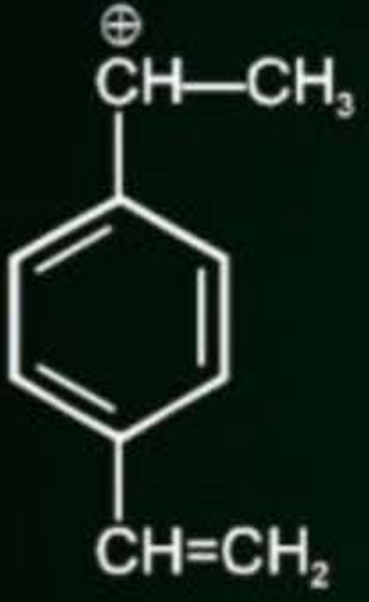
Ⓑ 

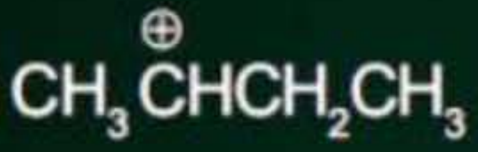
Ⓒ $CH_3CH=CH_2$

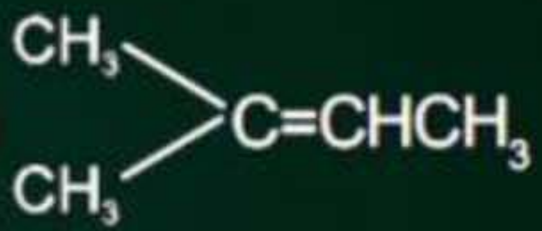
Ⓓ $(CH_3)_3C-\overset{+}{C}H_2$

QUESTION 09

The number of hyperconjugable hydrogen atoms of following species are respectively:

(P) 
$\overset{\oplus}{C}H-CH_3$
$CH=CH_2$

(Q) 
$CH_3\overset{\oplus}{C}HCH_2CH_3$

(R) 
$(CH_3)_2C=CHCH_3$

(S) $CH_3CH=CHC_2H_5$

A 3, 5, 9, 8

B 3, 5, 9, 5

C 5, 5, 3, 5

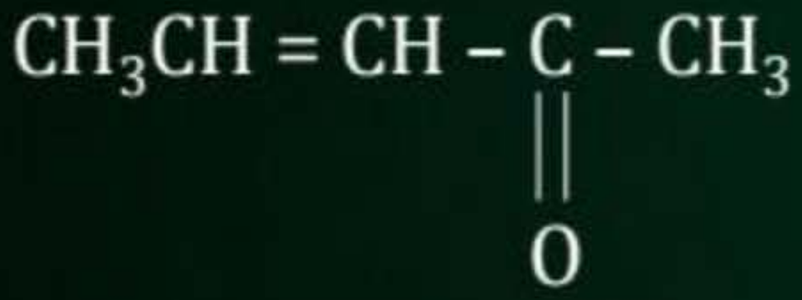
D 5, 2, 6, 5

QUESTION 10

Which one of the following has inductive, mesomeric and hyperconjugation effect?

(A) CH_3Cl

(B) $CH_3-CH=CH_2$

(C) 
$CH_3CH=CH-\underset{\underset{O}{\|}}{C}-CH_3$

(D) $CH_2=CH-CH=CH_2$

ANSWER KEY

1. B
2. C
3. A
4. A
5. B
6. A
7. C
8. D
9. B
10. C

Home Work From PW Module (Yakeen NEET)

Prarambh: Q 131, 137, 145

Prabal: Q 32

Parikshit: Q 39

Thank you!!

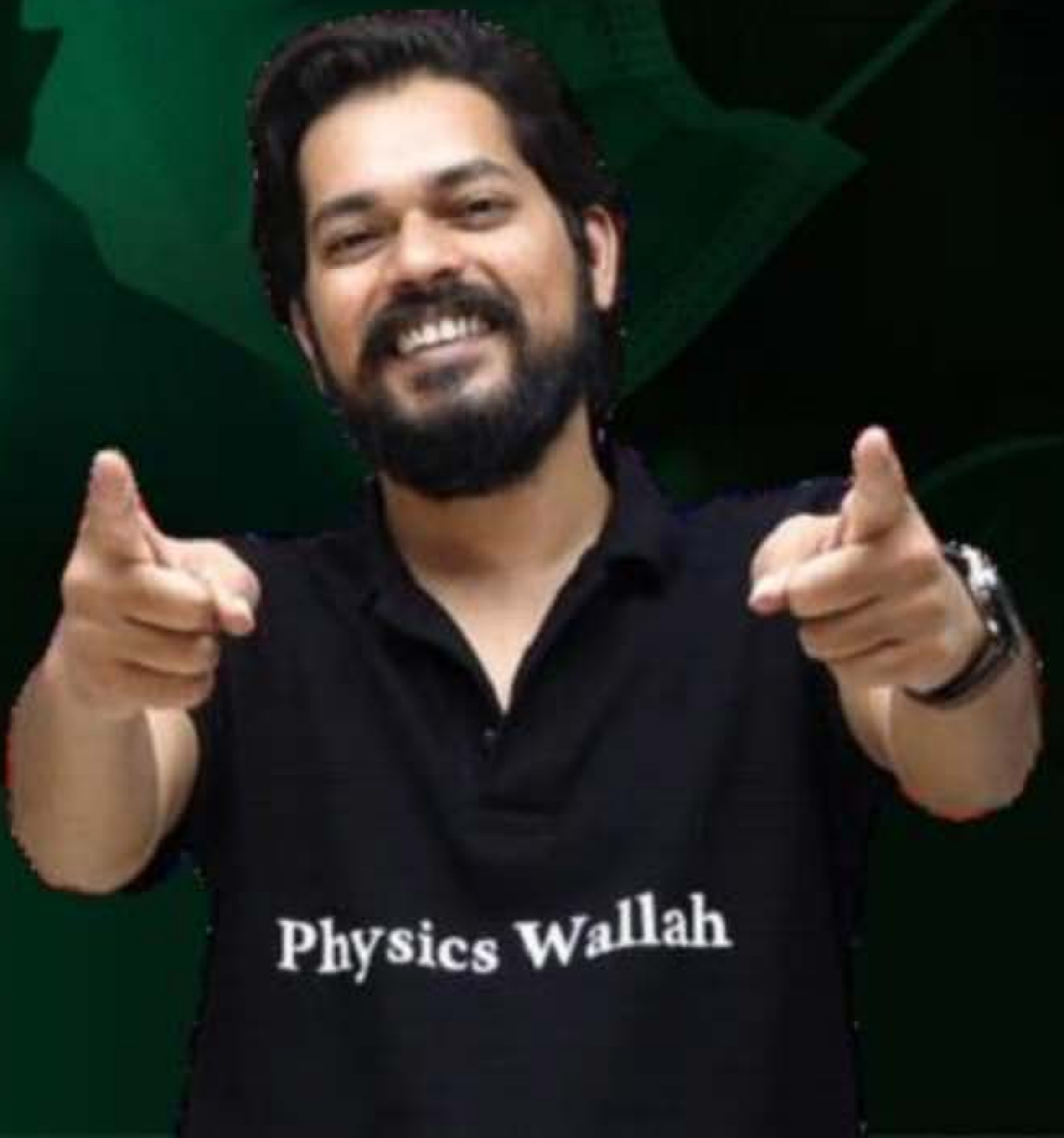
YAKEEN 2.0

FOR NEET 2025

Lecture- 07 **Organic Chemistry**

Some Basic Principles and Techniques (GOC)

By- Pankaj Sir(POPU MAMA)


Physics Wallah

Topics *to be covered*

1. Aromaticity ✓
2. Applications of Aromaticity ✓
3. Practice

Aromaticity

1. **Cyclic** ✓ (aankho se)
2. **Planar** ✓ Hybridisation of each atom in ring $\longrightarrow sp^2$
3. **Conjugation** ✓ $C=C-\overset{\times\times}{A}$ /□/+/−/=
4. **Huckel's Rule**

$(4n+2)\pi e^{\ominus}s$

$n=0, 1, 2, 3$

$2\pi e^{\ominus}, 6\pi e^{\ominus}, 10\pi e^{\ominus}, 14\pi e^{\ominus}$ .....

Aro

4. sizzi's rule

$4n\pi e^{\ominus}s$

$n=1, 2, 3, 4$ ....

$4\pi e^{\ominus}, 8\pi e^{\ominus}, 12\pi e^{\ominus}, 16\pi e^{\ominus}$ ....

Anti Aro

Agar ①, ②, ③ main se
koi bhi ek fail ho jaye
toh comp non aromatic

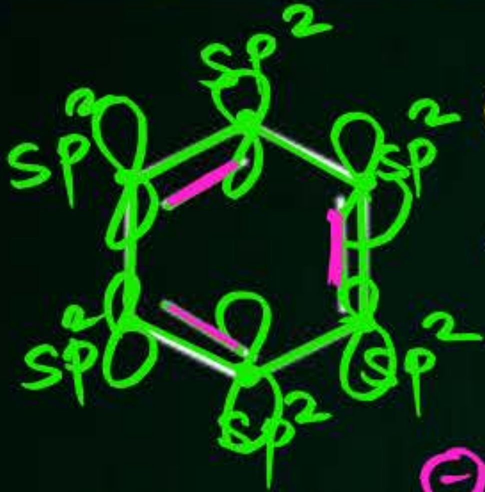
QUESTION

Comment on Aromaticity.

$\overset{\ominus}{C}H_3$ $3\sigma + 1$ Local L.P $= 4$ sp^3

$\overset{\ominus}{C}H_2-CH=CH_2$ $3\sigma \rightarrow sp^2$

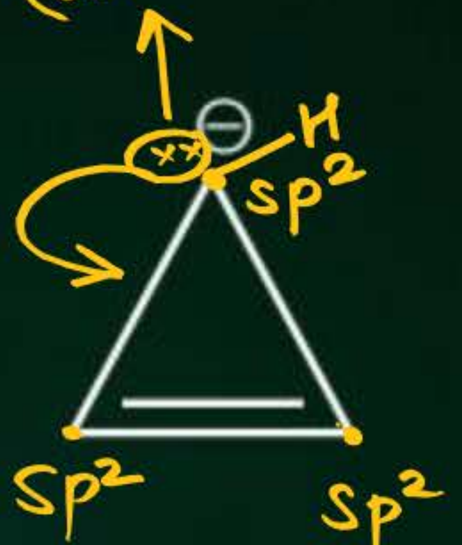
(deloca L.P) $C \rightarrow sp^2$



sp^2
sp^2
sp^2
sp^2
sp^2
sp^2

cyclic ✓
planar ✓
conjug ✓

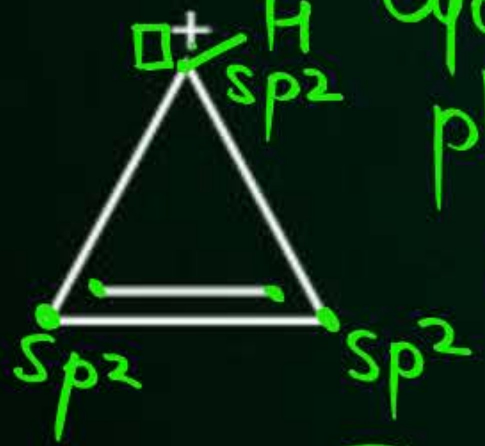
A $6\pi e^{\ominus}$



⊖
H
sp^2
sp^2
sp^2

cyclic ✓
planar ✓
conju ✓
$4\pi e^{\ominus}$

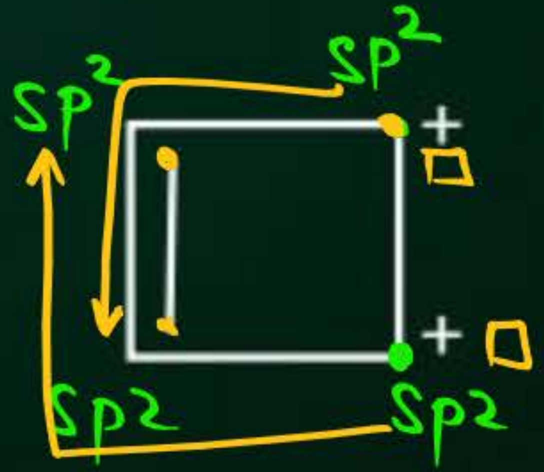
AA



+
H
sp^2
sp^2
sp^2

cyclic ✓
planar ✓
conju ✓

A $2\pi e^{\ominus}$



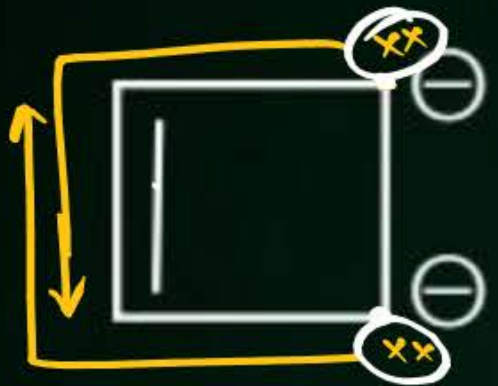
sp^2
sp^2
+
+
sp^2
sp^2

cyclic ✓
planar ✓
conju ✓
$2\pi e^{\ominus}$

A

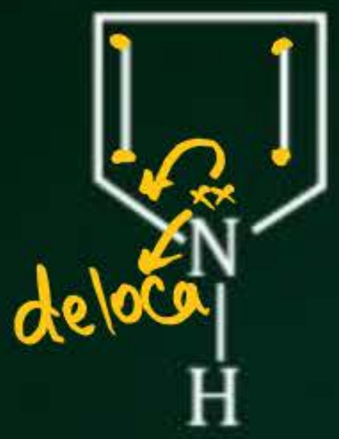
QUESTION

Comment on Aromaticity.

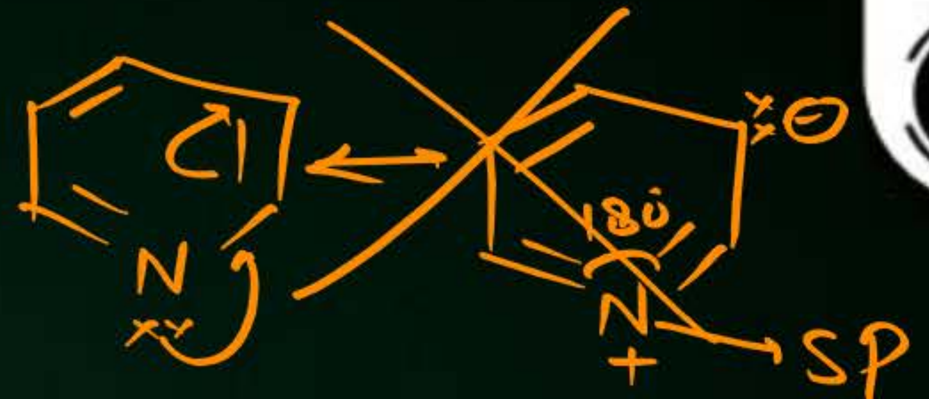


cyclic ✓
planar ✓
conju ✓
$6\pi e^{\ominus}$
Ⓐ

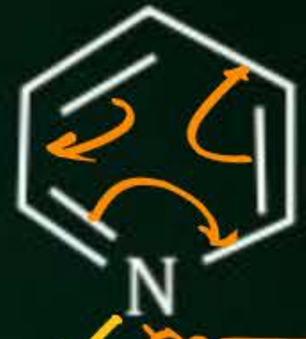
pyrolle


xx
N
H
deloca

cyclic ✓
planar ✓
conju ✓
$6\pi e^{\ominus}$
Ⓐ


Cl
N
xx
180°
N
+
⊖
SP

180°

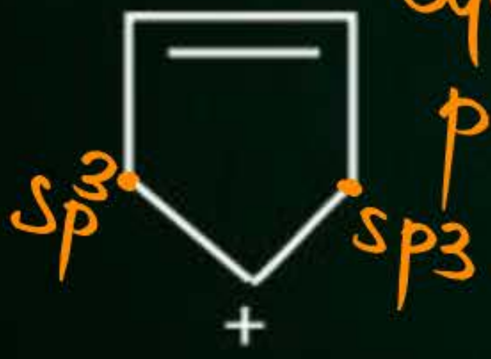


pyridine

xx ⟶ Loca

sp^2

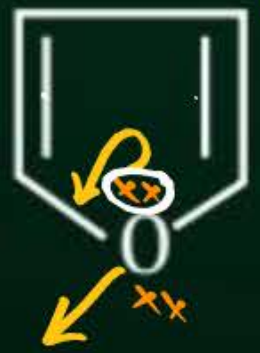
$2\sigma + 1LP = 3$



cyclic ✓
planar ×
(NA)

furan

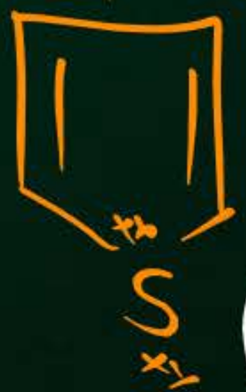
Ⓐ



cyclic ✓
planar ✓
conju ✓
$6\pi e^{\ominus}$

$2\sigma + 1LP = 3sp^2$

Thiophene



Ⓐ

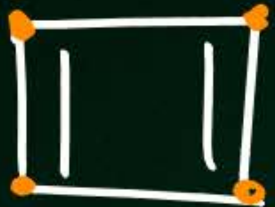
cyclic ✓
planar ✓
Conju ✓

$6\pi e^{\ominus}$

Ⓐ

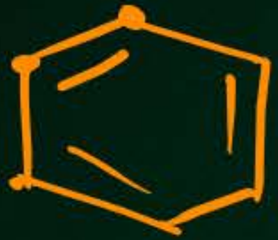
Annulenes :- cyclic rings without charge (alternate = bond)

[4]-Annulene



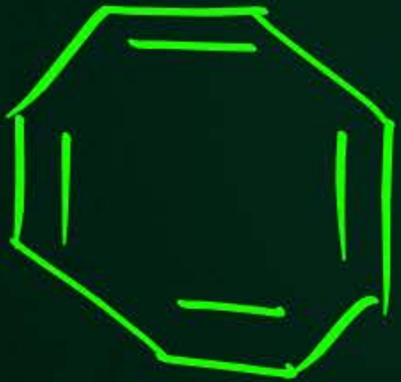
AA

[6]- Annulene

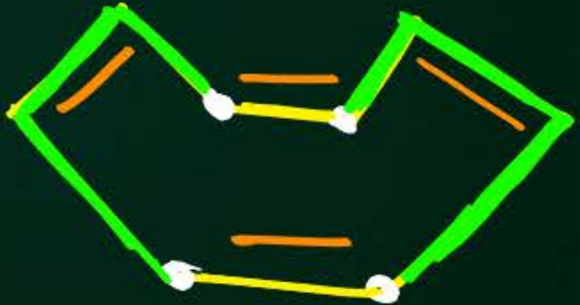


A

[8]-Annulene

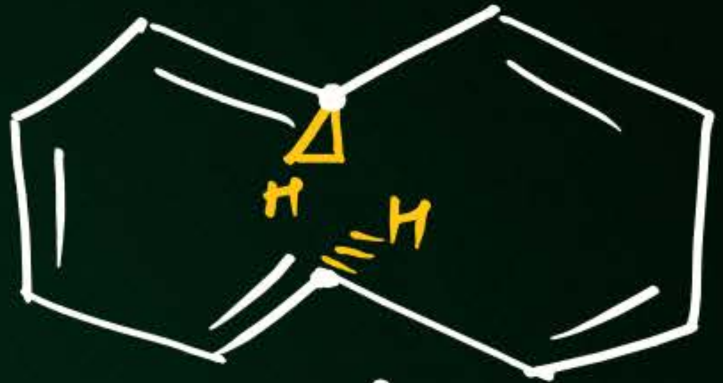


Non aro



Tublike struc
non planar

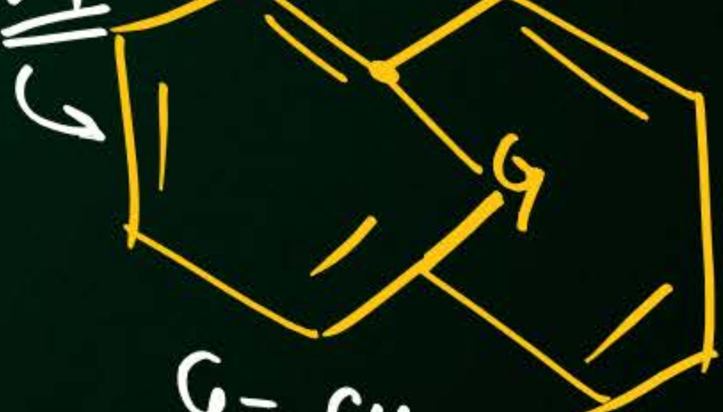
[10]-Annulene



Non planar

Non aro

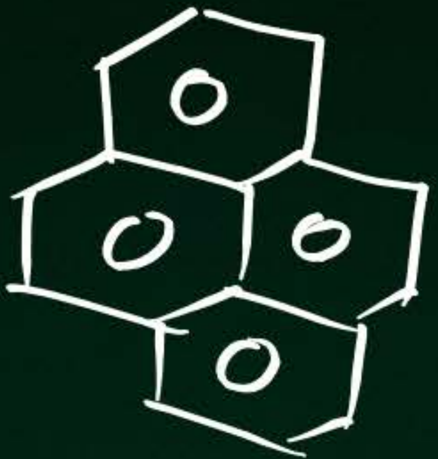
Aro

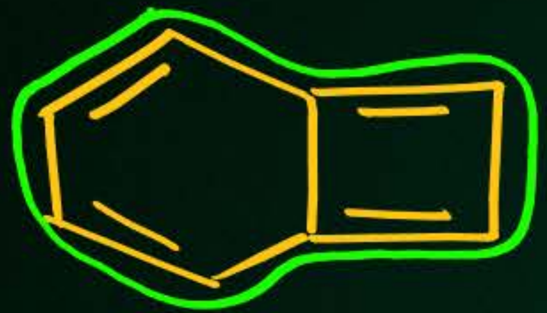


G = CH_2, O, NH, S

Peripheral conju :

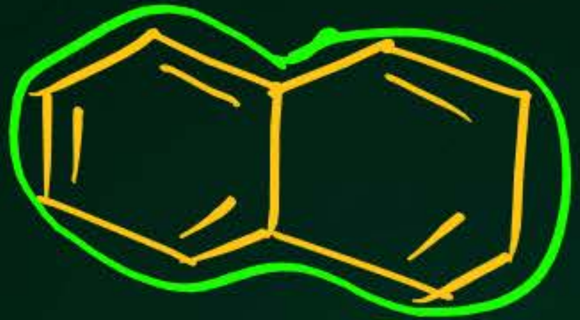
When more than one Rings are present.





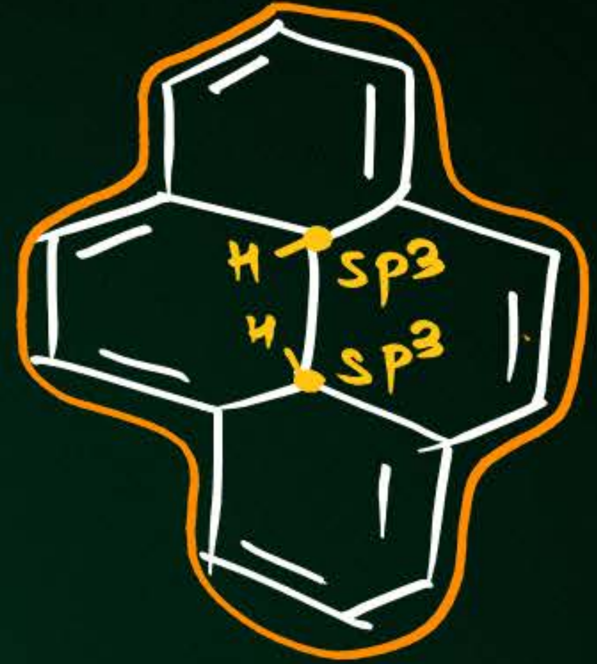
$8\pi e^{\ominus}$

AA



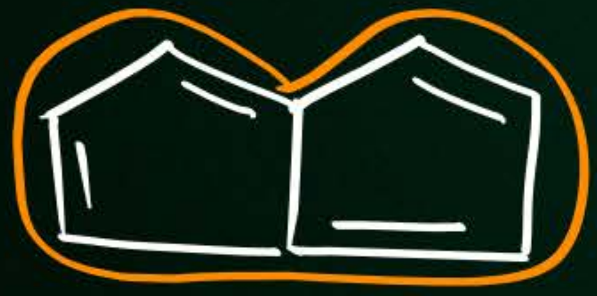
$10\pi e^{\ominus}$

$\bar{A}$



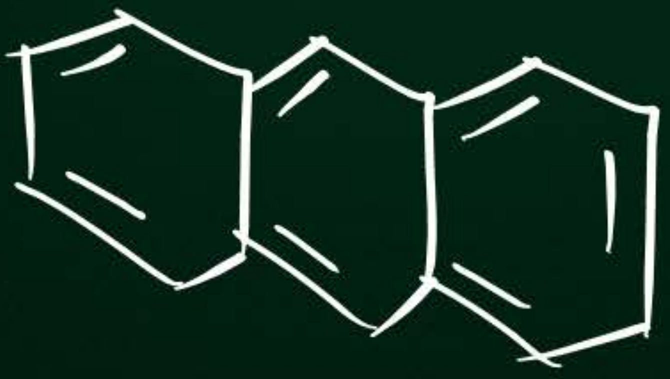
$14\pi e^{\ominus}$

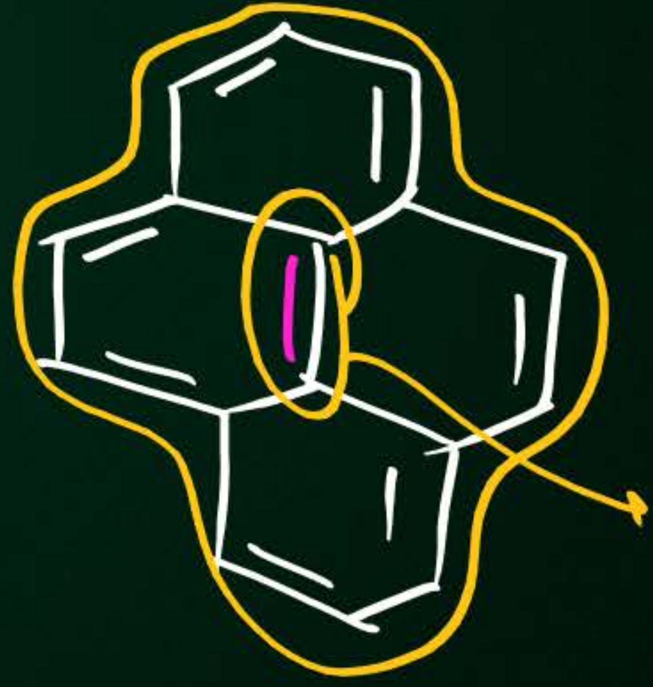
$\bar{A}$



$8\pi e^{\ominus}$

AA





$14\pi e^{\ominus}$

$\bar{A}$

isse koi farak nahi padta hai

Application of Aromaticity

1. Stability of Intermediates

Stability A > NA > AA

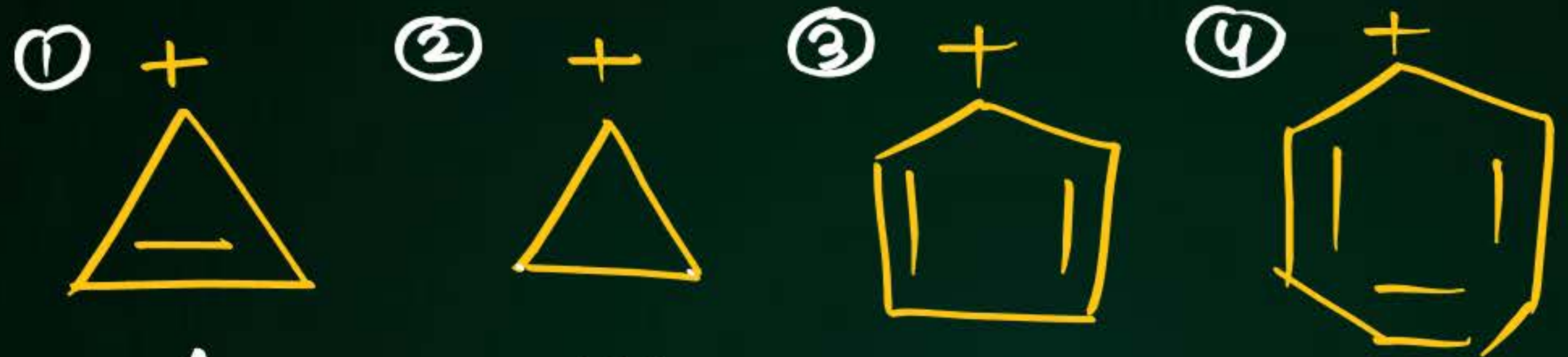
A → Loop

A, NA: $e^{\ominus}$ in BMO

NA → No Loop

AA → $e^{\ominus}$ in ABMO

①



① A Less reso

② NA

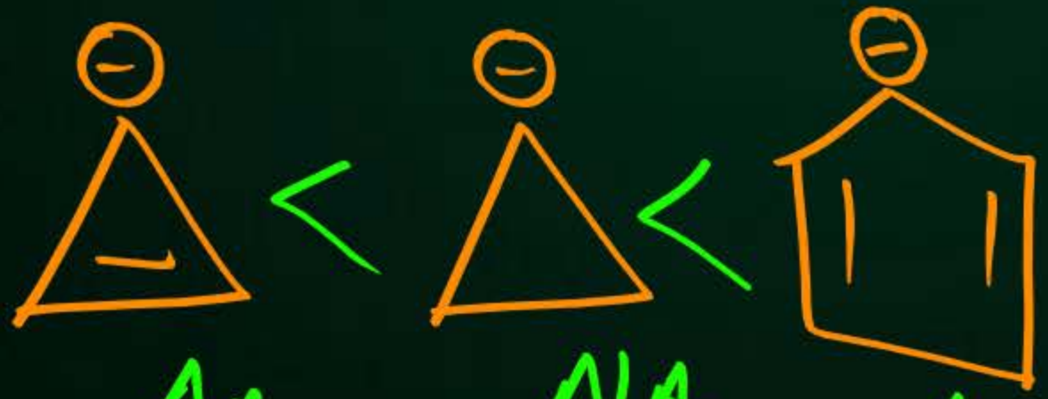
③ AA

④ A More Reso

④ > ① > ② > 3

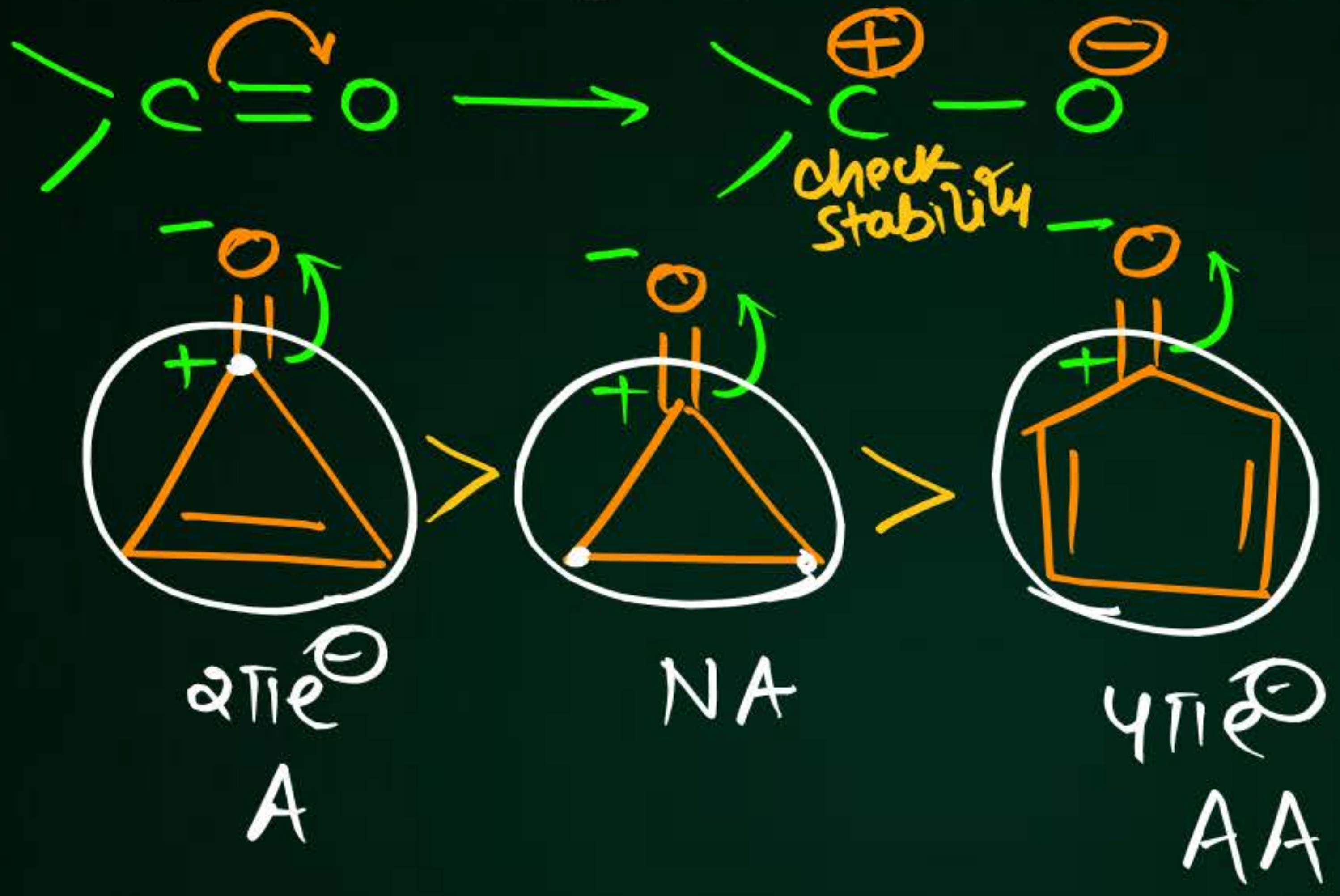
A > R > H > I
or
M

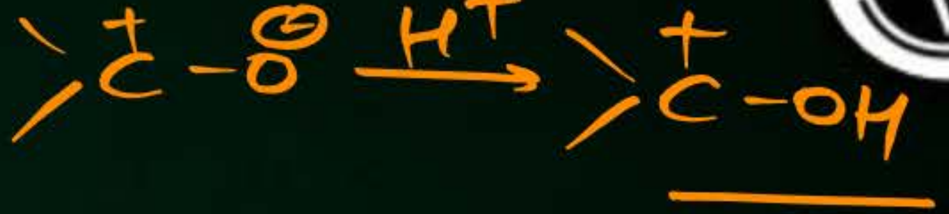
②



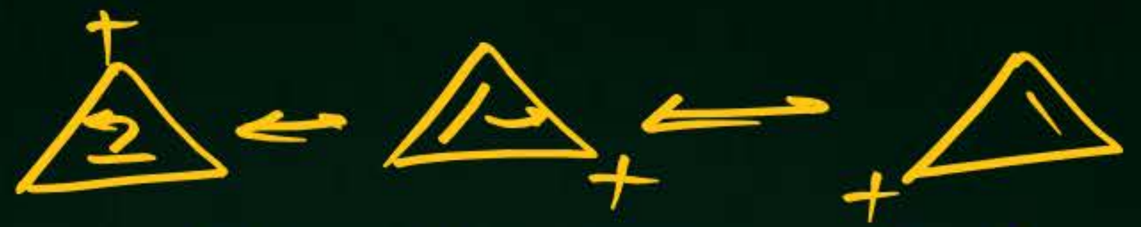
AA < NA < A

2. Dipole moment, Bond Length and Rate of Protonation

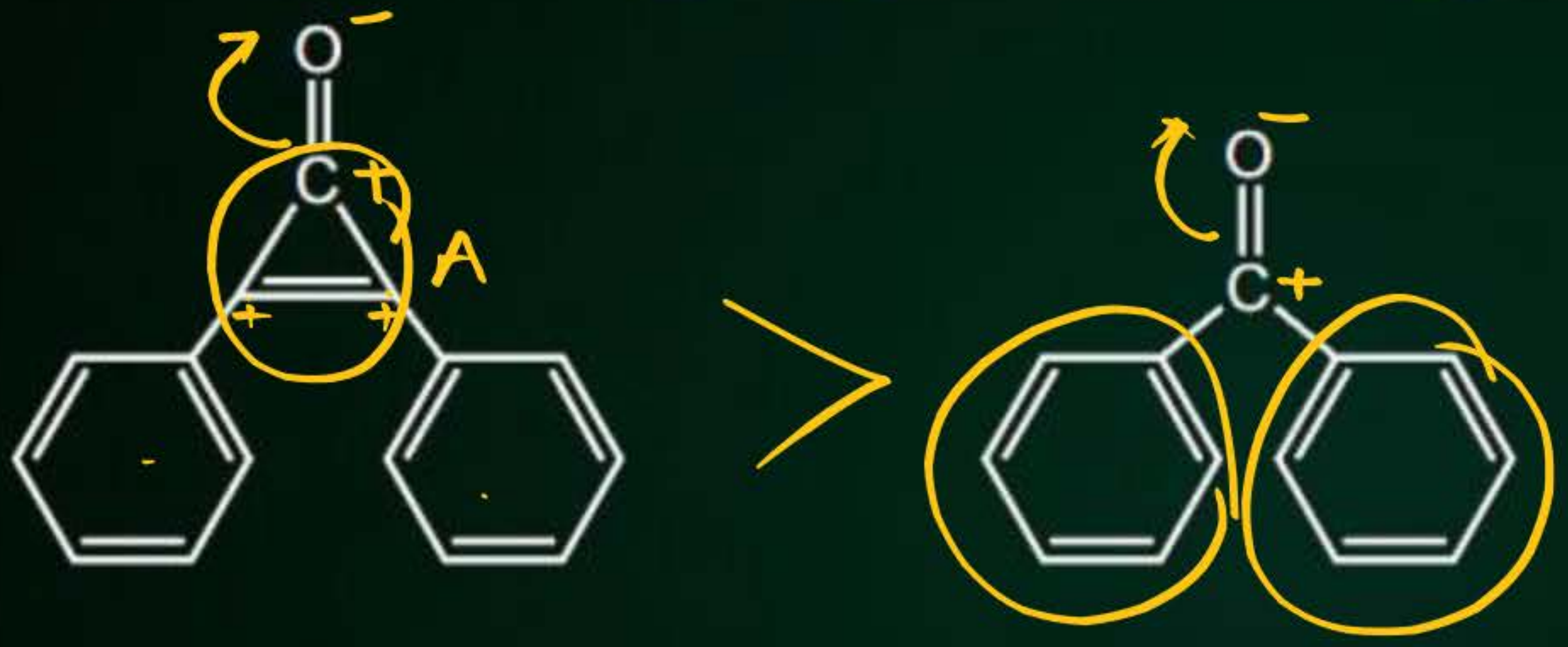

check stability
>
>
2πe⊖
A
NA
4πe⊖
AA



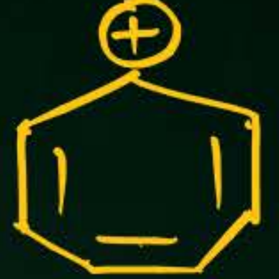
QUESTION



Which of the following compounds has the greater dipole moment?

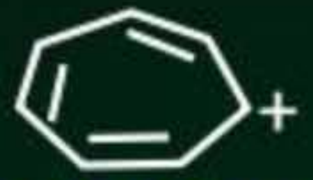


QUESTION



cyclic ✓
planar ✓
conju ✓
$6\pi e^{\ominus}s$ Ⓐ

Assertion: Tropylium cation is aromatic in nature.



Reason: The only property that determines its aromatic behavior is its planar structure.

A Both Assertion and Reason are correct and Reason is the correct explanation for Assertion.

B Both Assertion and Reason are correct and Reason is not the correct explanation for Assertion.

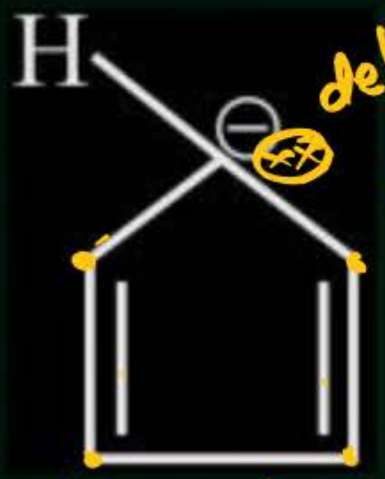
[✓ C] Assertion is correct but reason is incorrect.

D Assertion is incorrect and Reason is correct.

QUESTION

Which one of the following is not aromatic?

(A)



deloca

cyclic ✓

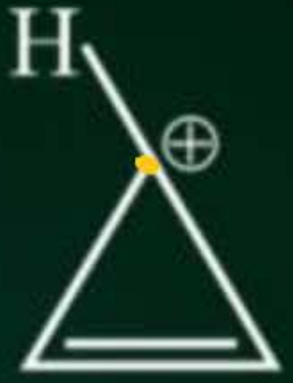
planar ✓

conju ✓

6π $e^{\ominus}$

(A)

(B)



cyclic ✓

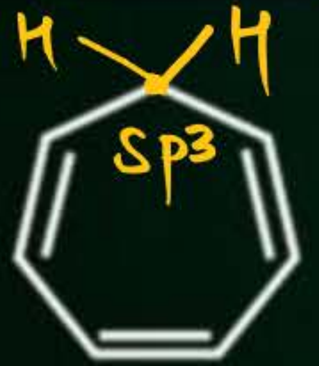
planar ✓

conju ✓

2π $e^{\ominus}$

(A)

✓ (C)

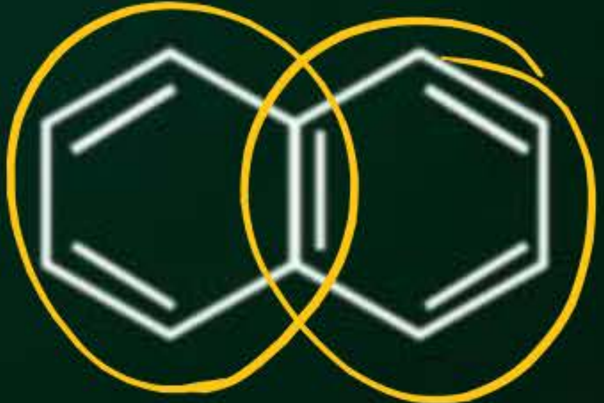


cyclic ✓

planar ✗

NA

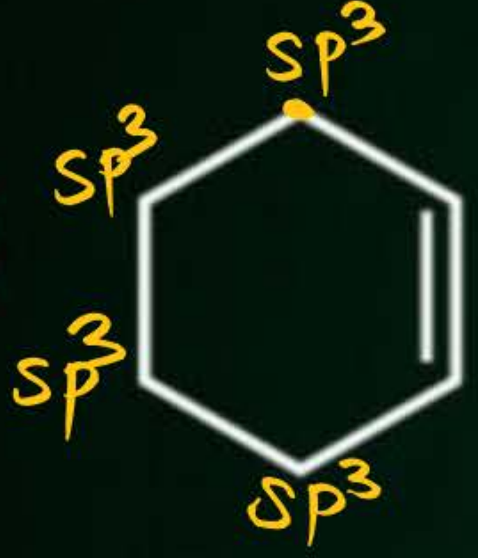
(D)



QUESTION

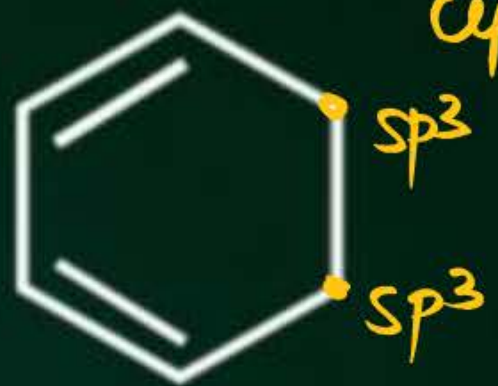
Which of the following is aromatic?

A


sp3
sp3
sp3
sp3

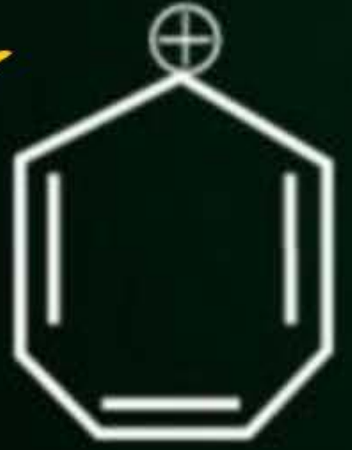
cyclic ✓
planor ×
NA

B



cyclic ✓
planor ×
NA

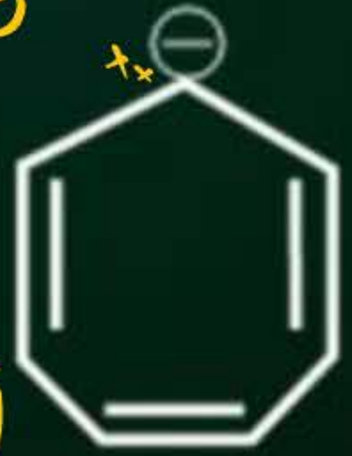
C ✓



A

D

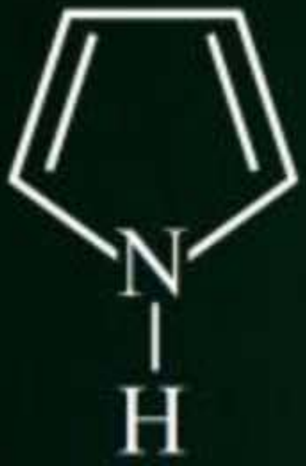
$8\pi e^{\ominus}$

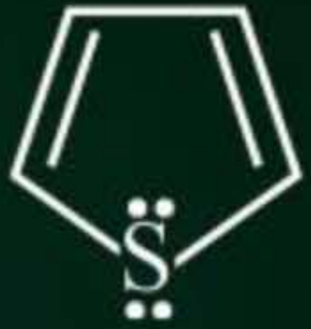


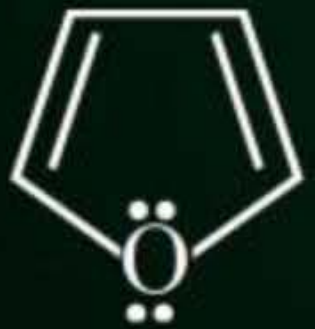
AA

QUESTION

Which of the following is aromatic compound?

A


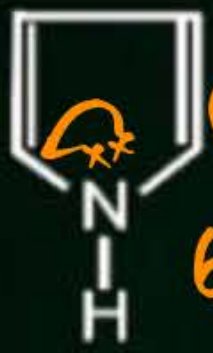
B


C


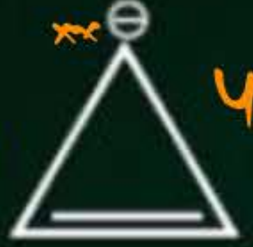
[✓ D] All of these

QUESTION How many of these following compounds is/are aromatic ?

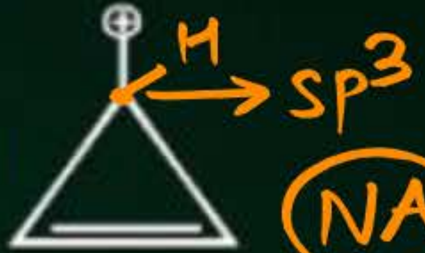
(i)



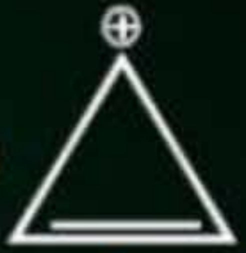
(ii)



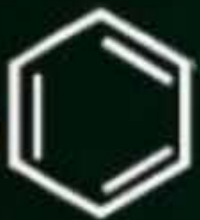
(iii)



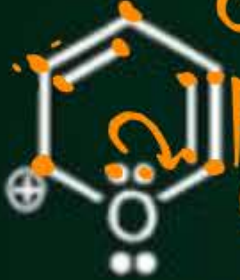
(iv)



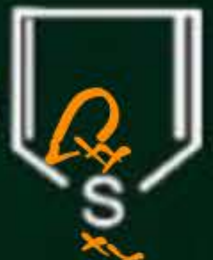
(v)



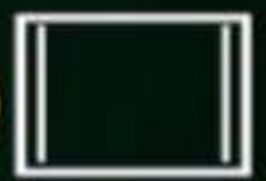
(vi)


O
cyclic ✓
planar ✓
conju ✓
$6\pi e^-$
A

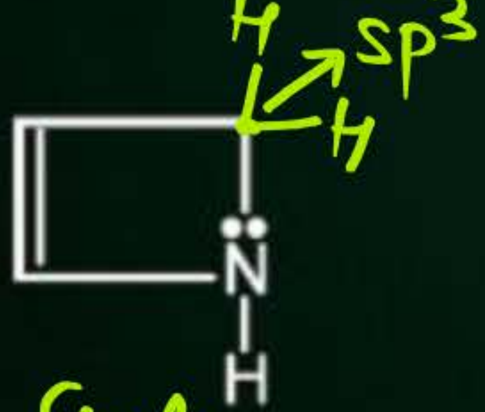
(vii)



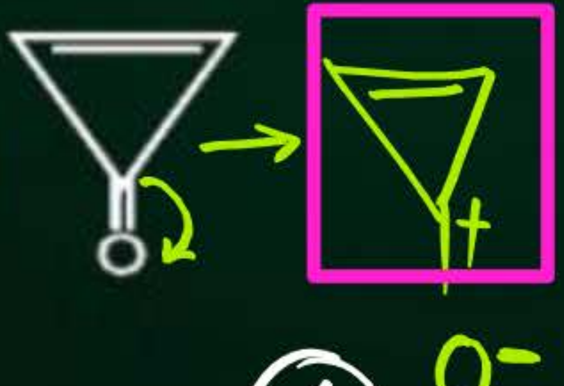
(viii)



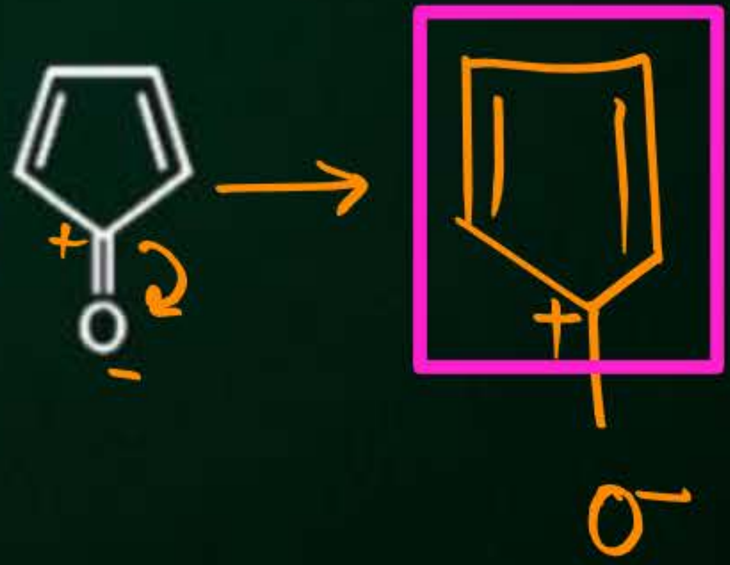
(ix)


H
H
sp^3
N
H
NA
cyclic ✓
planar ×

(x)



(xi)

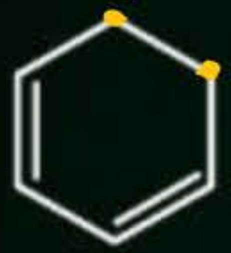


QUESTION

AA are unstable at room temp

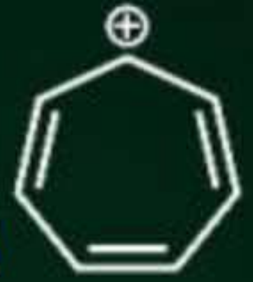
Which of the following is unstable at room temperature?

A



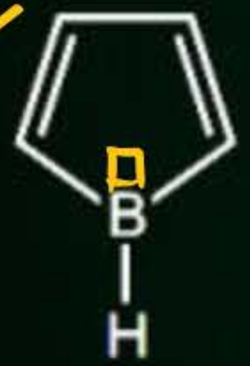
NA

B



A

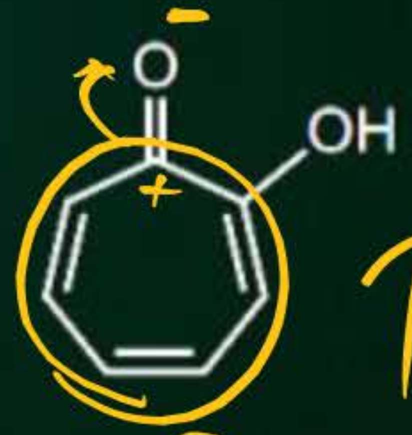
C ✓



$4\pi e^{\ominus}$

AA

D



Tropolone

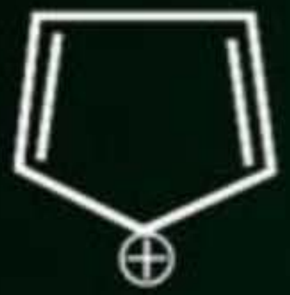
$6\pi e^{\ominus}$

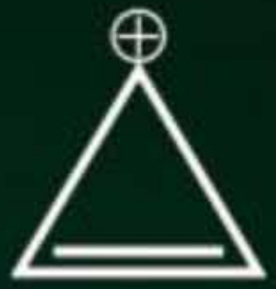
A

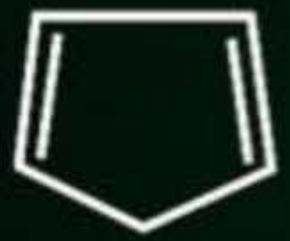
Home Work

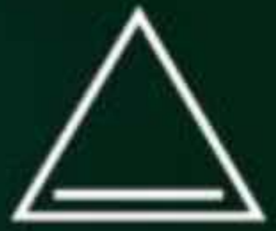
QUESTION 01

Which of the following compound is aromatic?

A


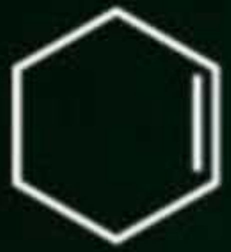
B


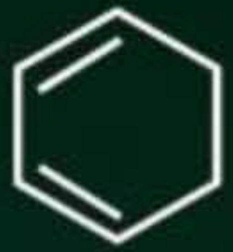
C


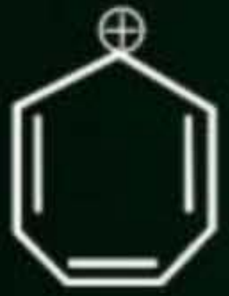
D


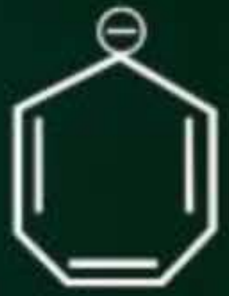
QUESTION 02

Which of the following is aromatic?

A 

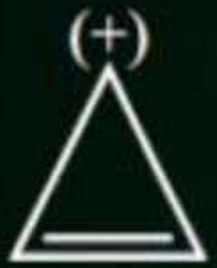
B 

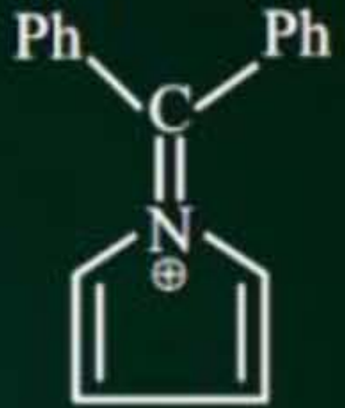
C 

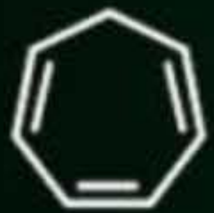
D 

QUESTION ③

Which is not aromatic?

A 

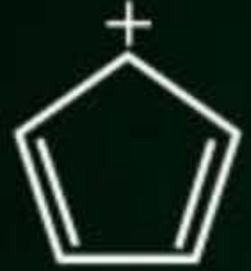
B 

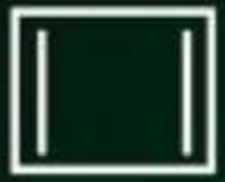
C 

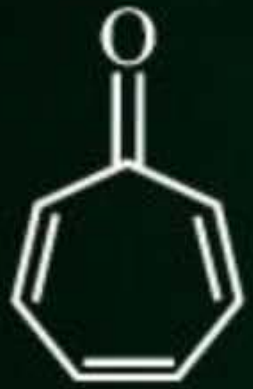
D Both (B) And (C)

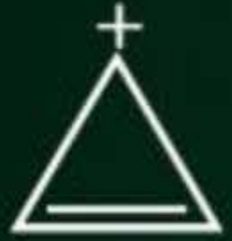
QUESTION 04

Which of the structures below would be aromatic?

(i)


(ii)


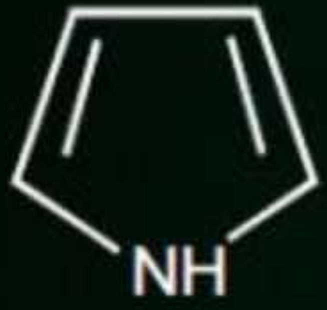
(iii)


(iv)


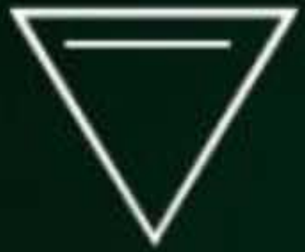
- **A** i and iv
- **B** i, iii and iv
- **C** iii and iv
- **D** ii

QUESTION 05

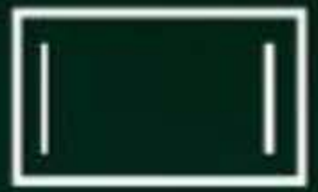
Which of the following structure is aromatic?



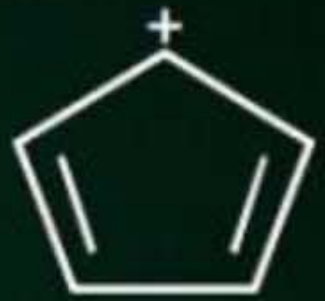
I



II



III



IV

(A) Structures I and II

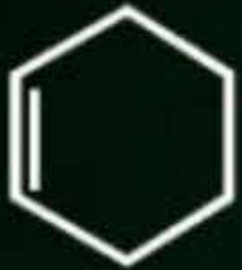
(B) Structure I only

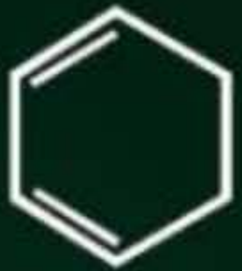
(C) Structure II only

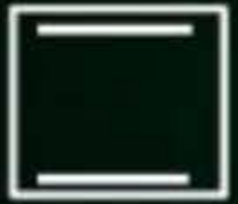
(D) Structure III only

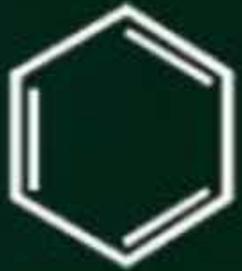
QUESTION ⑥

Which is not stable at room temperature?

Ⓐ 

Ⓑ 

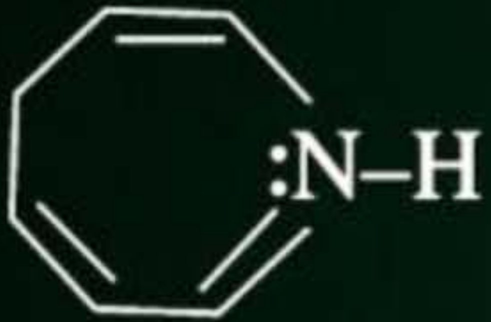
Ⓒ 

Ⓓ 

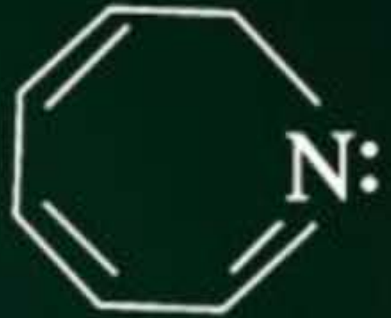
QUESTION⑦

Which of the following is best classified as heterocyclic aromatic compound?

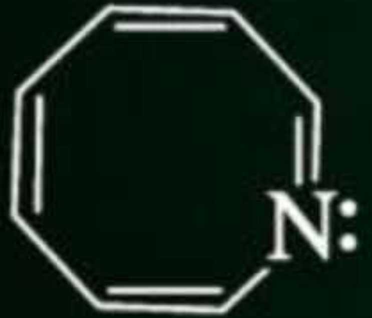
(A)



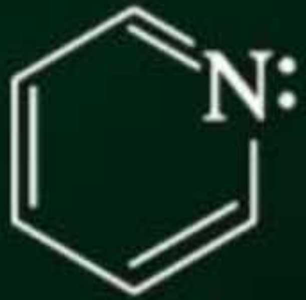
(B)



(C)

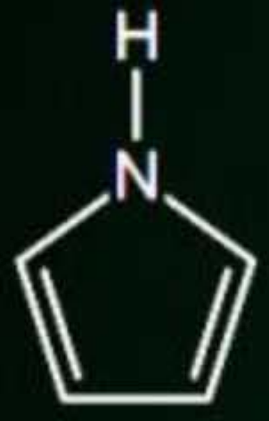


(D)

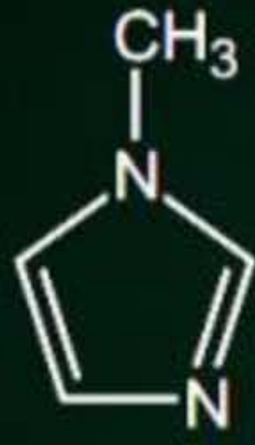


QUESTION 08

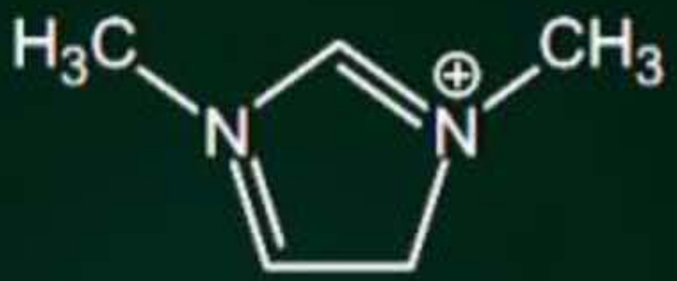
Choose the aromatic nitrogen heterocycles.



(i)



(ii)



(iii)

A i

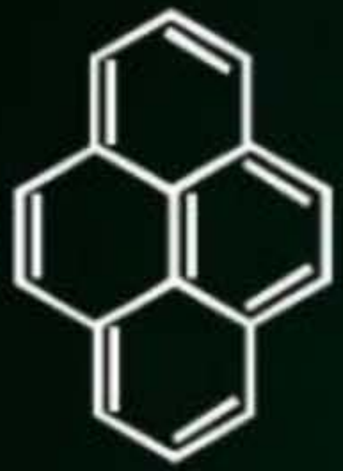
B ii

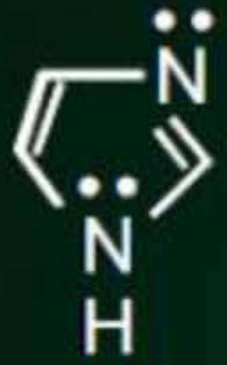
C iii

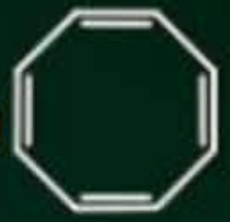
D i and ii

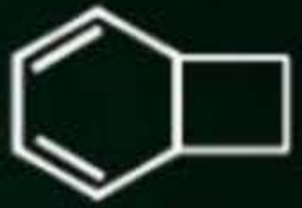
QUESTION ⑨

Which of the following is/are an aromatic compound?

(i) 

(ii) 

(iii) 

(iv) 

A i & ii

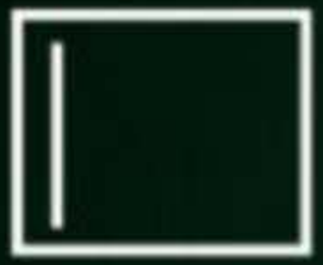
B i & iii

C ii & iii

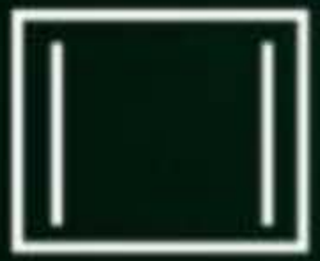
D All of these

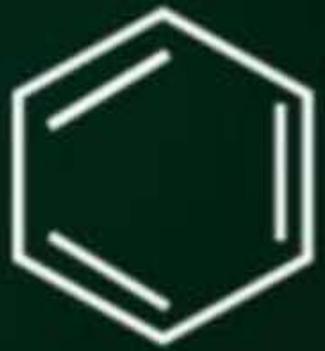
QUESTION 10

Select the anti-aromatic compound among the following:

(A) 

(B) $H_2C=CH-CH=CH_2$

(C) 

(D) 

ANSWER KEY

1. B
2. C
3. C
4. C
5. B
6. C
7. D
8. D
9. A
10. C

Home Work From PW Module (Yakeen NEET)

Prabal: Q 29

Parikshit: Q 02, 28

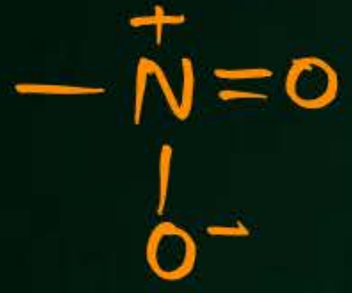
Home Work

Discussion of L-04

QUESTION 01

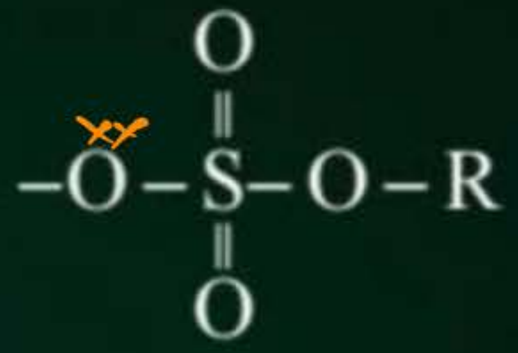
Which of the following group show –M effect?

[✓ A] $-NO_2$



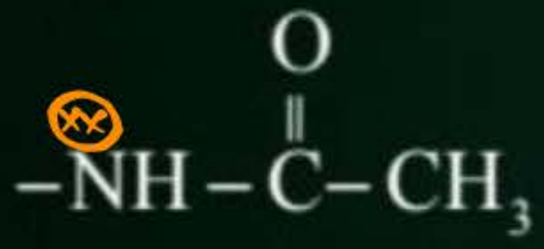
$-\overset{+}{N}(-O^-)=O$

B



$-\ddot{O}-\overset{O}{\overset{\|}{\underset{\underset{O}{\|}}{S}}}-O-R$

C



$-\ddot{N}H-\overset{O}{\overset{\|}{C}}-CH_3$

D $-\ddot{Cl}$

QUESTION 02

Arrange the following groups in order of decreasing –~~M~~ I directing strength.

$-\overset{+}{N}R_3$, $-CN$, $-NO_2$, $-COOH$

[✓ A] $-\overset{+}{N}R_3 > -NO_2 > -CN > -COOH$

B $-COOH > -CN > -NO_2 > -\overset{+}{N}R_3$

C $-CN > -NO_2 > -COOH > -\overset{+}{N}R_3$

D $-NO_2 > -CN > -\overset{+}{N}R_3 > -COOH$

QUESTION 03

Which of the following have both +M & –I effect?

(A) $-NO_2$ $-M$ $-I$

[✓ (B)] $-\overset{\times\circ}{Cl}$ $+M$ $-I$

(C) $-COOH$ $-M$ $-I$

(D) $-CH_3$ $+H$ $+I$

QUESTION 04

Which of the pair of group have overall electron eithdrawing effect when attached to a phenyl ring?

✓ (A) $-Cl, -NO_2$

$-I > \cancel{+M}$ $-M > \cancel{I}$

(B) $-NO_2, -OH$

$-M > \cancel{-I}$ $+M > \cancel{-I}$

(~~C~~) $-NO, -OCH_3$

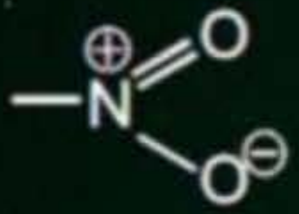
$\left.\begin{matrix}+M\\-M\end{matrix}\right\}-I$ $\underline{\underline{\pm}}M > \cancel{I}$

(D) $-CN, -NH_2$

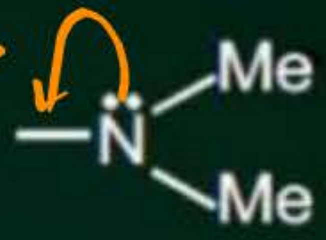
$-M > \cancel{-I}$ $+M > \cancel{-I}$

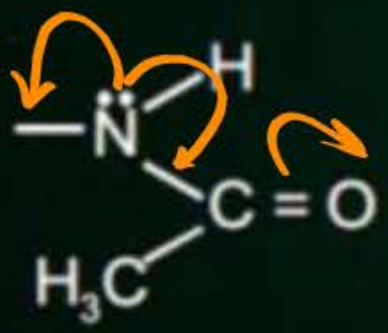
QUESTION 05

Which of the following group will have the strongest electron donating Mesomeric effect?

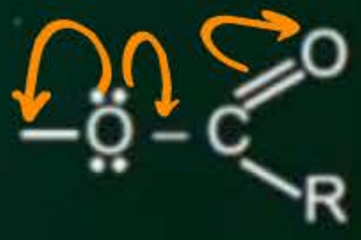
(A) 

−M

✓ (B) 

(C) 

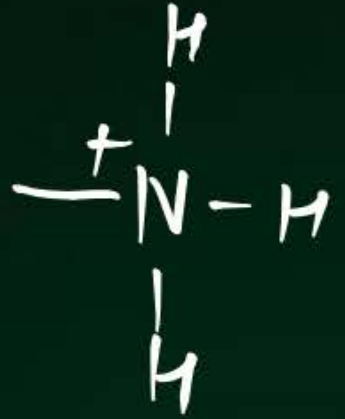
+M

(D) 

+M

QUESTION 06

Which is correct?



[✓ A] $-CD_3 > -CH_3$(+I–effect)

B $-\overset{\oplus}{N}H_3$ (Shows –M and –I effect)

C $-F > -Cl$ (Net electron withdrawing nature for benezne ring)

D All

QUESTION 07

Which of the following group(s) show +M effect?

(A) $-\underset{\times\times}{\overset{\ominus}{C}}H_2$

(B) $-\overset{\times\times}{N}HCOR$

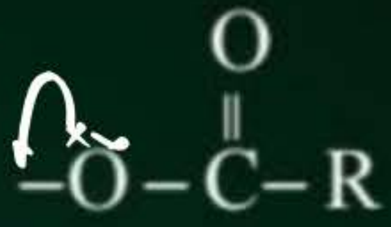
(C) $-\overset{\times\circ}{O}^{-}$

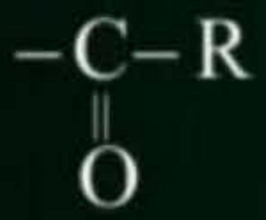
[✓ (D)] All of these

QUESTION 08

Which of the following group show +M > –I effect?

(A) –F $-I > +M$

✓ (B)

$-\ddot{O}-\overset{\overset{O}{\|}}{C}-R$ $+M > -\cancel{I}$

(C)

$-\underset{\underset{O}{\|}}{C}-R$ $-M > -I$

(D) –COOH

$-M > -I$

QUESTION 09

+ M and +I both effects are shown by:

(A) $-\ddot{\underset{\cdot\cdot}{O}}H$ +M −I

(B) $-\ddot{N}HCH_3$ +M −I

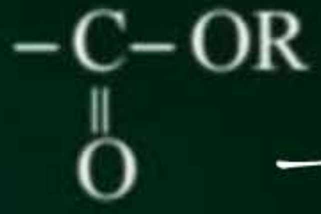
[✓ (C)] $-O^{\ominus}$ +M, +I

(D) $-C(CH_3)_3$ +I

QUESTION 10

Which of the following group show +M and –I effect?

(A)
$-\overset{}{\underset{\underset{O}{\|}}{C}}-F$ −M −I

(B) 
$-\underset{\underset{O}{\|}}{C}-OR$ −M −I

(C) $-O^{\ominus}$ +M +I

[✓ (D)] $-OH$ +M −I

ANSWER KEY

1. A
2. A
3. B
4. A
5. B
6. A
7. D
8. B
9. C
10. D

Home Work

Discussion of L-06

QUESTION 01

Hyperconjugation phenomenon is possible in:

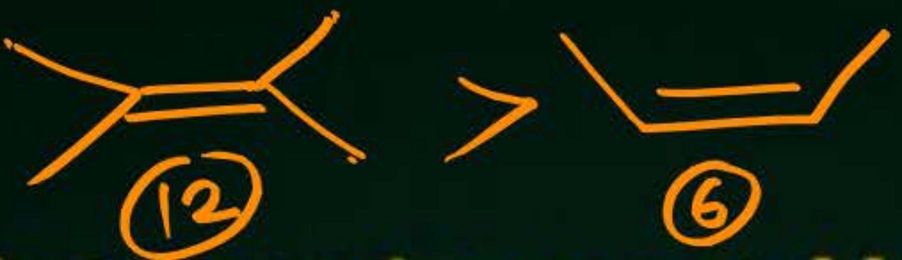
A $H_2C = CH_2$

[✓ B] $CH_3\overset{\alpha}{C}H_2CH=CH_2$

C $C_6H_5CH=CH_2$

D $(CH_3)_3C-CH=CH_2$

QUESTION 02



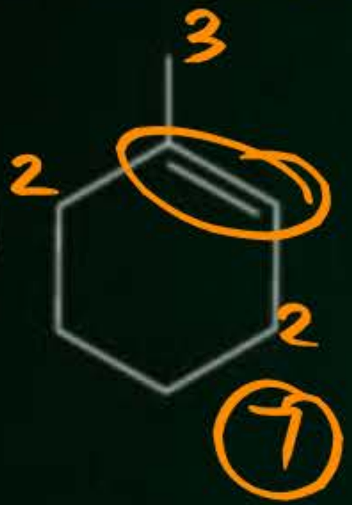
Assertion: 2,3-Dimethylbut-2-ene is more stable than but-2-ene.
Reason: Six hyperconjugation structures can be written for 2, 3-dimethylbut-2-ene while but-2-ene has twelve.

- **A** Both Assertion and Reason are correct and Reason is the correct explanation for Assertion.
- **B** Both Assertion and Reason are correct but Reason is not the correct explanation for Assertion.
- [✓ **C** Assertion is correct but Reason is incorrect.]
- **D** Both Assertion and Reason are incorrect.

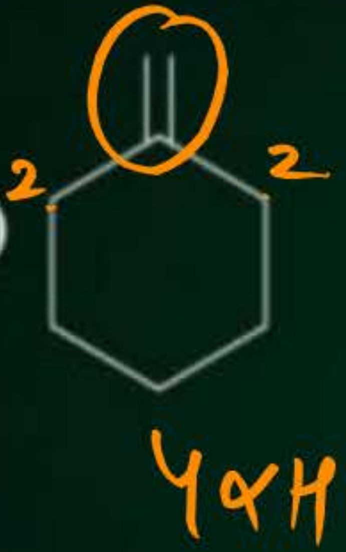
QUESTION 03

Compare stability of alkenes of the following:

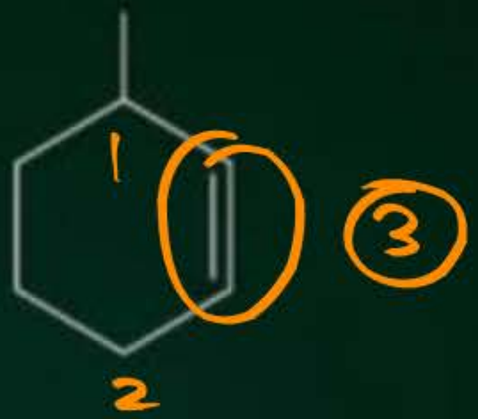
(i)



(ii)



(iii)



[✓ **A**] i > ii > iii

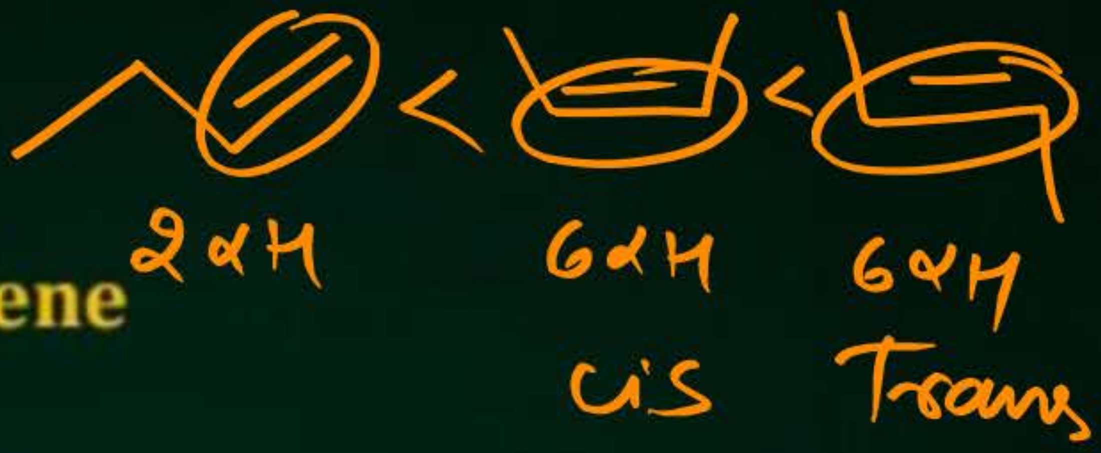
B iii > ii > i

C ii > i > iii

D ii > iii > i

QUESTION 04

Among the following alkenes:
1-Butene; cis-2-Butene; trans-2-Butene
I II III
The decreasing order of stability is:



<
<
2αH
6αH
6αH
cis
Trans

A [✓ III > II > I]

B III > I > II

C I > II > III

D II > I > III

QUESTION 05

Considering the following alkenes:

$CH_3CH_2CH=CH_2$,
But–1–ene
2αH (I)

12αH
$(CH_3)_2C=C(CH_3)_2$,
2,3 – Dimethyl but – 2 – ene
(II)

$(CH_3)_2C=CHCH_3$,
2 – Methyl but – 2 – ene
(III) 9αH

$(CH_3)_2C=CH_2$ 6αH
2 – Methyl propene
(IV)

The correct decreasing order of stability is:

Ⓐ I > II > III > IV

[✓ Ⓑ] II > III > IV > I

Ⓒ IV > III > II > I

Ⓓ III > IV > I > II

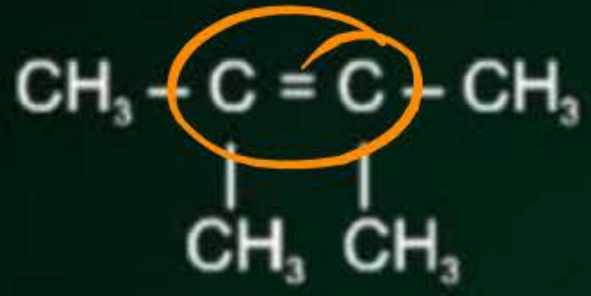
QUESTION 06

Stability of π-bond in following alkenes in the increasing order is:

$CH_3-CH=CH-CH_3$

6αH

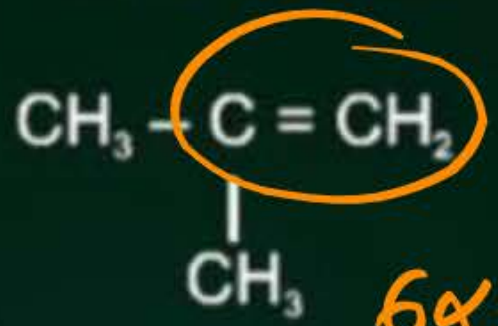
(I)



$CH_3-\underset{CH_3}{\underset{|}{C}}=\underset{CH_3}{\underset{|}{C}}-CH_3$

(II)

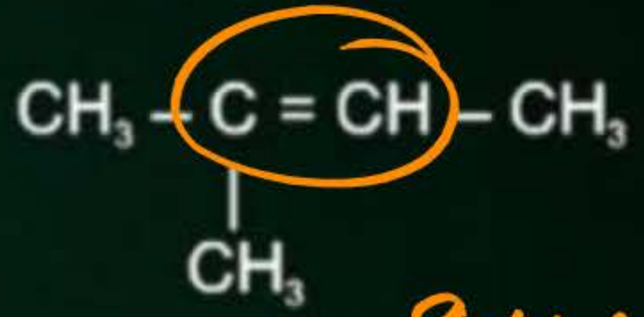
12αH



$CH_3-\underset{CH_3}{\underset{|}{C}}=CH_2$

6αH

(III)



$CH_3-\underset{CH_3}{\underset{|}{C}}=CH-CH_3$

(IV)

9αH

[✓ A] I < III < IV < II

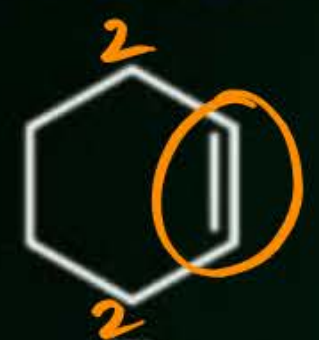
B I < II < III < IV

C IV < III < II < I

D II < III < IV < I

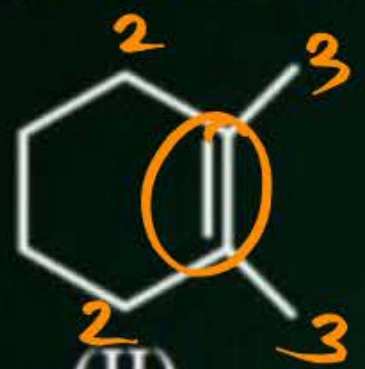
QUESTION 07

Arrange the following in increasing order of stability:



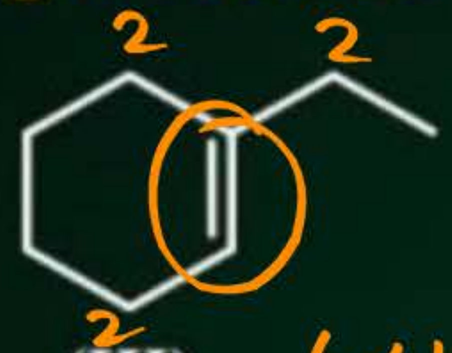
(I)

4αH



(II)

10αH



(III)

6αH

A I < II < III

B II < I < III

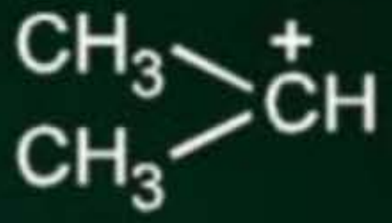
[✓ **C**] I < III < II

D II < III < I

QUESTION 08

Which of the following cannot exhibit hyperconjugation?

(A) $CH_3\dot{C}H_2$

(B)


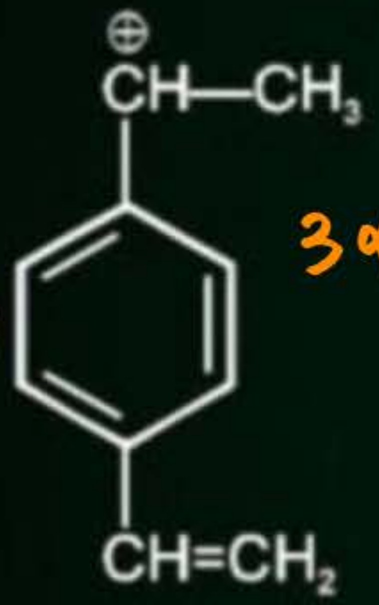
(C) $CH_3CH=CH_2$

[✓ (D)] $(CH_3)_3C-\overset{+}{C}H_2$

0 αH

QUESTION 09

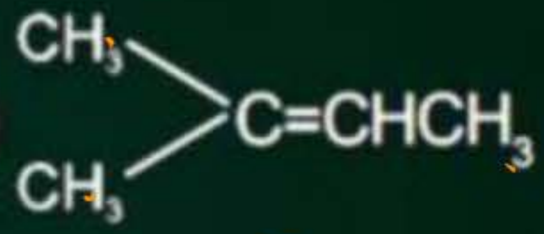
The number of hyperconjugable hydrogen atoms of following species are respectively:

(P)

$\overset{\oplus}{C}H-CH_3$
$CH=CH_2$

3αH

(Q) $CH_3\overset{\oplus}{C}HCH_2CH_3$

5αH

(R)

CH_3
CH_3
$C=CHCH_3$

9αH

(S) $\overset{\alpha}{CH_3}CH=CH\overset{\alpha}{C_2H_5}$ CH_2-CH_3

5αH

A 3, 5, 9, 8

B ✓ 3, 5, 9, 5

C 5, 5, 3, 5

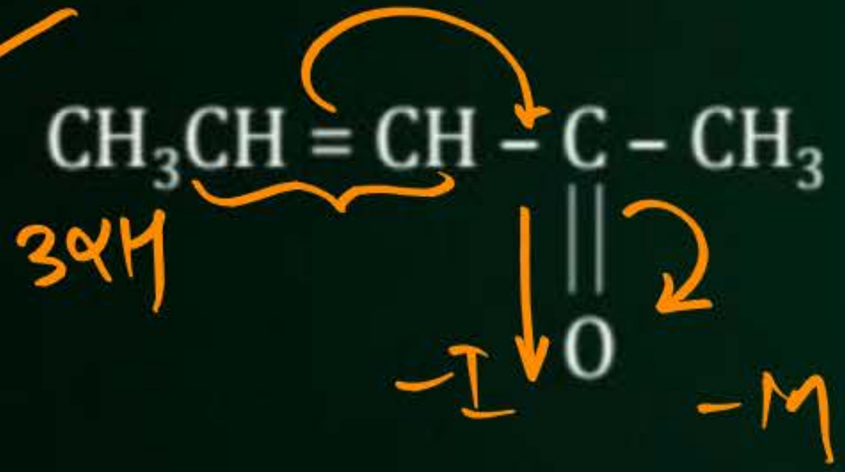
D 5, 2, 6, 5

QUESTION 10

Which one of the following has inductive, mesomeric and hyperconjugation effect?

(A) CH_3Cl

(B) $CH_3-CH=CH_2$

[✓ (C)] 

$CH_3CH=CH-\underset{\underset{O}{\|}}{C}-CH_3$

(D) $CH_2=CH-CH=CH_2$

ANSWER KEY

1. B
2. C
3. A
4. A
5. B
6. A
7. C
8. D
9. B
10. C

Thank you!

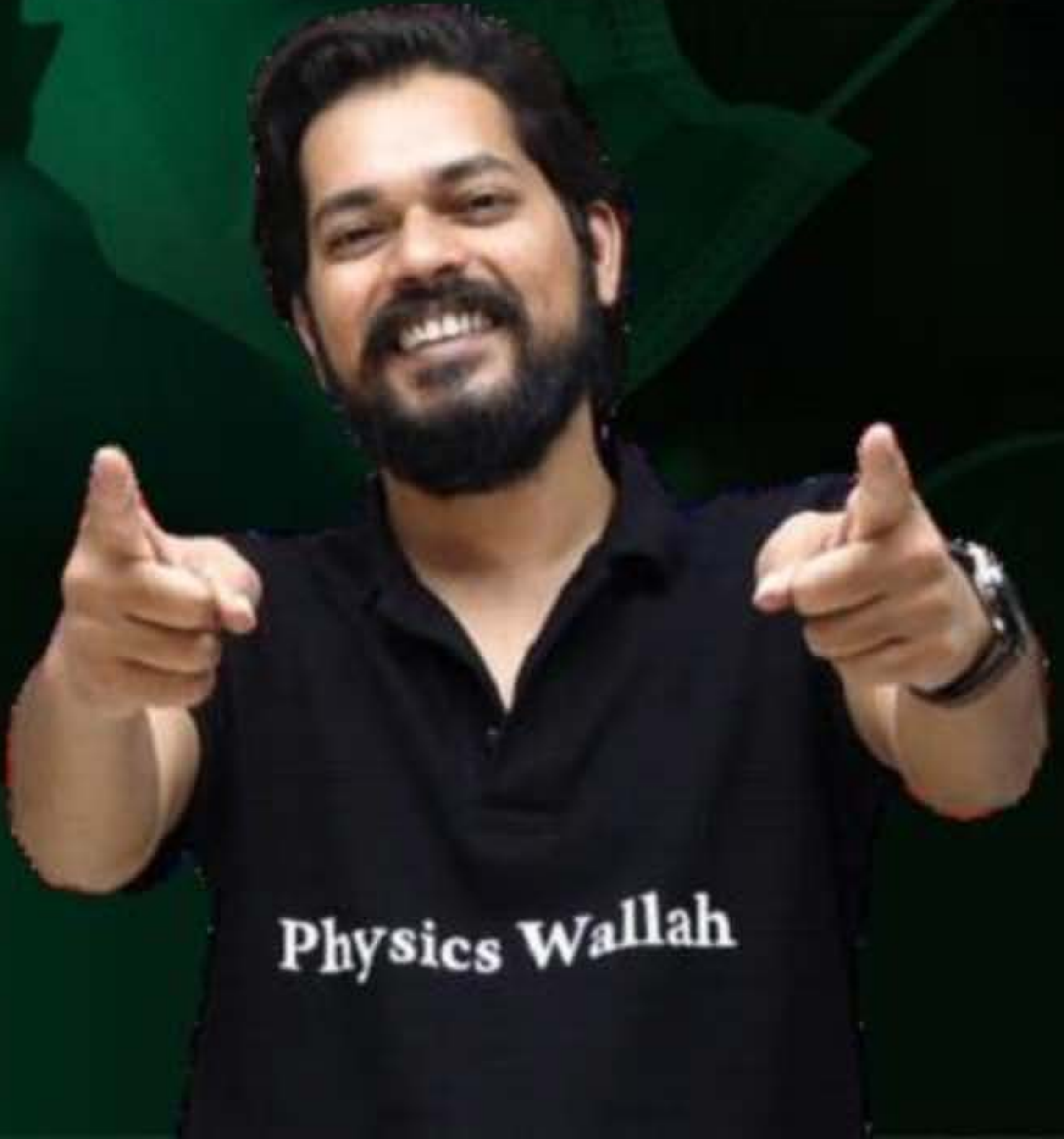
YAKEEN 2.0

FOR NEET 2025

Lecture- 08 | **Organic Chemistry**

Some Basic Principles and Techniques (GOC)

By- Pankaj Sir(POPU MAMA)

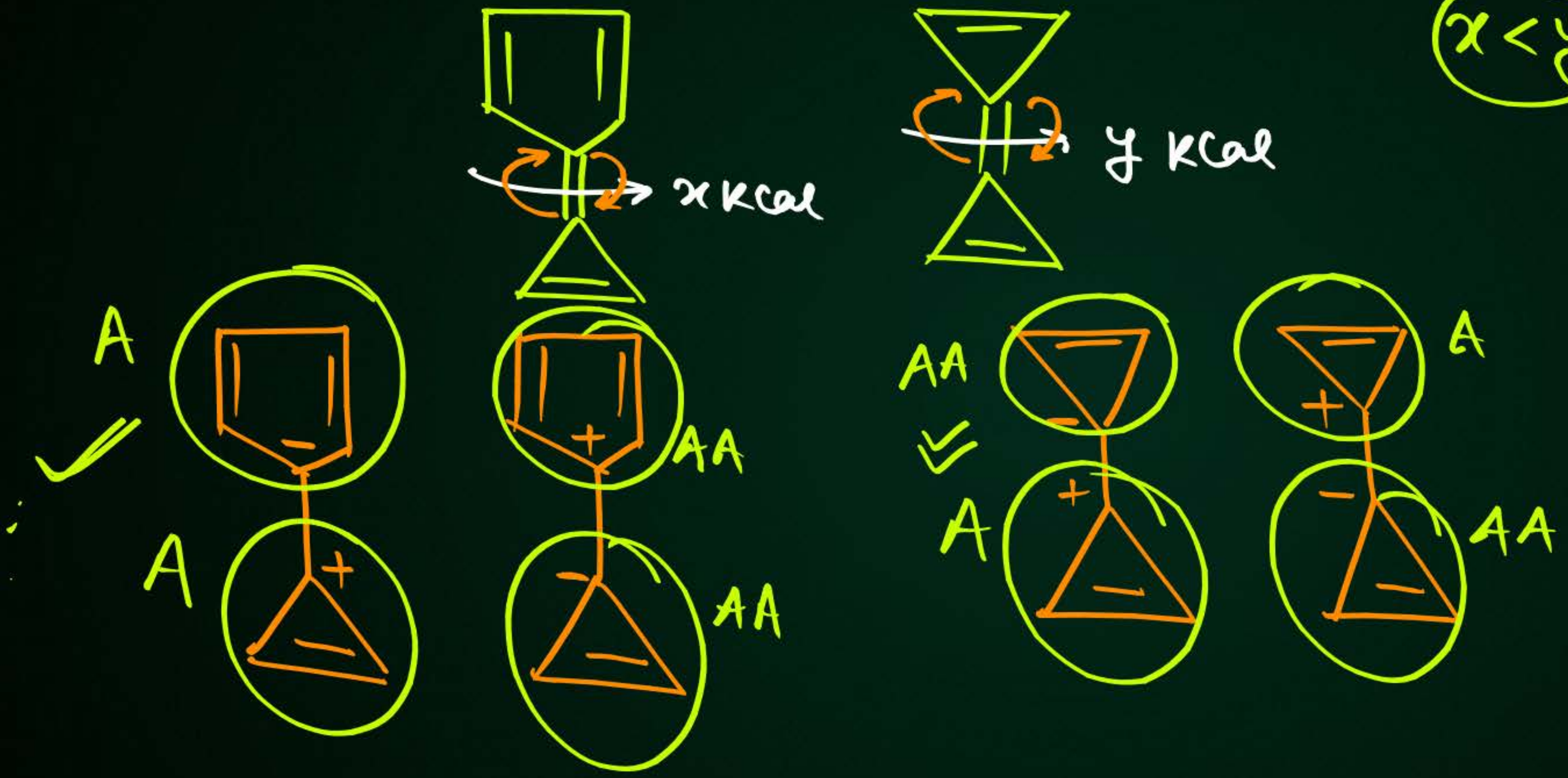

Physics Wallah

Topics *to be covered*

1. Stability of Intermediates ✓
2. Practice ✓

③ Rotational energy barrier :-

Stability ↑ BE ↓

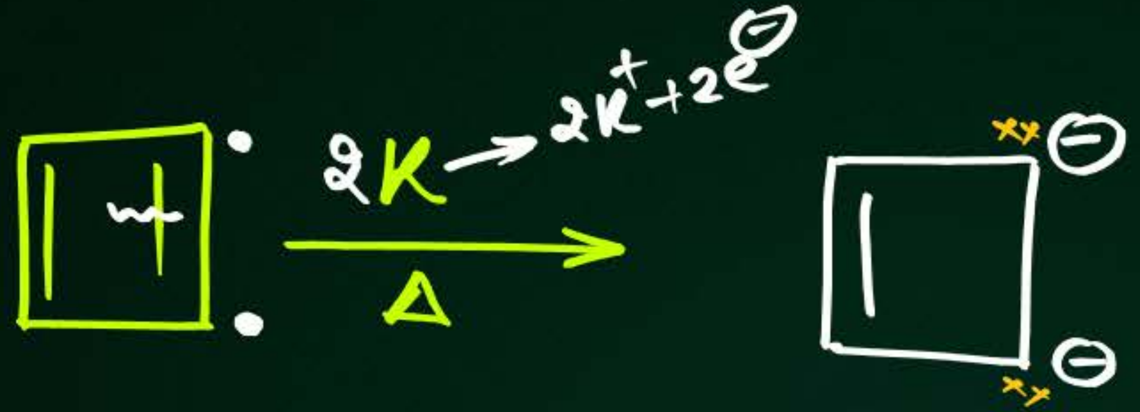


x kcal
y kcal
A
A
✓
AA
AA
AA
✓
A
A
AA

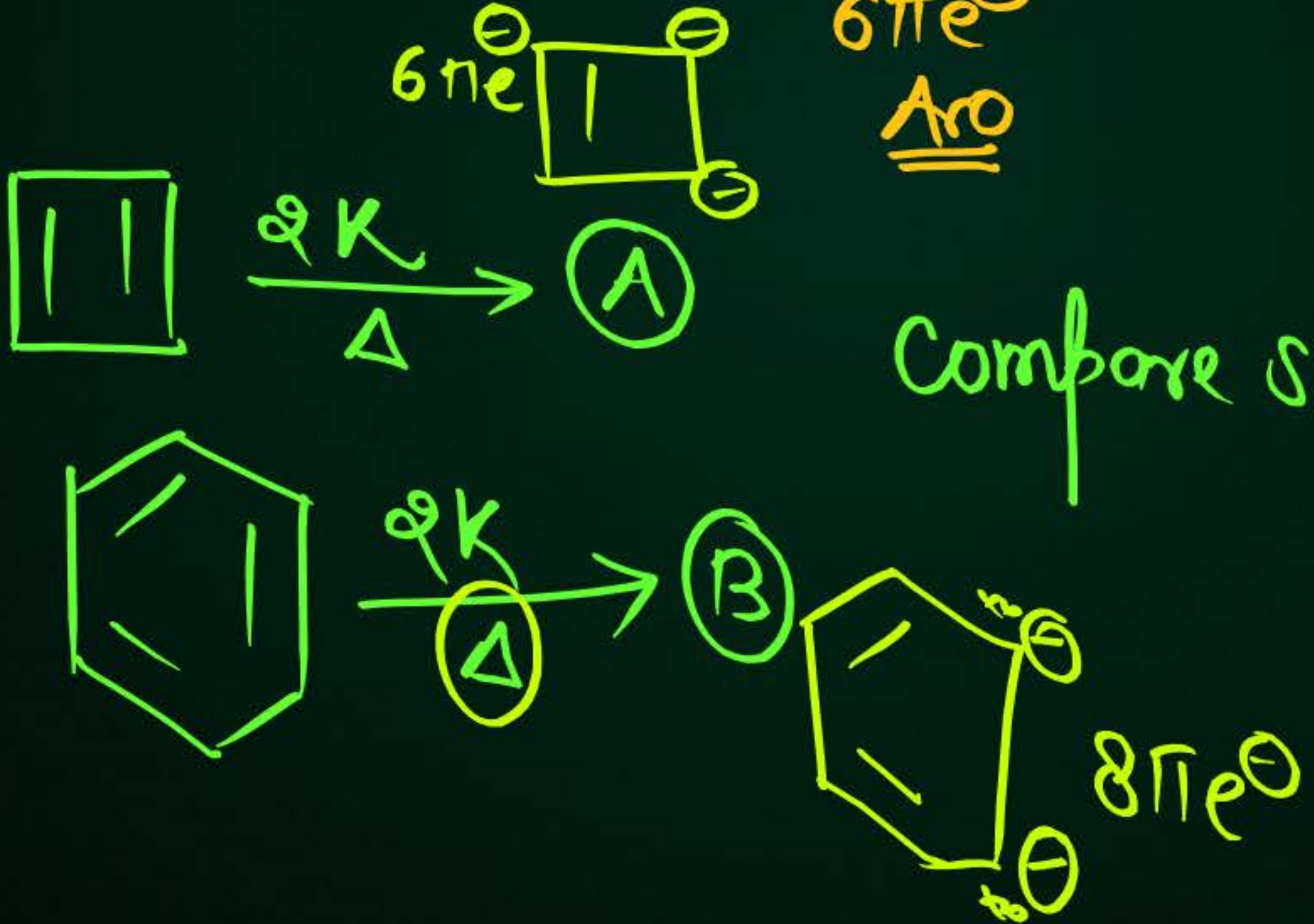
$x < y$

④ Rxn with metals K, Na, Al etc

$$2K \longrightarrow 2K^{+} + 2e^{\ominus}$$


2K → 2K⁺+2e⊖
Δ
6πe⊖
Aro

Q

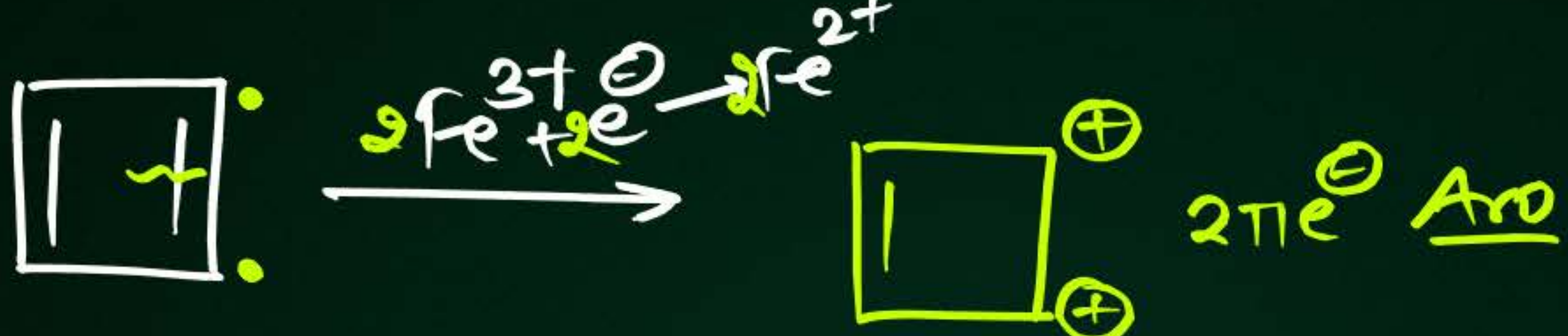

6πe
2K
Δ
Ⓐ
2K
Δ
Ⓑ
8πe⊖

Compare stability of Ⓐ & Ⓑ ?

Ⓐ > Ⓑ

⑤ Rxn with Fe^{3+}

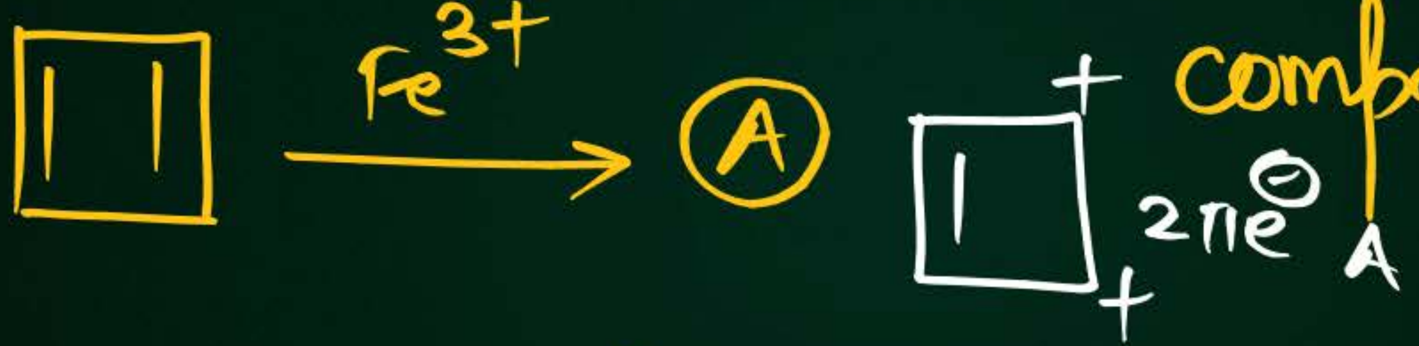
$2Fe^{3+} + 2e^{\ominus} \longrightarrow 2Fe^{2+}$



$\xrightarrow{2Fe^{3+} + 2e^{\ominus} \longrightarrow 2Fe^{2+}}$

$2\pi e^{\ominus}$ Aro

Q

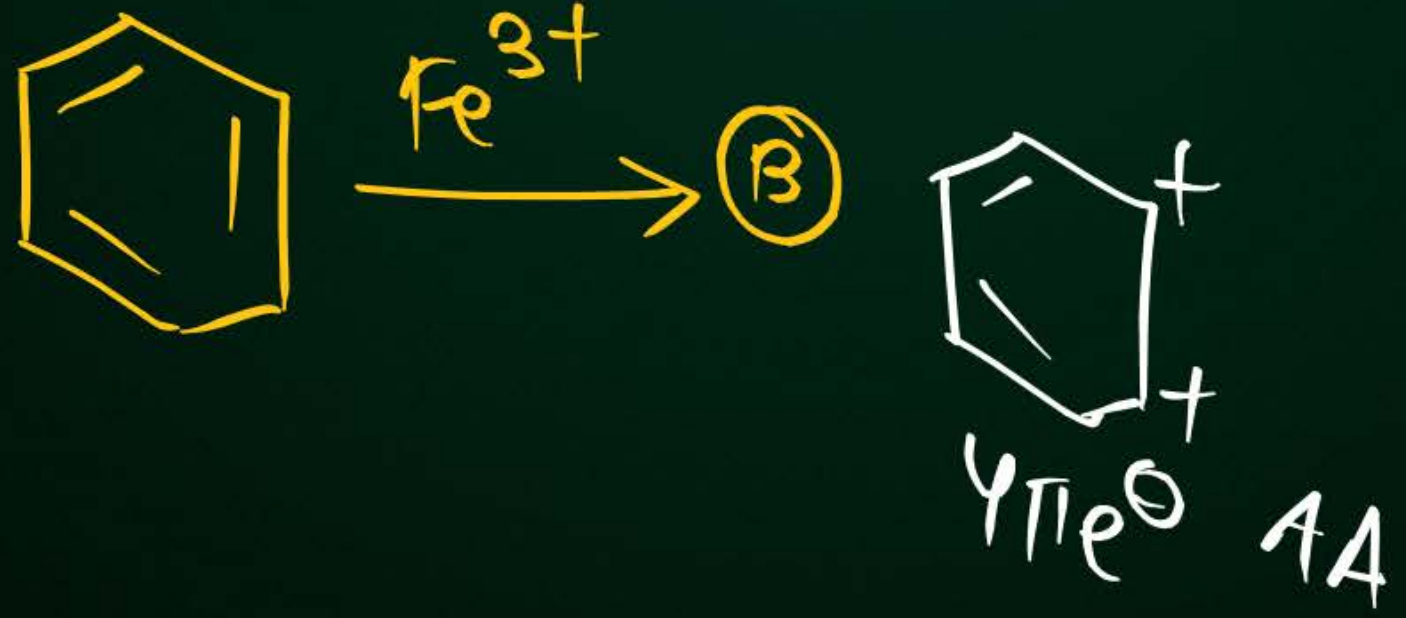


$\xrightarrow{Fe^{3+}}$ Ⓐ

$2\pi e^{\ominus}$ A

compare stability of Ⓐ & Ⓑ

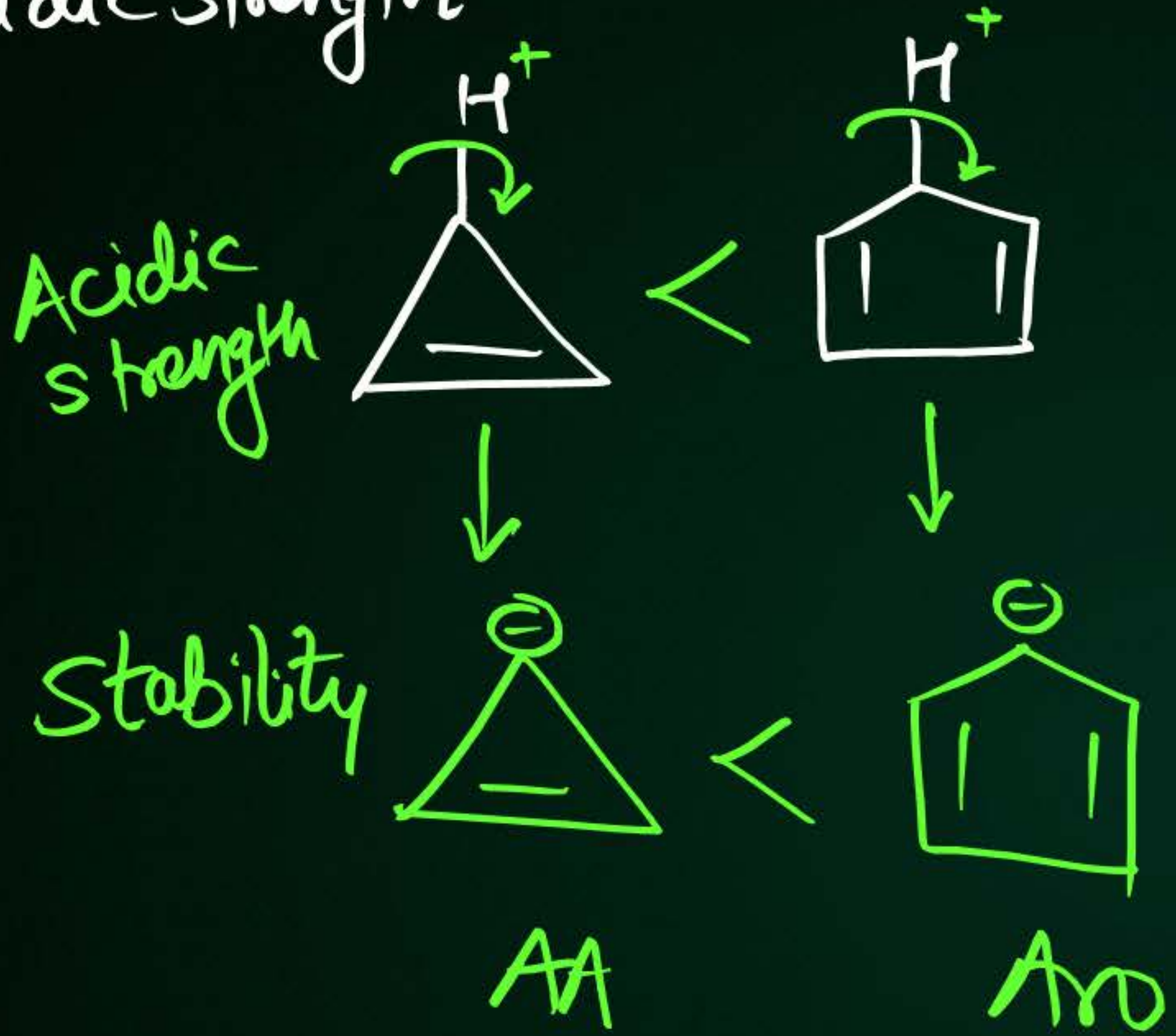
Ⓐ > Ⓑ



$\xrightarrow{Fe^{3+}}$ Ⓑ

$4\pi e^{\ominus}$ AA

⑤ Acidic strength


H⁺
H⁺
Acidic strength
<
Stability
<
AA
Aro

Stability of Intermediates

$\boxed{\text{NEET-2025}}$

C^+

$\underline{BB} > \underline{Aro} > \underline{M} > \underline{H} > \underline{I}$

1) BB → $\overset{+}{C}-\overset{\cdot\cdot}{A} \leftrightarrow C=\overset{+}{A}$

Stab ∝ BB ∝ extent of overlap (Size diff↓)

2) $\underline{\underline{Aro}}$ A>NA>AA

3) stability ∝ +M, +H, +I

$$\propto \frac{1}{-M, -H, -I}$$

4) Hybri

$CH\equiv\overset{+}{C} < CH_2=\overset{+}{C}H < CH_3-\overset{+}{C}H_2$

% S↑ E.N↑

$C^{\bullet}$

Same as $C^{\oplus}$

$\boxed{M > H > I}$

$CH\equiv\dot{C} < CH_2=\dot{C}H < CH_3-\dot{C}H_2$

C^-

d-orbital reso

↑

BB > Aro > M > H > I

1) BB → $\overset{\ominus}{C}-\overset{\square}{A}$ vacant 'd'

Stab ∝ BB ∝ extent of overlap (size diff↓)

2) Aro : A>NA>AA

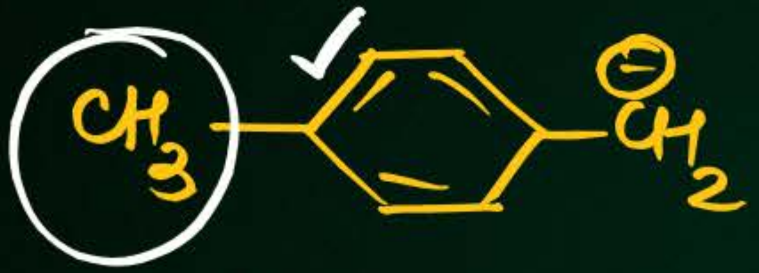
3) stability ∝ −M, −H, −I

$$\propto \frac{1}{+M, +H, +I}$$

4) $CH\equiv\overset{\ominus}{C} > CH_2=\overset{\ominus}{C}H > CH_3-\bar{C}H_2$

% S↑ EN↑

$CH_3-\overset{\ominus}{C}H_2$ Hyper ×


✓
CH_3
$\overset{\ominus}{C}H_2$

Hyper ✓

3αH

+H

QUESTION (NCERT Exemplar)

(BB) (A) (M) H

What is the correct order of decreasing stability of the following cations?

$CH_3-\overset{\oplus}{C}H-CH_3$

I. 6αH

$CH_3-\overset{\oplus}{C}H-\ddot{O}CH_3$

II.

$CH_3-\overset{\oplus}{C}H-CH_2-OCH_3$

III. 5αH

[✓ A] II > I > III

B II > III > I

C III > I > II

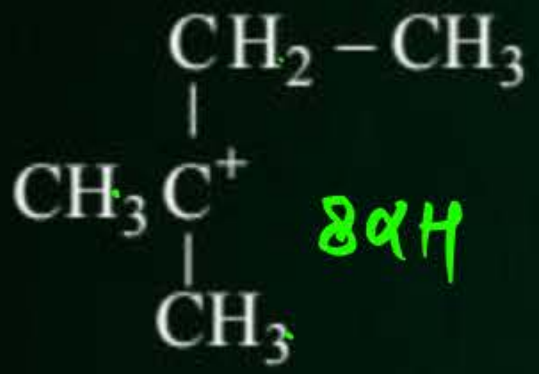
D I > II > III

II > I > III

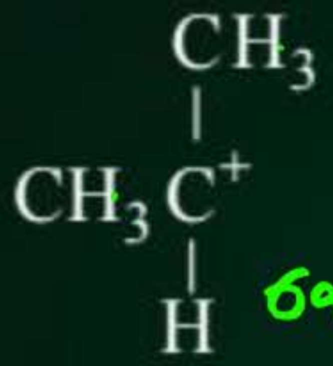
QUESTION (AIIMS 2019)

BB ✗ A ✗ M H

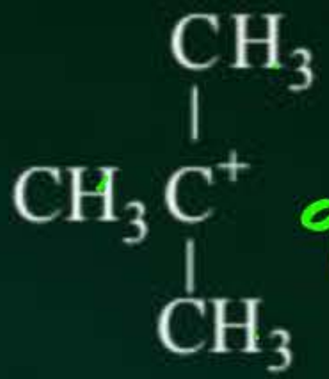
Stability order of following carbocation is:

(i)

$CH_3-\overset{\overset{\displaystyle CH_2-CH_3}{|}}{\underset{\underset{\displaystyle CH_3}{|}}{C^+}}$

8αH

(ii)

$CH_3-\overset{\overset{\displaystyle CH_3}{|}}{\underset{\underset{\displaystyle H}{|}}{C^+}}$

6αH

(iii)

$CH_3-\overset{\overset{\displaystyle CH_3}{|}}{\underset{\underset{\displaystyle CH_3}{|}}{C^+}}$

9αH

(iv) $Ph-CH^+-CH_3$

Reso

A i > ii > iii > iv ✗

B ✓ iv > iii > i > ii

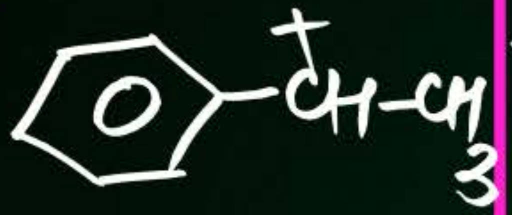
C iv > iii > ii > i

D iii > iv > ii > i ✗

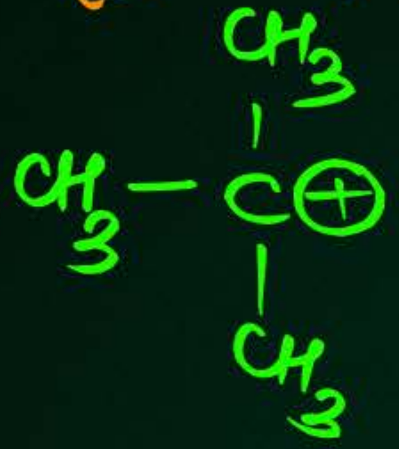
Maha imp

tert butyl $C^{\oplus}$

Benzyl C^{+}

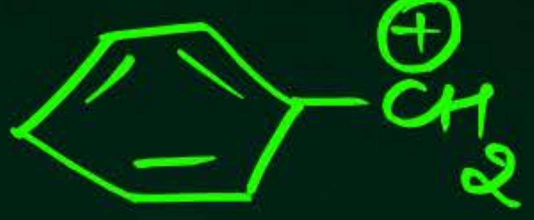


>


CH3
CH3–C⊕
CH3

$$(CH_3)_3C^{\oplus}$$

>

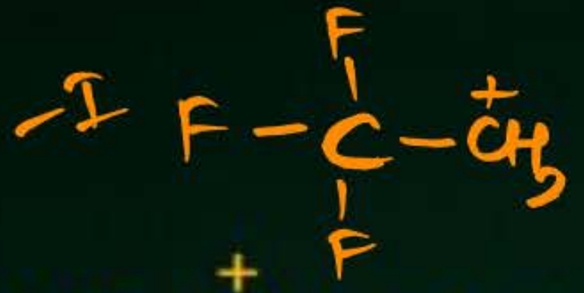


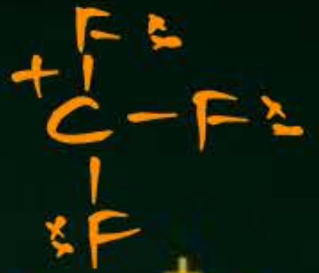
1 Ring
+ 3αH

9 αH
3 CH_3 (+I)

1 Ring reso

QUESTION (AIIMS 2018)





Assertion: The carbocation $\underset{\text{NO BB}}{CF_3-\overset{+}{C}H_2}$ is less stable than $\underset{\text{BB}}{\overset{+}{C}F_3}$.

Reason: In case of $CF_3-\overset{+}{C}H_2$, the strongly electron-withdrawing $-CF_3$ group intensifies the +ve charge but in case of $\overset{+}{C}F_3$, the lone pairs $\underset{\boxed{\text{BB}}}{\text{of electrons}}$ on each of the three F-atoms overlap with the empty *p*-orbital of the carbocation carbon thereby dispersing the +ve charge.

[✓ A] If both Assertion and Reason are correct and the Reason is a correct explanation of the Assertion.

B If both Assertion and Reason are correct but Reason is not a correct explanation of the Assertion.

C If the Assertion is correct but Reason is incorrect.

D If the Assertion is incorrect but Reason is correct.

QUESTION (AIIMS 2017)

The increasing order of stability of the following free radicals is:

III > II > I

A $(C_6H_5)_2\dot{C}H < (C_6H_5)_3\dot{C} < (CH_3)_3\dot{C} < (CH_3)_2\dot{C}H$

B ✓ $(CH_3)_2\dot{C}H < (CH_3)_3\dot{C} < (C_6H_5)_2\dot{C}H < (C_6H_5)_3\dot{C}$

6αH 9αH 2 Ring 3 Ring

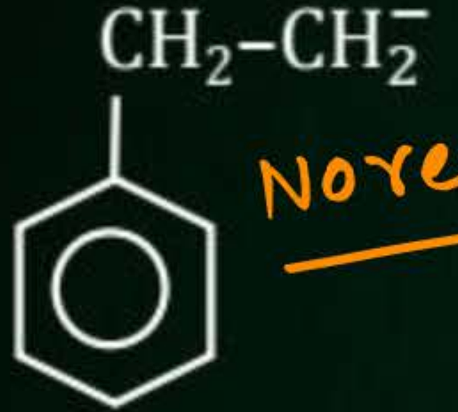
C ✓ $(CH_3)_2\dot{C}H < (CH_3)_3\dot{C} < (C_6H_5)_2\dot{C}H < (C_6H_5)_3\dot{C}$

D $(C_6H_5)_3\dot{C} < (C_6H_5)_2\dot{C}H < (CH_3)_3\dot{C} < (CH_3)_2\dot{C}H$

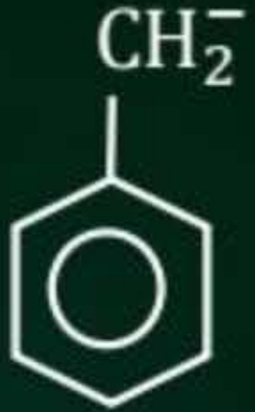
QUESTION (AIIMS 2013)

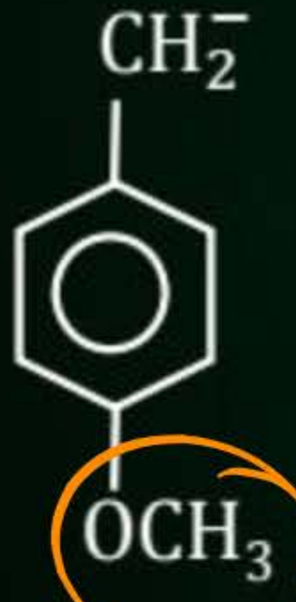
$(D > B > C > A)$

The most stable carbanion among the following is:

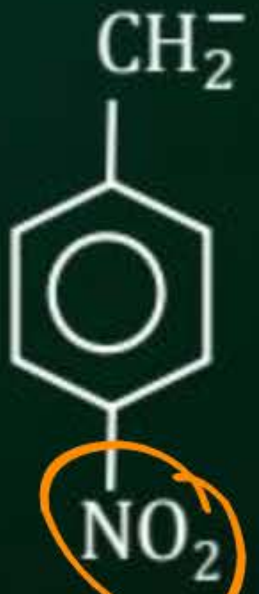
A


No reso

B


C


$+M > -I$

D


$-M > -I$

QUESTION

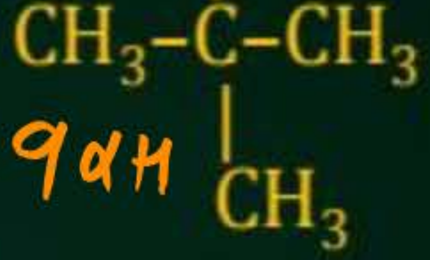
The stability of given free radicals in decreasing order is:

(i) $CH_3-\dot{C}H_2$

3αH

(ii) $CH_3-\dot{C}H-CH_3$

6αH

(iii)

$CH_3-\dot{C}(CH_3)-CH_3$

9αH

(iv) $\dot{C}H_3$

0αH

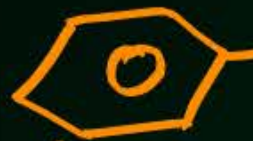
(A) iii > iv > i > ii

(B) i > ii > iii > iv

(C) iii > ii > iv > i

[✓ (D)] iii > ii > i > iv

QUESTION



$-\dot{C}H_2 > CH_2=CH-\dot{C}H_2 > R_2\dot{C}H > R-\dot{C}H_2$

Jhamajham Reso

Less Reso

Which of the following is the correct order of stability of free radicals?

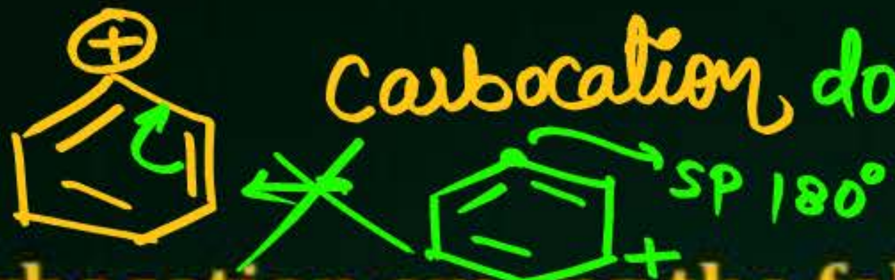
[✓ A] benzyl > allyl > 2° > 1°

(B) ally > benzyl > 2° > 1°

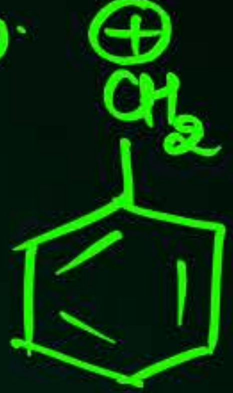
(C) allyl > 2° > 1° > benzyl

(D) benzyl > 2° > 1° > allyl

QUESTION

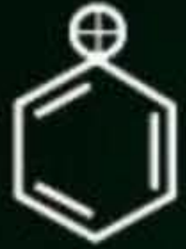


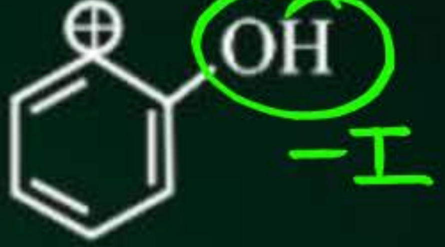
Carbocation does not parti in reso.

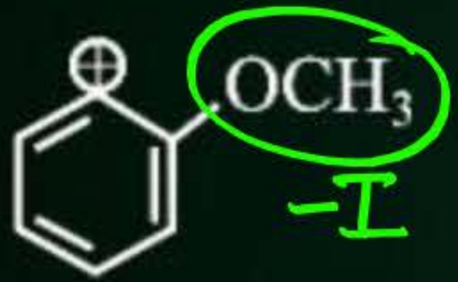


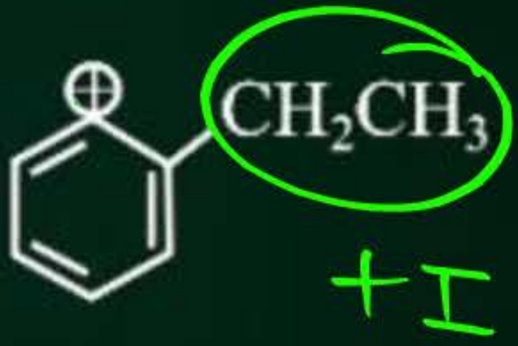
Carbo parti in reso

Th most stable carbocation among the following is:

(A)


(B)


(C)


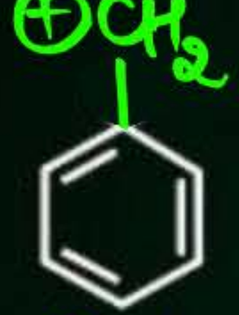
✓ (D)


$$\boxed{D > A > B > C}$$

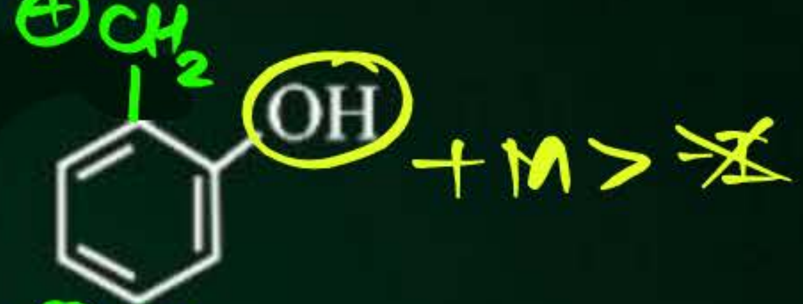
QUESTION

Th most stable carbocation among the following is:

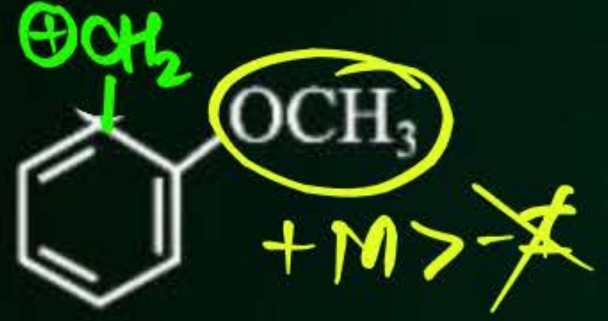
A



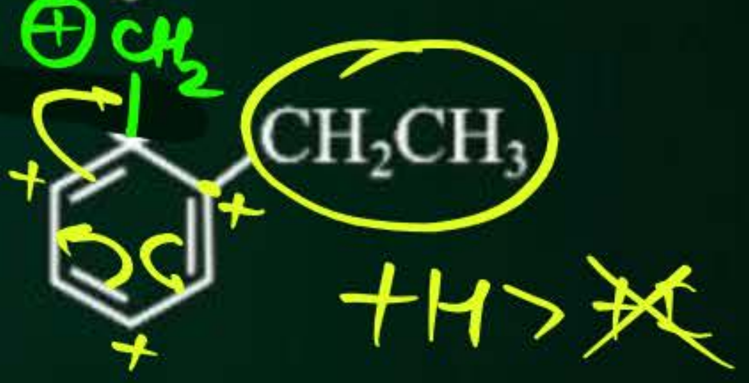
[✓ B]



C



D



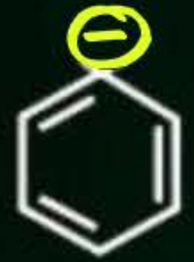
⊕CH2
CH2CH3
+H > I

$\boxed{B > C > D > A}$

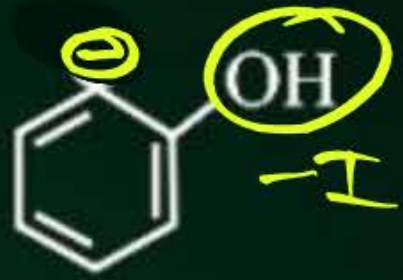
QUESTION

Th most stable carboanion among the following is:

A

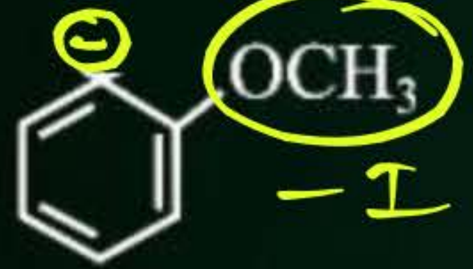


B



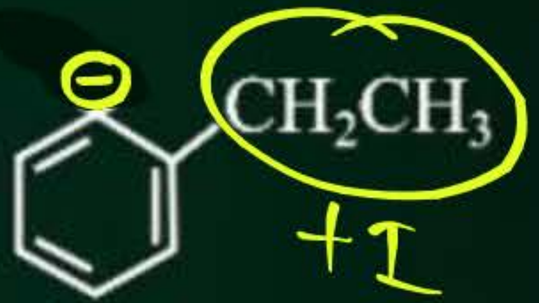
−I

C ✓



−I

D



+I

$\boxed{C > B > A > D}$

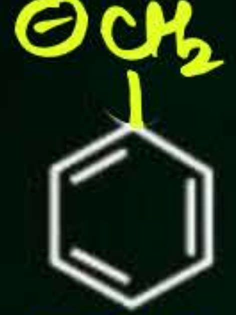
QUESTION

Th most stable carboanion among the following is:

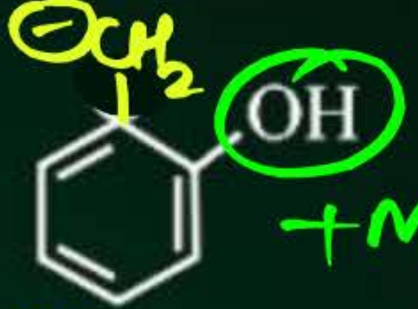
+M power

$-OH > -OR$

(A) ✓

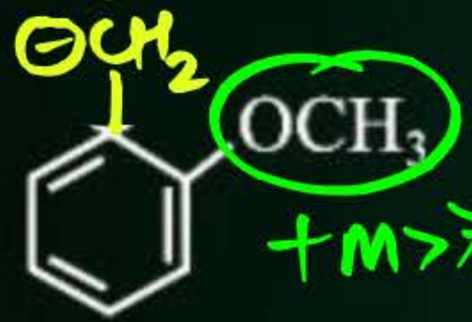


(B)



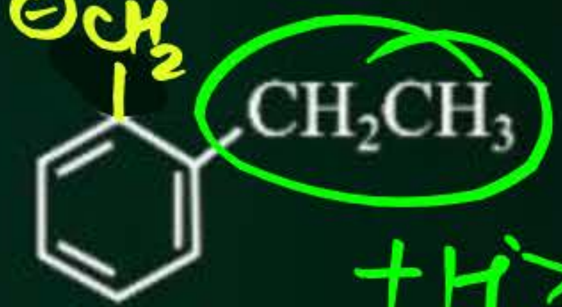
+M > -I

(C)



+M > -I

(D)

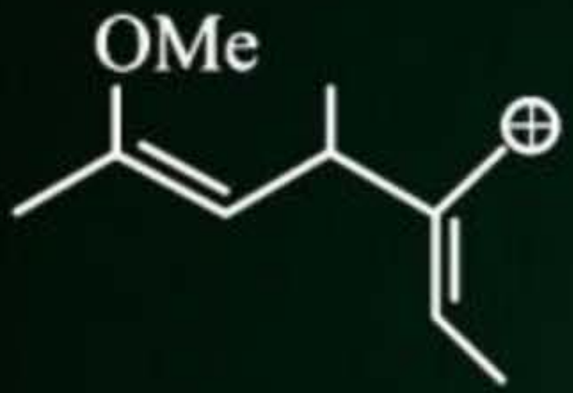


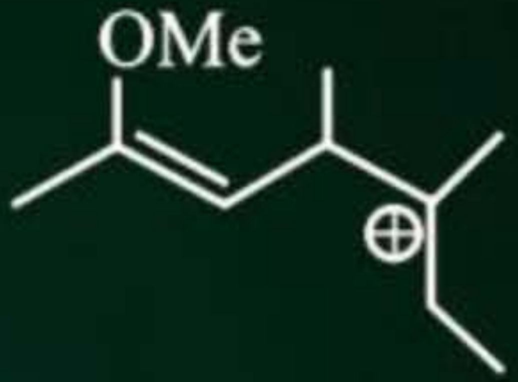
+H > +I

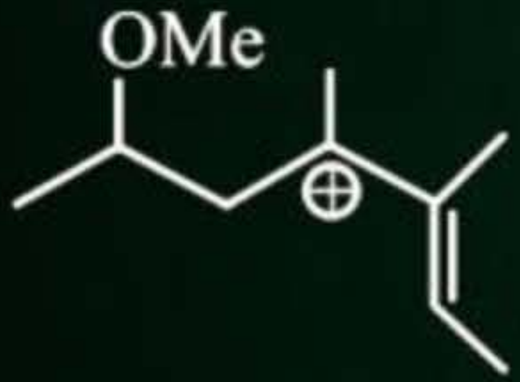
$$\boxed{A > D > C > B}$$

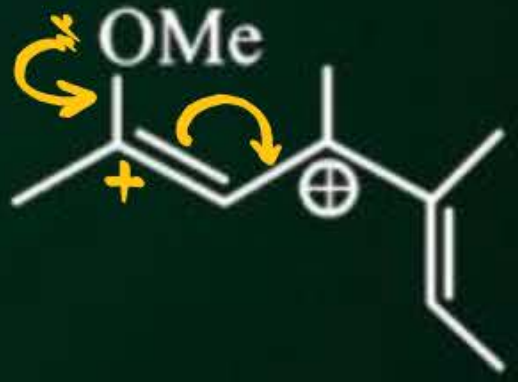
QUESTION

Which of the following is the most stabilized carbocation?

A


B


C


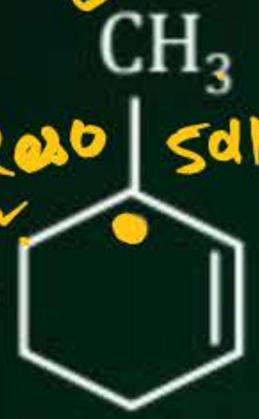
✓ D


QUESTION

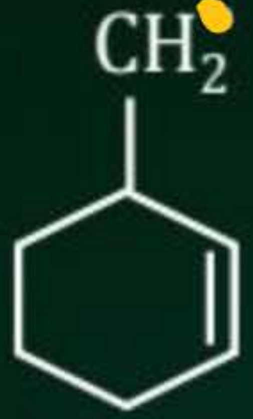
Decreasing order of stability for the following radicals is:

$\underbrace{CH_2 = \dot{C}H}$, $\dot{C}H_2CH = CH_2$, Reso

(I) (II)


Reso
saH

(III)


No conju

(IV)

$\underline{III} > II > \underline{IV} > I$

A II > III > I > IV

B III > II > I > IV

C III < II < I < IV

D ✓ I < IV < II < III

QUESTION

The order of decreasing stability of the following cations is:

$CH_3\overset{+}{C}HCH_3$, $CH_3\overset{+}{C}H\overset{\circledcirc}{O}CH_3$, $\underbrace{CH_3\overset{+}{C}HCOCH_3}$

(I) 6αH

(II) BB

(III) 3αH

A III > II > I

B I > II > III

[✓ **C**] II > I > III

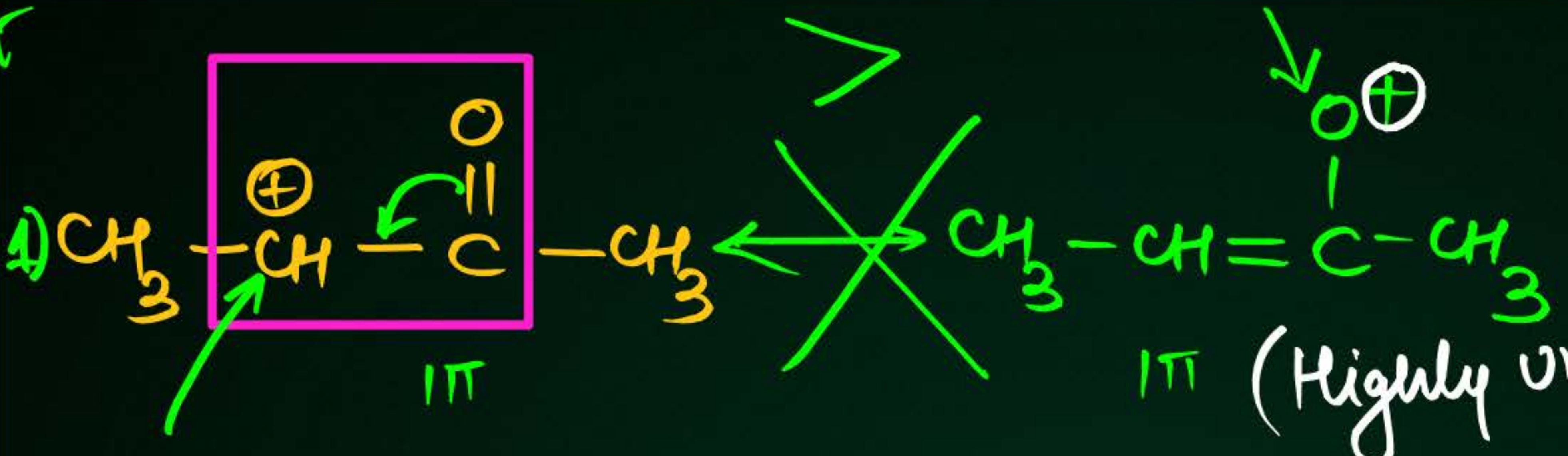
D I > III > II

II > I > III

(C)

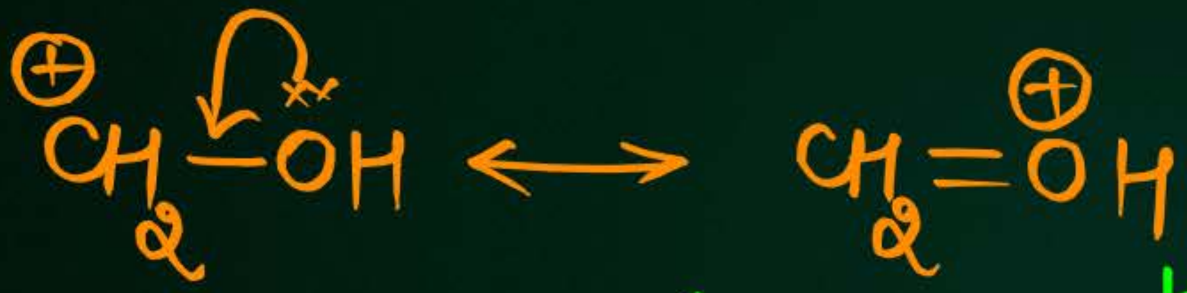
Op point

Stable $C^+ > O^+$



1) $CH_3-\overset{\oplus}{C}H-\overset{O}{\overset{\|}{C}}-CH_3 \longleftrightarrow CH_3-CH=\overset{O^{\oplus}}{\overset{|}{C}}-CH_3$

1π > 1π (Highly unstable)



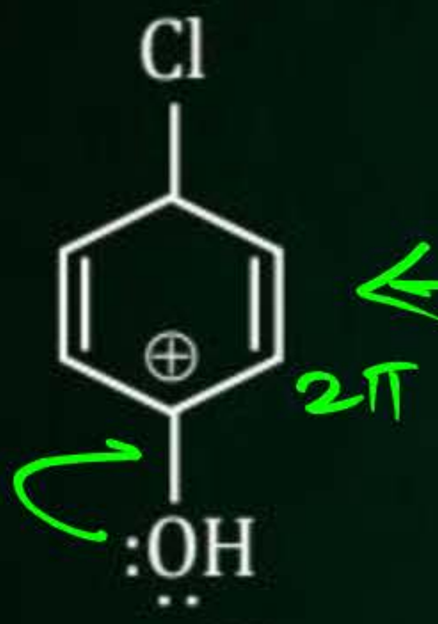
2) $\overset{\oplus}{C}H_2-\ddot{O}H \longleftrightarrow CH_2=\overset{\oplus}{O}H$

0π < 1π highly stable

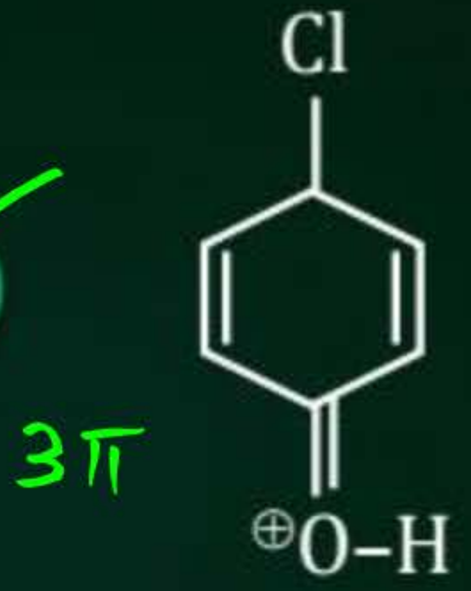
QUESTION

Which one of the following is most stable?

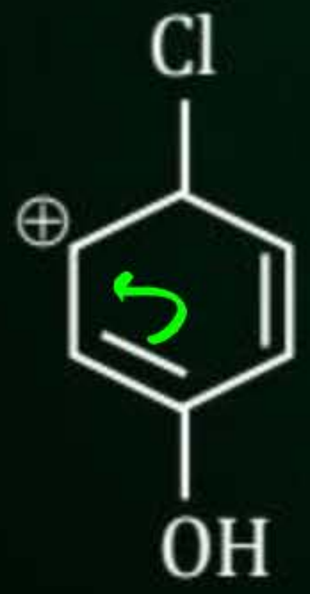
A



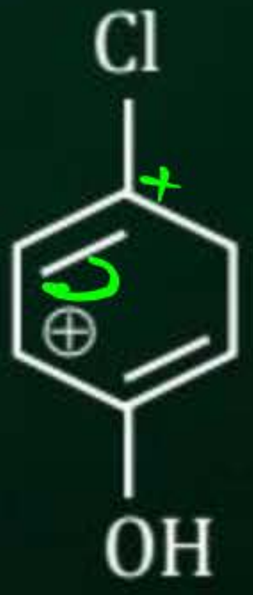
B



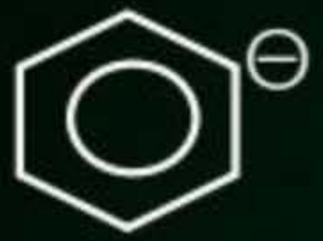
C

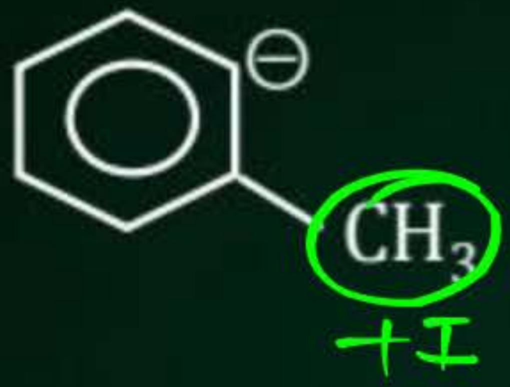


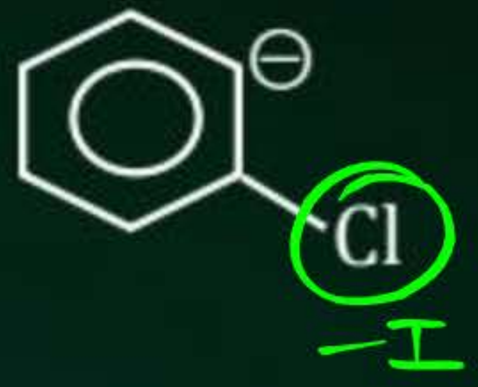
D



QUESTION

(I)


(II)


(III)


Which of the following orders is correct for the stability of these carbanions?

A I > II > IIII

[✓ C] III > I > II

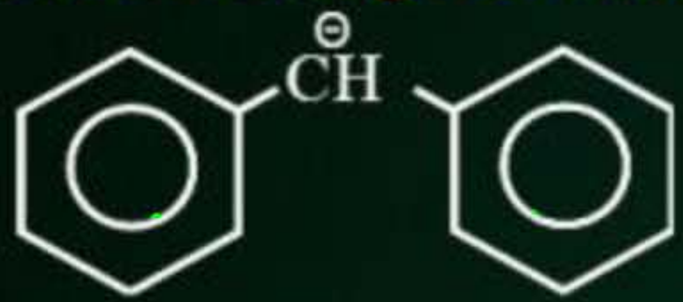
B III > II > I

D II > III > I

QUESTION

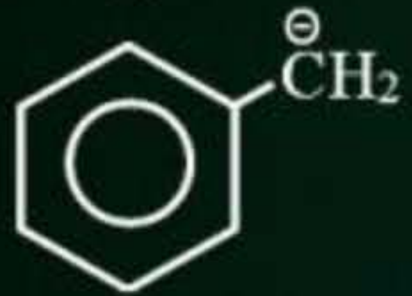
Arrange following carbanions in the stability order:

(a)


$\overset{\ominus}{C}H$

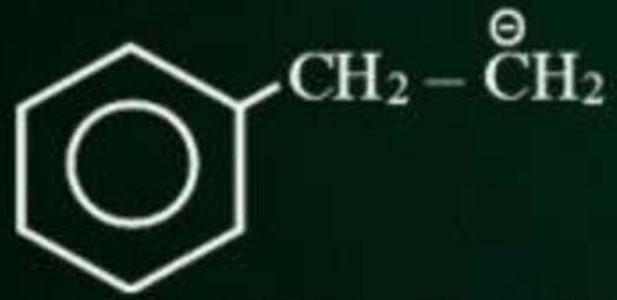
2 Ring

(b)


$\overset{\ominus}{C}H_2$

1 Ring

(c)


$CH_2-\overset{\ominus}{C}H_2$

No reso

(d) $CH_2=CH-CH_2^{\ominus}$

Less Reso

A d > c > a > b

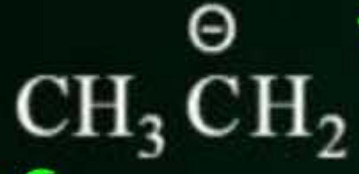
B b > a > c > d

[✓ **C** a > b > d > c]

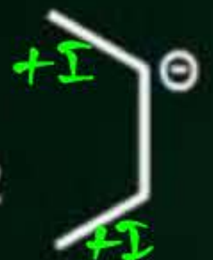
D c > a > b > d

QUESTION

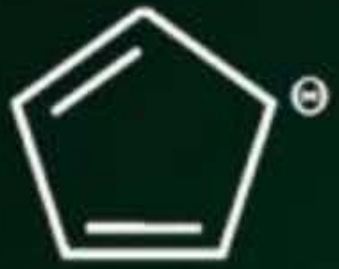
The order of stability of the following carbanion is:


$CH_3\overset{\ominus}{C}H_2$

+I (I)

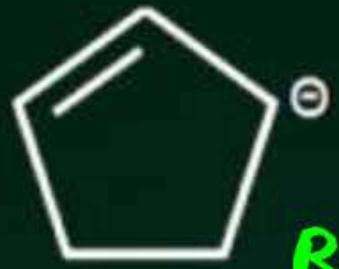


(II)



(III)

Aro



(IV)

Reso

A) I > II > III > IV

B) I > III > II > IV

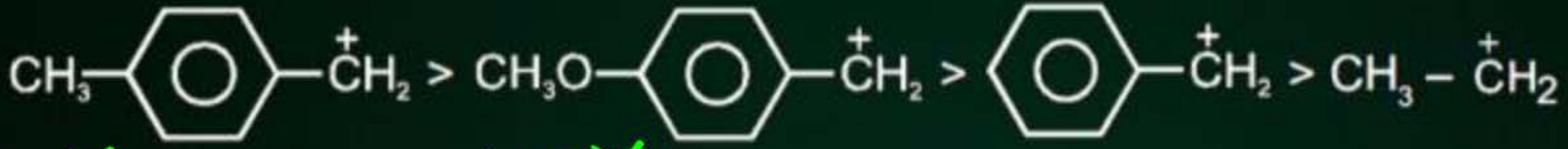
C) IV > III > II > I

D) III > IV > I > II

QUESTION

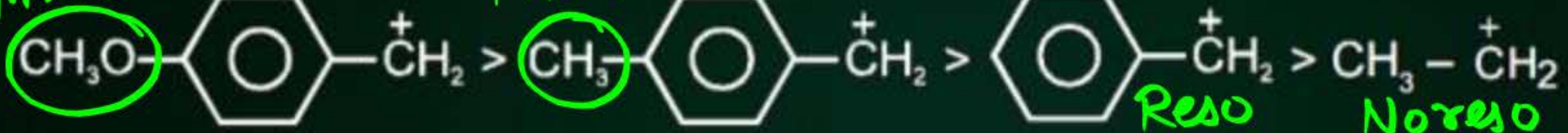
Which of the following shows the correct order of decreasing stability?

A


CH$_3$–C$_6$H$_4$–$\overset{+}{C}$H$_2$ > CH$_3$O–C$_6$H$_4$–$\overset{+}{C}$H$_2$ > C$_6$H$_5$–$\overset{+}{C}$H$_2$ > CH$_3$–$\overset{+}{C}$H$_2$

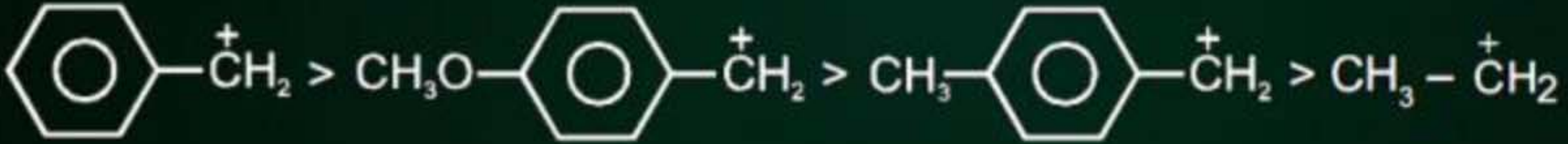
✓ **B**

+M > +I +H > +I

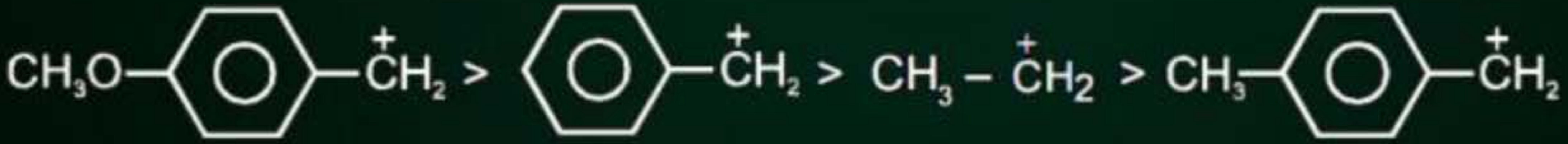

CH$_3$O–C$_6$H$_4$–$\overset{+}{C}$H$_2$ > CH$_3$–C$_6$H$_4$–$\overset{+}{C}$H$_2$ > C$_6$H$_5$–$\overset{+}{C}$H$_2$ > CH$_3$–$\overset{+}{C}$H$_2$

Reso No reso

C

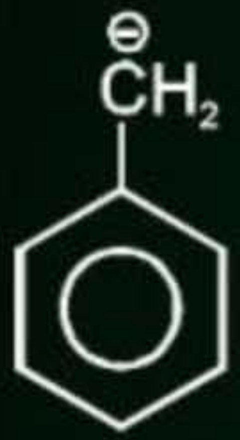

C$_6$H$_5$–$\overset{+}{C}$H$_2$ > CH$_3$O–C$_6$H$_4$–$\overset{+}{C}$H$_2$ > CH$_3$–C$_6$H$_4$–$\overset{+}{C}$H$_2$ > CH$_3$–$\overset{+}{C}$H$_2$

D

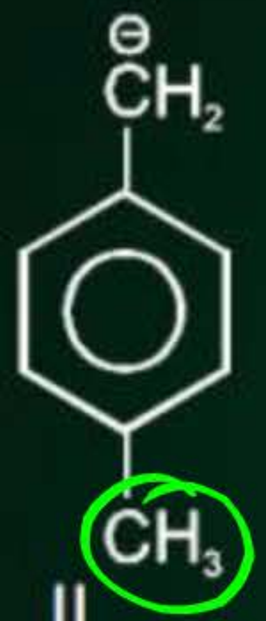

CH$_3$O–C$_6$H$_4$–$\overset{+}{C}$H$_2$ > C$_6$H$_5$–$\overset{+}{C}$H$_2$ > CH$_3$–$\overset{+}{C}$H$_2$ > CH$_3$–C$_6$H$_4$–$\overset{+}{C}$H$_2$

QUESTION

Arrange the following carbanions in decreasing order of stability:

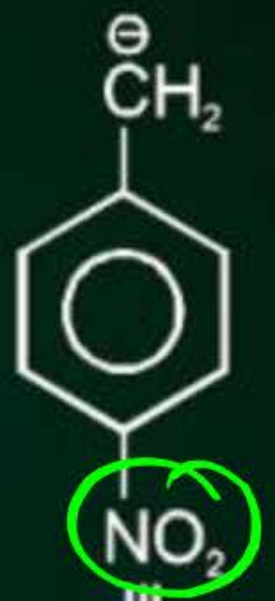

$\overset{\ominus}{C}H_2$

I


$\overset{\ominus}{C}H_2$
CH_3

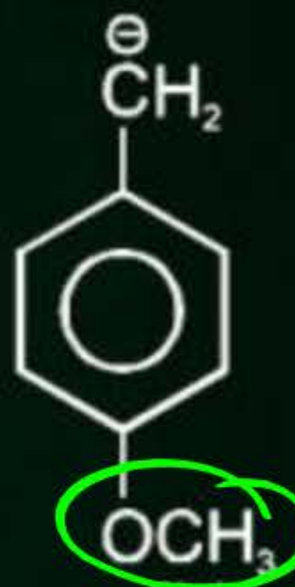
II

+H > ~~+I~~


$\overset{\ominus}{C}H_2$
NO_2

III

-M > ~~I~~


$\overset{\ominus}{C}H_2$
OCH_3

IV

+M > ~~I~~

A III > I > IV > I

B ~~III~~ > II > I > IV

C ~~I > III > II > IV~~

D ✓ III > I > II > IV

QUESTION

Which of the following is the least stable carbanion?

A $HC\equiv\bar{C}$

%s

B $(C_6H_5)_3\bar{C}$

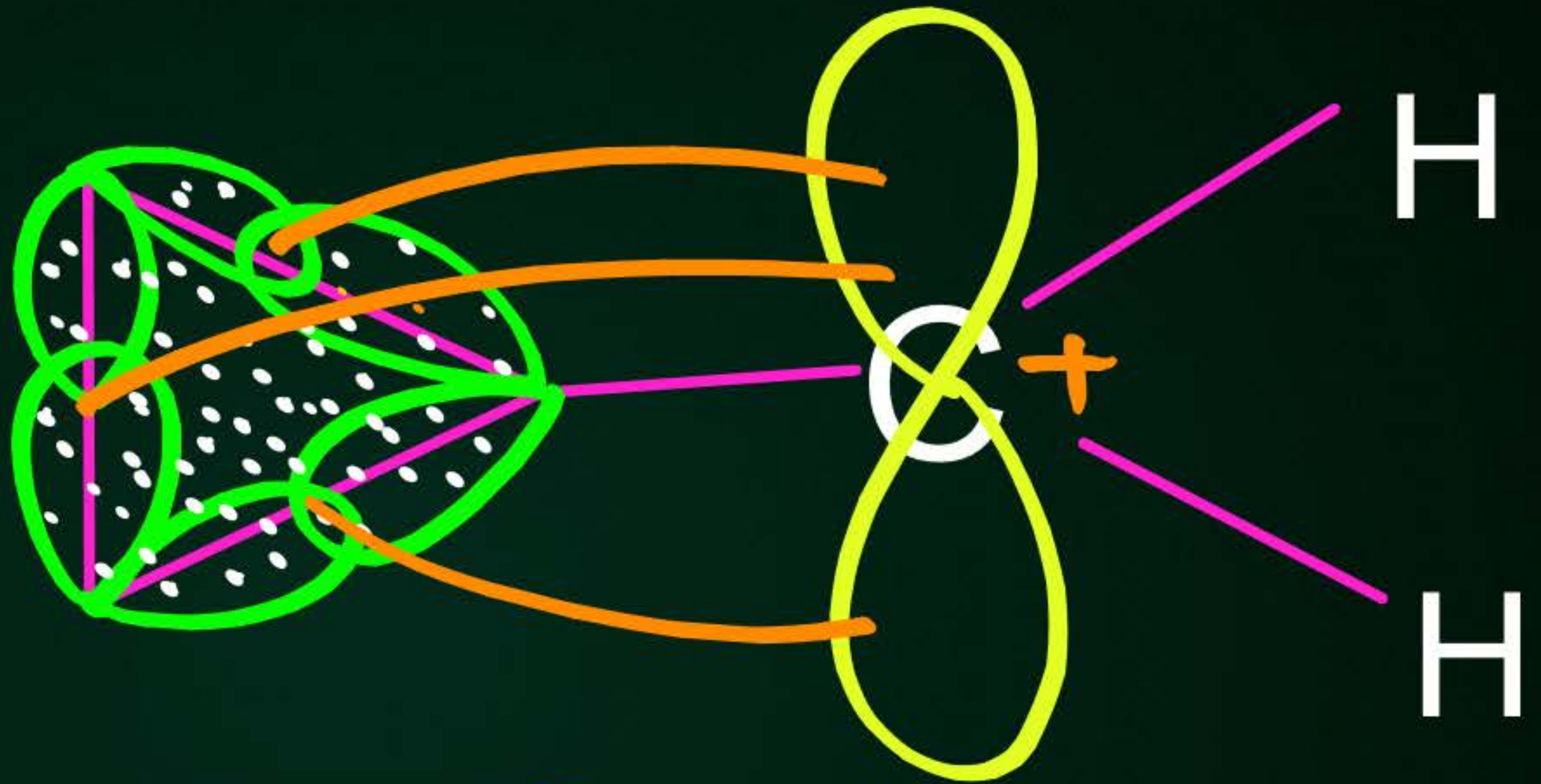
3 Ring

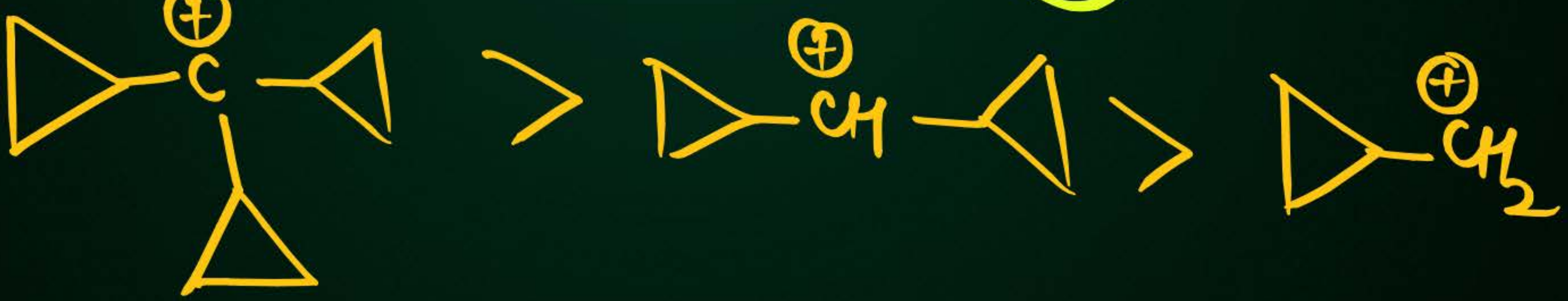
[✓ **C**] $(CH_3)_3\bar{C}$

3(+I)

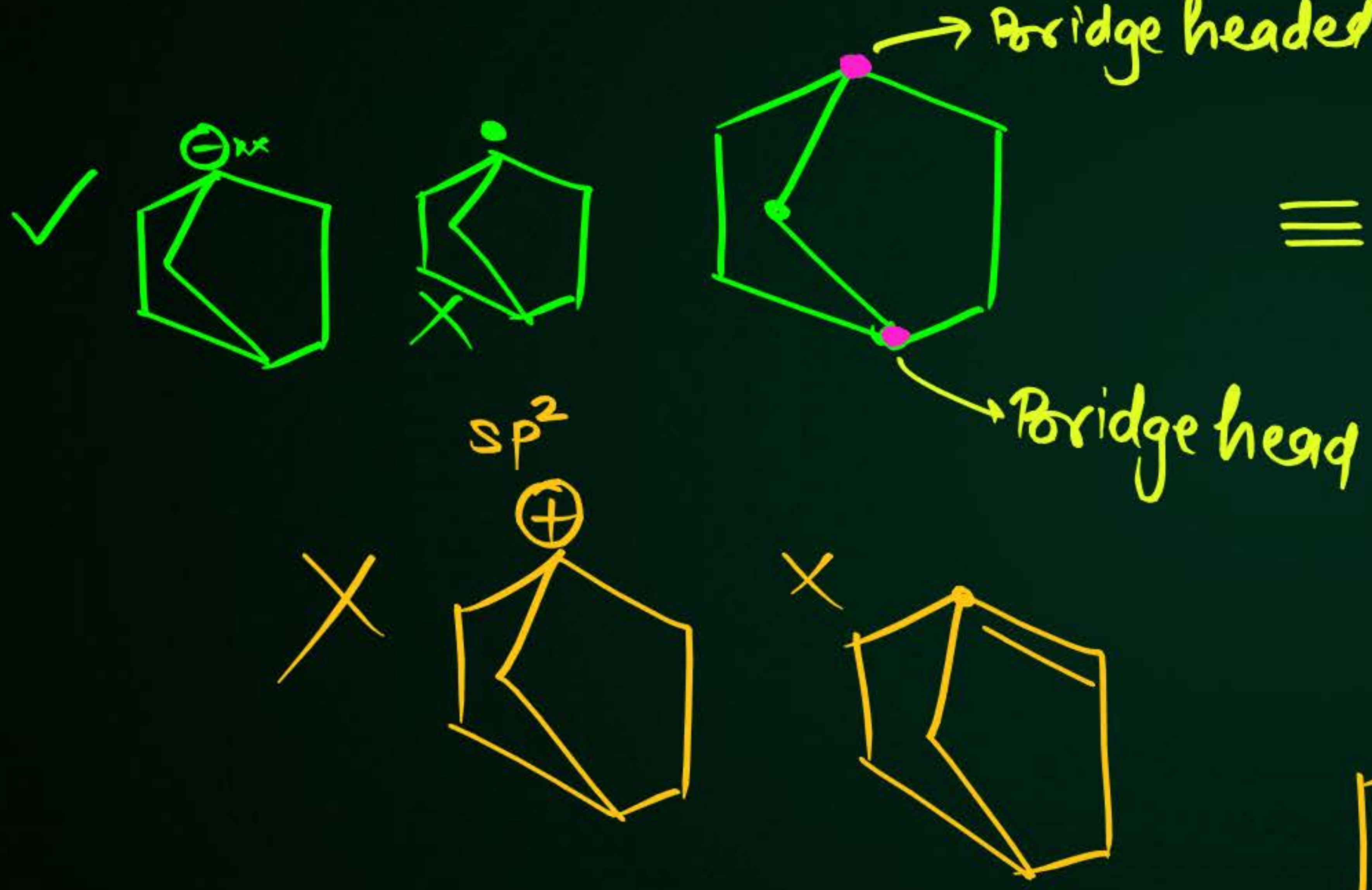
D $\bar{C}H_3$

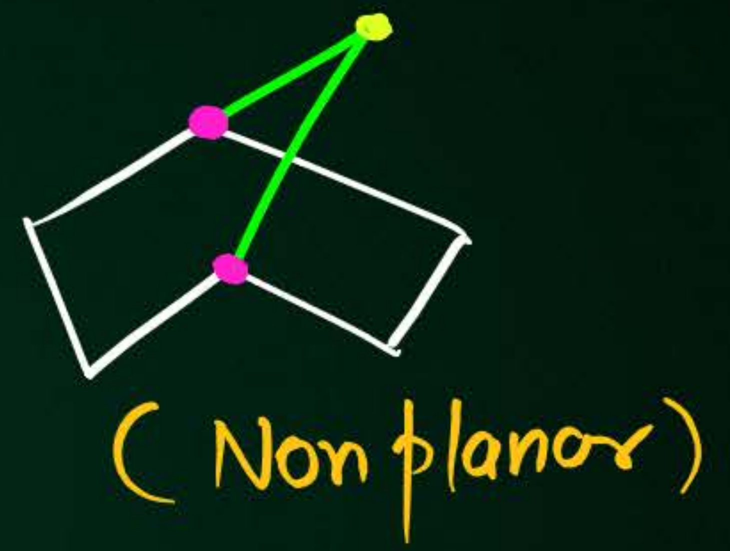
Dancing Reso
or
Bent 'p'
overlap



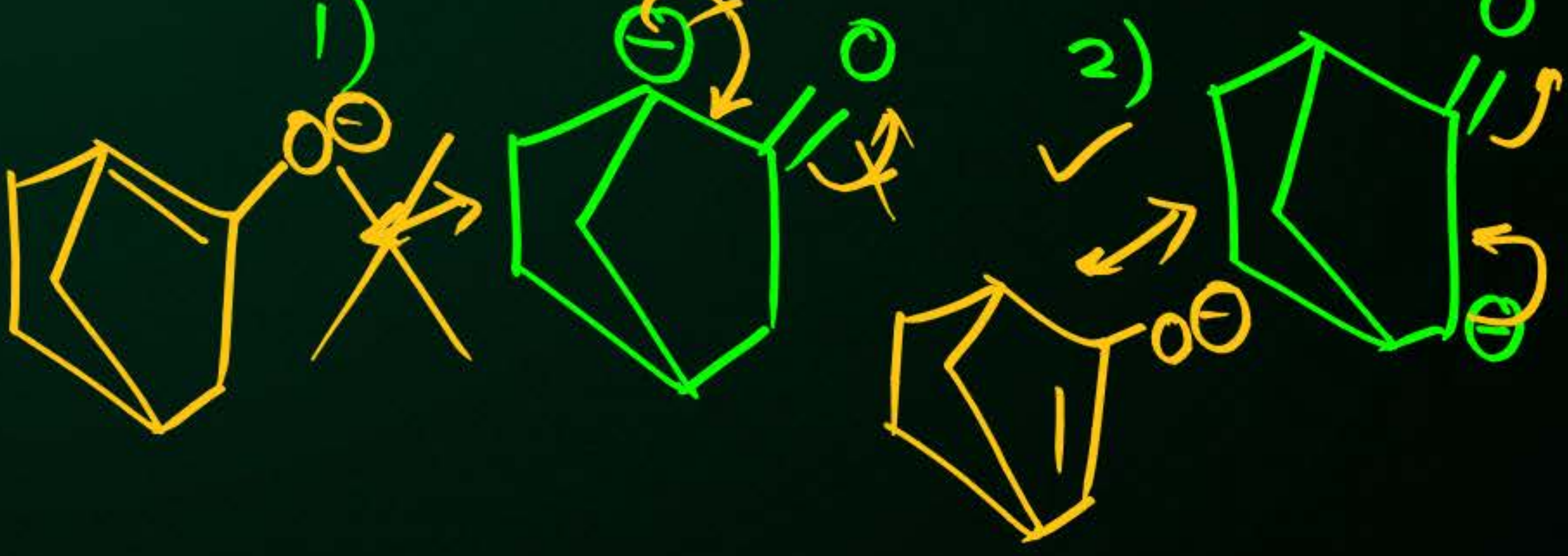


Bredt's rule :- Planarity can not exist at bridge headed carbons.


✓
✗
Bridge headed
Bridge head
≡
sp²
✗
✗



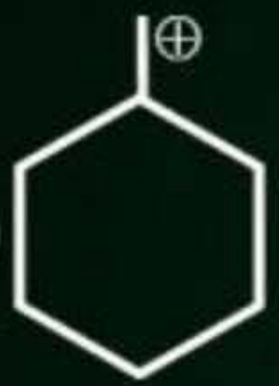
Q Reso is possible or not

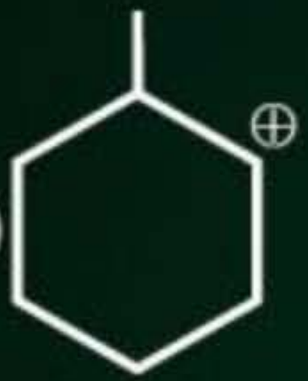


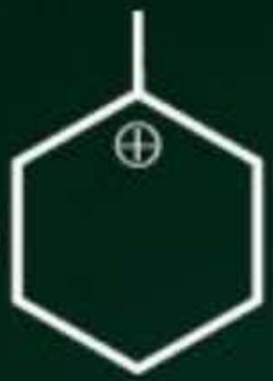
Home Work

QUESTION 01

Which is the correct stability order of following intermediates:

(a)


(b)


(c)


A a > b > c

B a > c > b

C c > b > a

D b > a > c

QUESTION 02

The most unstable carbocation is:

A $CH_3\overset{\oplus}{C}H_2$

B $Cl-CH_2-\overset{\oplus}{C}H_2$

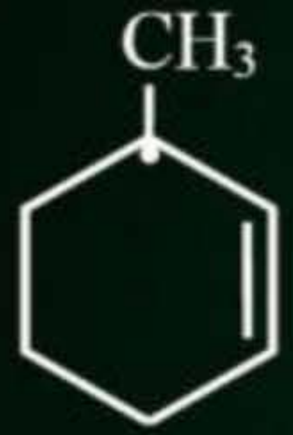
C $\overset{\oplus}{C}H_2-CHO$

D $\overset{\oplus}{C}H_2-O-CH_3$

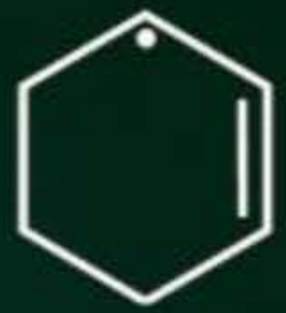
QUESTION 03

Most stable radical is:

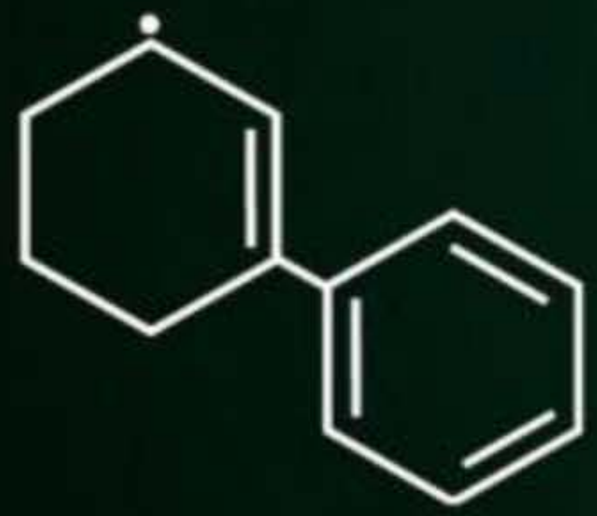
(A)



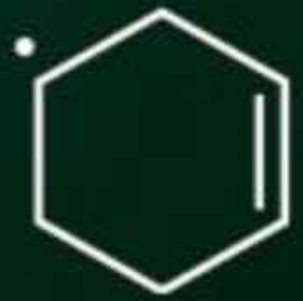
(B)



(C)

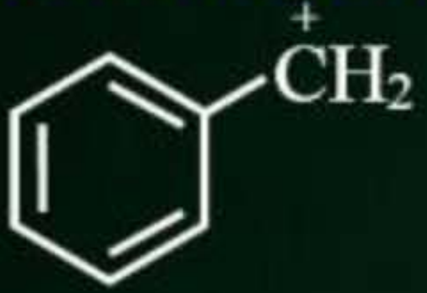


(D)

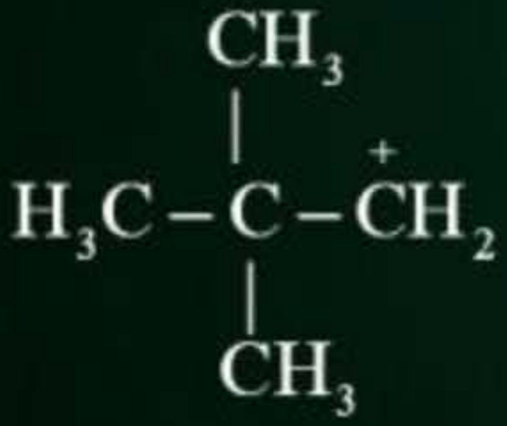


QUESTION 04

Which of the following options is the correct order of relative stabilities of cations, I, II and III written below (most stable first)?

(I) 

(II) $H_2C=CH-CH_2-\overset{+}{C}H-CH_3$

(III) 
$H_3C-\underset{CH_3}{\overset{CH_3}{\underset{|}{\overset{|}{C}}}}-\overset{+}{C}H_2$

(A) I > II > III

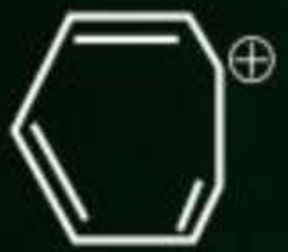
(B) II > III > I

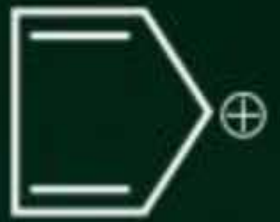
(C) III > I > II

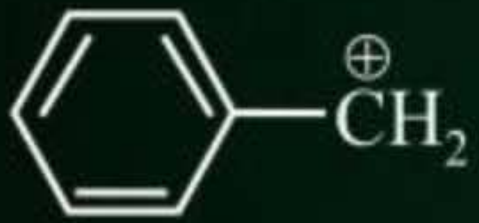
(D) I > III > II

QUESTION 05

Which of the following is most stable carbocation

(A) 

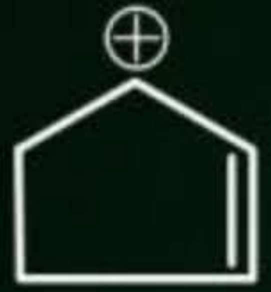
(B) 

(C) 

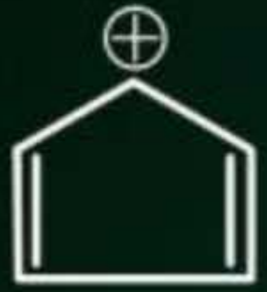
(D) $CH_2=CH-\overset{\oplus}{C}H_2$

QUESTION 06

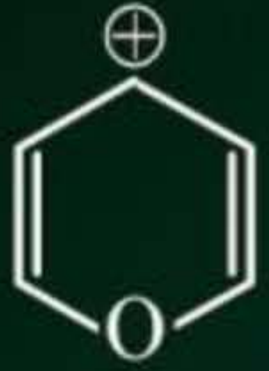
Compare the stability of carbocation



(i)



(ii)



(iii)

A (III) > (II) > (I)

B (II) > (III) > (I)

C (III) > (I) > (II)

D (II) > (I) > (III)

QUESTION 07

The most stable radical among all is

A $CH_3CH_2\overset{\square}{C}HPh$

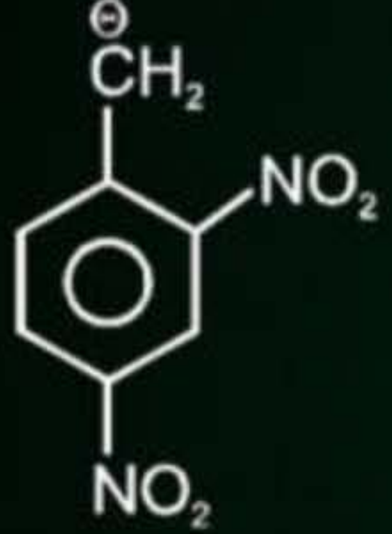
B $CH_2=CH\overset{\square}{C}HPh$

C $CH_3CH_2\overset{\square}{C}(CH_3)_2$

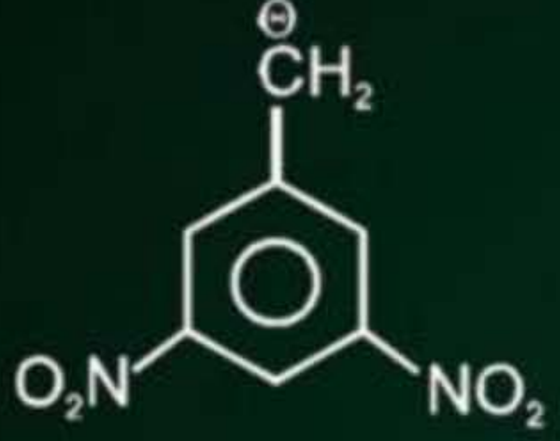
D $CH_2=CH\overset{\square}{C}HCH_3$

QUESTION 08

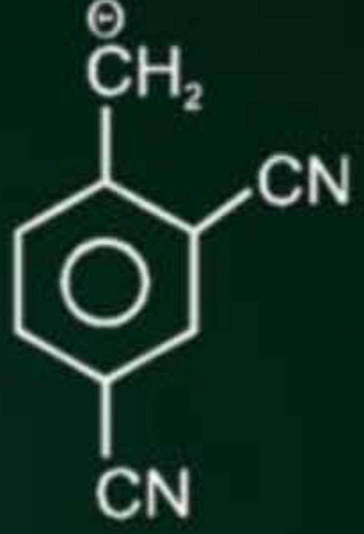
Arrange the following carbanions in increasing order of stability:



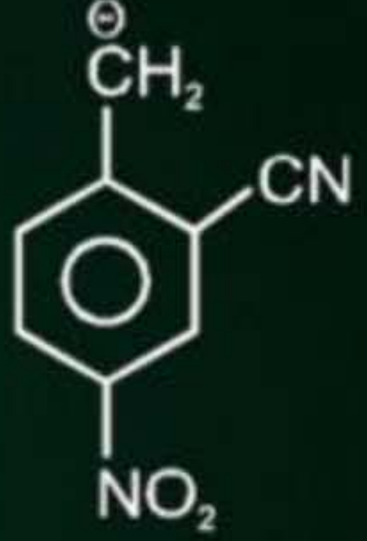
I



II



III



IV

A III > IV > I > II

B I > III > IV > II

C I > II > III > IV

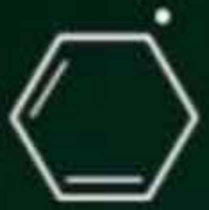
D I > IV > III > II

QUESTION 09

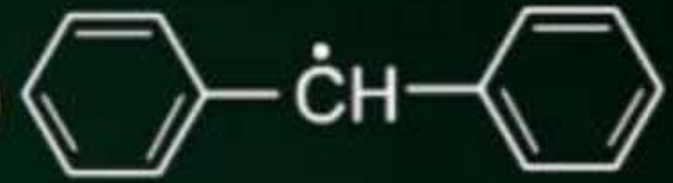
Arrange the following radicals in decreasing order of stability.

(I) $\dot{C}H_3$ (II) $CH_3-\dot{C}H_2$

(III)



(IV)



A IV > I > III > II

B IV > III > II > I

C I > II > III > IV

D IV > III > I > II

QUESTION 10

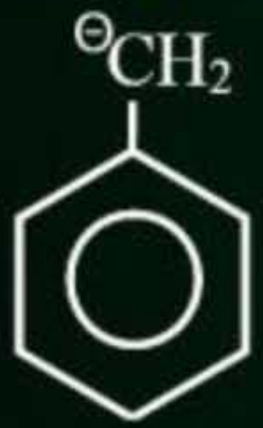
Arrange following carbanions in the stability order:

(a) $CH_2 = CH - CH_2^{\ominus}$

(b) $CH_2 = CH - CH_2 - CH_2^{\ominus}$

(c) $CH_2 = CH - CH^{\ominus} - CH = CH_2$

(d)



Ⓐ d > c > a > b

Ⓑ b > a > c > d

Ⓒ a > b > d > c

Ⓓ c > a > b > d

ANSWER KEY

1. C
2. C
3. C
4. A
5. A
6. C
7. B
8. D
9. B
10. A

Home Work From PW Module (Yakeen NEET)

Prarambh: Q 125, 130, 137, 138, 141

Parikshit: Q 15

Thank you!!

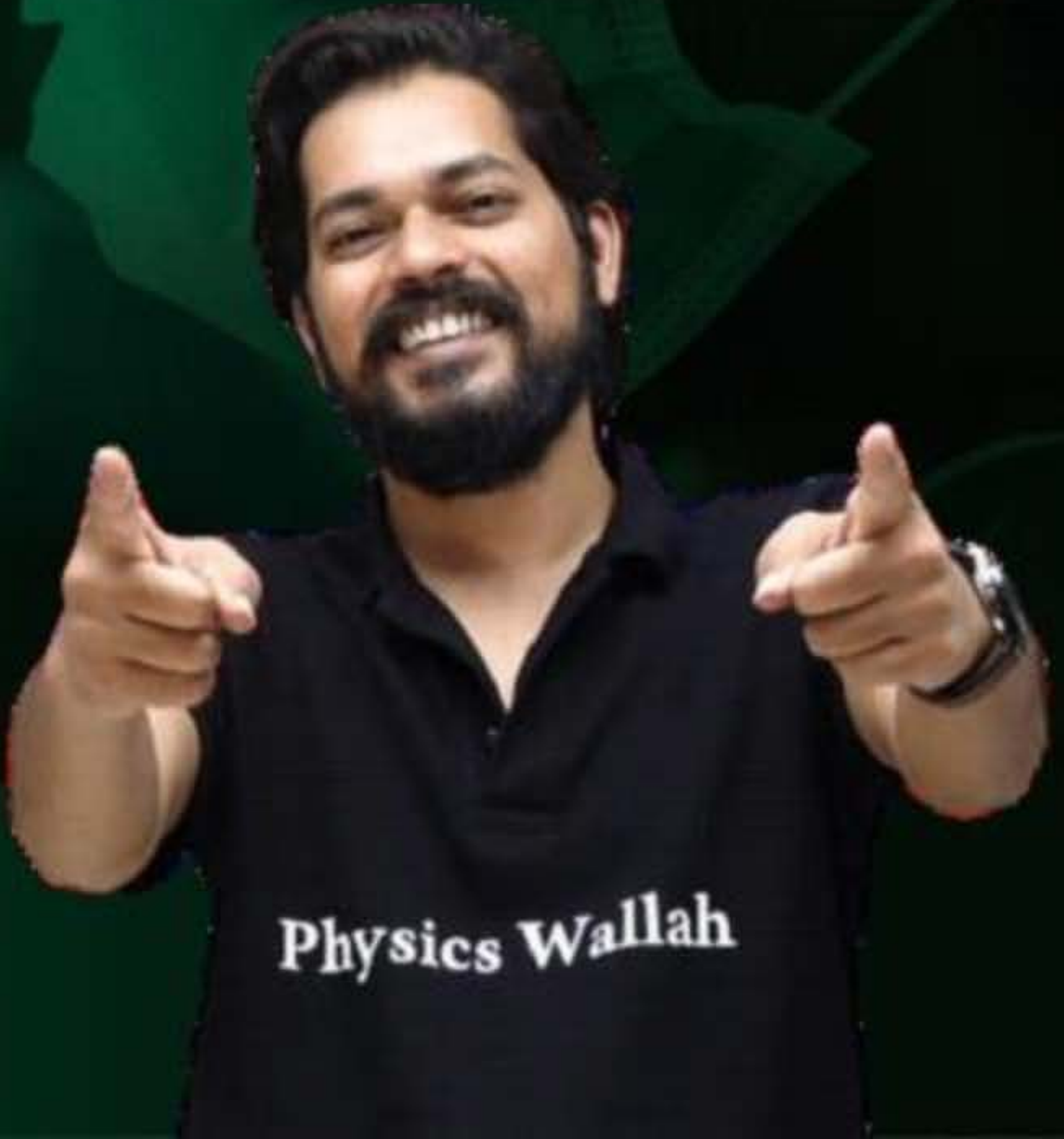
YAKEEN 2.0

FOR NEET 2025

Lecture- 09 | **Organic Chemistry**

Some Basic Principles and Techniques (GOC)

By- Pankaj Sir(POPU MAMA)

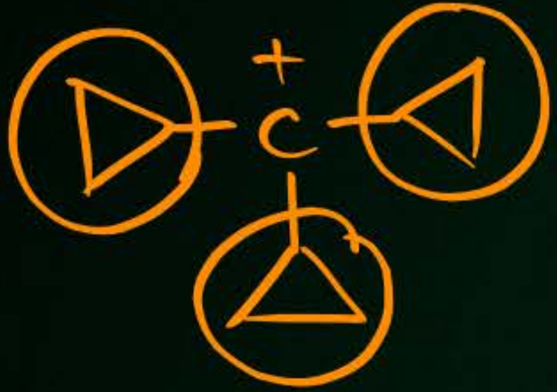

Physics Wallah

Topics *to be covered*

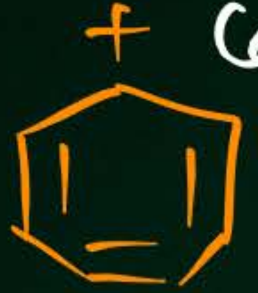
1. Enol Content & Resonance Energy
2. Heat of Hydrogenation & Heat of Combustion
3. Practice

imp order

stability of $C^{\oplus}$



>

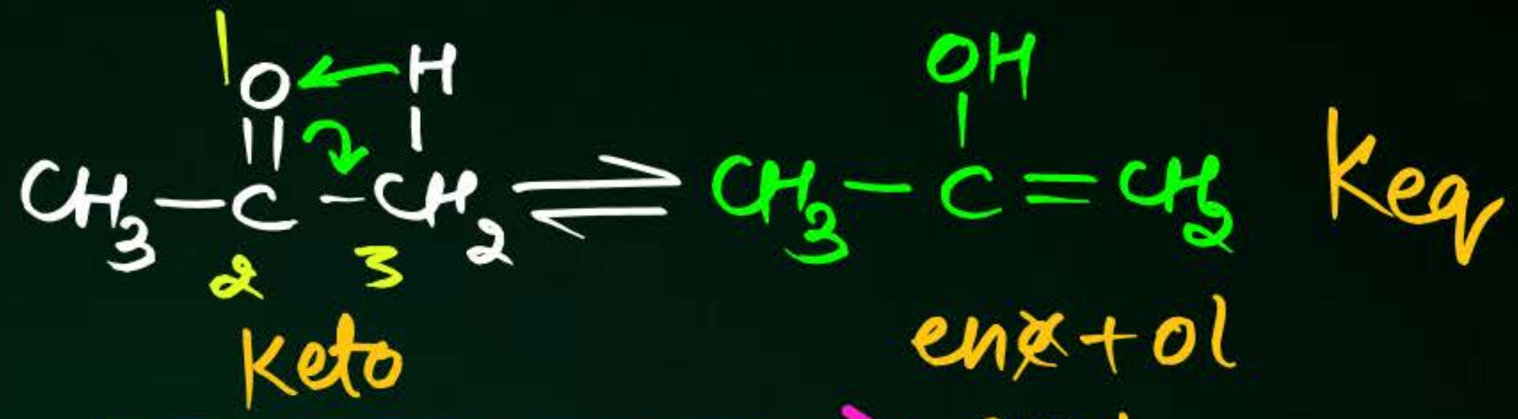


Tropylium cation

$> \underline{Ph_3}\overset{+}{C} > \underline{Ph_2}\overset{+}{C}H > \underline{\underline{Ph}}\overset{+}{C}H-R > \overset{9\alpha H}{\boxed{Me_3\overset{+}{C}}} > \underset{1\ Ring}{Ph\overset{+}{C}H_2}$

$CH_2=CH-\overset{+}{C}H_2 > Me_2\overset{+}{C}H > CH_3\overset{+}{C}H_2 > \overset{+}{C}H_3 > CH_2=\overset{+}{C}H > CH\equiv\overset{+}{C}$

Enol Content



$$CH_3-\underset{2}{\overset{\overset{O \leftarrow H}{\|\quad |}}{C-CH_2}} \rightleftharpoons CH_3-\overset{\overset{OH}{|}}{C}=CH_2 \quad K_{eq}$$

Keto

en~~e~~+ol

$\text{Keto} \longrightarrow$ enol

$$\text{enol content} = K_{eq} = \frac{[\text{enol}]}{[\text{Keto}]}$$

$\boxed{\text{enol content} \uparrow}$, $[\text{enol}] \uparrow$, $[\text{Keto}] \downarrow$

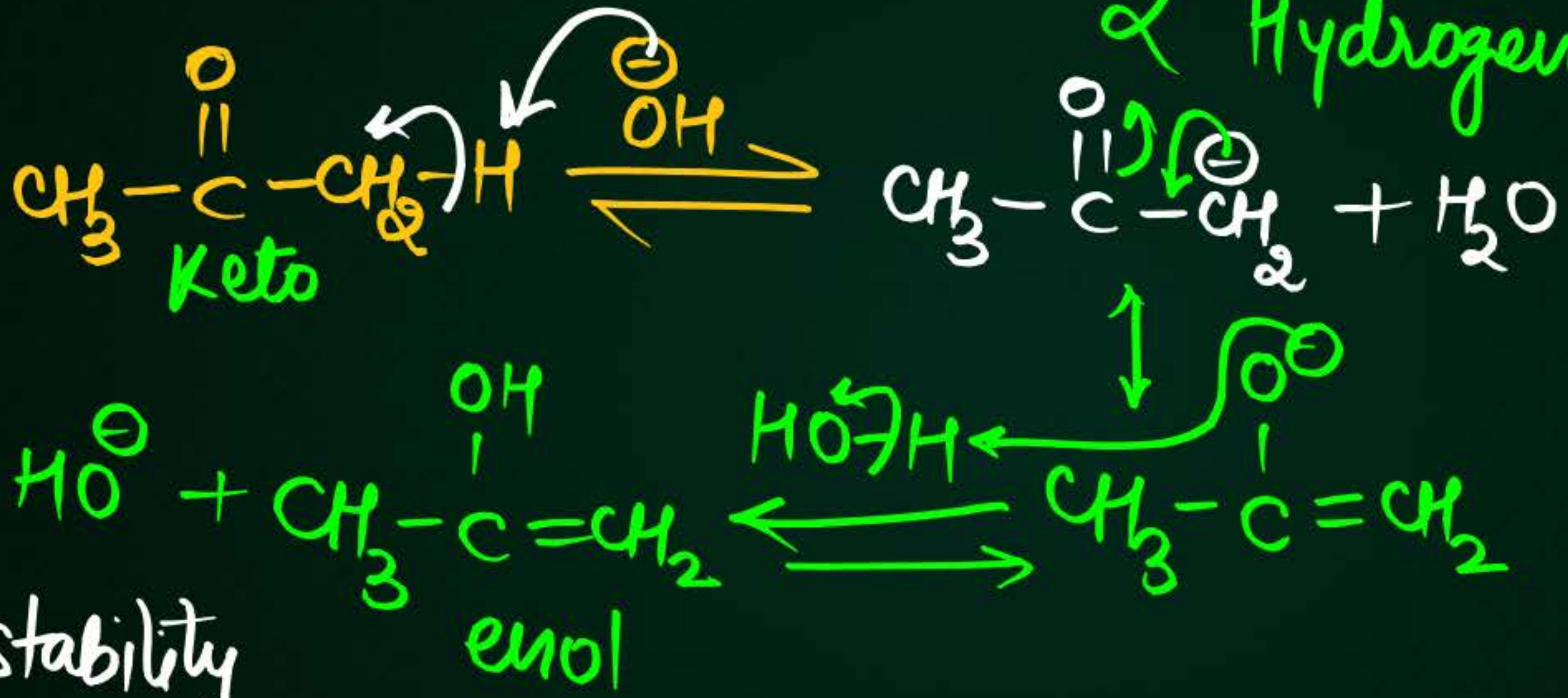
$\boxed{\text{Stability enol} > \text{Keto}}$

enol content ∝ stability of enol ∝ Aro
∝ R
∝ H
∝ Hydrogen bonding (F–H O–H N–H)

Aro > R > H

↷ stepwise study of the rxn

Mech :



$$CH_3-\overset{\overset{O}{||}}{C}-CH_2-H \xrightleftharpoons{\ominus OH} CH_3-\overset{\overset{O}{||}}{C}-\overset{\ominus}{C}H_2 + H_2O$$

$$\updownarrow$$

$$HO^{\ominus} + CH_3-\overset{\overset{OH}{|}}{C}=CH_2 \rightleftharpoons CH_3-\overset{\overset{O^{\ominus}}{|}}{C}=CH_2 \quad (HO-H)$$

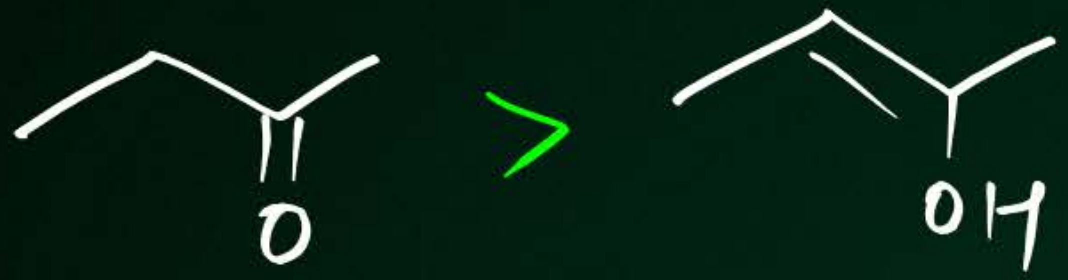
stability

Simple mono Keto > enol

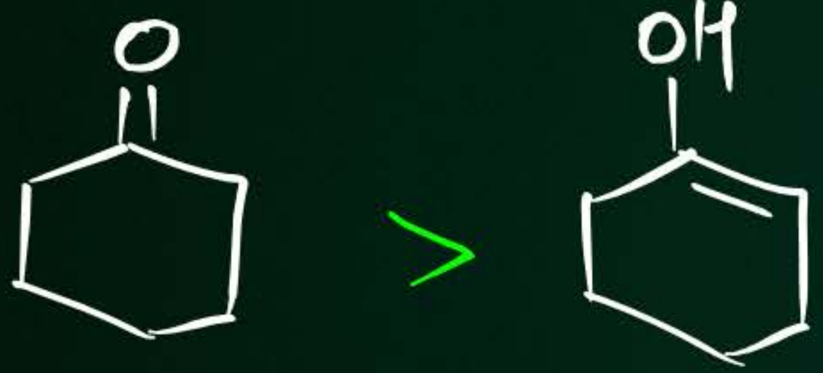
BE C=O > C=C

Q. compare stability

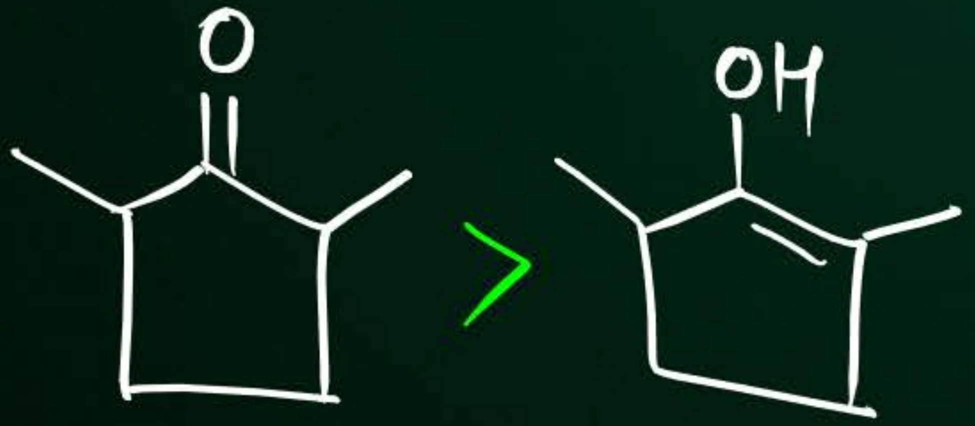
1)



2)

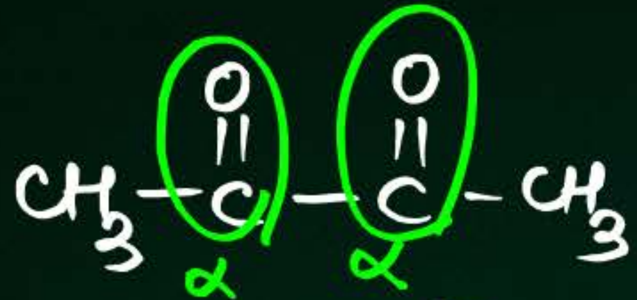


3)



α- diketones

a) Acyclic



CH_3
O
O
C
C
α
α
CH_3

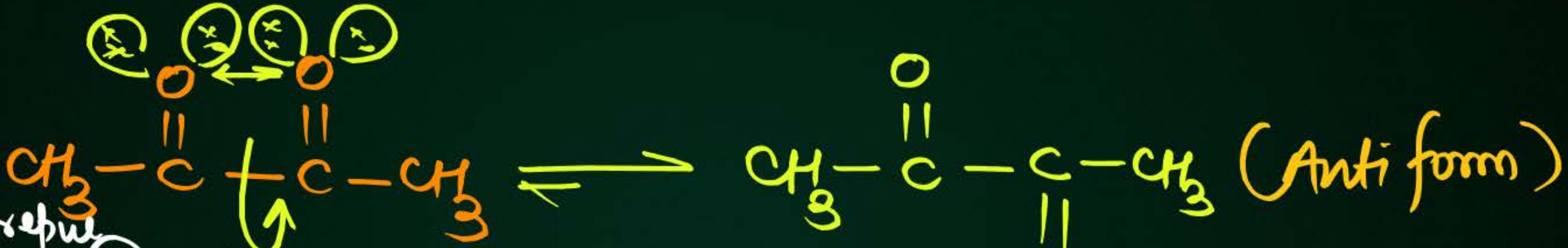
α- diketone

$\overset{\delta-}{C=O}$ Ⓐ

$\overset{\delta-}{C-O}$ Ⓑ

polarity Ⓐ > Ⓑ

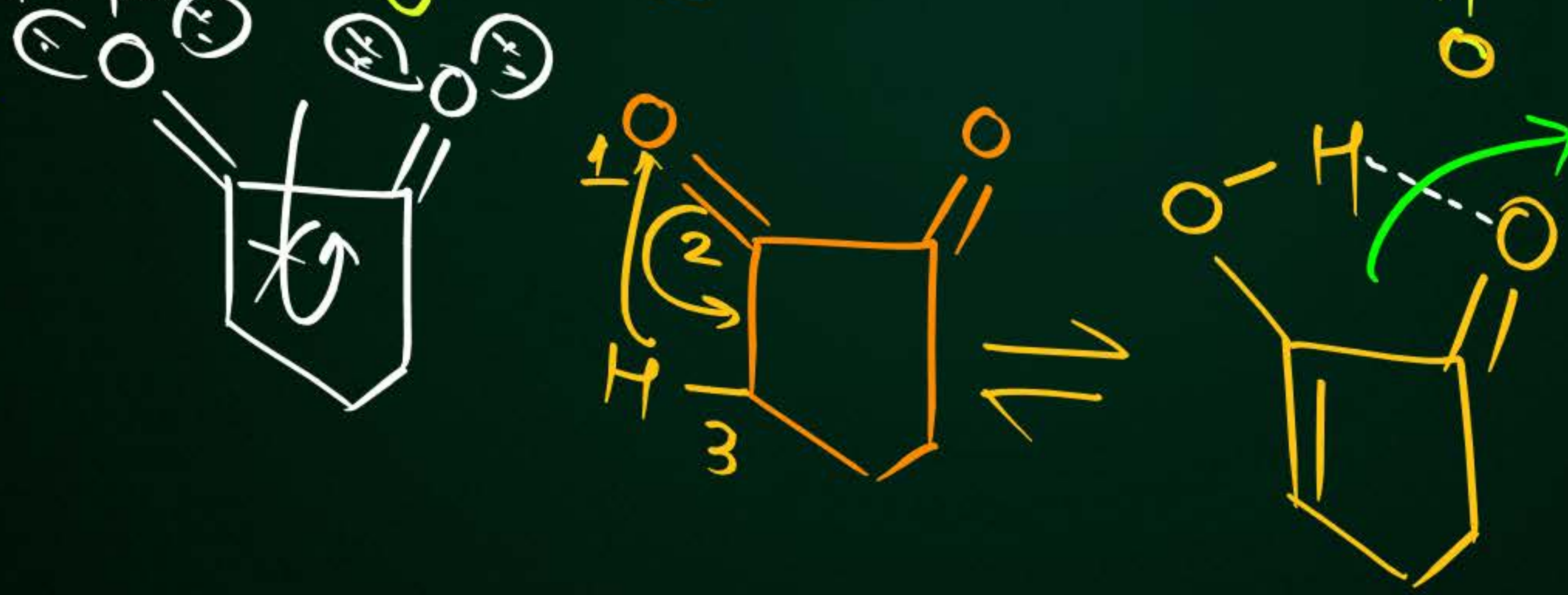
LP-LP repulsion



CH_3
C
O
O
C
CH_3
CH_3
C
O
C
O
CH_3
(Anti form)

b) Cyclic

LP-LP repulsion



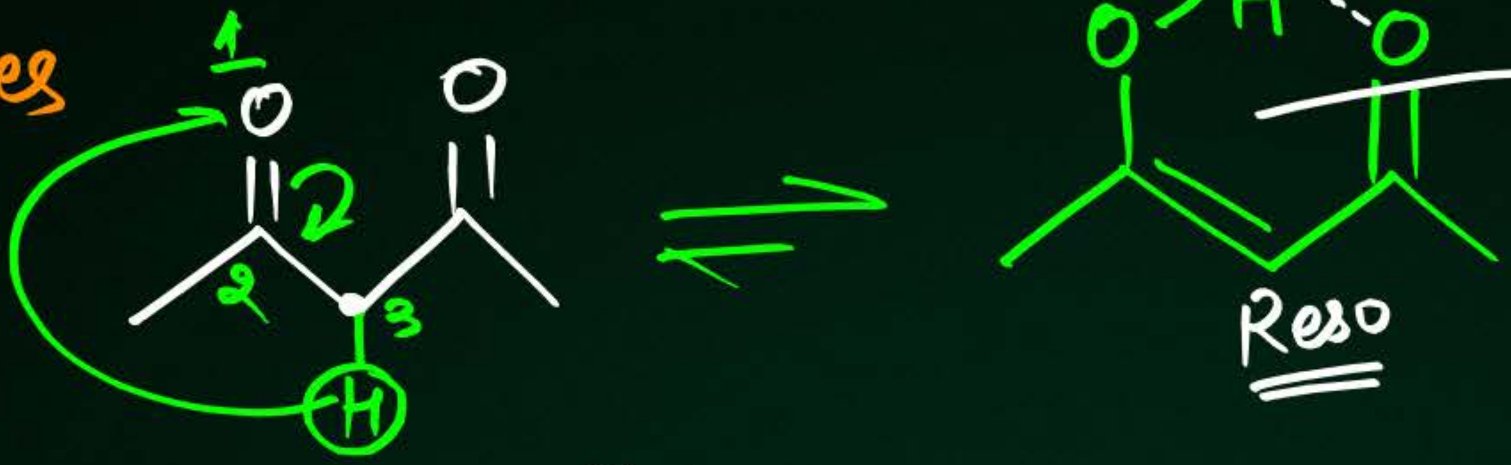
O
O
O
O
1
2
H
3
O
H
O

5 membered chelate

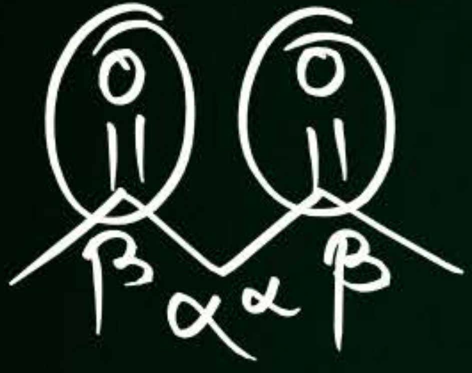
Intra 'H' bond

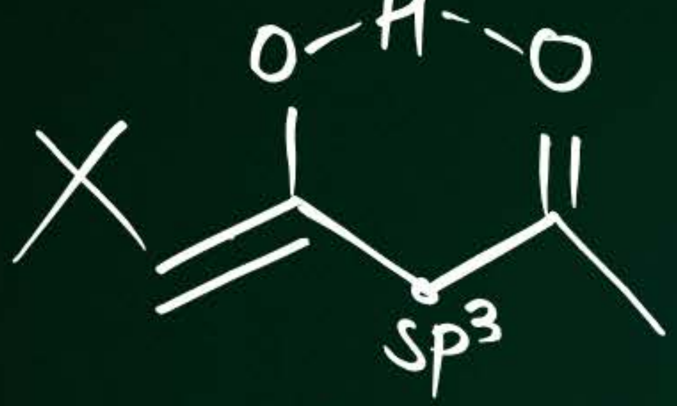
β-diketones

*Acyclic

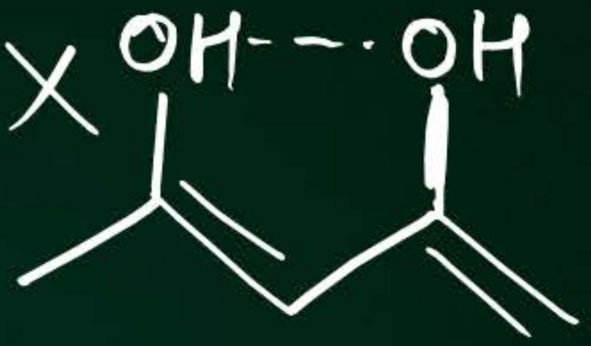

1
2
2
3
H
O-H---O
Reso

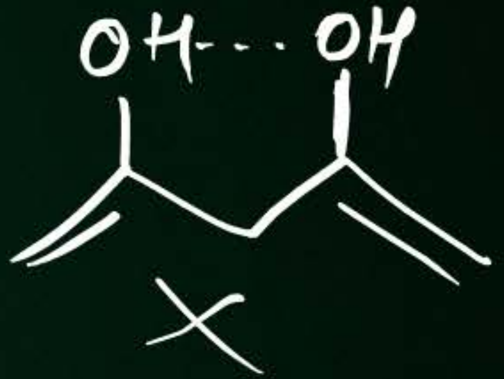
6 membered chelate
Intra 'H' bonding

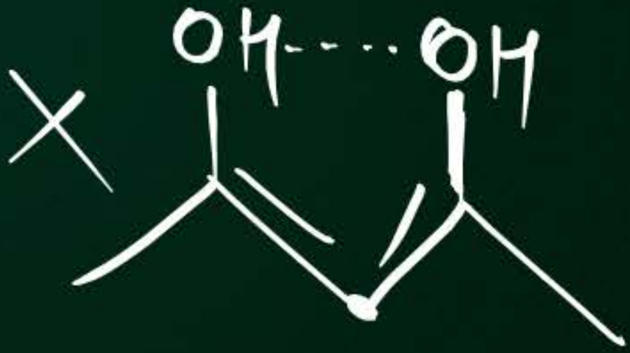




No reso

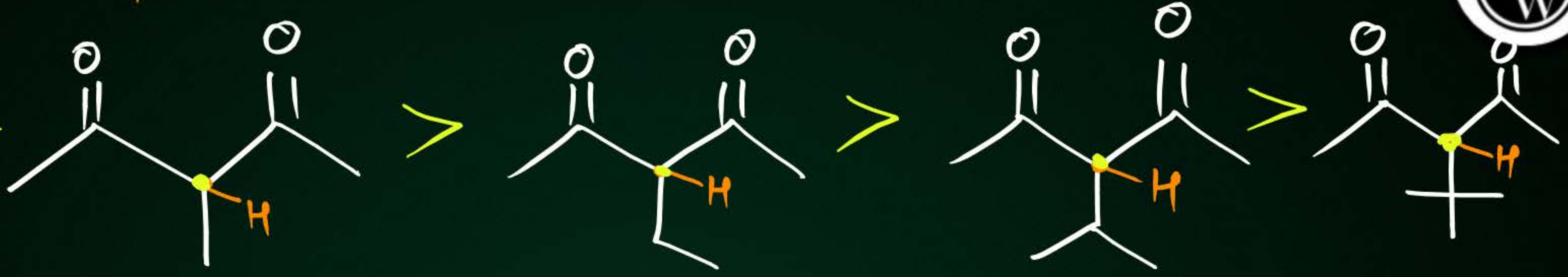




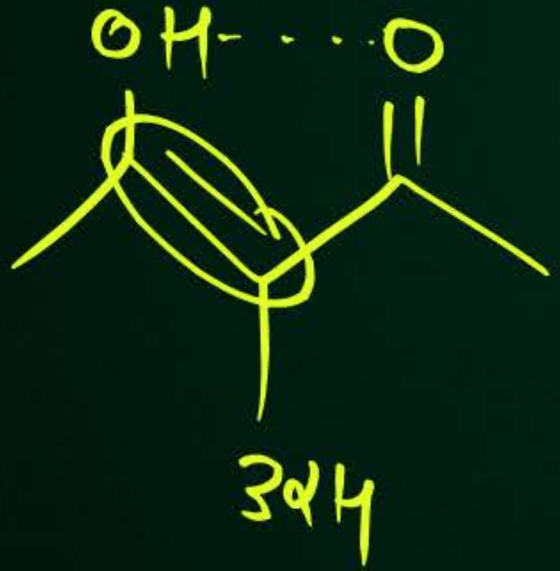


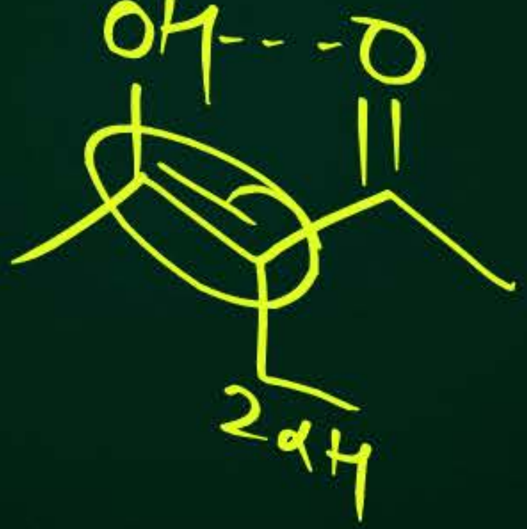
Steric hind in β-diketone

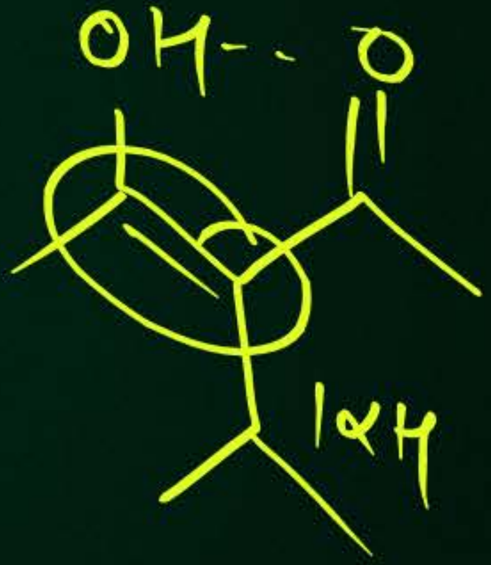
Enol Content

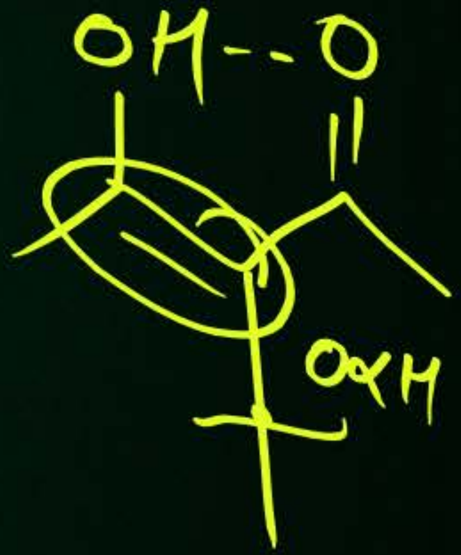

O
O
H
>
O
O
H
>
O
O
H
>
O
O
H

[SH ∝ NO of 'C']

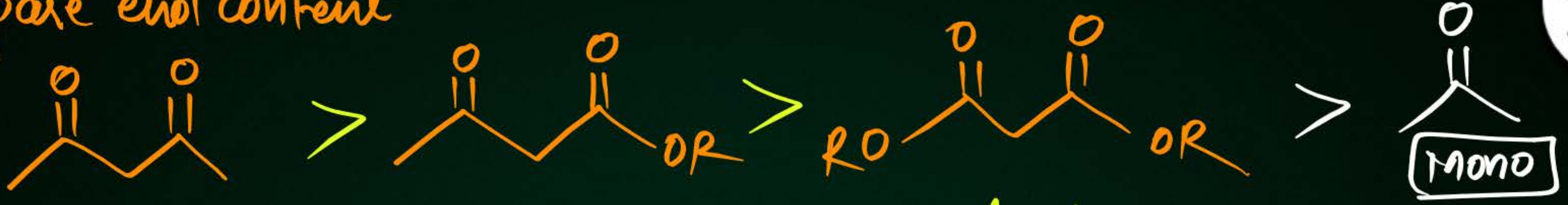






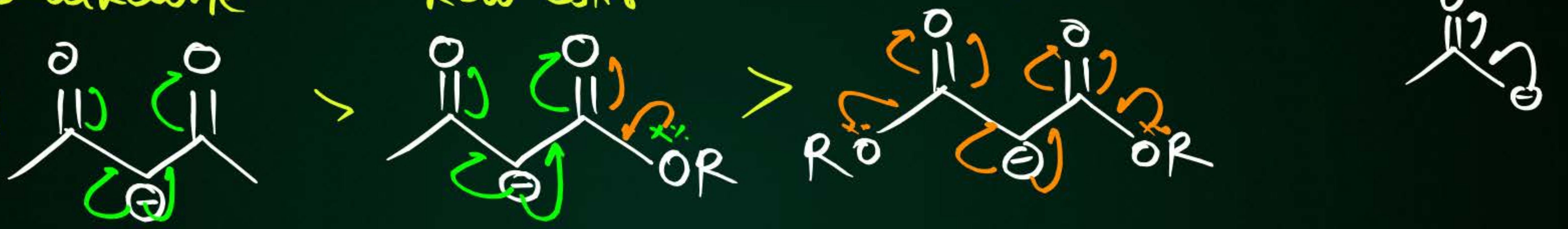


Q Compare enol content


>
OR
>
RO
OR
>
Mono

β-diketone keto ester diester

Stability



No cross (OR)

1→OR cross conju

2 OR cross conju

(Di > mono)

Heat of Hydrogenation

Definition: The amount of energy released during hydrogenation reaction.

① $\overset{H}{C}H_2 \overset{2}{=} \overset{H}{C}H_2 + H_2 \xrightarrow{Ni} CH_3-CH_3 \quad [\Delta H_{HOH} = -ve]$

② $\overset{H}{\overset{H}{C}}H \overset{3}{\equiv} \overset{H}{\overset{H}{C}}H + 2H_2 \xrightarrow{''} CH_3-CH_3 \quad [\Delta H_{HOH} = -ve]$

ΔH_{HOH} ② > ①

Compare Heat of Hydrogenation

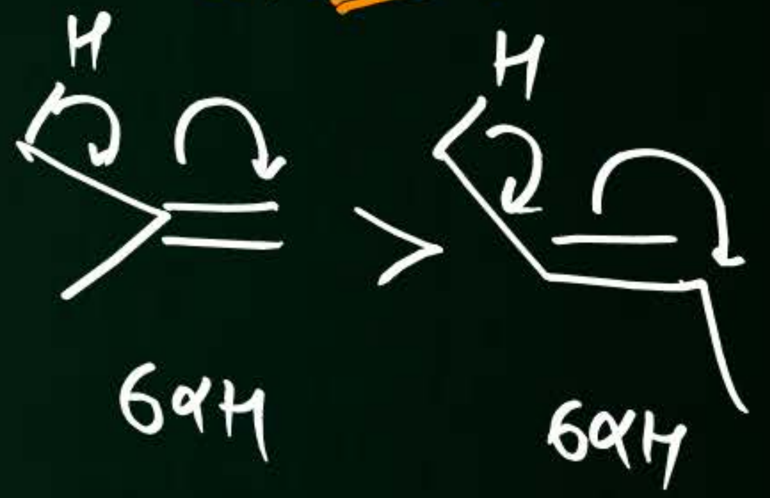
① HOH $\propto$ No of π Bond

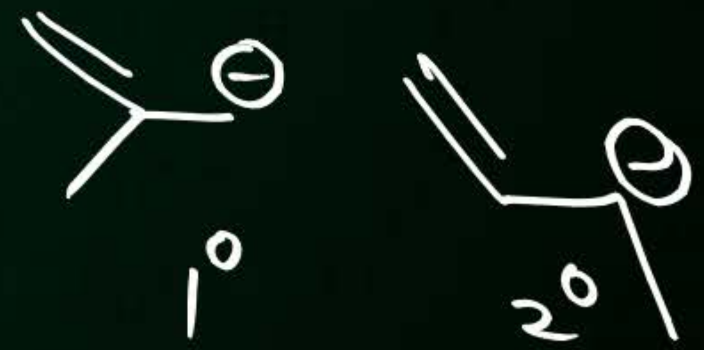
② HOH $\propto \dfrac{1}{\text{Stability of alkene}}$

Stability of alkene $\propto$ ResO

$\propto$ NO. of α-H

Stability





Heat of Combustion

Definition: The amount of energy released during combustion reaction.

$$C_xH_y + \left(x+\frac{y}{4}\right)O_2 \longrightarrow xCO_2 + \frac{y}{2}H_2O \quad \left(\Delta H_{HOC} = -ve\right)$$

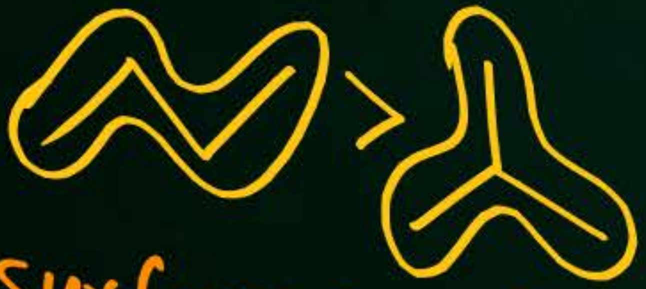
Compare Heat of Combustion

① HOC $\propto$ No. of 'C' atoms

② HOC $\propto \frac{1}{(\text{Stability})}$

i) stability of alkanes

stability $\propto \frac{1}{\text{Branch}}$



surface area ↑

V.W force ↑ stability ↑

ii) stability of alkene

Stability $\propto$ Reso

$\propto$ No. of α-H

iii) stability of cyclo alkane

Stability

$[3 < 4 < 5 < 6]$

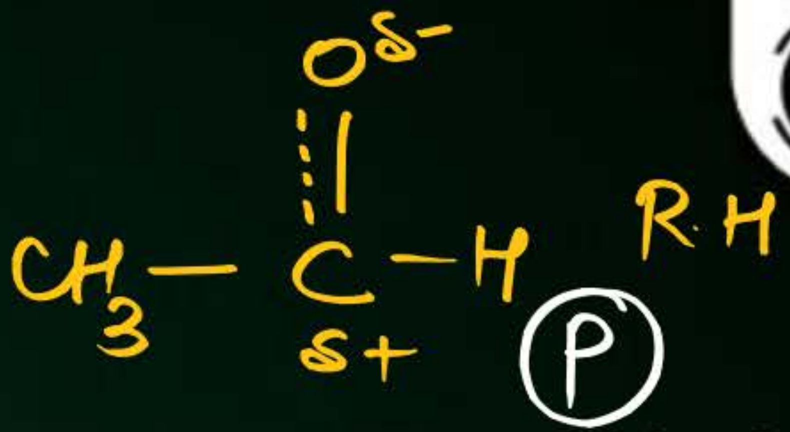
HOC $x < y < z < w$

③ ④ ⑤ ⑥

$\frac{\text{HOC}}{CH_2}$ $\frac{x}{3} > \frac{y}{4} > \frac{z}{5} > \frac{w}{6}$

$\frac{\text{HOC}}{CH_2}$ ↓, stability ↑

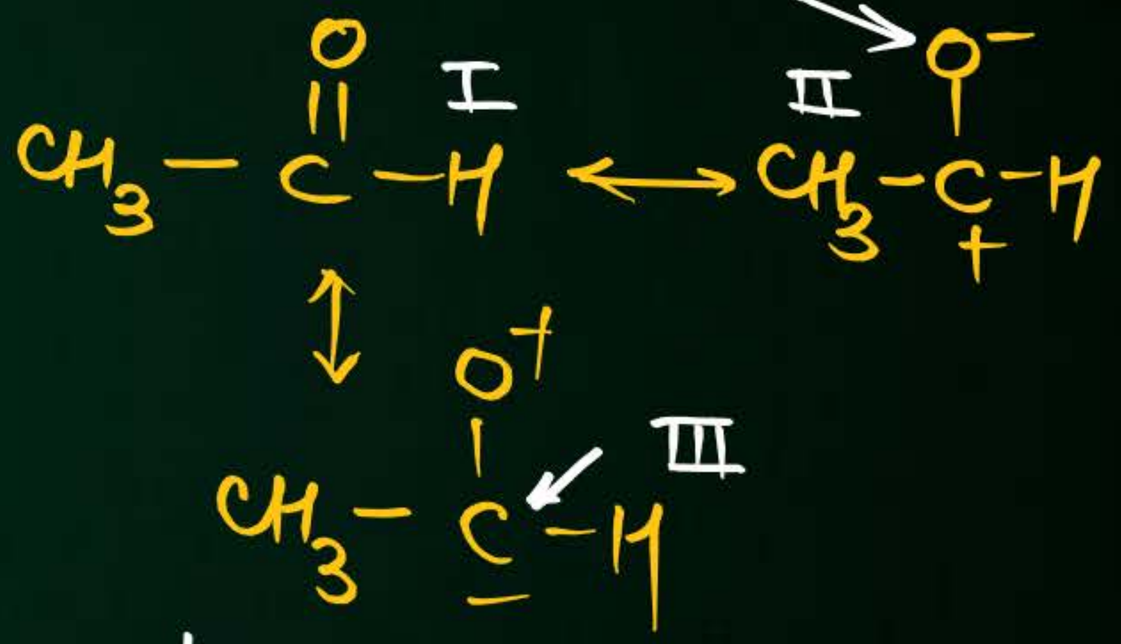
Resonance Energy


$O^{\delta-}$
CH_3-C-H
$\delta+$
R.H
(P)

Definition: The potential energy difference between resonance hybrid and most stable resonating structure.

1. R.E is always negative. $= P - q$

2. R.E can be calculated by HOH data.
(Thermochemistry)



stability I > II > III
(q)

Compare Resonance Energy

R.E $\propto$ JhamaJham Reso

Mast, Badiya, Jyada

QUESTION

Assertion(A): All combustion reactions are exothermic reactions. ✓

Reason(R): During combustion reaction, heat energy is liberated. ✓

[✓ **A** Both (A) and (R) correct.]

B (A) is correct but (R) is wrong.

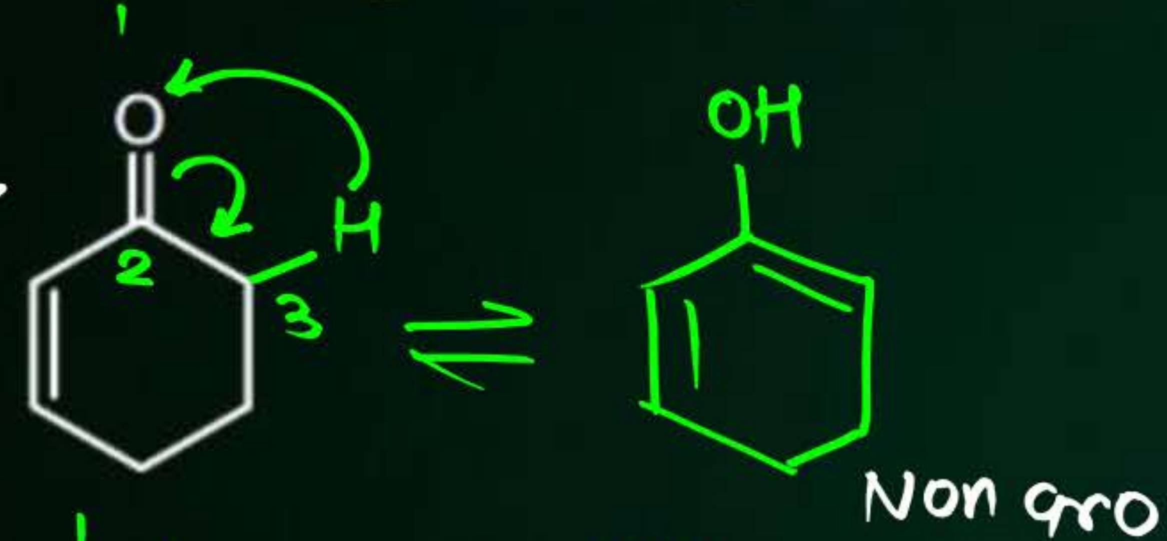
C Both (A) and (R) are wrong.

D (A) is wrong but (R) is correct.

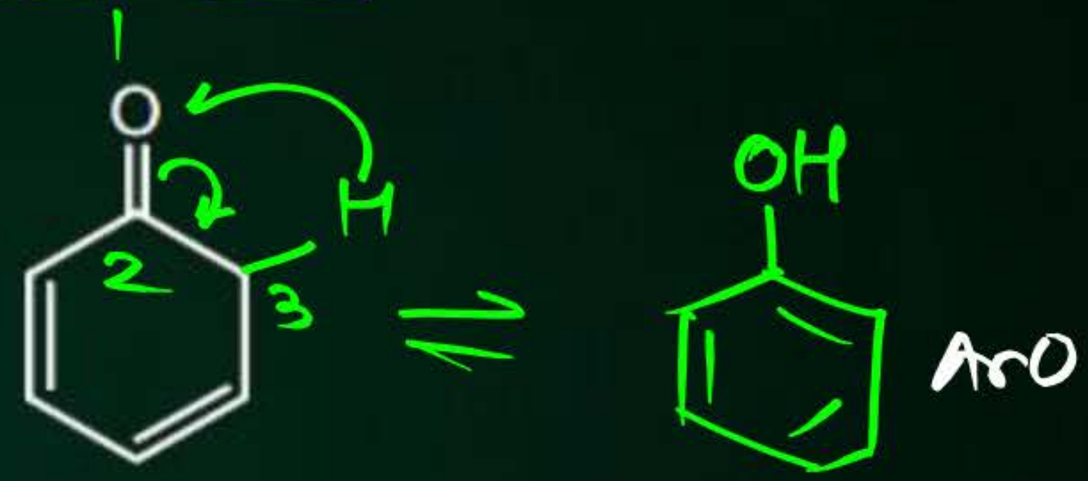
QUESTION

Which of the given compounds will have minimum enol content?

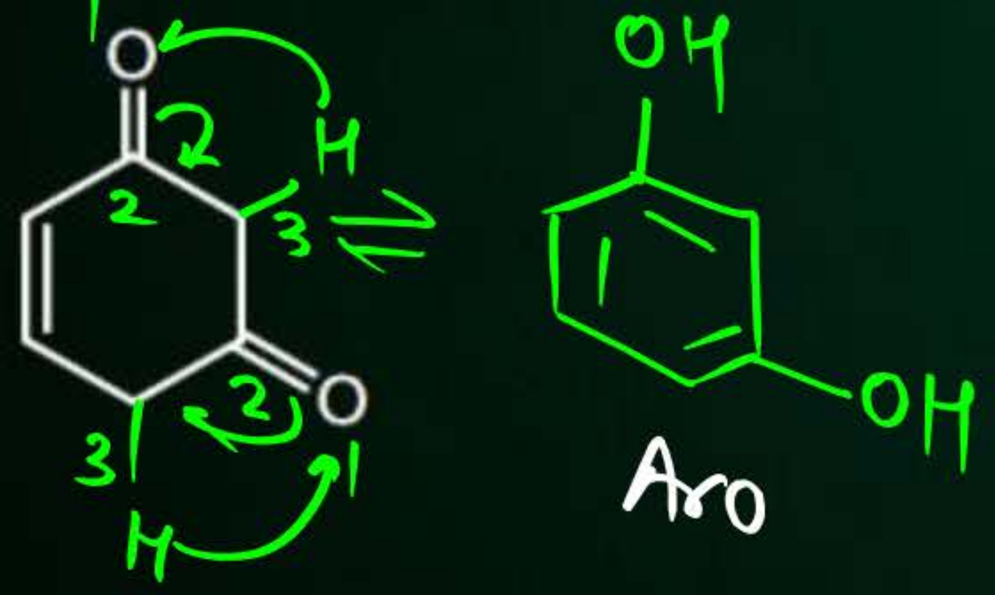
(A)


1
O
2
H
2
3
OH
Non aro

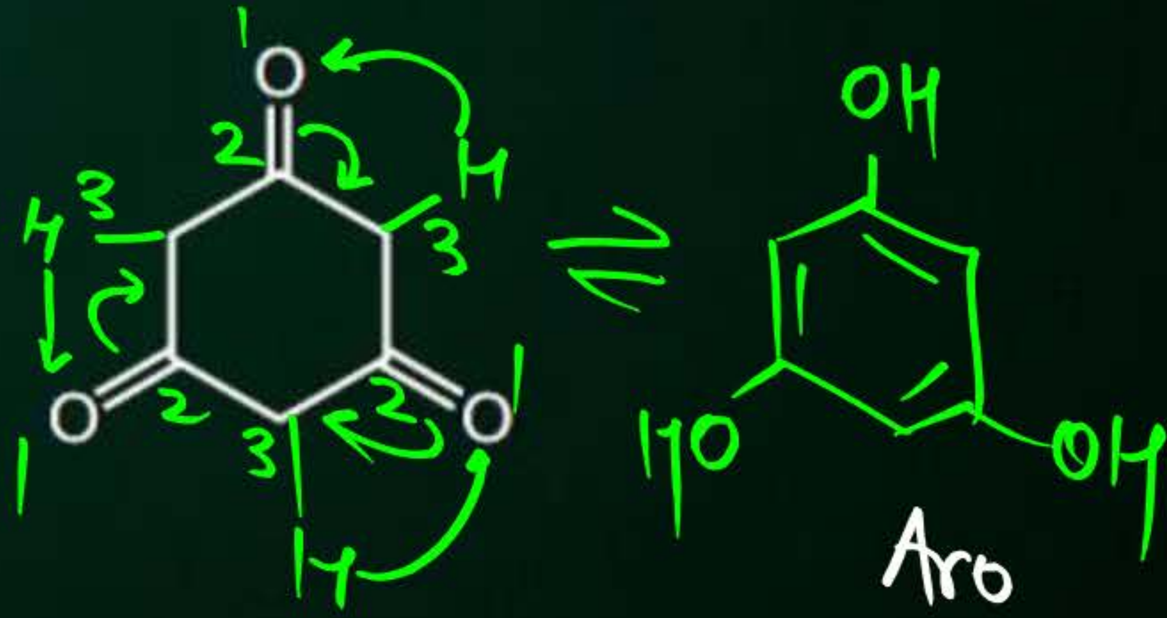
(B)


1
O
2
H
2
3
OH
AroO

(C)


1
O
2
H
2
3
O
2
1
3
H
OH
OH
Aro

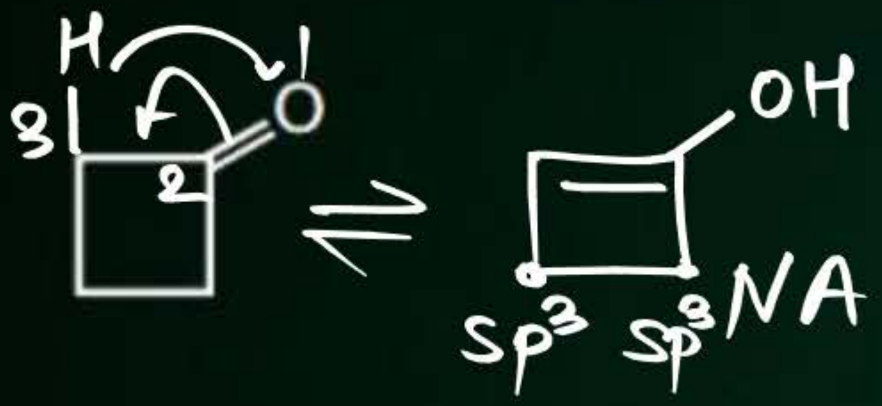
(D)


1
O
2
2
H
3
4
3
1
O
2
3
2
O
1
H
OH
HO
OH
Aro

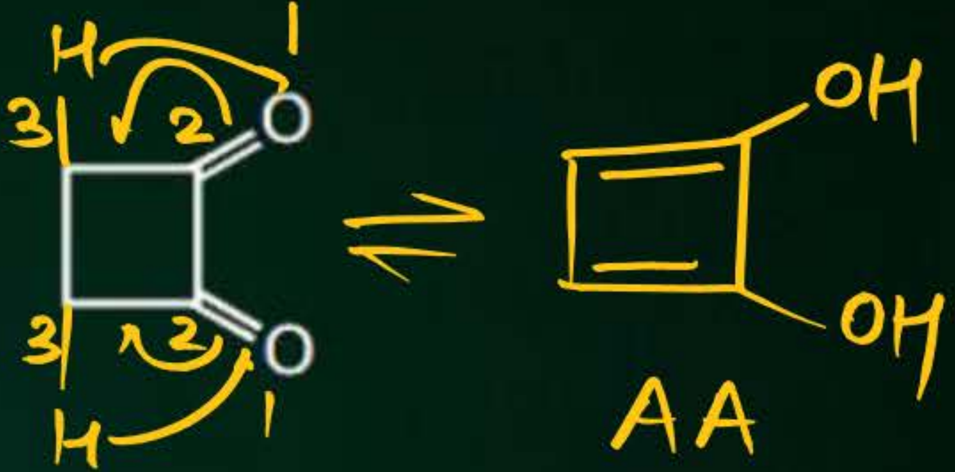
QUESTION

Maximum enol content is in which of the given compound:

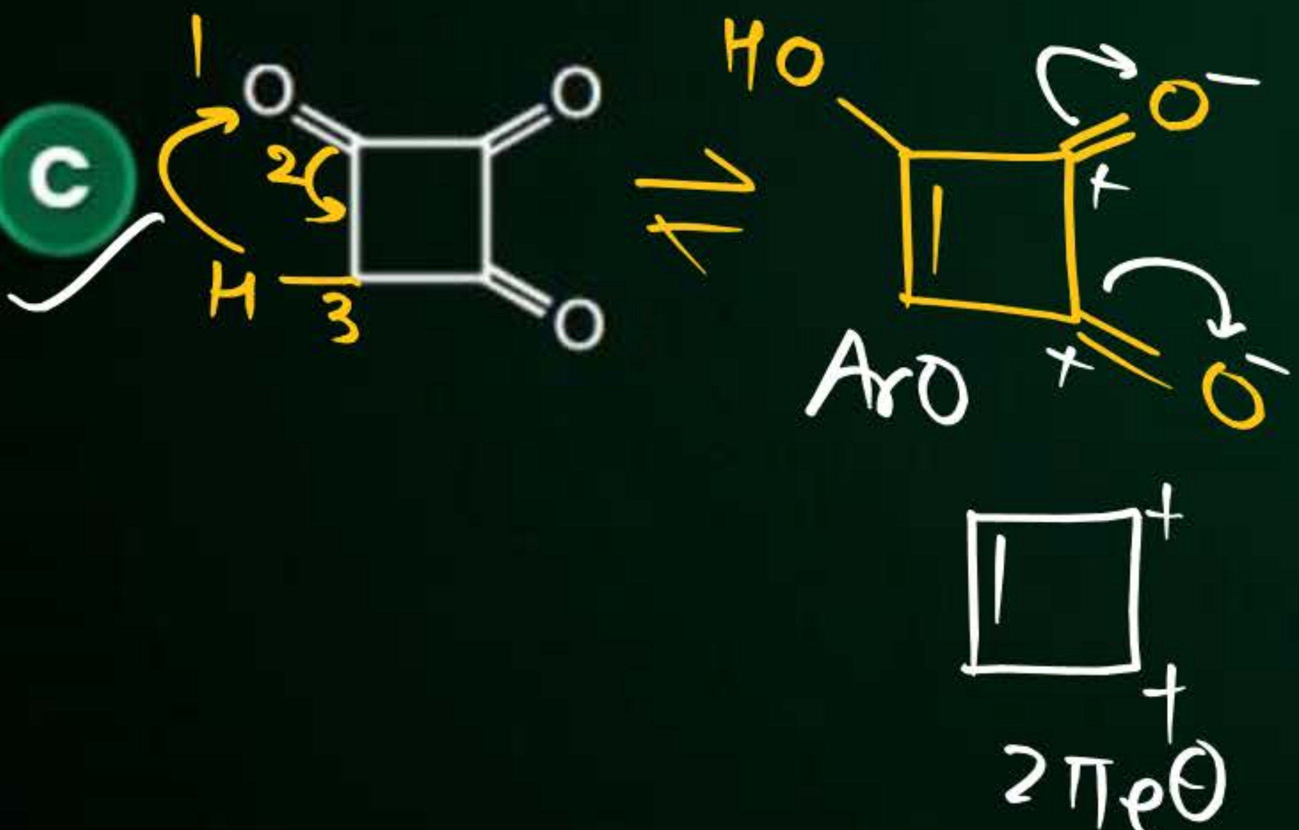
Ⓐ


H
3
2
1
O
OH
sp³
sp³
NA

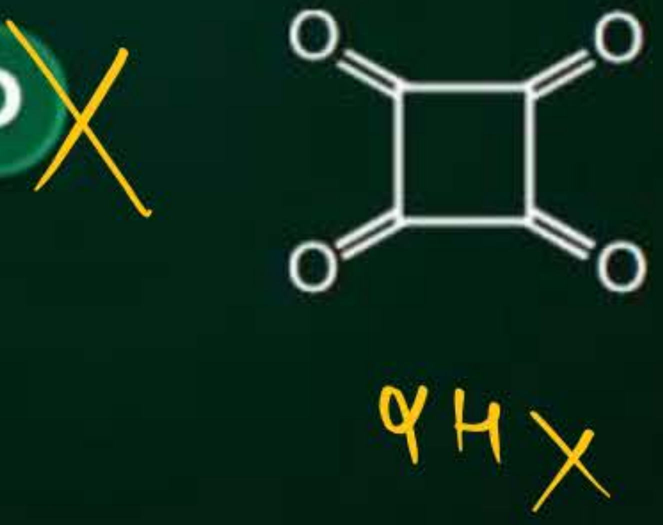
Ⓑ


H
1
3
2
O
3
2
O
H
1
OH
OH
AA

Ⓒ


1
O
2
H
3
O
O
HO
O⁻
+
+
ArO
O⁻
+
+
2πe⊖

Ⓓ



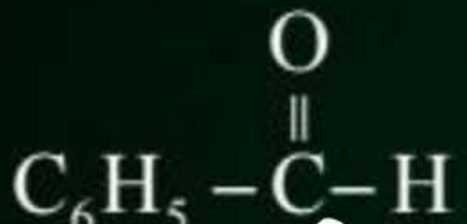
QUESTION

$\alpha-C\ sp^3$

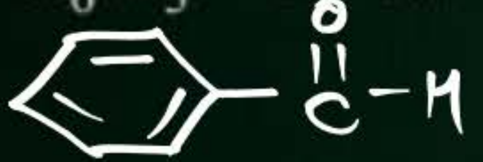
αH

Keto-enol tautomerism does not observe in:

[✓ A]

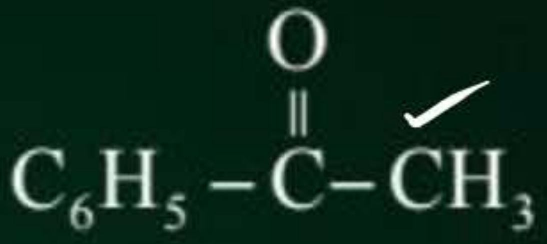


$C_6H_5-\overset{\overset{O}{\|}}{C}-H$



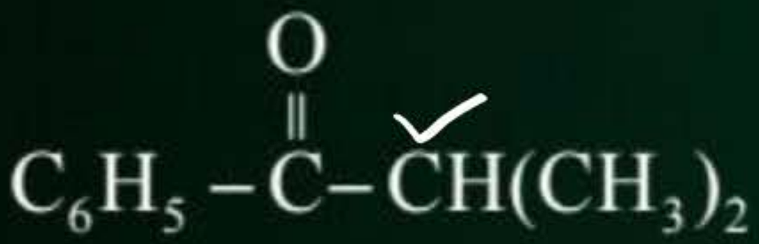
NO αH

(B)



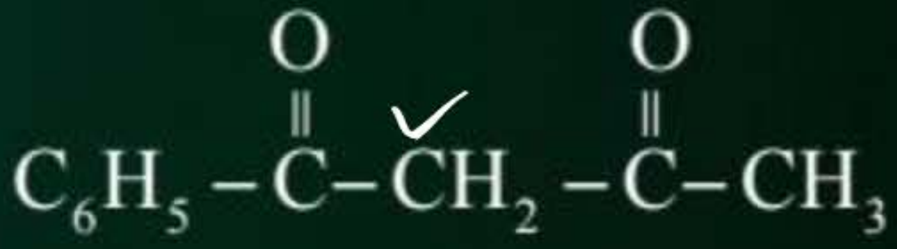
$C_6H_5-\overset{\overset{O}{\|}}{C}-\overset{\checkmark}{C}H_3$

(C)



$C_6H_5-\overset{\overset{O}{\|}}{C}-\overset{\checkmark}{C}H(CH_3)_2$

(D)

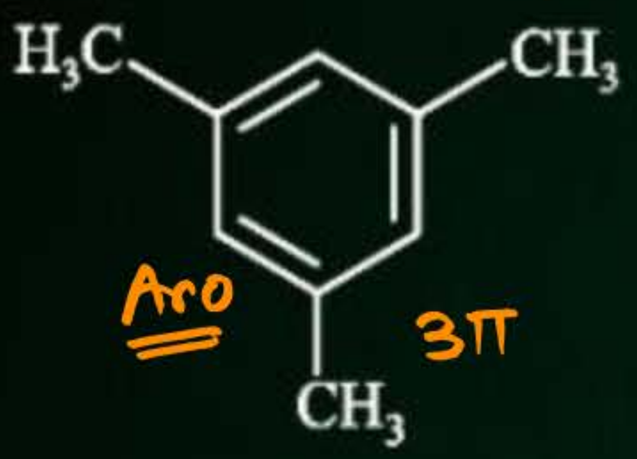


$C_6H_5-\overset{\overset{O}{\|}}{C}-\overset{\checkmark}{C}H_2-\overset{\overset{O}{\|}}{C}-CH_3$

QUESTION

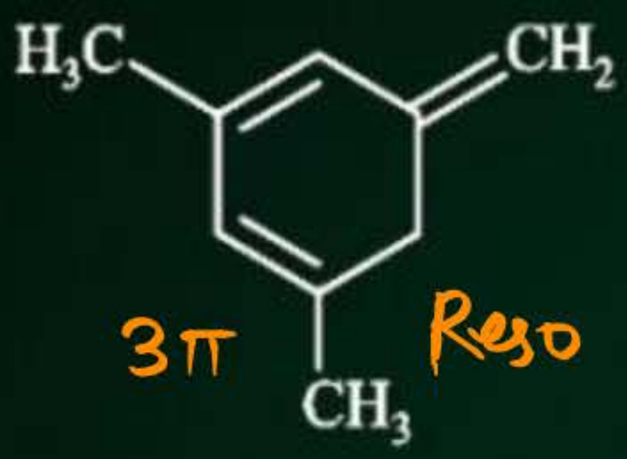
Stability I > II > III

HOH III > II > I


Aro

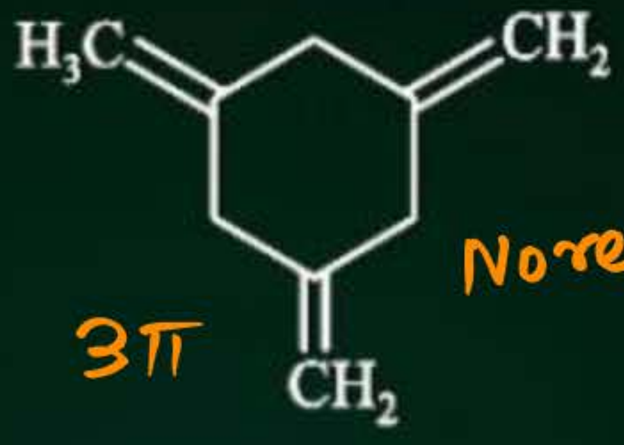
3π

I


3π

Reso

II


3π

No reso

III

The enthalpy of hydrogenation of these compound will be in the order as

(A) I > II > III

[✓ (B)] III > II > I

(C) II > III > I

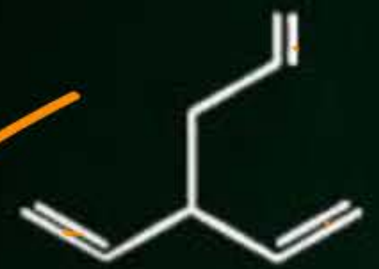
(D) II > I > III

QUESTION

Highest heat of hydrogenation is shown by which of the following compound

Lowest stable

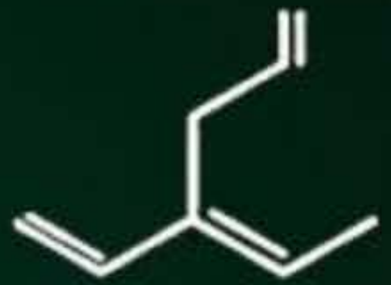
A



No reso

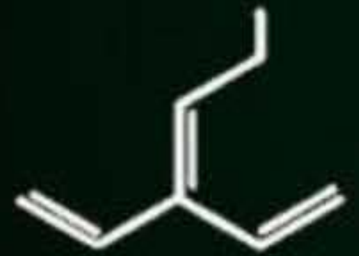
3π

B



3π Less Reso

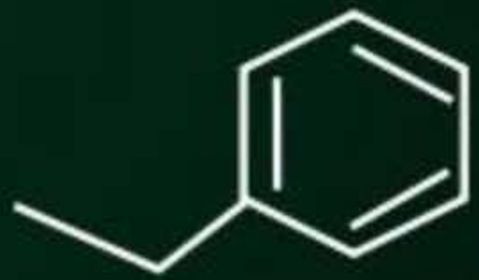
C



more reso

3π

D



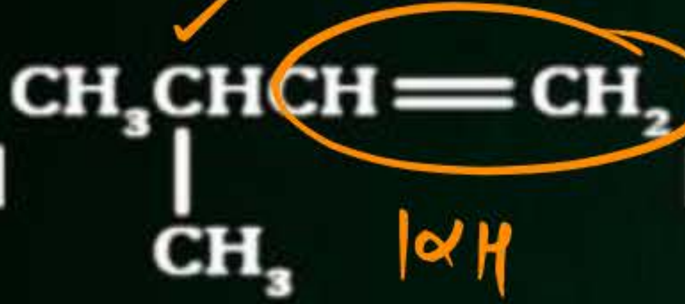
Aro

3π

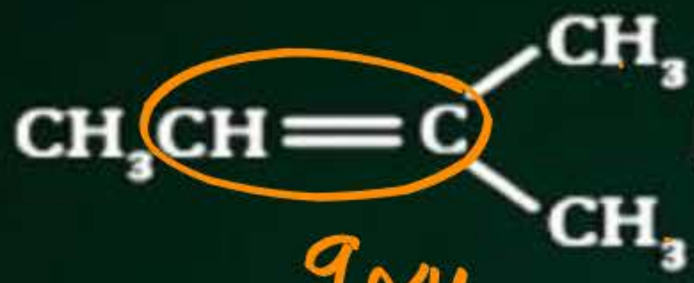
QUESTION

Lowest stable

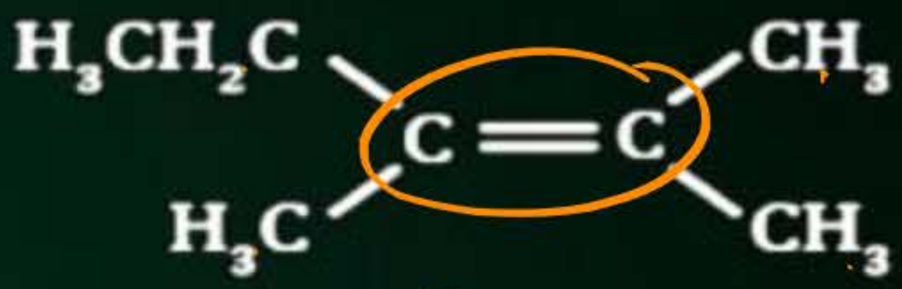
Which one has the highest heat of hydrogenation?

I

$CH_3\underset{\substack{|\\ CH_3}}{C}HCH=CH_2$

1αH

II


9αH

III


11αH

(A) I

(B) II

(C) III

(D) None of the above

QUESTION

Which of the following compounds has the highest heat of combustion?

A C_4H_{10}

B C_6H_{14}

C C_5H_{12}

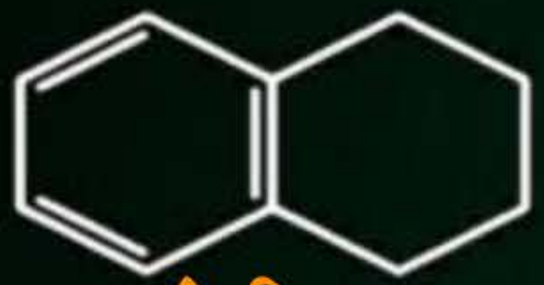
[✓ D] $C_{10}H_{22}$

QUESTION

Stability i > iii > ii

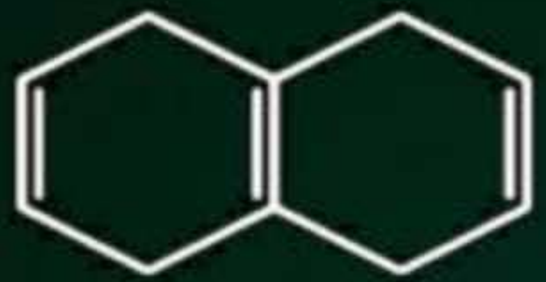
HOC i < iii < ii

Choose the correct order for heat of combustion of the following compounds:



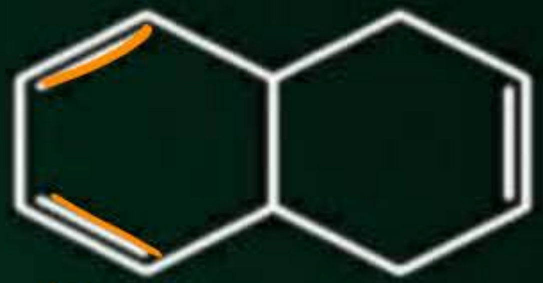
Aro

(i)



Noreso

(ii)



Resu

(iii)

A (i) > (ii) > (iii)

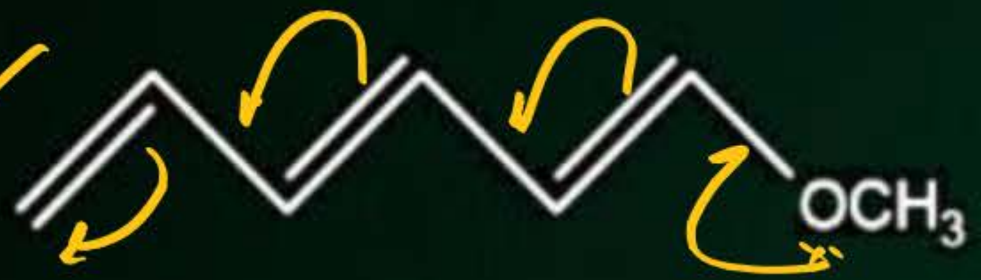
B (i) > (iii) > (ii)

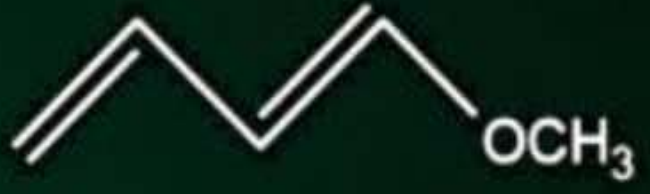
[✓ C] (ii) > (iii) > (i)

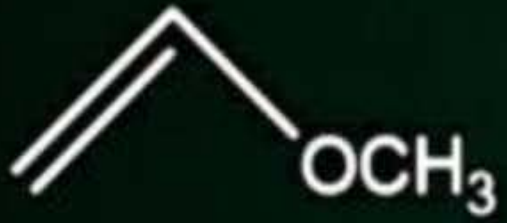
D (iii) > (ii) > (i)

QUESTION

Which of the following compounds has the highest resonance energy?

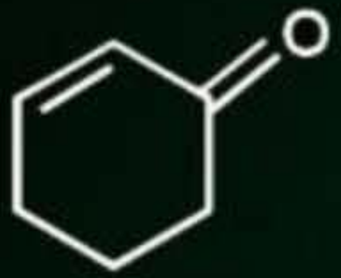
(A) 

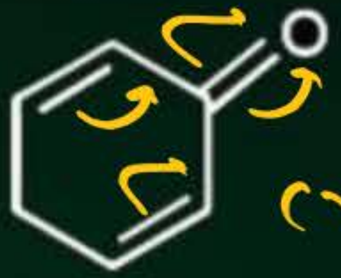
(B) 

(C) 

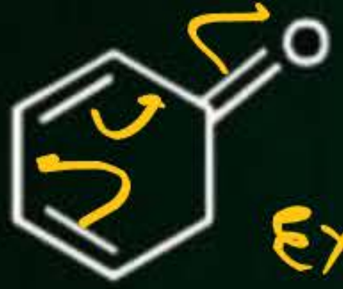
(D) All have the same resonance energy.

QUESTION

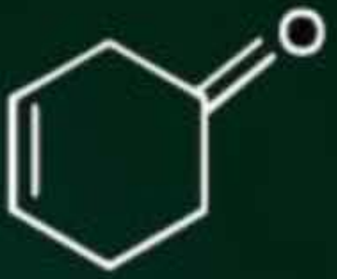
(I)


(II)


cross

✓ (III)


Ext

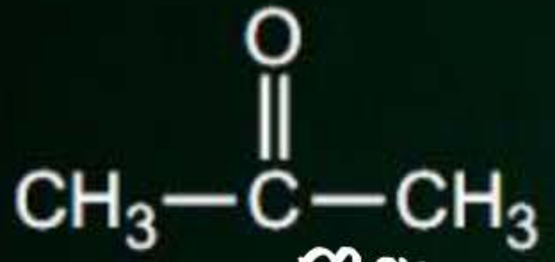
(IV)


Among these compounds, which one has maximum resonace energy?

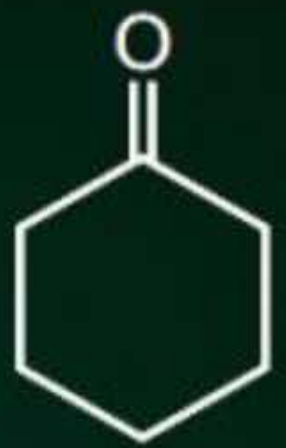
- A I
- B II
- [✓ C] III
- D IV

QUESTION

Maximum enol content is observed in:

A

$CH_3-\overset{\overset{\displaystyle O}{\|}}{C}-CH_3$

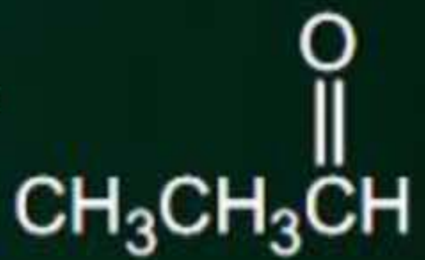
mono

B
mono


[✓ C] $CH_3COCH_2COCH_3$

di

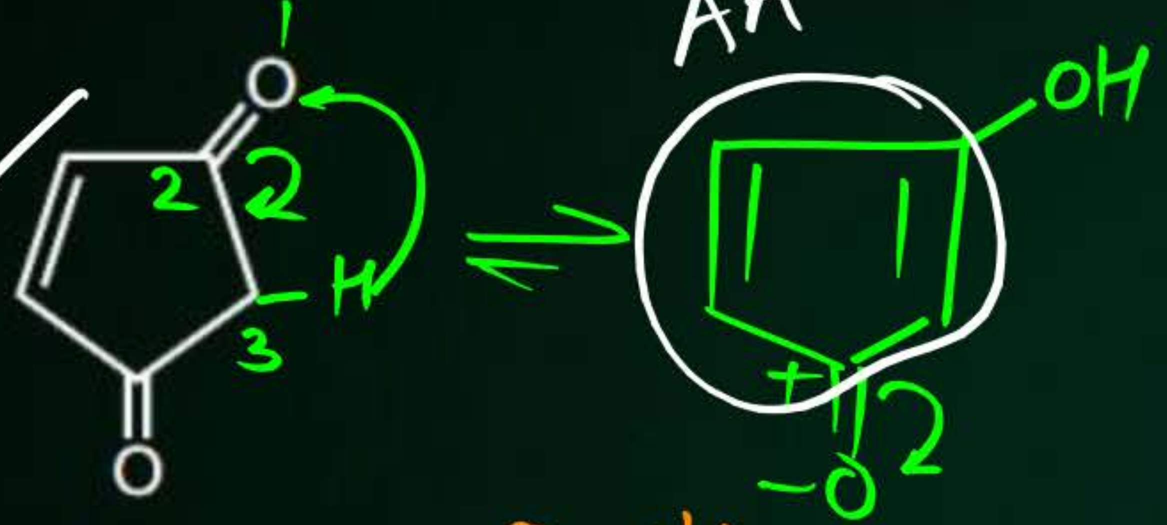
mono

D

$CH_3CH_3\overset{\overset{\displaystyle O}{\|}}{C}H$

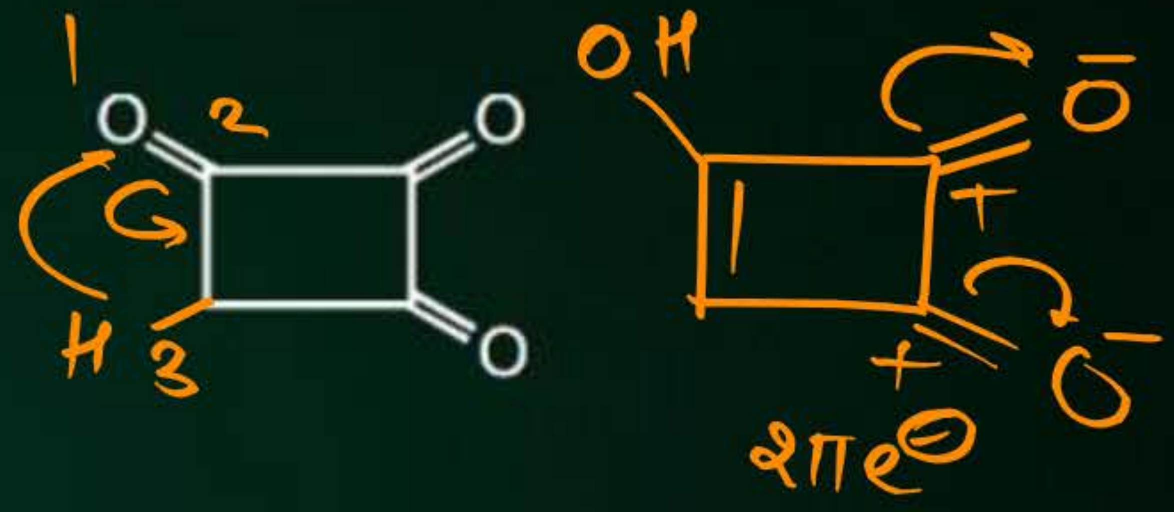
QUESTION

Which of the following compounds has negligible enol?

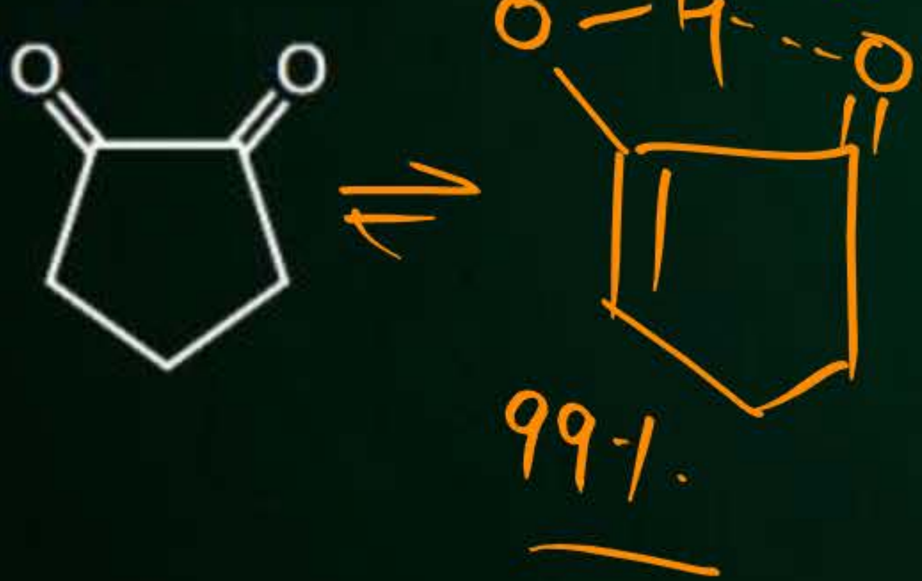
A


1
2
2
3
H
AA
OH
2

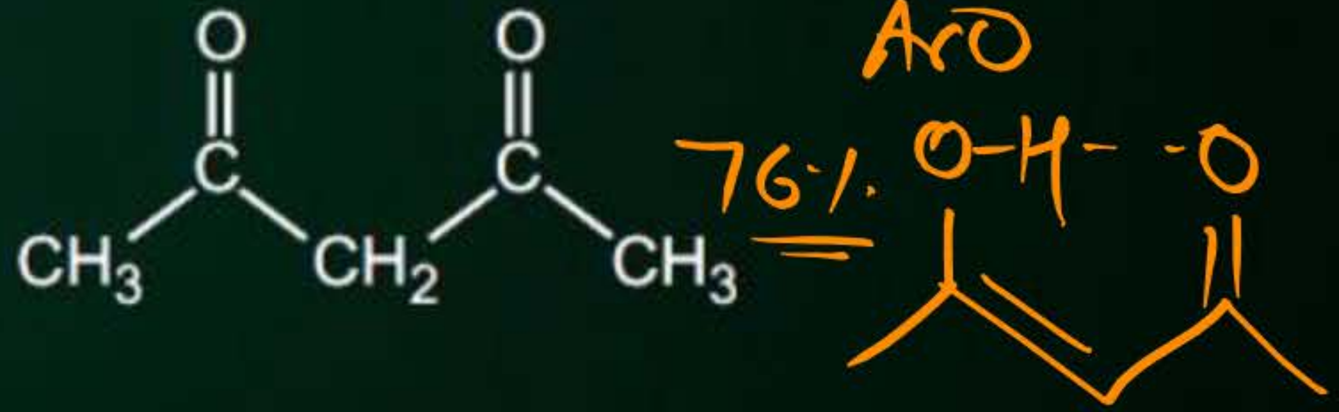
B



C

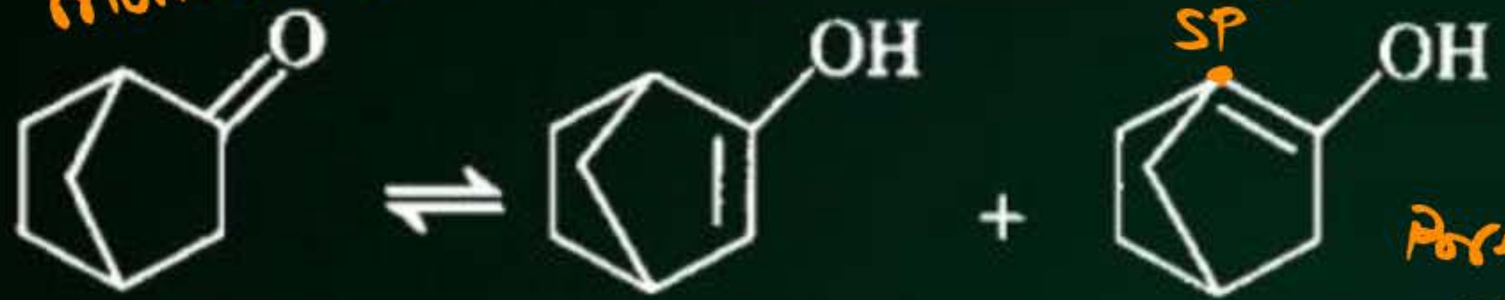


D


CH3
CH2
CH3
76%
ArO

QUESTION

Stability order among these tautomer is:


mono keto
O
OH
sp^2
OH
Bredt's rule

(X) (Y) (Z)

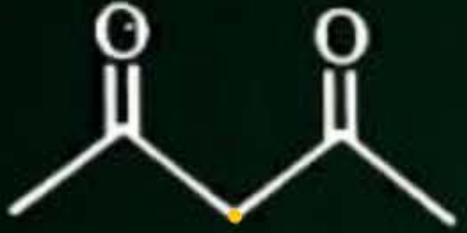
- Ⓐ $X > Y > Z$ ✓
- Ⓑ $Y > X > Z$
- Ⓒ $Z > X > Y$
- Ⓓ $Y > Z > X$

$X > Y > Z$

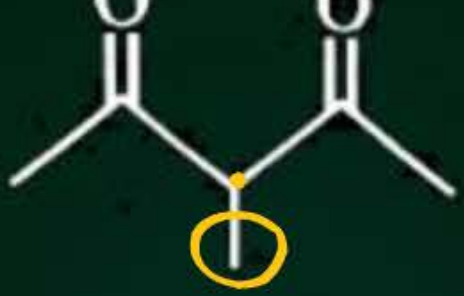
QUESTION

The decreasing order of enol content of following 1,3-dicarbonyl compound is:

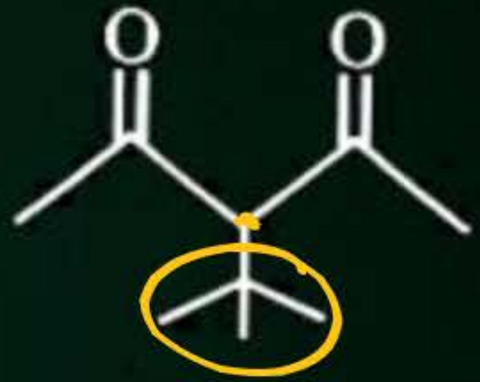
(I)



(II)



(III)



[✓ A] I > II > III

B II > I > III

C III > II > I

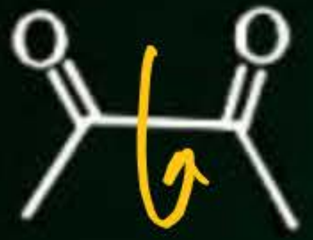
D II > III >I

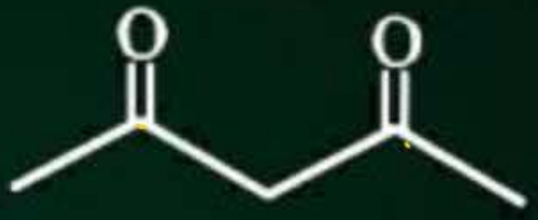
QUESTION

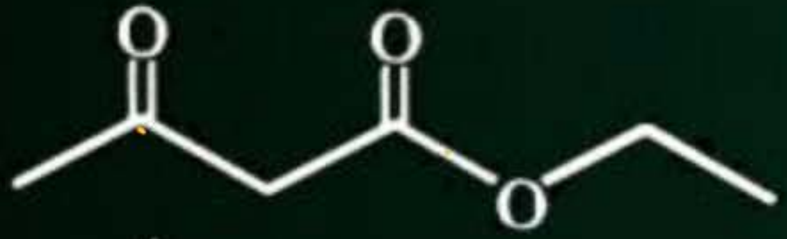
Max enol content

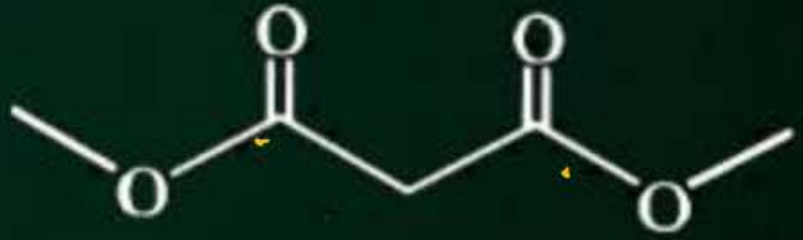
The compound which predominantly exists in its enol form is:

B>C>D>A

A


B


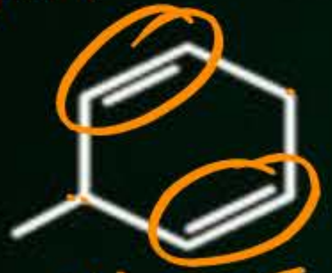
C


D


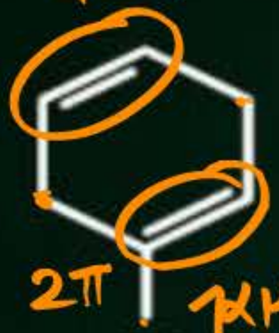
QUESTION

Stability III >

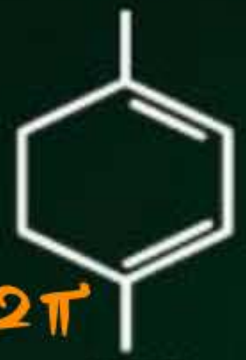
The order of heat of hydrogenation in following compound is:



(I)

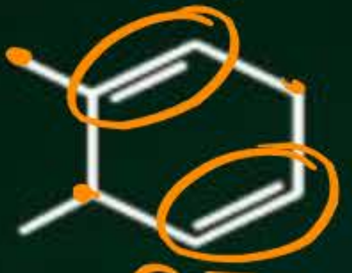


(II)



(III)

Reso



(IV)

(A) I < II < IV < III

(B) ✓ III < IV < II < I

(C) II < III < I < IV

(D) II < IV < 1 < III

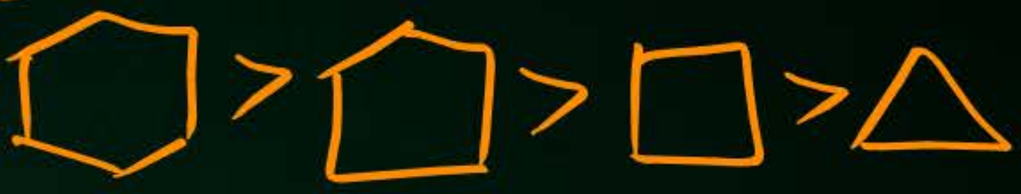
QUESTION

Stability 3>1>4>2

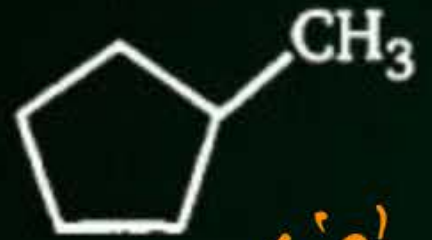
HOC 2>4>1>3

No of C ↑

HOC ↑



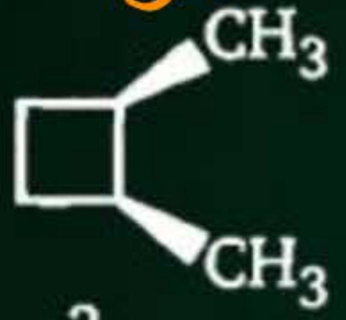
Rank the following substances in order of decreasing heat of combustion (maximum → minimum).



6'C'

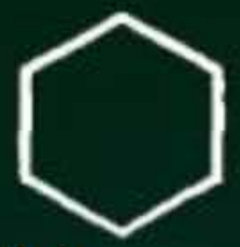
1

cis



2

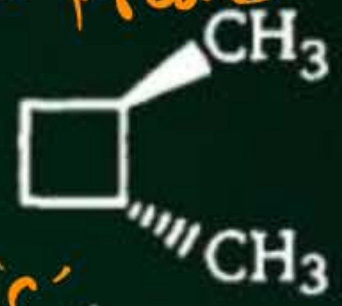
6'C'



6'C'

3

Trans



6'C'

4

Stability of Ring

6>5>4>3

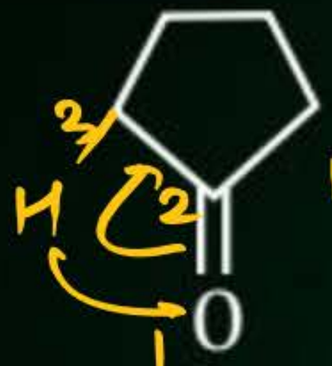
A 1 > 2 > 4 > 3

B 3 > 4 > 2 > 1

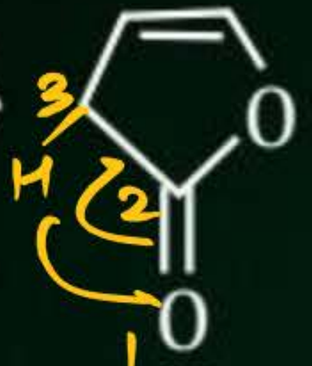
[✓ **C** 2 > 4 > 1 > 3]

D 1 > 3 > 2 > 4

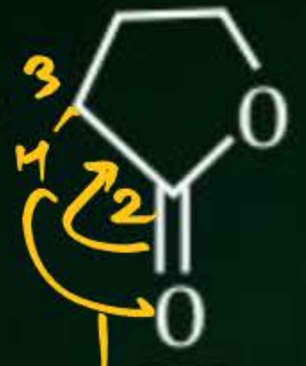
QUESTION



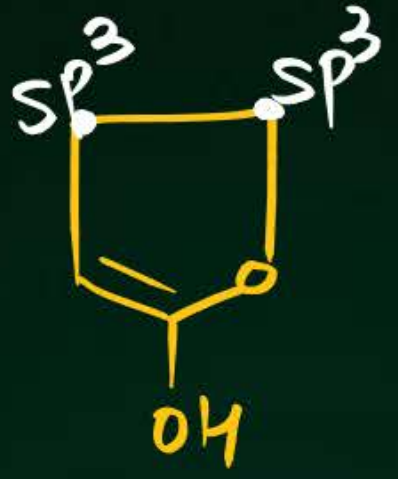
I

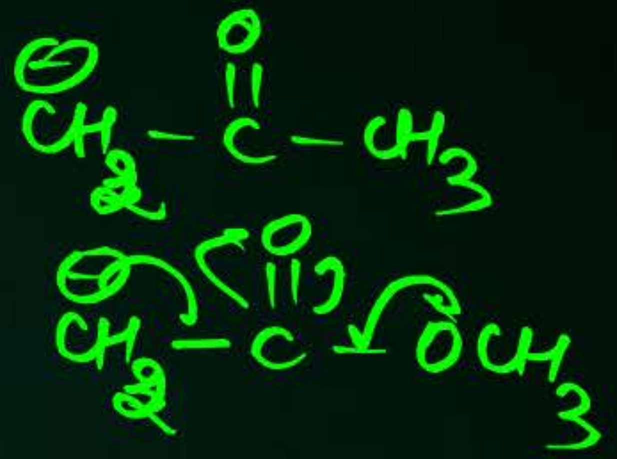


II



III

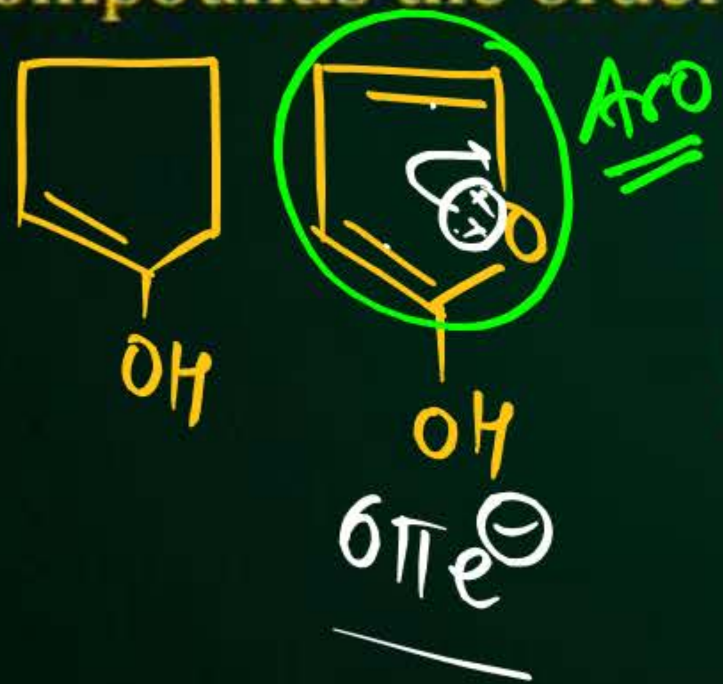




$\overset{\ominus}{C}H_2-\overset{O}{\overset{\|}{C}}-CH_3$

$\overset{\ominus}{C}H_2-\overset{O}{\overset{\|}{C}}-\ddot{O}CH_3$

Among these compounds the order of enol content should be:


OH
OH
Aro
6πe⊖

(A) I > II > III

(B) III > II > I

[✓ (C) II > I > III]

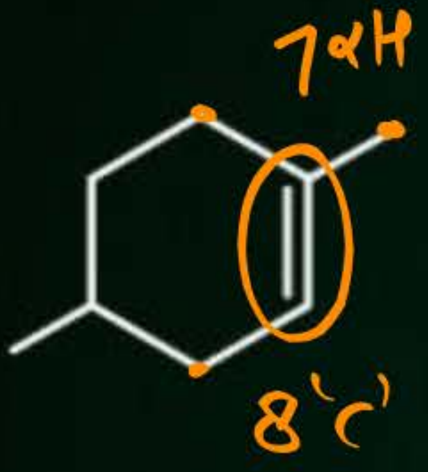
(D) II > III > I

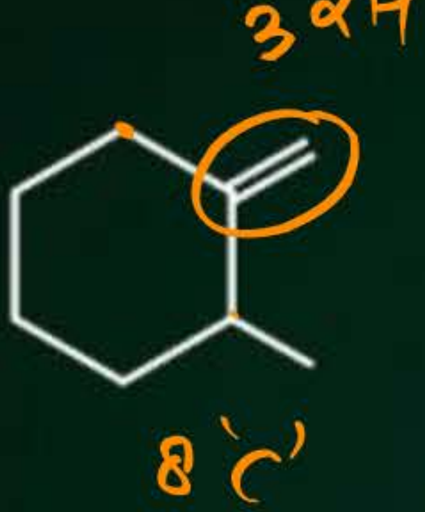
QUESTION

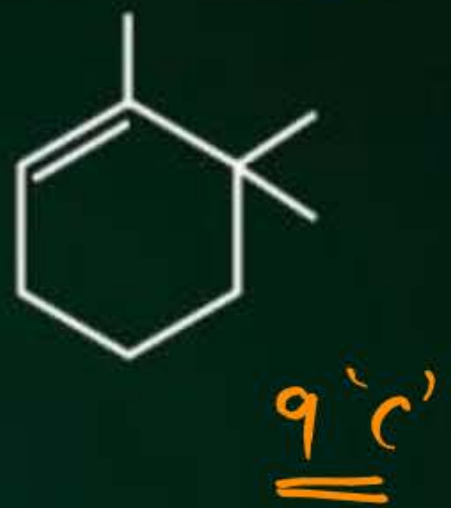
stability I > IV > II

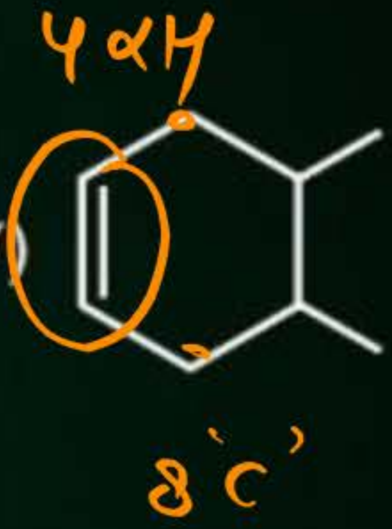
HOC I < IV < II < III

Correct order for the heat of combustion of the following is:

(I)


(II)


(III)


(IV)


A I > II > IV > III

B IV > I > II > III

C III > I > IV > II

[✓ **D**] III > II > IV > I

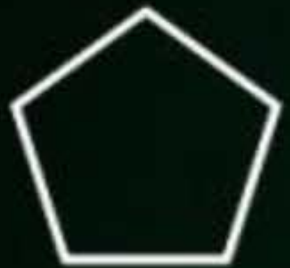
QUESTION

stability of Ring

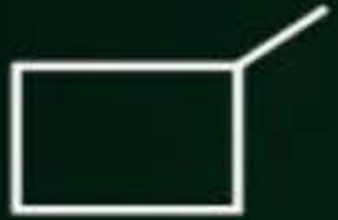
$I > II > III$

Which of the following will have largest heat of combustion?

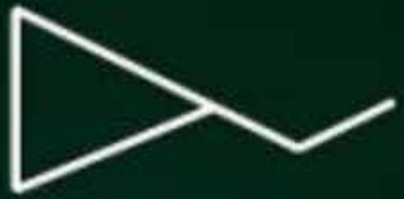
HOC $I < II < III$



(I) 5 'C'



(II) 5 'C'



5 'C' (III)

A I

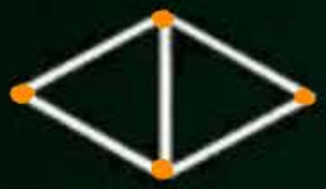
B II

[✓ **C** III]

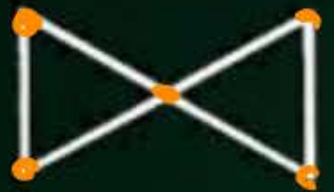
D All will have same heat of combustion because DBE = 1 for all

QUESTION

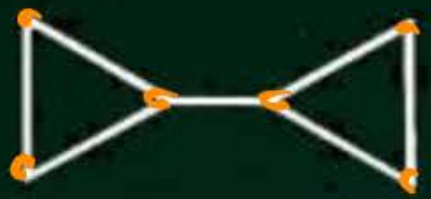
The correct order of heat of combustion of the following compound is:



(I) 4 'C'.



(II) 5 'C'



(III) 6 'C'

A I > II > III

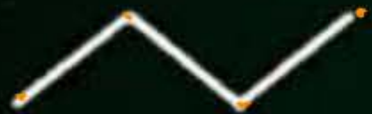
B II > I > III

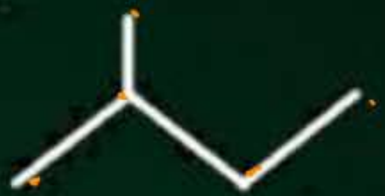
[✓ C] III > II > I

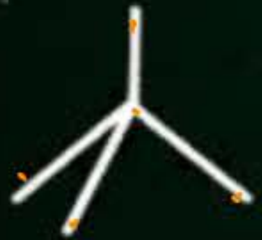
D II > III > I

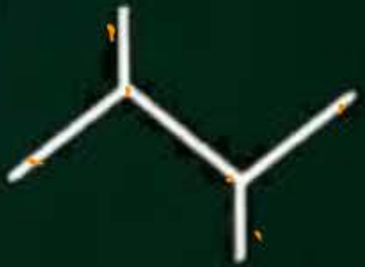
QUESTION

The compound having highest heat of combustion among the following is

A

4 'C'

B

5 'C'

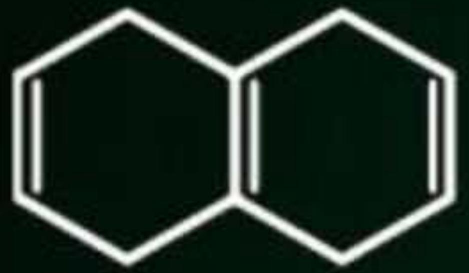
C

5 'C'

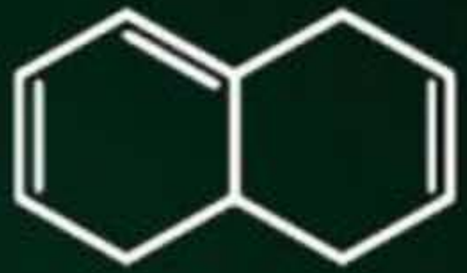
[✓ D]

6 'C'

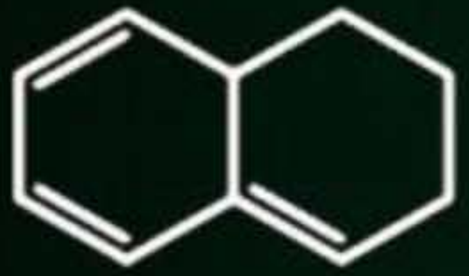
QUESTION

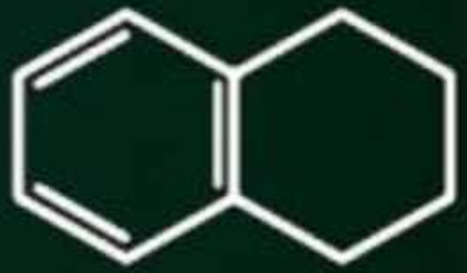
more stable

Which of the following is having minimum heat of hydrogenation?

A


B


C


[✓ D]


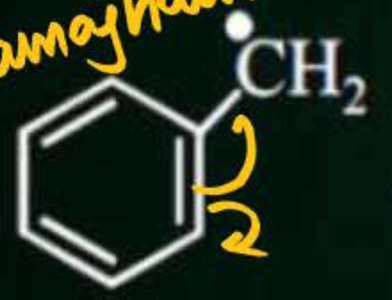
Aro

QUESTION

In the given pair of compounds select the one in each pair having higher resonance energy:

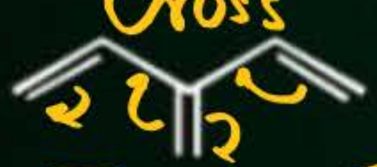
A $\overset{-}{C}H_2 = CH - \overset{\ominus}{N}H$ < and $H\overset{-}{N} = CH - \overset{\ominus}{N}H$

B Jhamajham

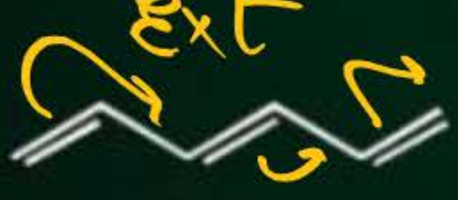


> and $CH_2 = CH - \dot{C}H_2$

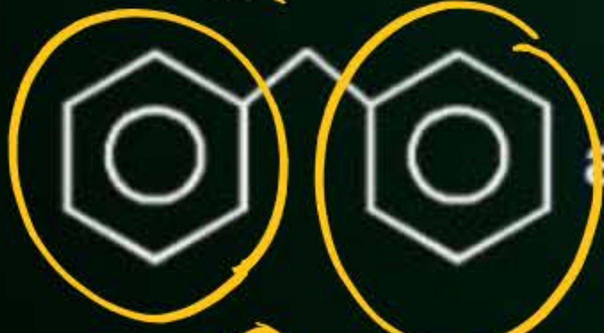
C Cross



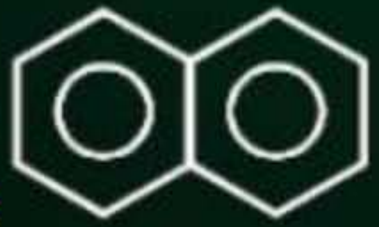
< and Ext

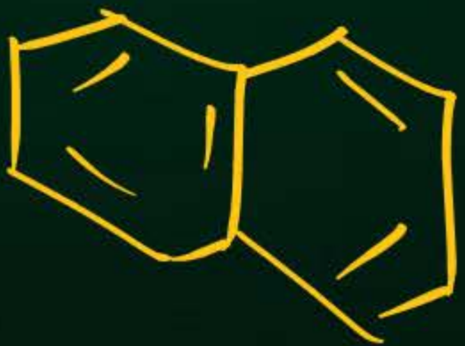


D



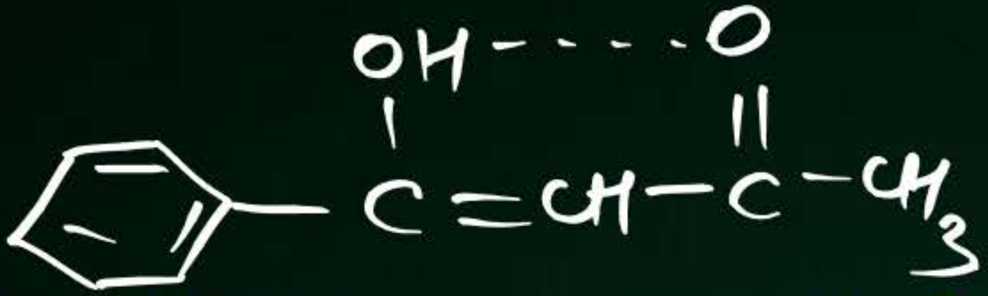
and >

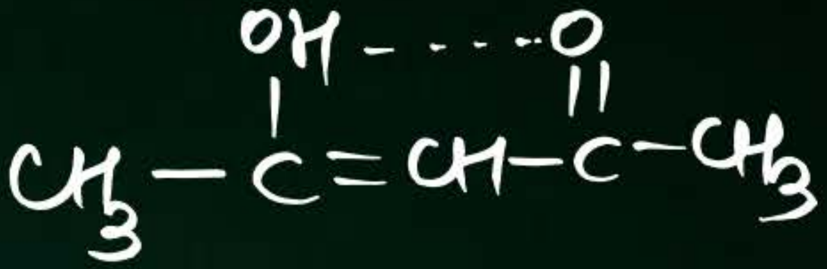




④ ③

QUESTION

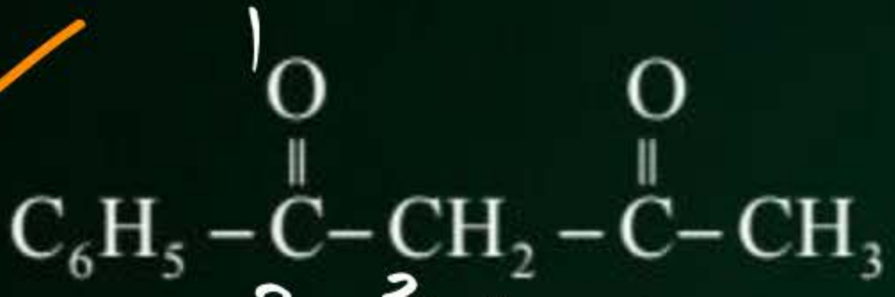




$CH_3-\overset{\overset{OH\cdots\cdots O}{|\qquad\quad\ \|}}{C=CH-C}-CH_3$

Which among the following compound will give maximum enol content in solution?

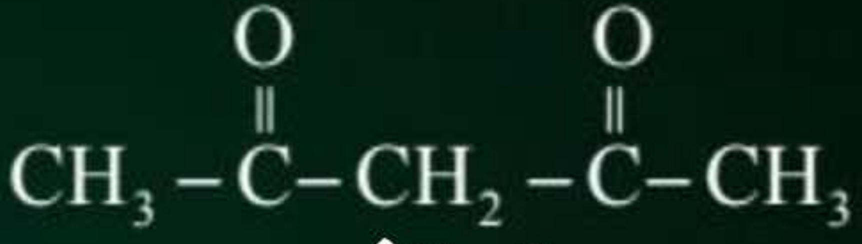
[✓ A]



$C_6H_5-\overset{\overset{O}{\|}}{C}-CH_2-\overset{\overset{O}{\|}}{C}-CH_3$

1 2 3 diketo

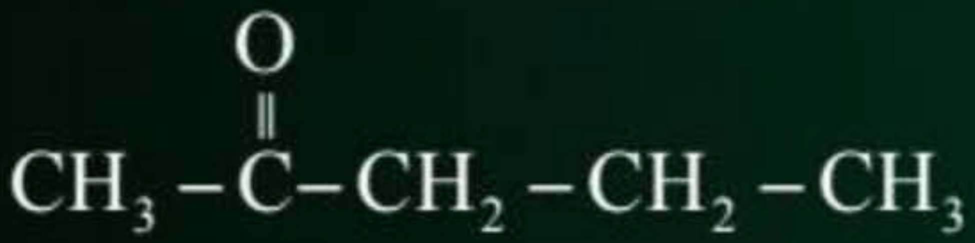
B



$CH_3-\overset{\overset{O}{\|}}{C}-CH_2-\overset{\overset{O}{\|}}{C}-CH_3$

diketo

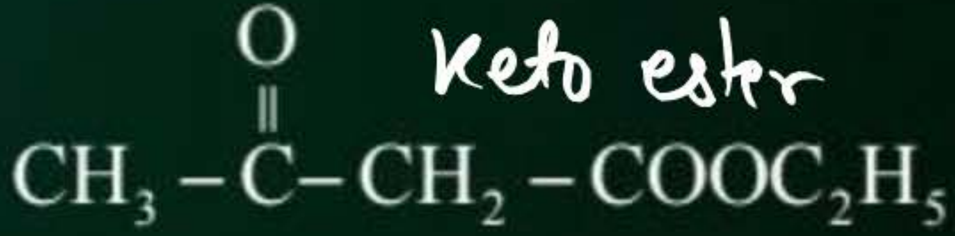
C



$CH_3-\overset{\overset{O}{\|}}{C}-CH_2-CH_2-CH_3$

Mono keto

D

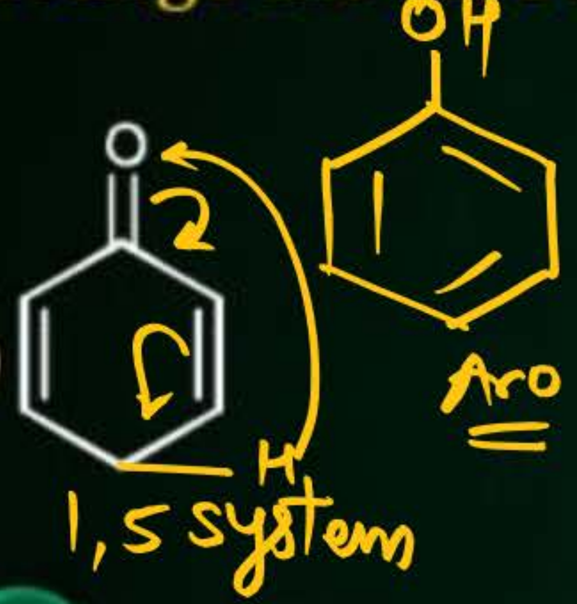


$CH_3-\overset{\overset{O}{\|}}{C}-CH_2-COOC_2H_5$

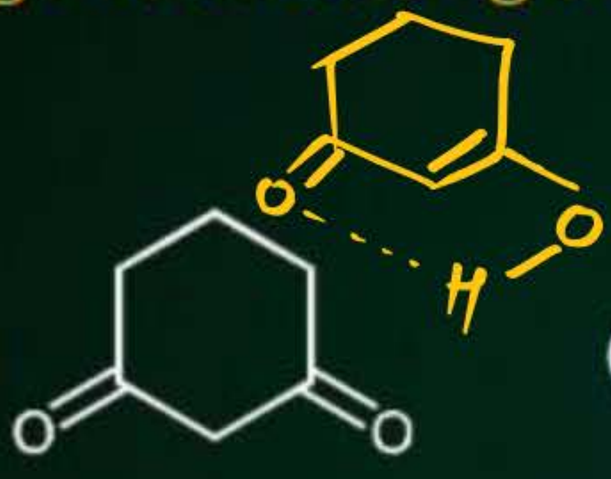
keto ester

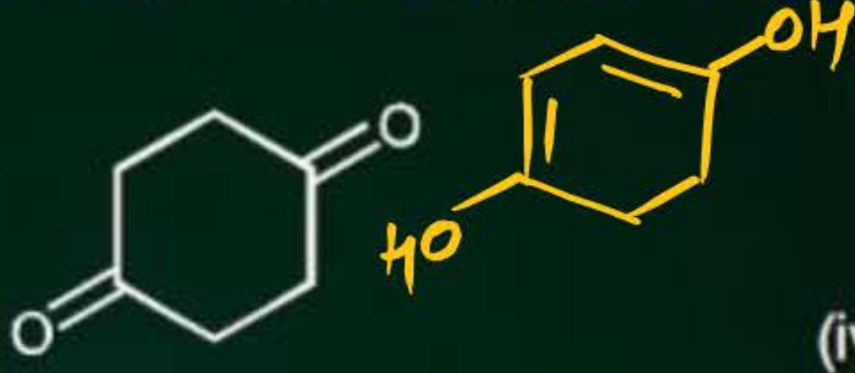
QUESTION

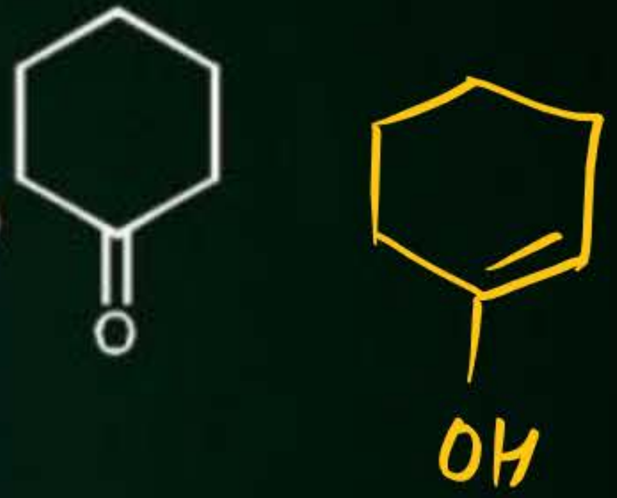
Arrange the following in decreasing order of percentage enol content.

(i)


OH
2
Aro
H
1,5 system

(ii)


(iii)


(iv)


[✓ A] I > II > III > IV

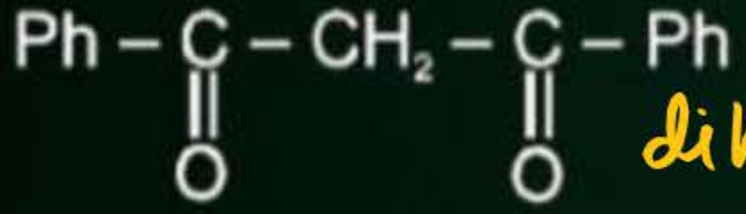
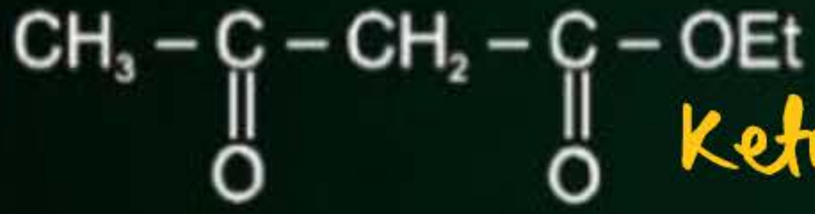
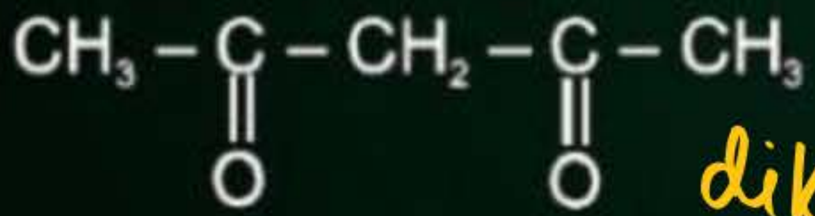
B II > I > III > IV

C II > III > I > IV

~~D~~ III > II > IV > I

QUESTION

Match the column.

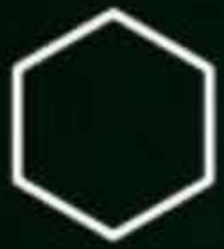
Column-I (Keto)	Column-II (% enol)
(A) $CH_3-CH=O$ – (z)	(x) 95 %
(B)  $\mathrm{Ph}-\underset{\underset{O}{\parallel}}{C}-CH_2-\underset{\underset{O}{\parallel}}{C}-\mathrm{Ph}$ diketo (x)	(y) 76 %
(C)  $CH_3-\underset{\underset{O}{\parallel}}{C}-CH_2-\underset{\underset{O}{\parallel}}{C}-OEt$ Keto ester (w)	(z) 0.0001 %
(D)  $CH_3-\underset{\underset{O}{\parallel}}{C}-CH_2-\underset{\underset{O}{\parallel}}{C}-CH_3$ diketo (y)	(w) 7.2 %

Home Work

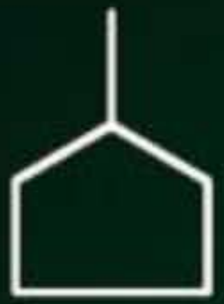
QUESTION 01

The correct order of heat of combustion of the following hydrocarbons is:

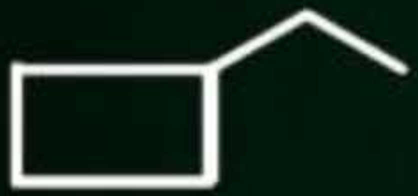
(I)



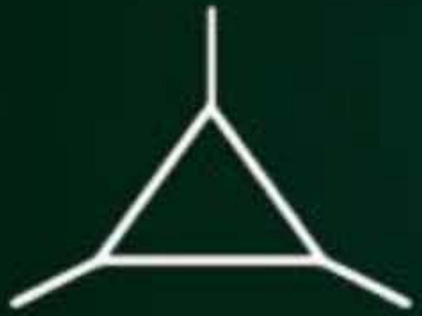
(II)



(III)



(IV)



(A) I < II < III < IV

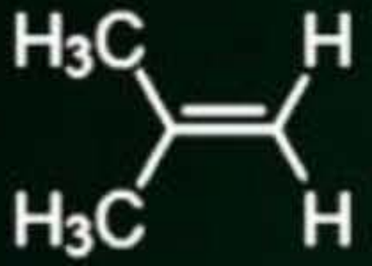
(B) I < II < IV < III

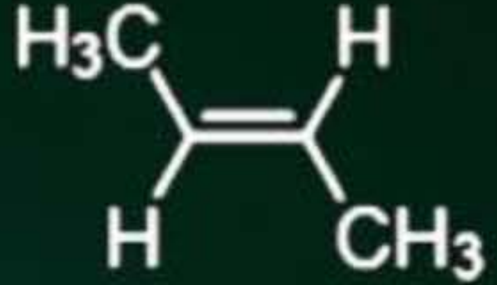
(C) II < I < III < IV

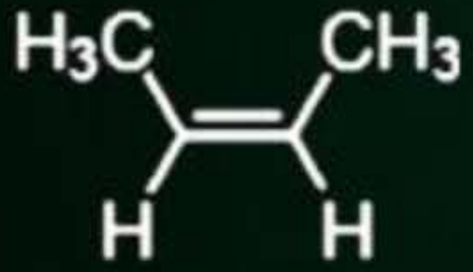
(D) IV < III < II < I

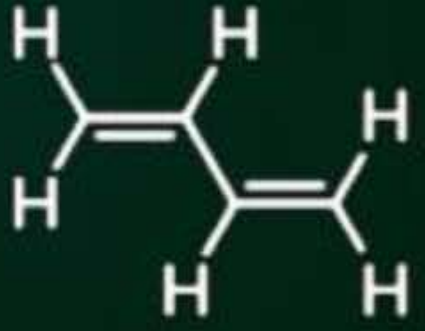
QUESTION 02

The minimum heat of hydrogenation among the following will be shown by

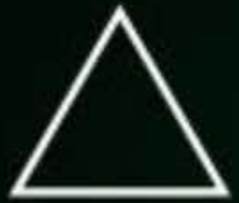
(A)


(B)


(C)


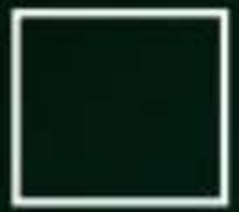
(D)


QUESTION 03



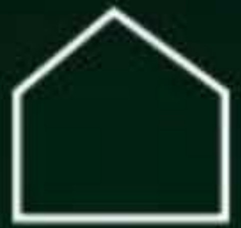
Cyclopropane

(i)



Cyclobutane

(ii)



Cyclopentane

(iii)

The correct order of heats of combustion of above compounds is:

A I > II > III

B II > I > III

C III > II > I

D III > I > II

QUESTION 04

Assertion: Heat of hydrogenation of 1-butene is more than 2-butene.
Reason: With 6-αH 2-butene is more stable than 1-butene with only 2-αH.

A Both Assertion and Reason are correct and Reason is the correct explanation for Assertion.

B Both Assertion and Reason are correct but Reason is not the correct explanation for Assertion.

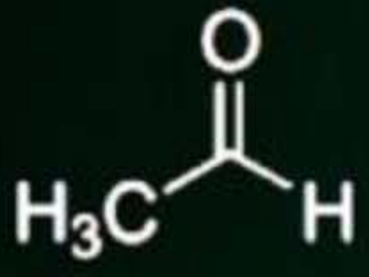
C Assertion is correct but Reason is incorrect.

D Both Assertion and Reason are incorrect.

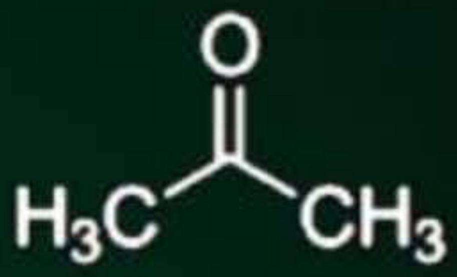
QUESTION 05

From the following compounds which has the highest enol content?

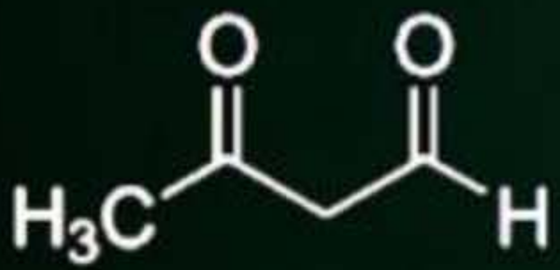
A



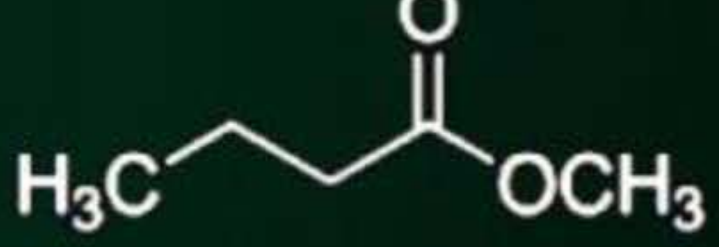
B



C



D



QUESTION 06

Which one of the following compounds would have the highest heat of hydrogenation?

A $H_2C = CH_2$

B $CH_3{-}CH_2{-}CH = CH_2$

C $H_3C{-}CH = CH - CH_3$

D $(CH_3)_2C = C(CH_3)_2$

QUESTION 07

Which of the following alkene have maximum heat of combustion?

- A 2, 4-Dimethyl-1-pentene
- B 1-Heptene
- C 2, 4-Dimethyl-2-pentene
- D 4, 4-dimethyl-2-pentene

QUESTION 08

Which of the following compounds will show the maximum 'enol' content?

(A) CH_3COCH_3

(B) $CH_3COCH_2COCH_3$

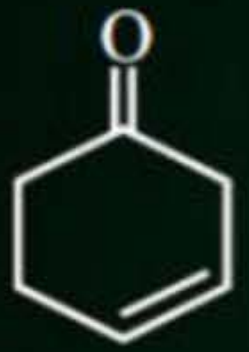
(C) $CH_3COCH_2COOC_2H_5$

(D) $CH_3COCH_2CONH_2$

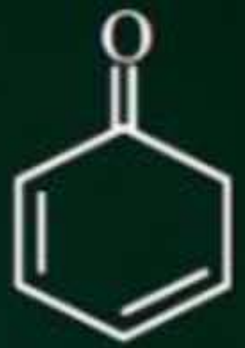
QUESTION 09

Which of the following has highest resonance energy?

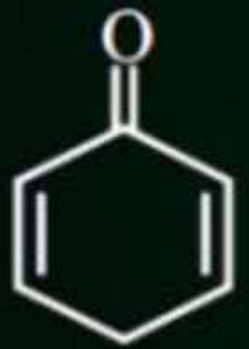
A



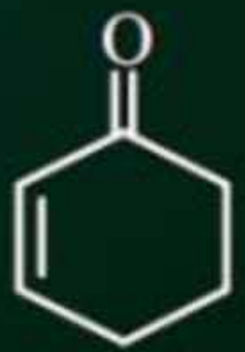
B



C



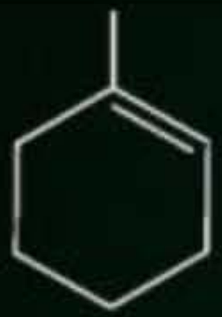
D



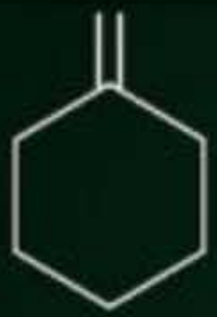
QUESTION 10

Compare heat of hydrogenation of the following:

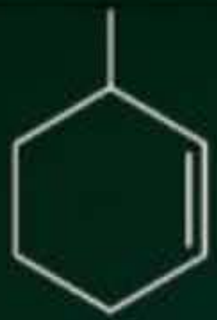
(i)



(ii)



(iii)



A i > ii > iii

B iii > ii > i

C ii > i > iii

D ii > iii > i

ANSWER KEY

1. A
2. A
3. C
4. A
5. C
6. A
7. B
8. B
9. B
10. B

Home Work From PW Module (Yakeen NEET)

Prarambh: Q 97, 144

Prabal: Q 22

Parikshit: Q 13

Thank you!!

YAKEEN 2.0

FOR NEET 2025

Lecture- 10 Organic Chemistry

Some Basic Principles and Techniques
(GOC)

By- Pankaj Sir(POPU MAMA)

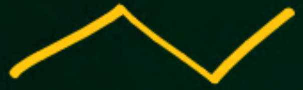
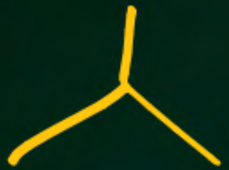
Physics Wallah

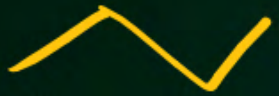
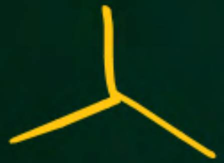
Topics *to be covered*

1. Acidic Strength ✓
2. Acidic Strength in different families ✓
3. Practice

Stability of Alkane

Branch ↑ stability ↑

Stability  < 

HOC  > 

Acidic Strength of Carboxylic Acids & Phenols

S.I.R ⇒ Steric inhibition in resonance

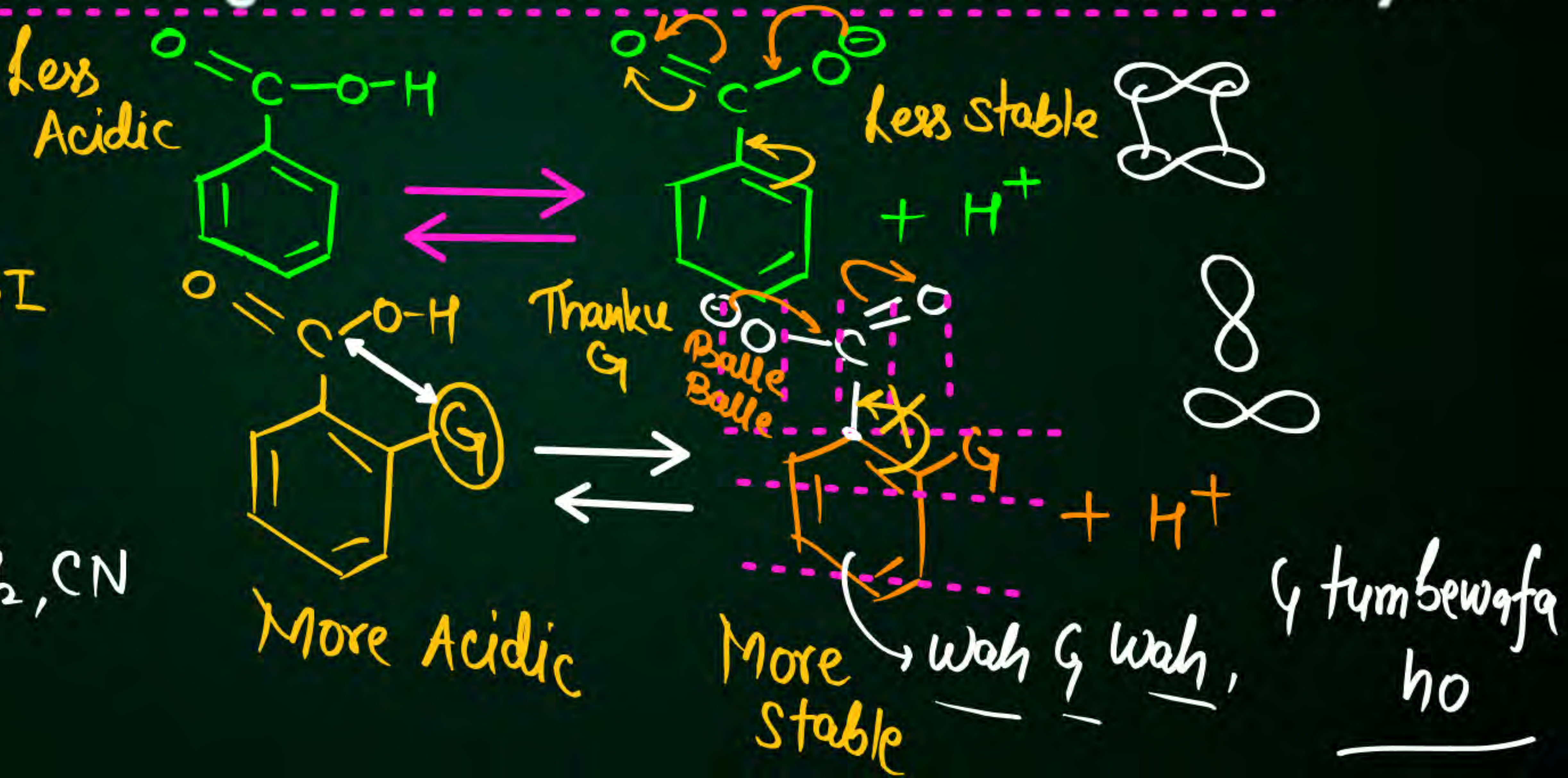
Ortho Effect: Acidic strength of ortho substituted aromatic carboxylic acid increases.

G → Bulky

R, NO_2, Cl, Br, I
CHO etc

Non bulky

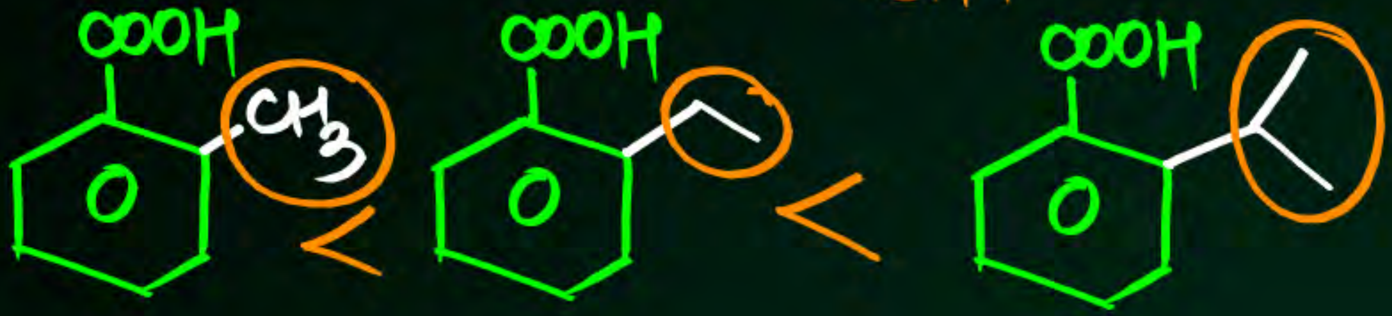
H, D, T, F, OH, NH_2, CN
etc


Less Acidic
less stable
$+ H^+$
Thanku G
Balle Balle
$+ H^+$
More Acidic
More Stable
wah G wah,
G tum bewafa ho

Q Compare A.S

No of C ↑ Size ↑ bulky ↑
SH ↑

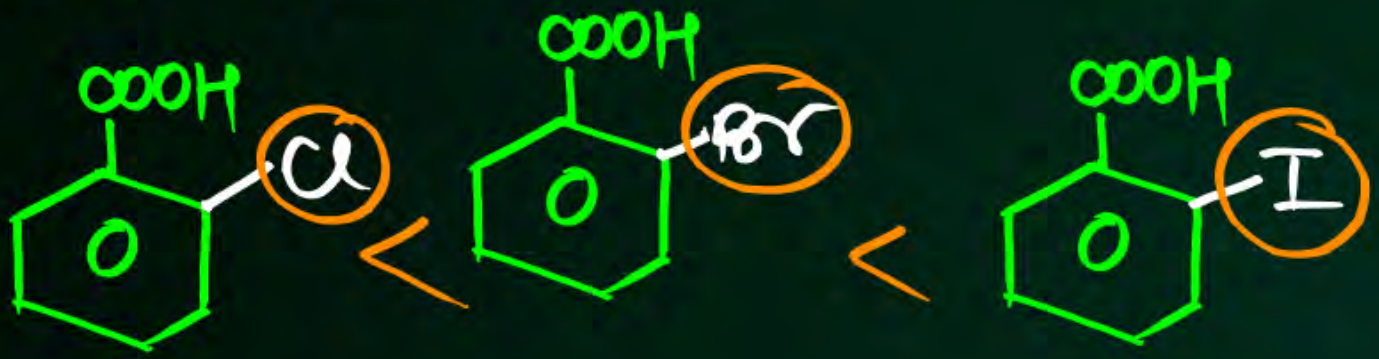
①



COOH
CH_3
<
COOH
<
COOH

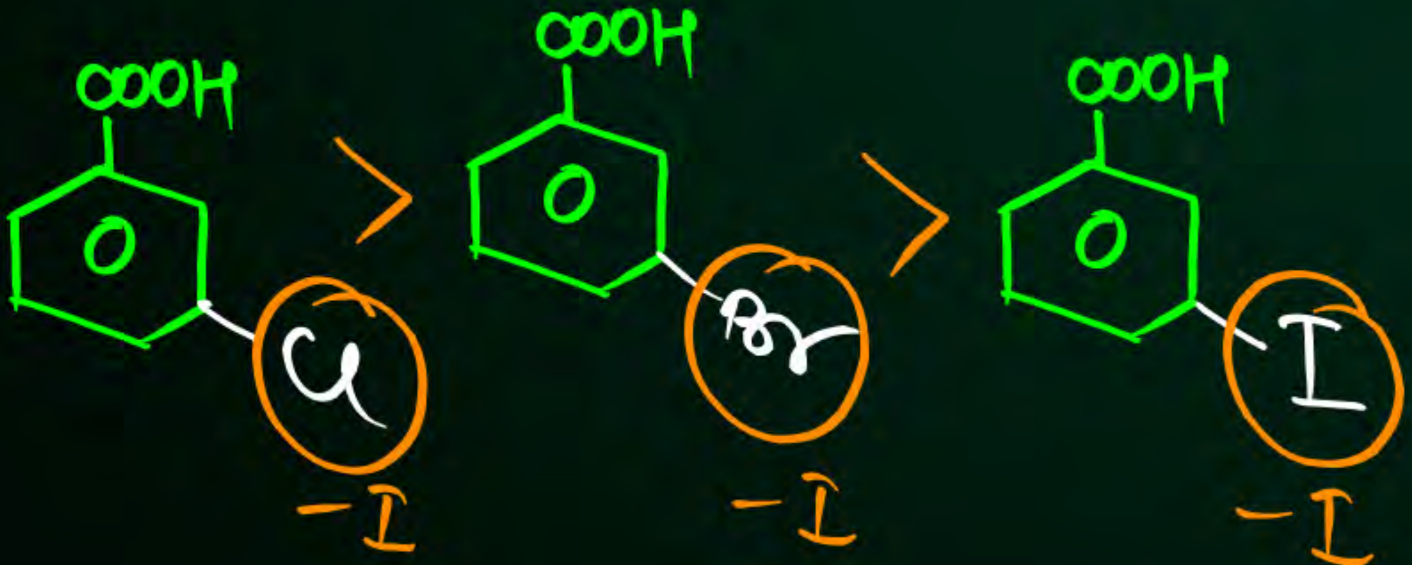
Size Cl < Br < I

②



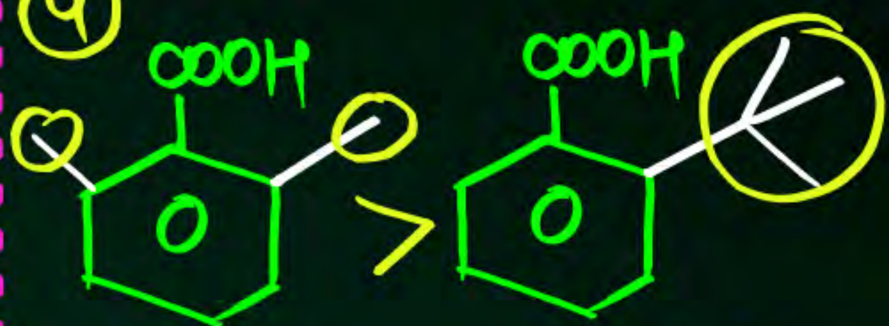
COOH
Cl
<
COOH
Br
<
COOH
I

③



COOH
Cl
-I
>
COOH
Br
-I
>
COOH
I
-I

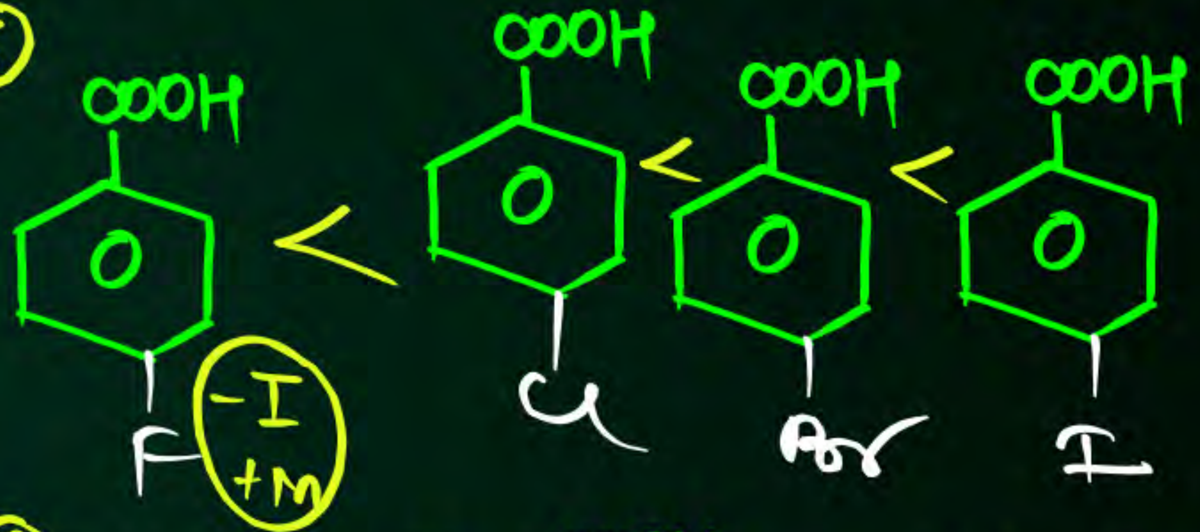
④*



2 SIR 1 SIR

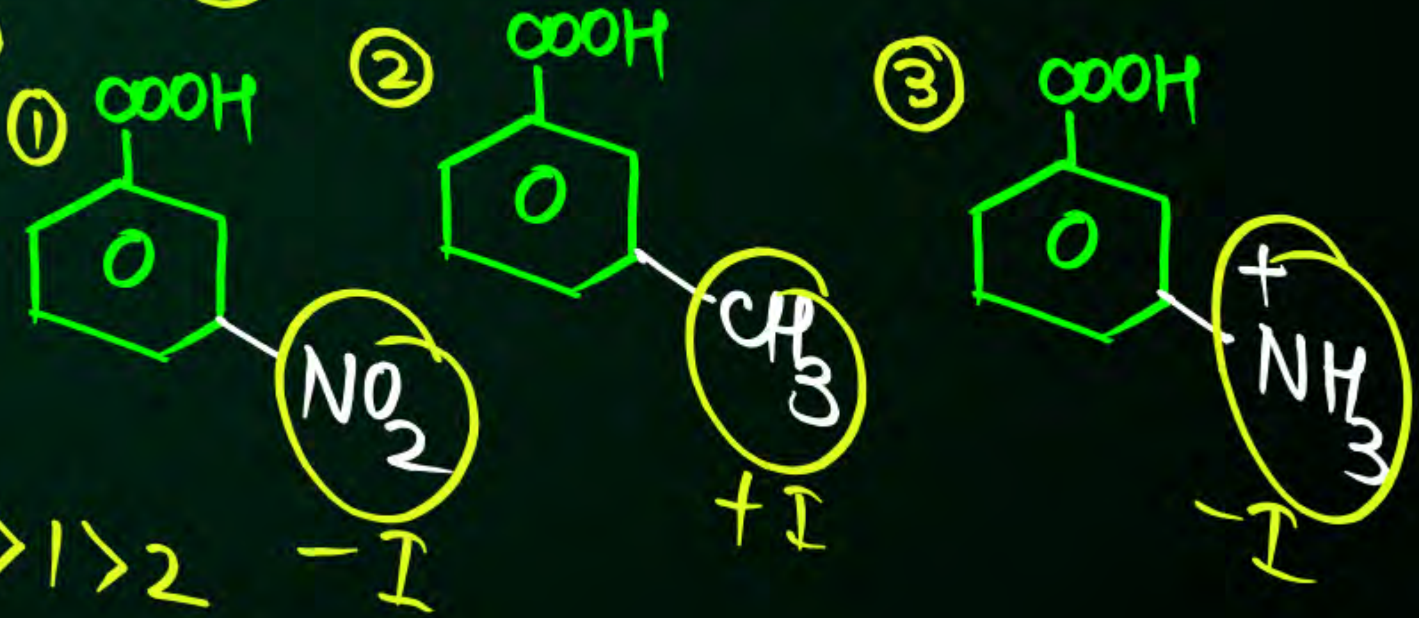
ewg
[F < Cl < Br < I]

⑤



COOH
F
-I
+M
<
COOH
Cl
<
COOH
Br
<
COOH
I

⑥



①
COOH
NO_2
-I
②
COOH
CH_3
+I
③
COOH
$\overset{+}{N}H_3$
-I

3 > 1 > 2

orthoeffect ✓

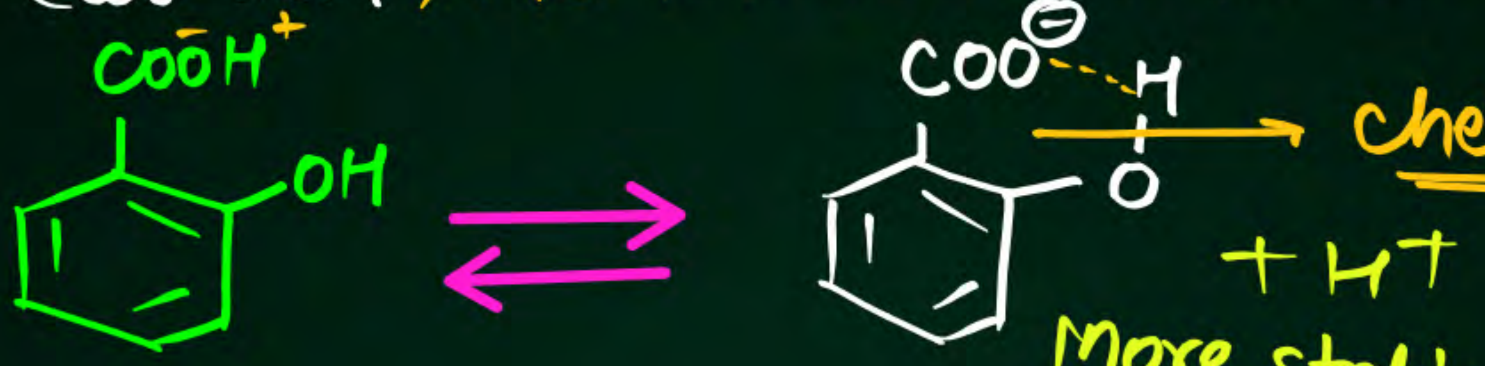
AS↑ orthoeffect se

$$\boxed{AS \propto -M, -H, -I \propto \frac{1}{+M, +H, +I}}$$

② Hydrogen Bonding

a) In Aromatic car acid, As increases due to Intra 'H' bond.

More Acidic

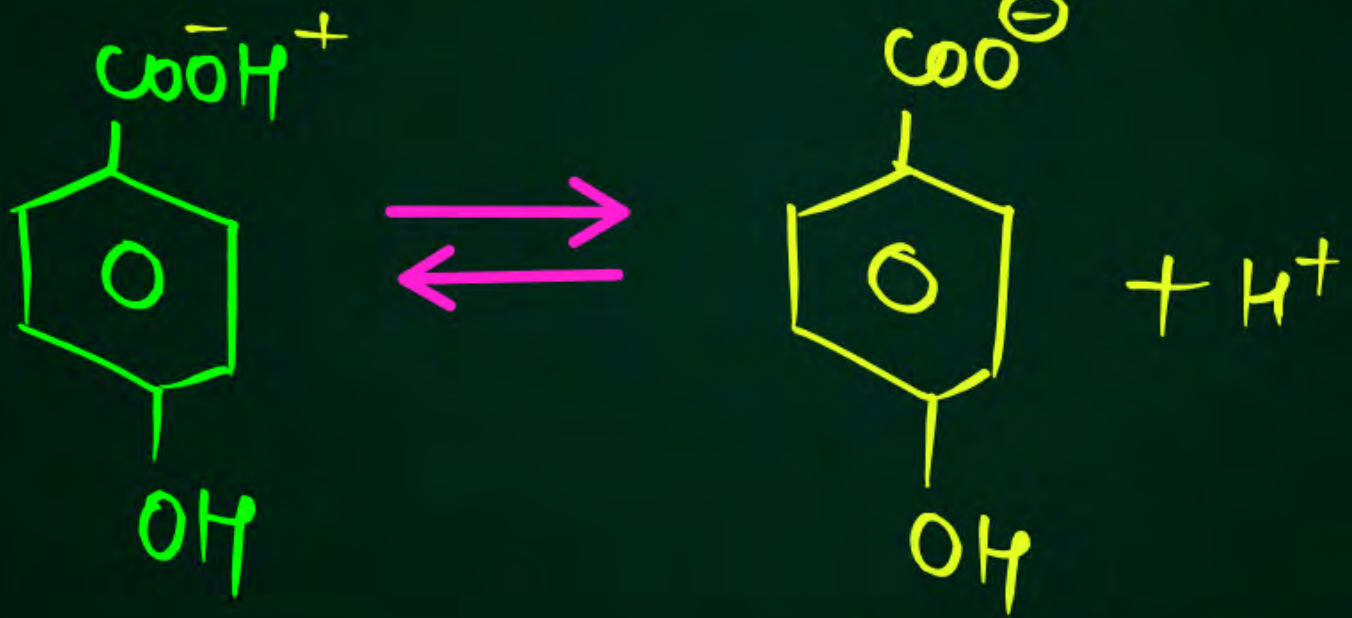


$CO\bar{O}H^+$
OH
$COO^{\ominus}$
H
O
+ H^+

chelate

More stable

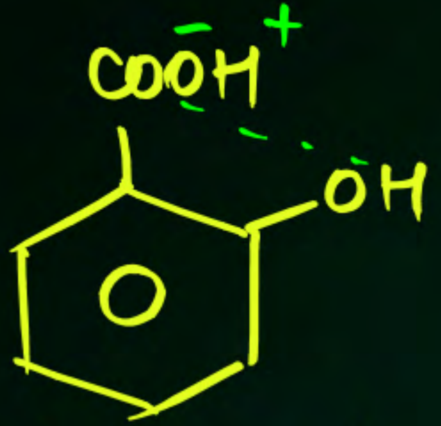
Less Acidic



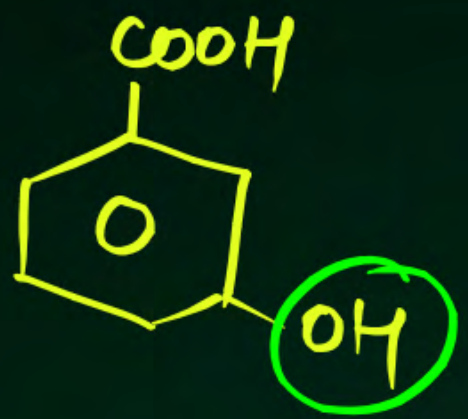
$CO\bar{O}H^+$
OH
$COO^{\ominus}$
OH
+ H^+

No chelate
Less stable

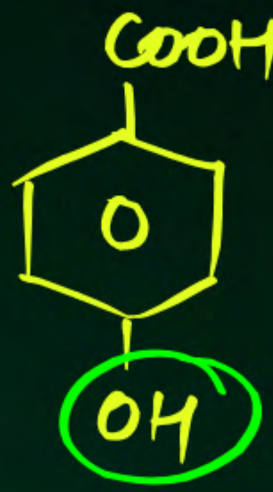
Q/



Intra 'H' Bond



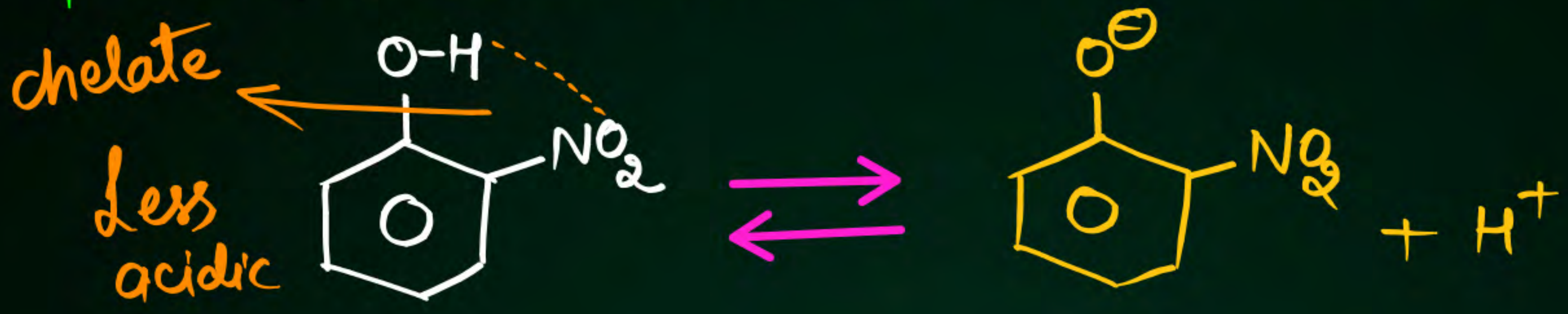
-I

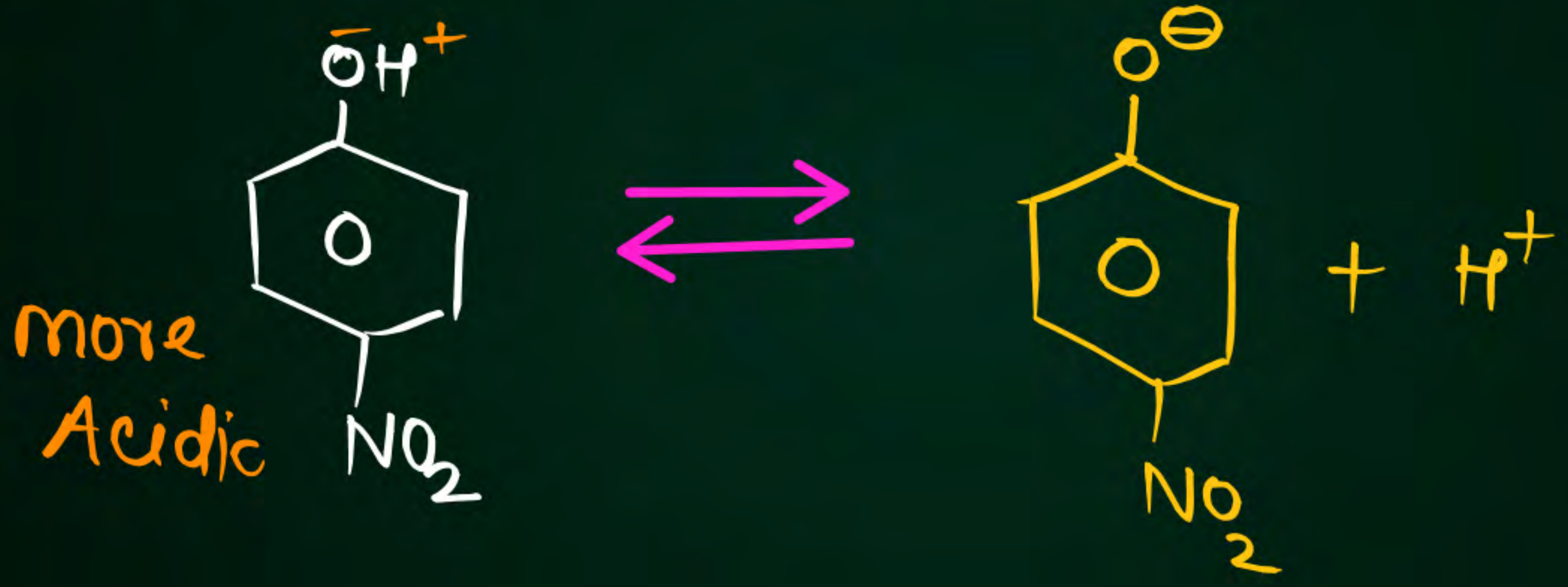


+M > ~~-I~~

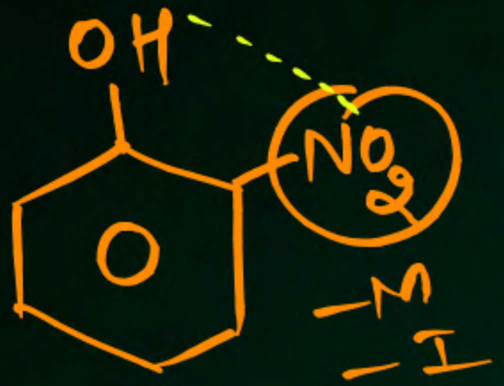
① > ② > ③

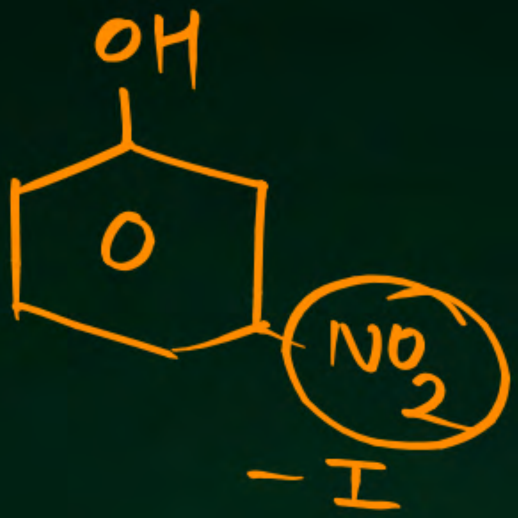
b) In phenols, A.S decreases due to Intra 'H' Bond.

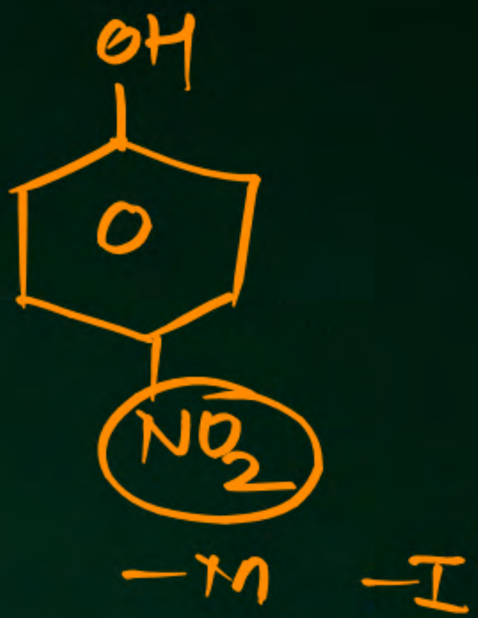

chelate
O-H
NO_2
Less acidic
$O^{\ominus}$
NO_2
$+ H^+$


$\bar{O}H^+$
more Acidic
NO_2
$O^{\ominus}$
$+ H^+$
NO_2

Q/



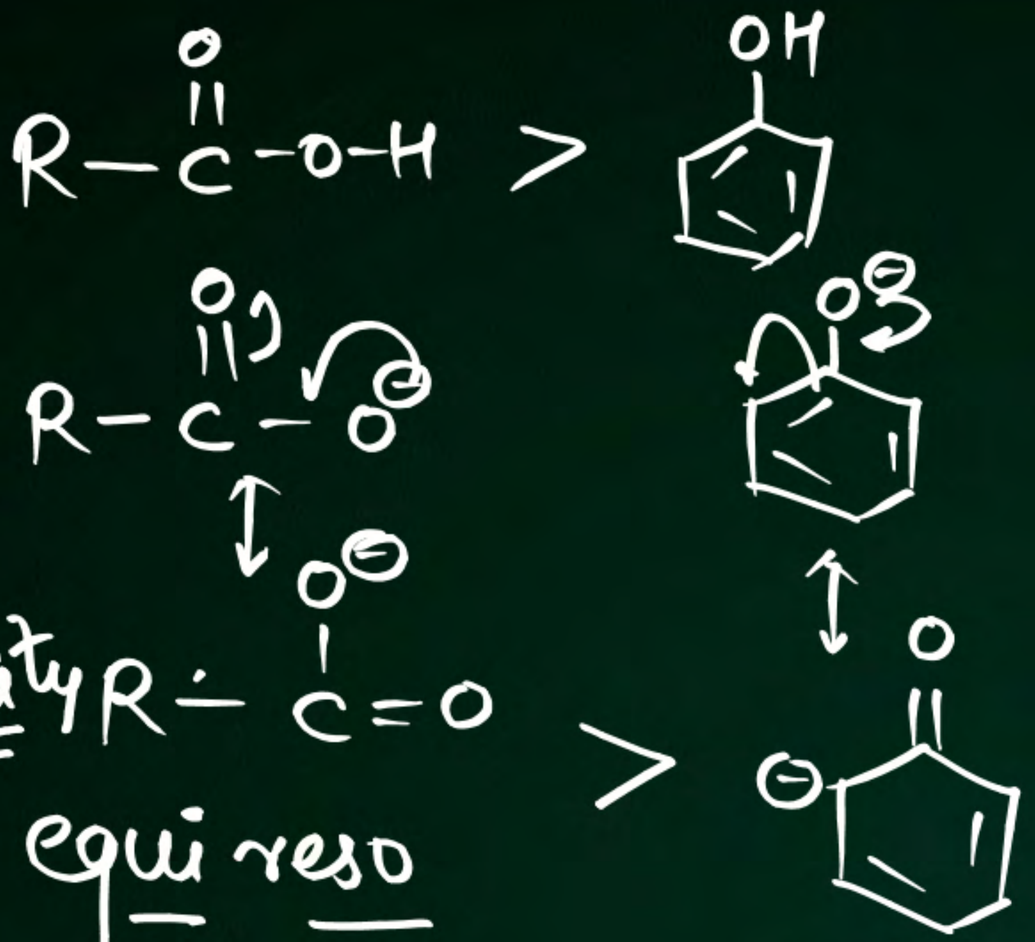




$$\boxed{P > O > M}$$

op point

A.S


R–C(=O)–O–H > OH
R–C(=O)–O⊖
R–C(–O⊖)=O
>
O⊖
O
⊖

Stability

equi reso

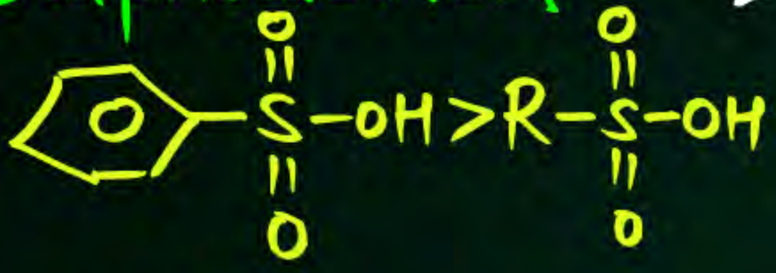
Non equi reso

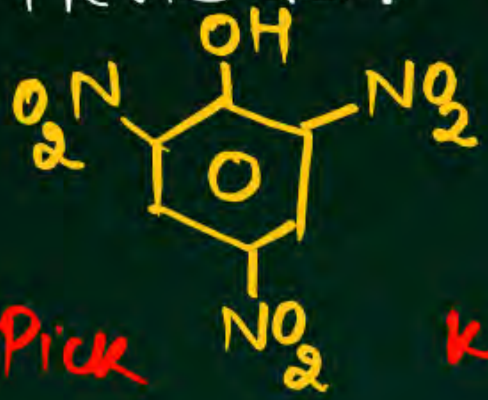
Acidic Strength in different families

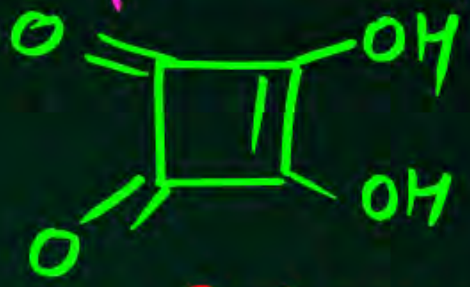
÷ Based on exp Pka value.

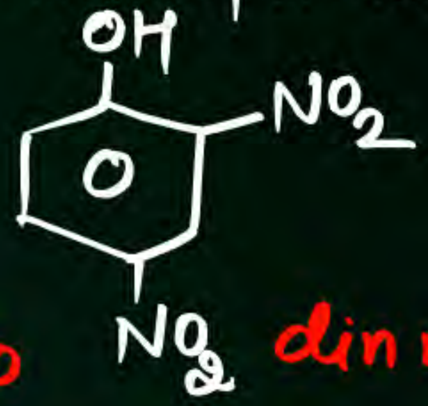
Mineral Acid

H^+ > Sulphonic Acid > Picric acid > Squaric acid > Dinitrophenol





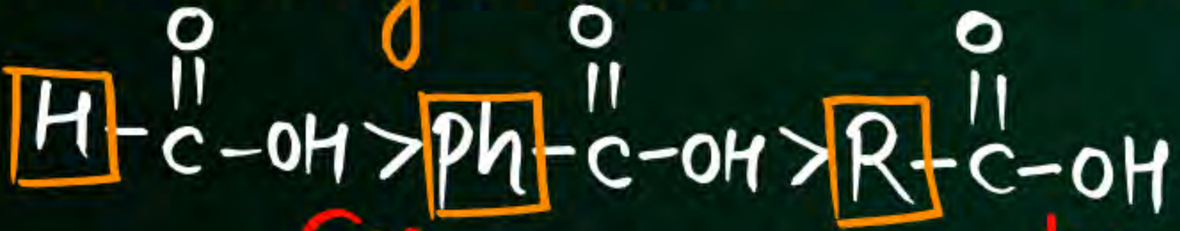




salman ne Pick kiya Sakeera ko din main aur

Phir

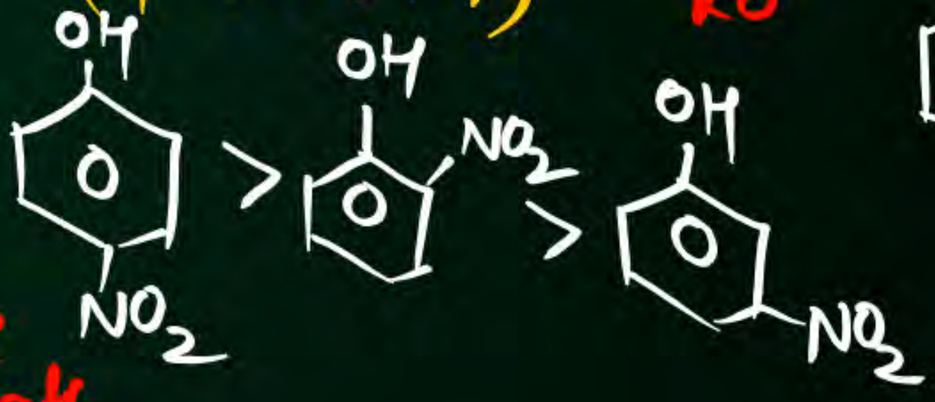
> Carboxylic acid > Carbonic acid > Mono nitrophenols > Phenol

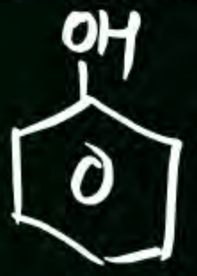


$\boxed{H}-\overset{O}{\overset{\|}{C}}-OH > \boxed{Ph}-\overset{O}{\overset{\|}{C}}-OH > \boxed{R}-\overset{O}{\overset{\|}{C}}-OH$

H_2CO_3

$(P > O > M)$ mona ko





Car he Car main

khilai aam ki mithai paani aur alcohol ke sath

CH_3OH

> Ammonium ion > methanol > H_2O > ROH

$-\overset{+}{N}H_3$

> $-C\equiv\overset{-}{C}-H^{+}$ > $-\overset{-}{N}\overset{+}{H_2}$ > $-CH=\overset{-}{C}\overset{+}{H_2}$ > $-\overset{-}{C}\overset{+}{H_3}$ > H_2

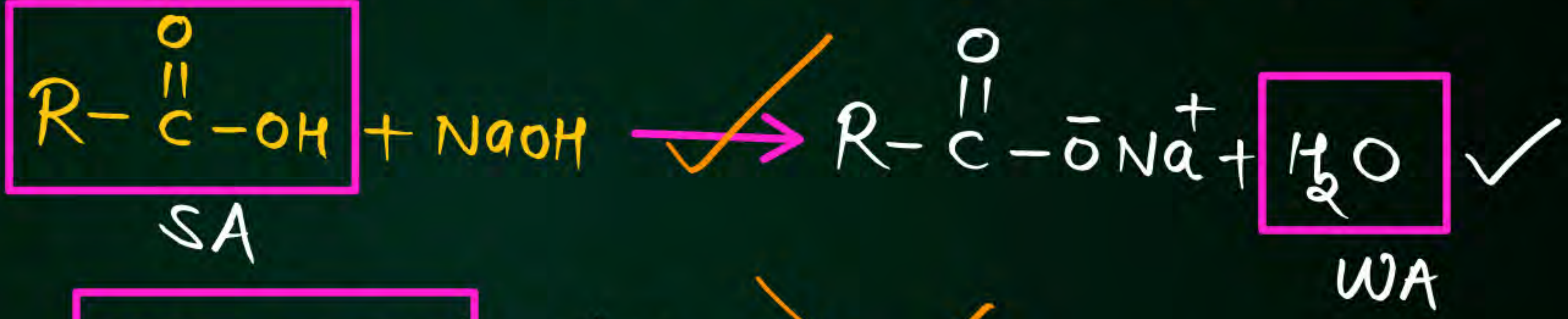
Alka boli Amine Alkene Alkane - - -

Bahut ganda acid

Application of Acidic Strength in different families

How to check the feasibility of Reaction ~~on~~ in microseconds in Pankaj sir's style

The $reac^n$ will proceed in the production of weaker Acid



$$\underset{SA}{\boxed{R-\overset{O}{\overset{\|}{C}}-OH}} + NaOH \xrightarrow{\checkmark} R-\overset{O}{\overset{\|}{C}}-\overset{-}{O}\overset{+}{Na} + \underset{WA}{\boxed{H_2O}} \checkmark$$

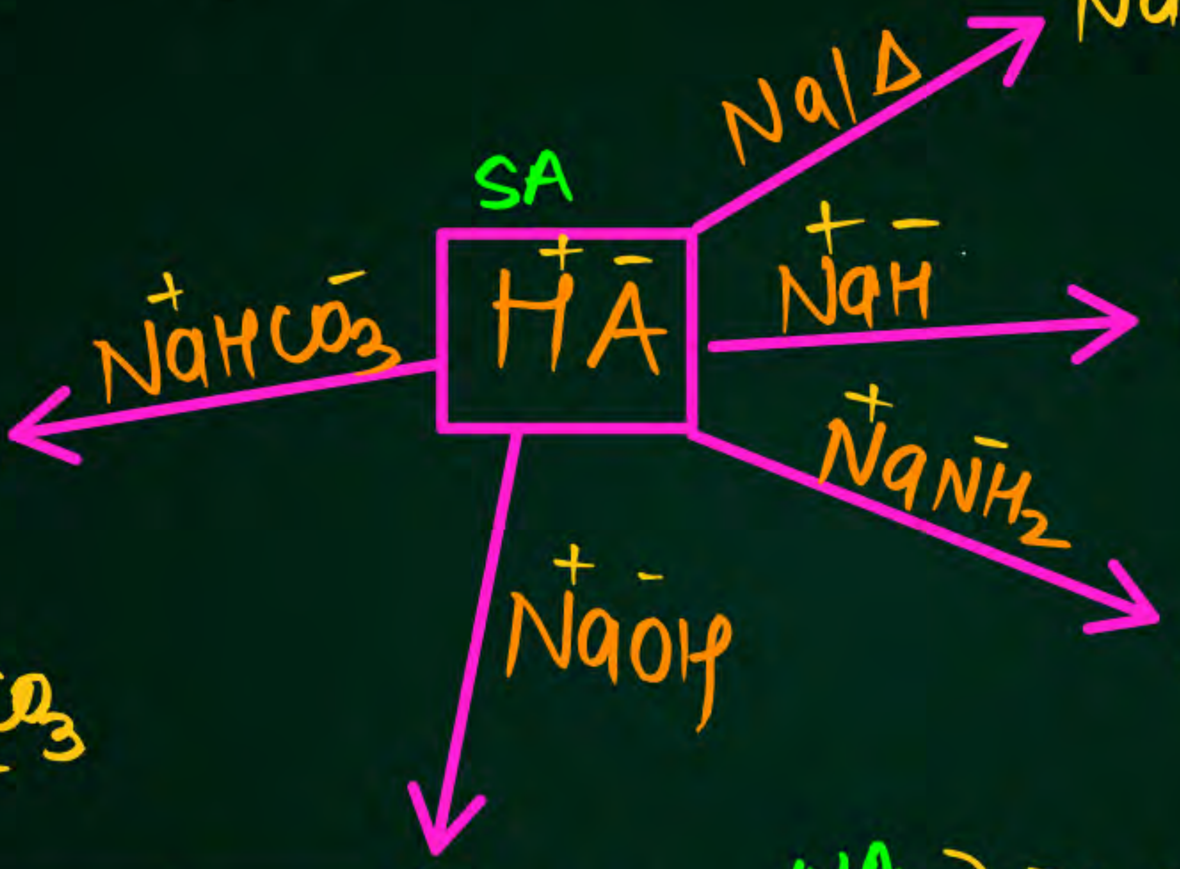
$$\underset{WA}{\boxed{CH_3-CH_2-\overset{-}{O}\overset{+}{H}}} + \overset{+}{Na}\overset{-}{OH} \not\longrightarrow CH_3-CH_2-\overset{-}{O}\overset{+}{Na} + \underset{SA}{\boxed{H_2O}}$$

$$SA\ \boxed{CH_3O-H} + NaOH \xrightarrow{\checkmark} CH_3\overset{-}{O}\overset{+}{Na} + \boxed{H_2O}\ WA$$

✓ POM

Brisk effervescence

HA → Acid



$CO_2 + H_2O$

WA

$\underbrace{H_2CO_3}$ + NaA $\xleftarrow{\overset{+}{Na}H\overset{-}{CO_3}}$ SA $\boxed{\overset{+}{H}\overset{-}{A}}$

Jinki A.S > H_2CO_3

$\overset{+}{H}\overset{-}{A} \xrightarrow{Na/\Delta} NaA + \overset{WA}{H_2}$

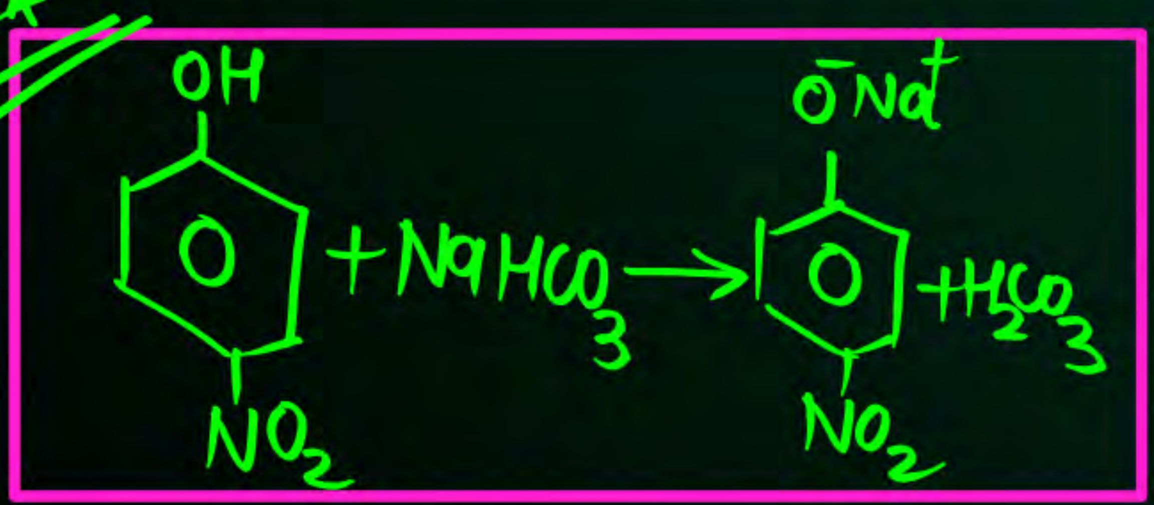
$\overset{+}{H}\overset{-}{A} \xrightarrow{\overset{+}{Na}\overset{-}{H}} NaA + \overset{WA}{H_2}$

} Table wale Saare ye Rxn denge

$\overset{+}{H}\overset{-}{A} \xrightarrow{\overset{+}{Na}\overset{-}{NH_2}} NaA + \overset{WA}{NH_3}$ } Jinki A.S Ammonia (amine) se jyada ho

$\overset{+}{H}\overset{-}{A} \xrightarrow{\overset{+}{Na}\overset{-}{OH}} NaA + \overset{WA}{H_2O}$ } Jinki A.S > H_2O

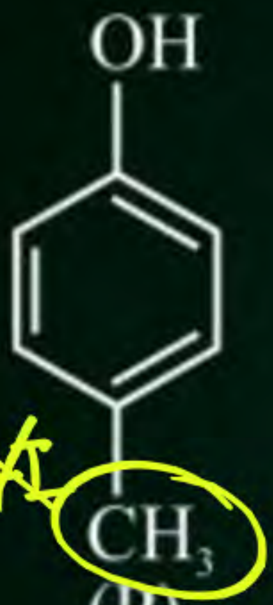
★



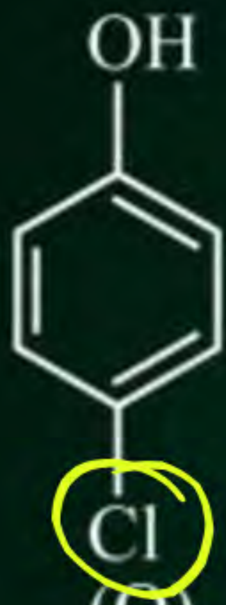
QUESTION

The decreasing order of acidity of following phenol derivatives is:

+H > ~~+I~~

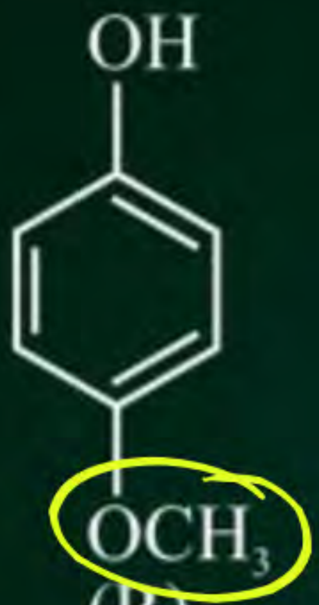


(P)



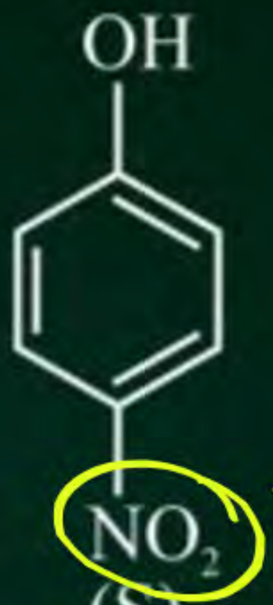
(Q)

−I > ~~+M~~



(R)

+M > ~~−I~~



(S)

−M > ~~−I~~

A. $S > P > Q > R$

~~B~~. $R > S > P > Q$

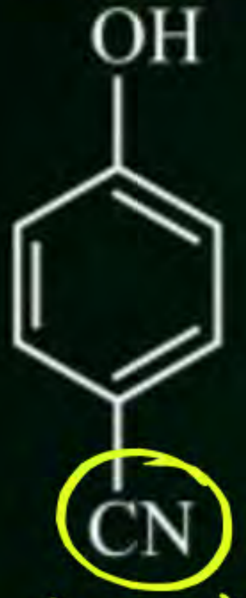
[✓ C]. $S > Q > P > R$

~~D~~. $P > Q > R > S$

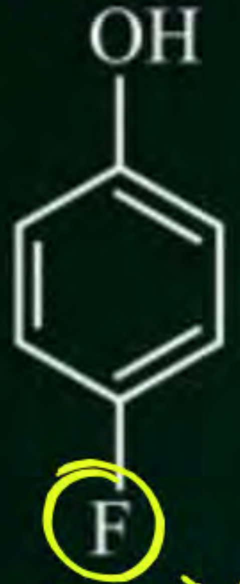
QUESTION

−m power −CN > −CHO

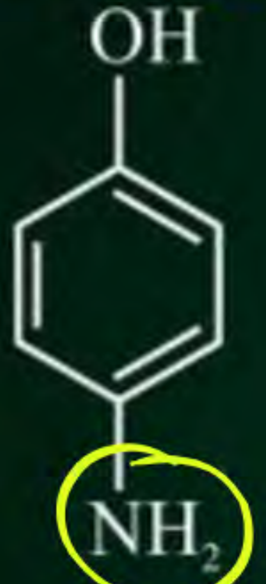
The decreasing order of acidity of following phenol derivatives is:


−M > −I

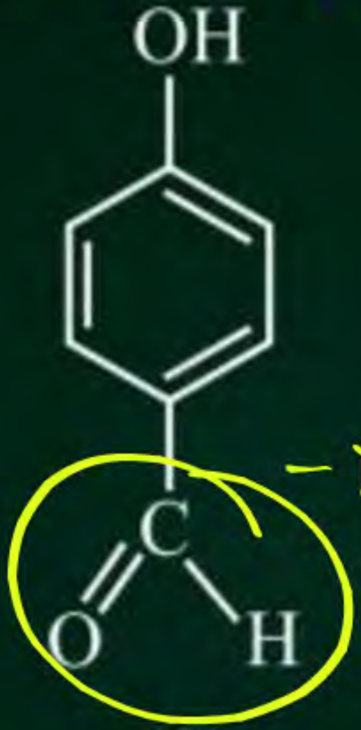
(P)


−I > +M

(Q)


+M > −I

(R)


−M > −I

(S)

[✓ A] P > S > Q > R

B S > Q > P > R

C R > Q > P > S

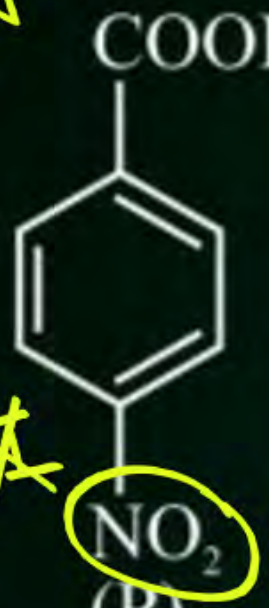
D P > Q > R > S

QUESTION

The decreasing order acidity of following benzoic acid derivatives is:

$-M$ power
$-NO_2 > -CN$

$-M > -I$



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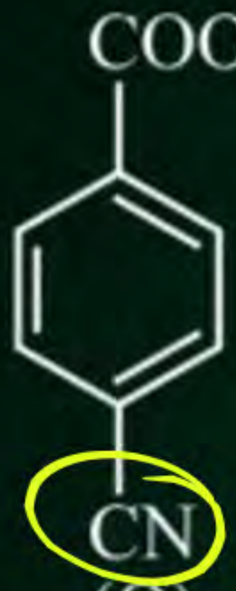
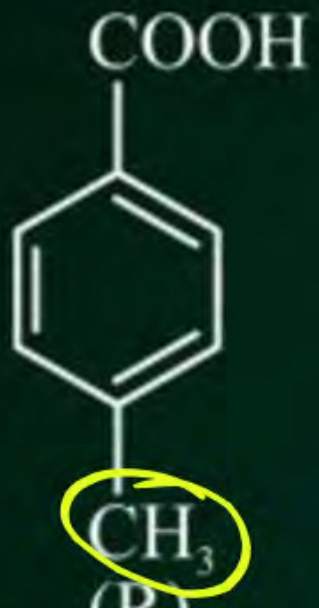


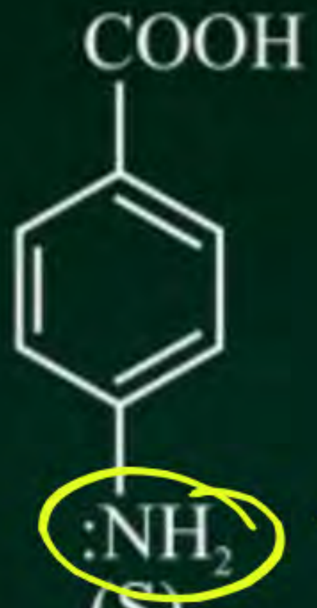
(Q)

$-M > -I$



(R)

$+H > +I$



(S)

$+M > -I$

[✓ A] $P > Q > R > S$

B $Q > P > S > R$

C $S > R > Q > P$

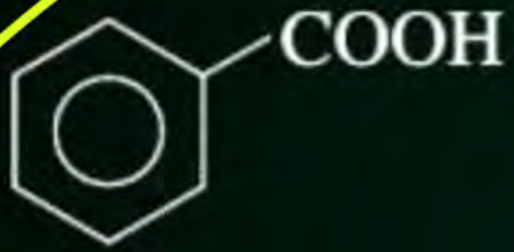
D $R > S > P > Q$

QUESTION

Lowest K_a (Acidic)

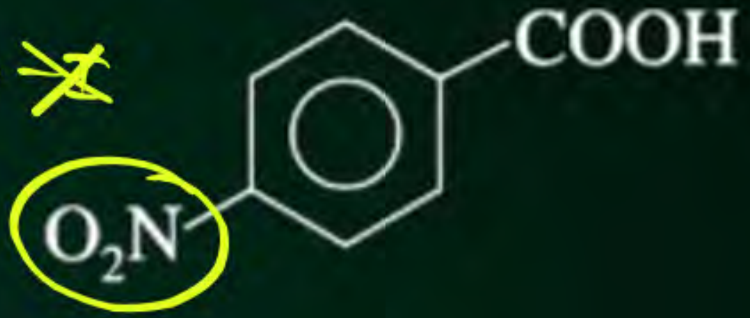
Which of the following compounds has the $\underbrace{\text{highest } pK_a}$ value?

A ✓

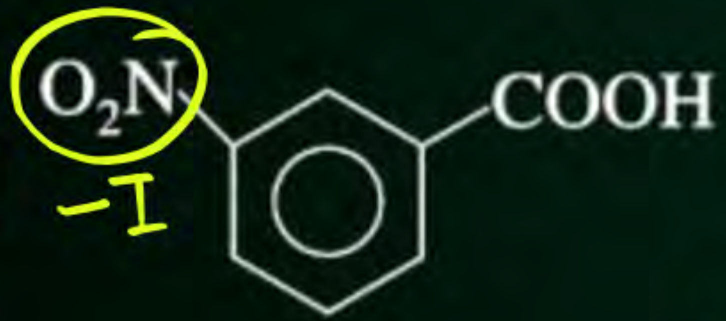


B

-M > -I

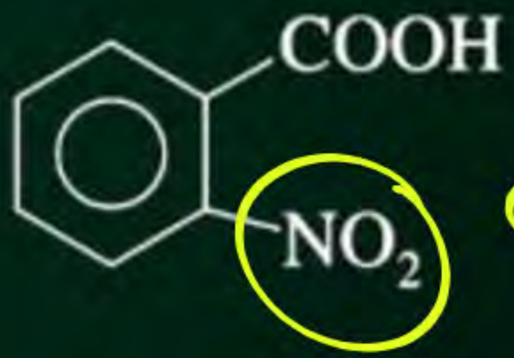


C



-I

D



ortho effect

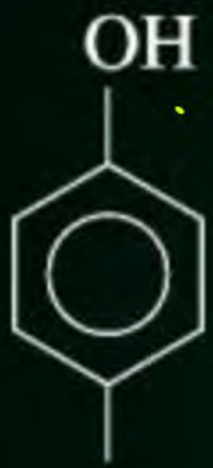
$D > B > C > \boxed{A}$

QUESTION

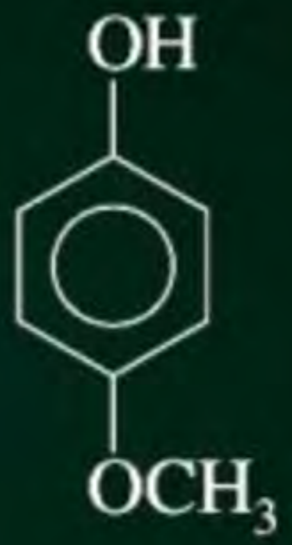
Most Acidic

Value of pK_a will be minimum for:

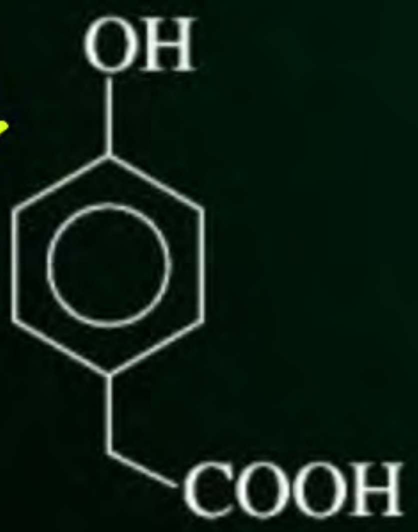
A



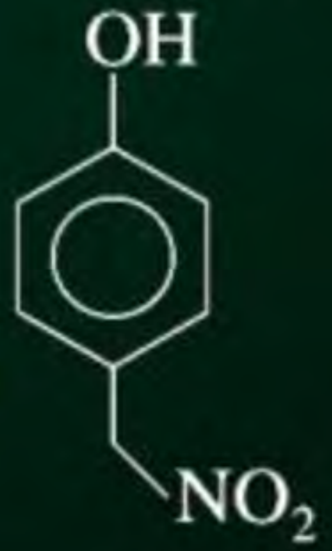
B



[✓ C]



D

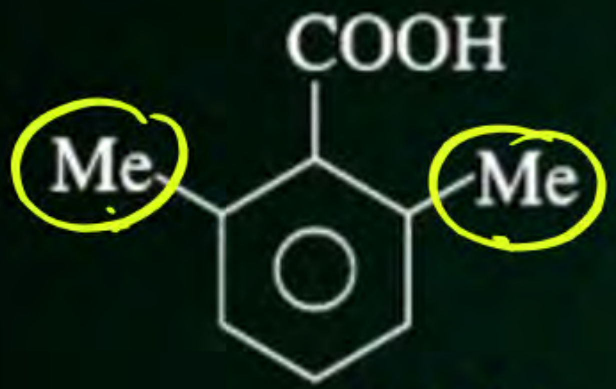


QUESTION

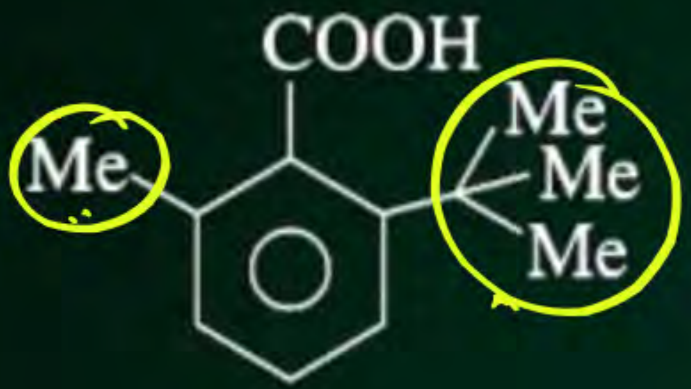
A.S Ka II > I > III

pKa II < I < III

Arrange in increasing order of pK_a value of given substance:

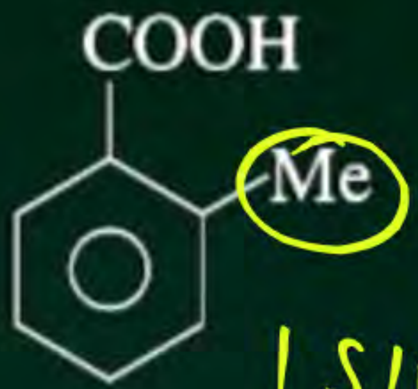


(I) 2 SIR


COOH
Me
Me
Me
Me

(II)

2 SIR



1 SIR

(III)

A $I < II < III$

B $III < I < II$

[✓ C] $II < I < III$

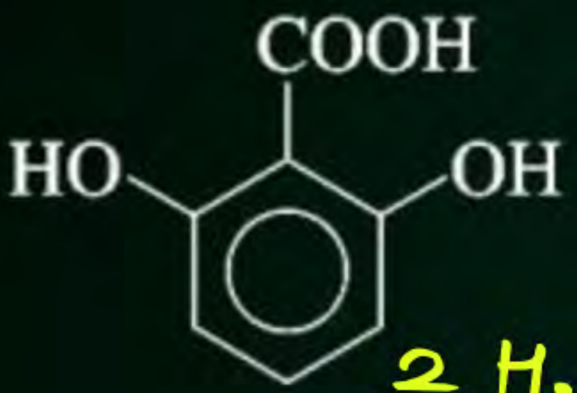
D $II < III < I$

QUESTION

(JEE Adv 2016)

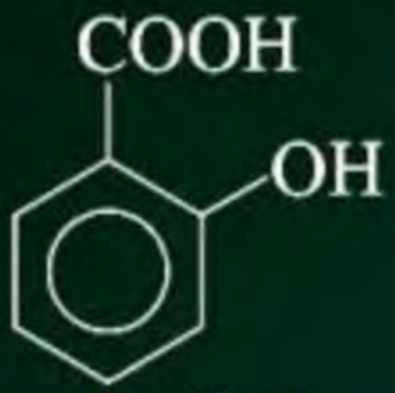
The decreasing order of acidic character of the following is:

(I)



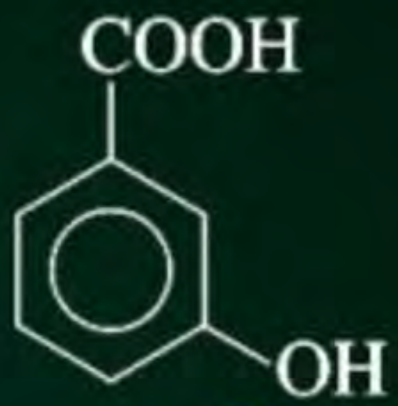
2 H.B

(II)



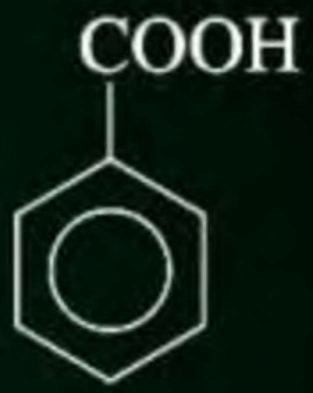
1 H.B

(III)



−I

(IV)



A) ✓ I > II > III > IV

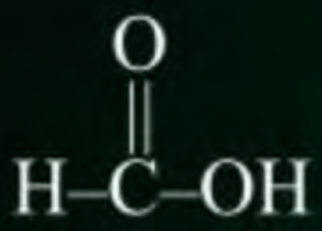
B) III > IV > II > I

C) IV > III > II > I

D) I > II > IV > III

QUESTION

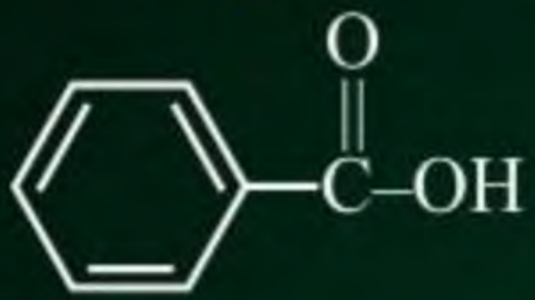
The decreasing order acidity of following benzoic acid derivatives is:



$H-\overset{\overset{\displaystyle O}{\|}}{C}-OH$

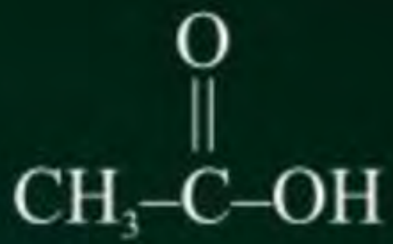
(P)

>



(Q)

>



$CH_3-\overset{\overset{\displaystyle O}{\|}}{C}-OH$

(R)

A $R > Q > P$

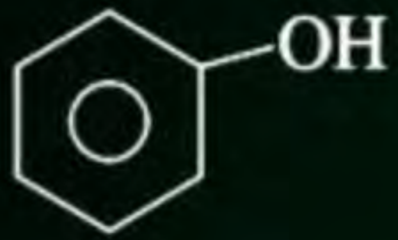
B $Q > P > R$

[✓ C] $P > Q > R$

D $Q > R > P$

QUESTION

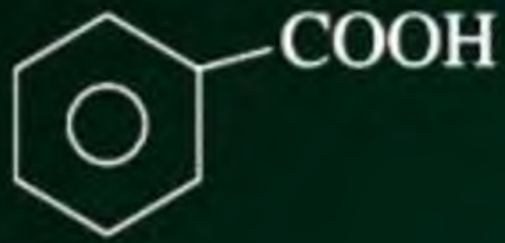
The correct order of the decreasing pK_a values of the compounds is:



I

CH_3OH

II



III

$HCOOH$

IV

Ka

IV > III > I > II

pKa

II > I > III > IV

(A) I > II > III > IV

[✓ (B)] II > I > III > IV

(C) III > IV > I > II

(D) IV > III > I > II

QUESTION

Among the following compounds, the strongest acid is:

(A) $HC \equiv CH$ $H-C \equiv C^{-}$

(B) NH_3 $\bar{N}H_2$

(C) $CH_2 = CH_2$ $CH_2 = \bar{C}H$

[✓ (D)] CH_3OH

$CH_3O^{\ominus}$

QUESTION

Which of the following shows the correct order of decreasing acidity?

A $PhCO_2H > PhSO_3H > PhCH_2OH > PhOH$

B $PhSO_3H > PhOH > PhCO_2H > PhCH_2OH$

C $PhCO_2H > PhOH > PhCH_2OH > PhSO_3H$

[✓ **D**] $PhSO_3H > PhCO_2H > PhOH > PhCH_2OH$

Sp^3

QUESTION

Which one of the following reaction is not possible?

A $CH_3COONa + \overset{SA}{\boxed{HCl}} \rightarrow \overset{WA}{\boxed{CH_3COOH}} + NaCl$

B $\overset{SA}{\boxed{CH_3SO_3H}} + H-C\equiv C-Na \rightarrow CH_3SO_3Na + \overset{WA}{\boxed{H-C\equiv C-H}}$

C ✓ $\overset{WA}{\boxed{R-C\equiv C-H}} + PhONa \rightarrow \overset{SA}{\boxed{PhOH}} + R-C\equiv C-Na$

D $\underset{SA}{\boxed{H-C\equiv \overset{-}{C}-\overset{+}{H}}} + \overset{+}{Na}\overset{-}{N}H_2 \rightarrow H-C\equiv C-Na + \underset{WA}{\boxed{NH_3}}$

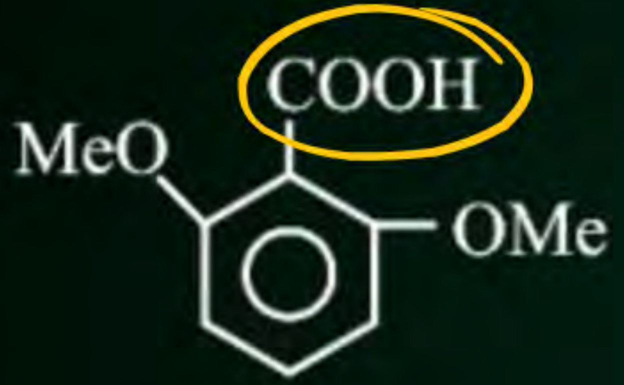
QUESTION

$$\overset{+}{H}-\overset{-}{A} \xrightarrow{\overset{+}{Na}H^{14}CO_3^{-}} NaA + H_2{}^{14}CO_3$$

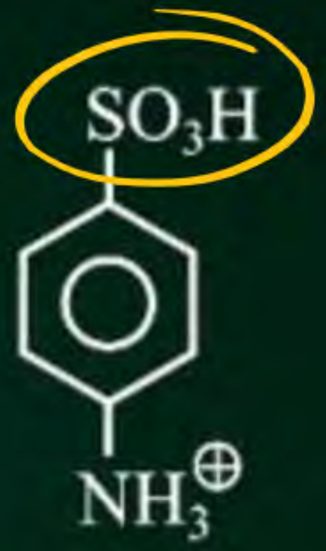
$$\hookrightarrow {}^{14}CO_2 + H_2O$$

Which of the following compounds will not liberate $^{14}CO_2$ from $NaH^{14}CO_3$?

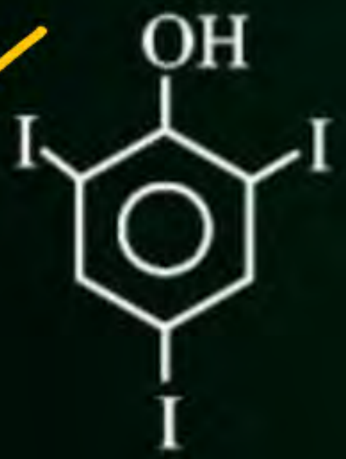
A


COOH
MeO
OMe

B


SO_3H
$NH_3^{\oplus}$

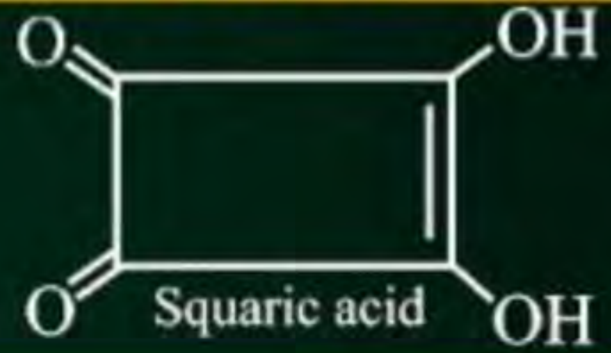
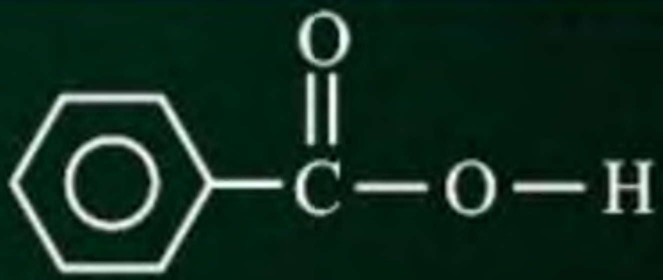
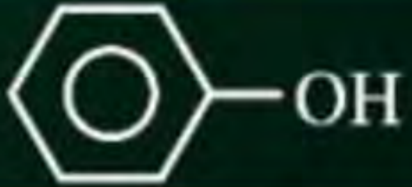
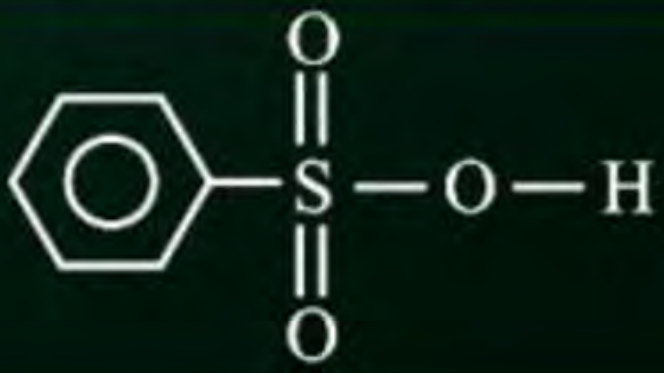
[✓ **C**]



D F_3C-SO_3H

QUESTION

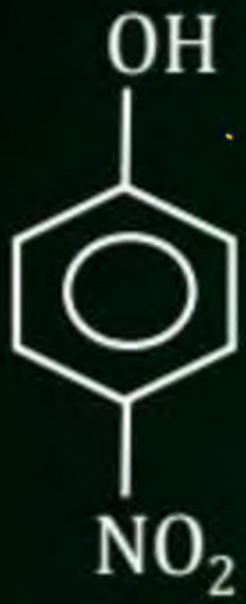
Match the following:

Column-I		Column-II	
I	$\underbrace{NaHCO_3}$ will react (P, Q, S)	P	
II	Na will react with (P, Q, R, S)	Q	
III	$\overset{+}{Na}\overset{-}{O}H$ will react with (P, Q, R, S)	R	
IV	$NaNH_2$ will react with (P, Q, R, S)	S	

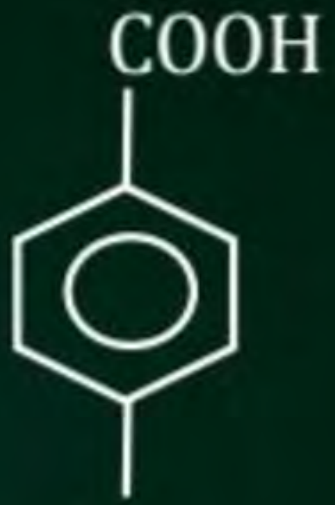
QUESTION

The most acidic compound is:

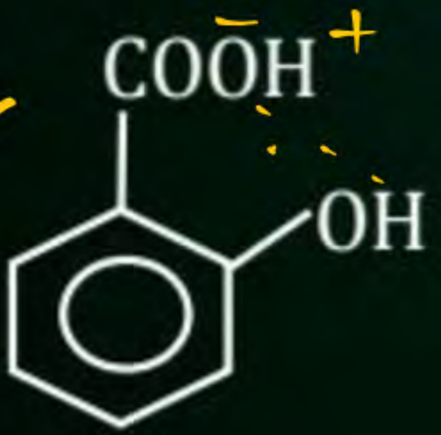
(A)



(B)

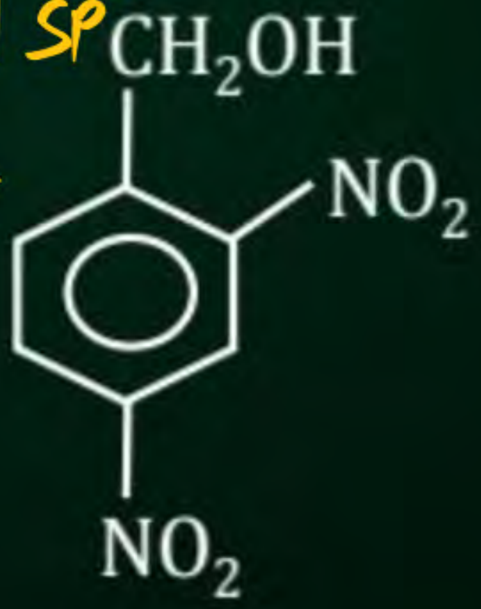


✓ (C)



(D)

Alcohol sp^3


CH2OH
NO2
NO2

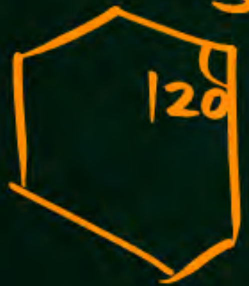
for cycloalkane stability

Baeyer's strain theory ÷ Acc^n to B.S.T cyclopentane is the most stable cycloalkane

Angle strain

Angle strain = Hybri angle − Geo angle

sp^3 109.5°

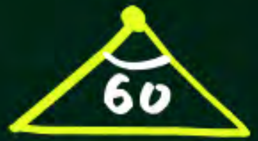


(A.S < −ve)

Exp theory combus theo stability

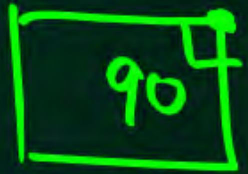
$\boxed{6 > 5 > 4 > 3}$

sp^3 109.5



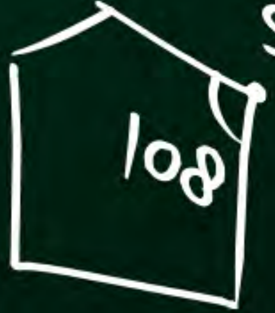
A.S = 109.5 − 60
= 49.5

sp^3 109.5



A.S = 109.5 − 90
= 19.5

sp^3 109.5



A.S = 109.5 − 108
= 1.5

QUESTION

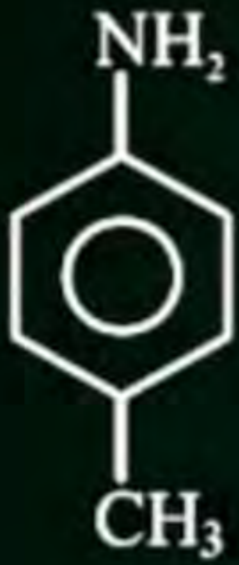
H_2O

Which of the following are soluble in aq. $\overset{+}{Na}\overset{-}{O}H$ solution?

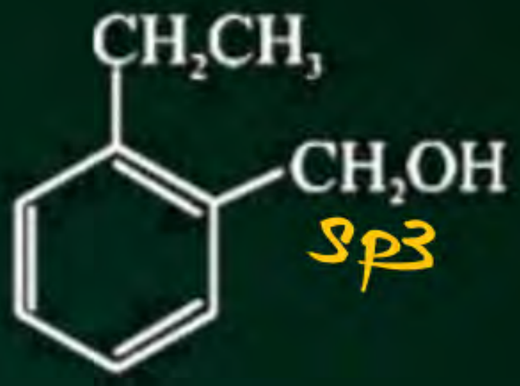
$\overset{+}{H}\overset{-}{A} \xrightarrow{\overset{+}{Na}\overset{-}{O}H} H_2O$

SA WA

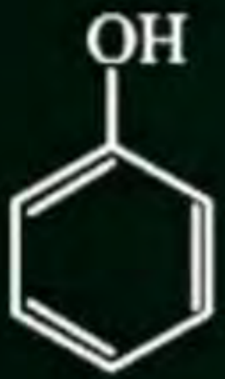
A ×



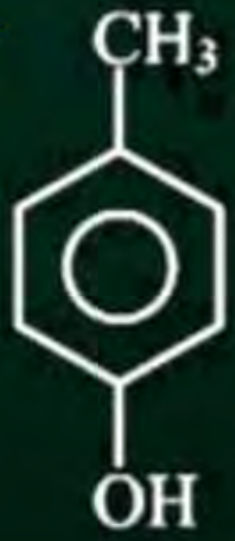
× **B**


CH2CH3
CH2OH
sp3

C ✓



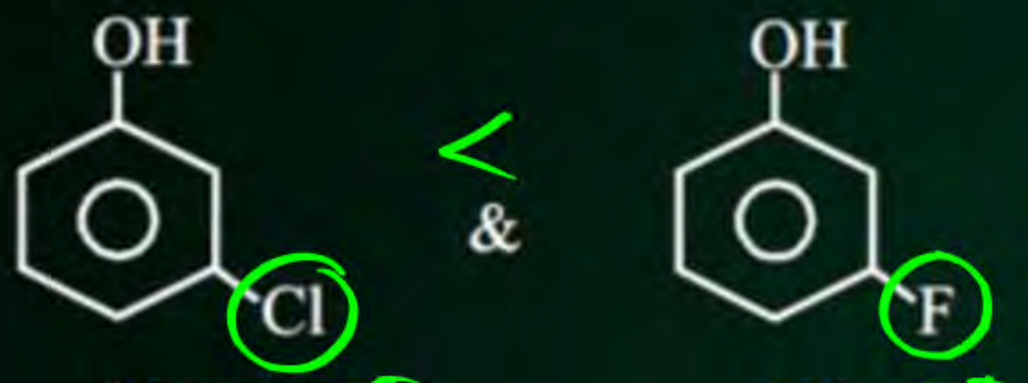
✓ **D**



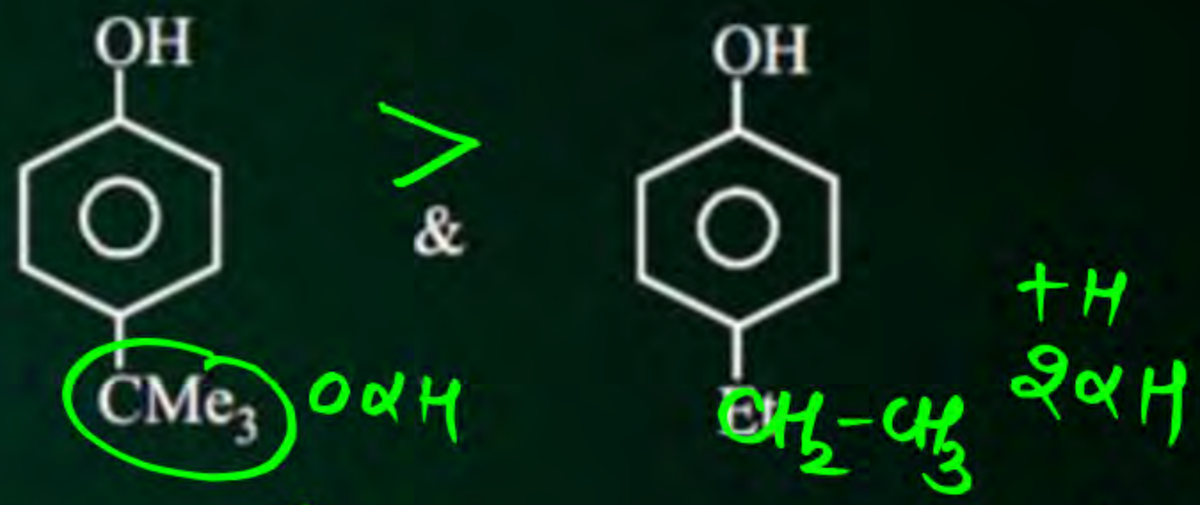
QUESTION

In which case Ist is more acidic than 2nd

A

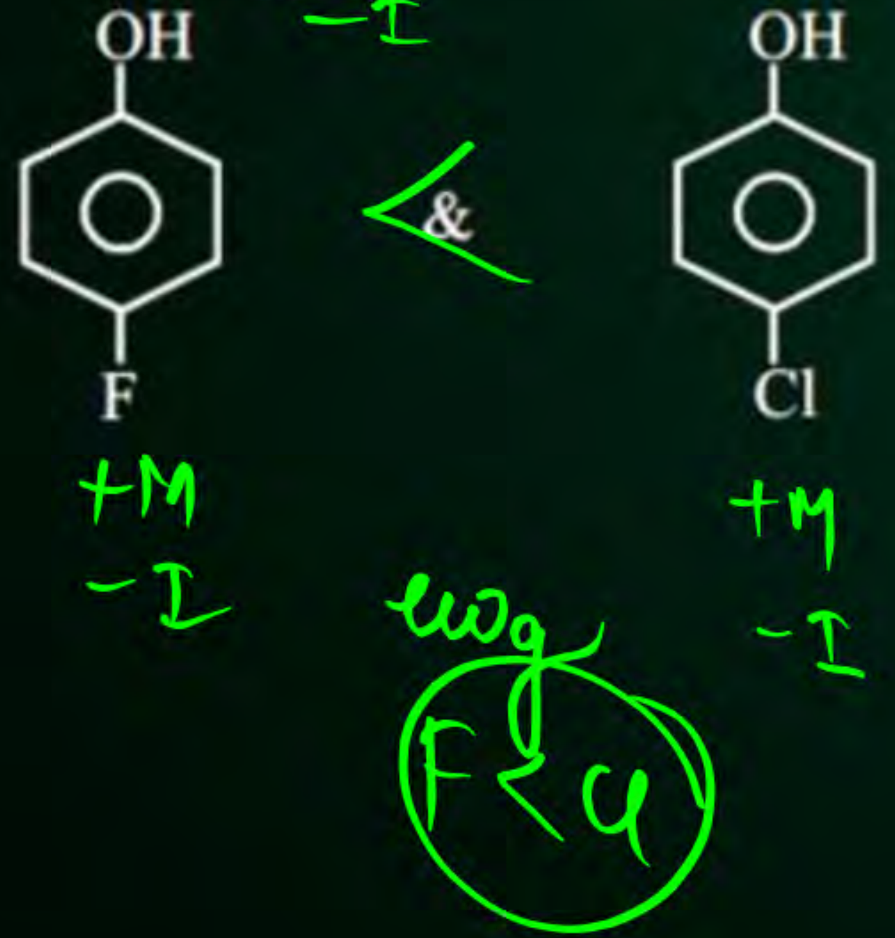


B



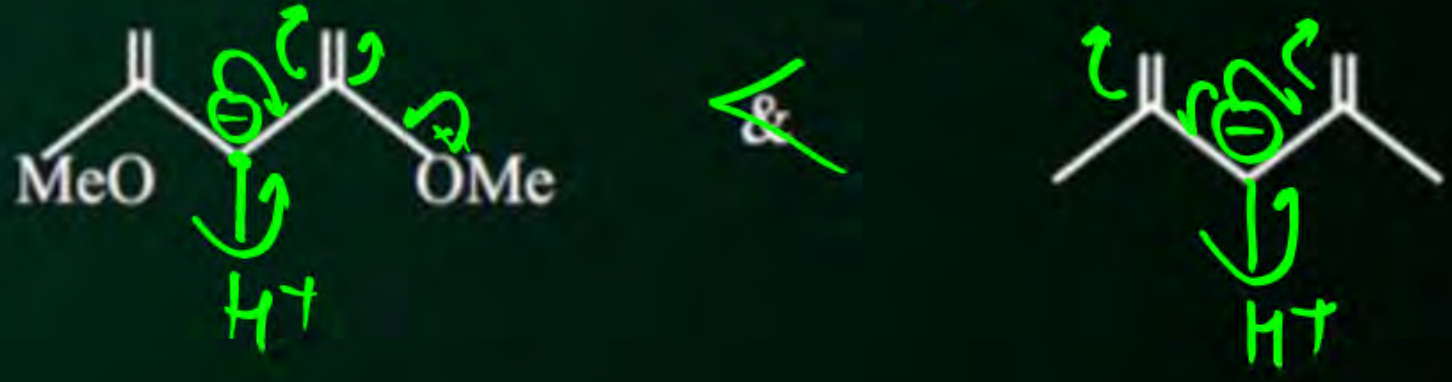
OH
CMe$_3$
0αH
>
&
OH
Et
CH$_2$-CH$_3$
+H
2αH

C



OH
F
+M
-I
<
&
OH
Cl
+M
-I
ewg
F < Cl

D

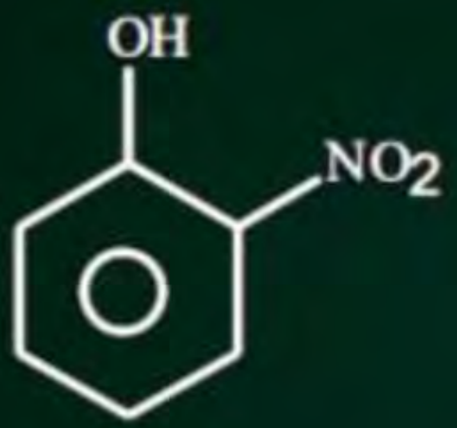


Home Work

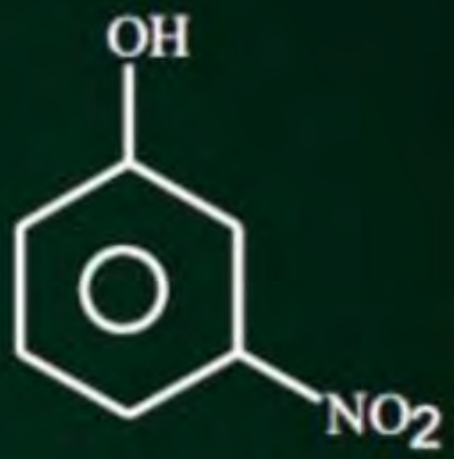
QUESTION 01

Arrange the following phenols in order of their increasing acidity.

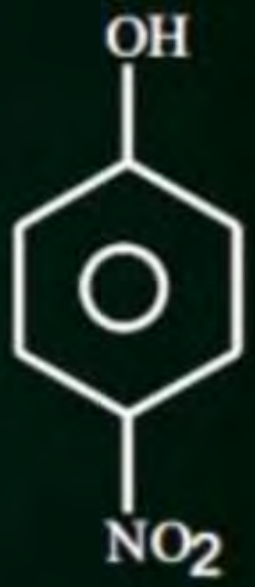
- **A** I > III > II
- **B** I > II > III
- **C** III > I > II
- **D** III > II > I



(I)



(II)

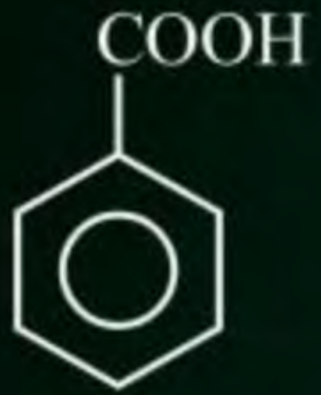


(III)

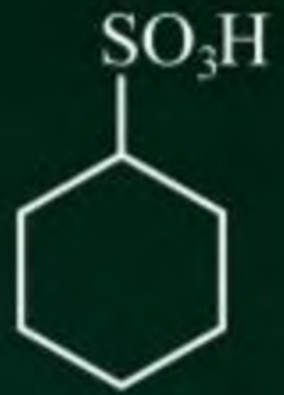
QUESTION 02

Which of the following is least acidic?

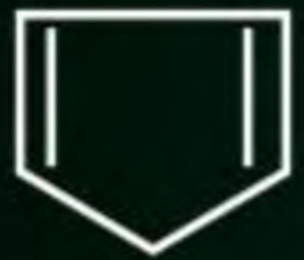
A



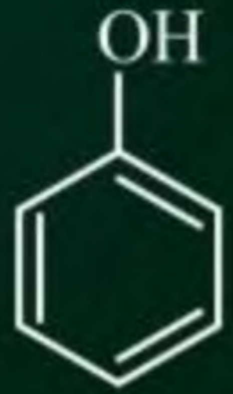
B



C



D



QUESTION 03

Rearrange the following in the increasing order of acidic strength.

(i) Benzoic acid

(ii) p-methoxybenzoic acid

(iii) o-methoxybenzoic acid

A i < ii < iii

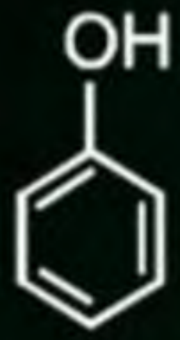
B iii < i < ii

C ii < i < iii

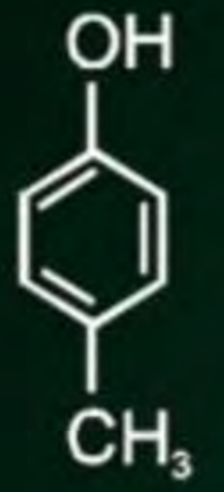
D iii < ii < i

QUESTION 04

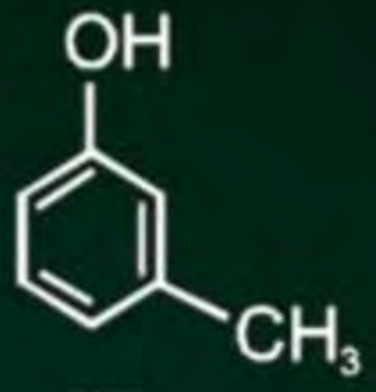
The correct order of acid Strength of the following compounds.



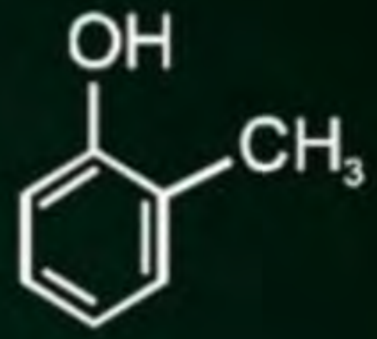
I



II



III



IV

A I > III > II > IV

B II > III > IV > I

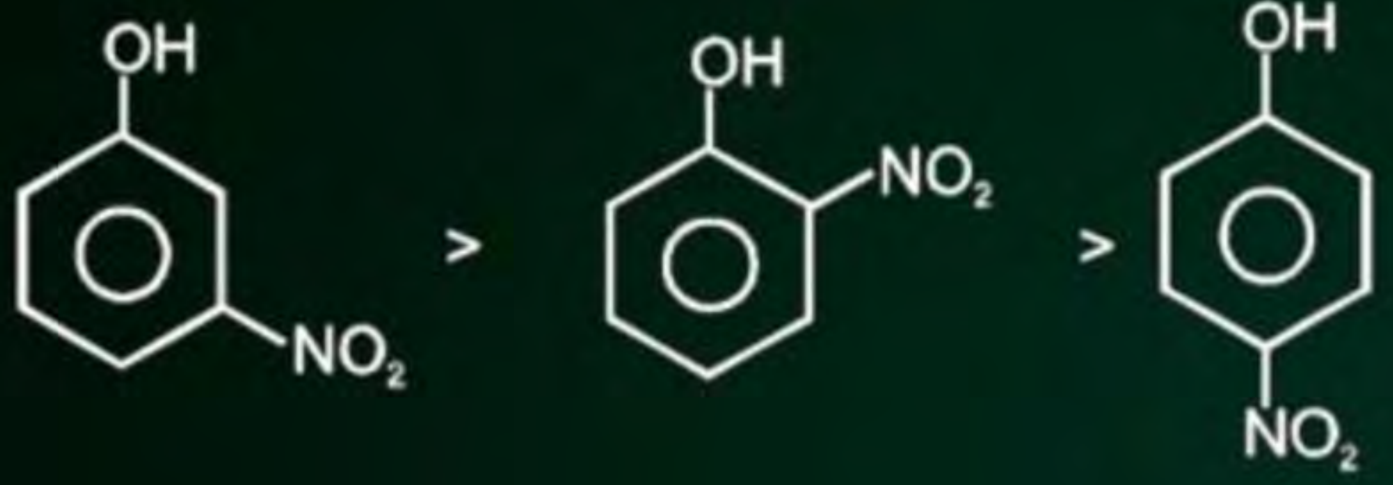
C III > II > IV > I

D I > III > IV > II

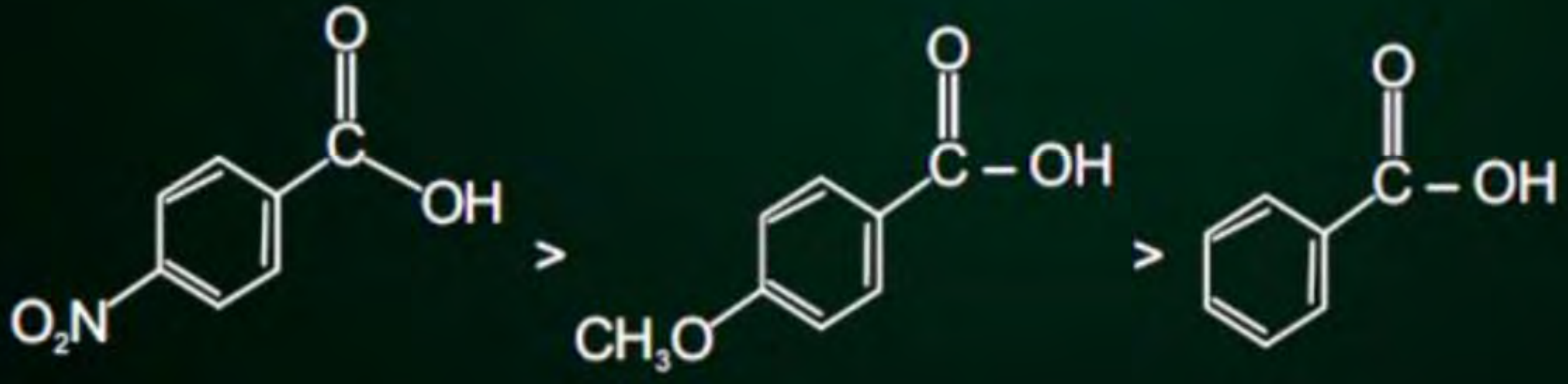
QUESTION 05

Acidic strength order is correctly mentioned in

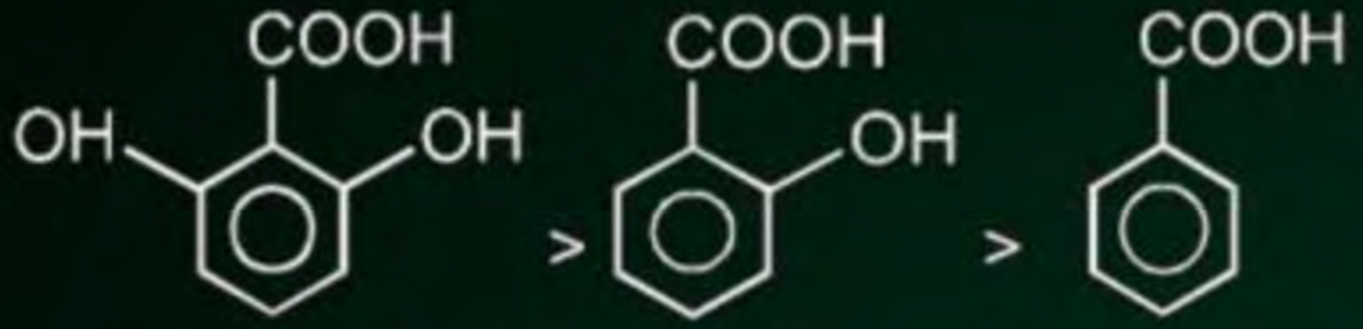
A


OH
NO₂
>
OH
NO₂
>
OH
NO₂

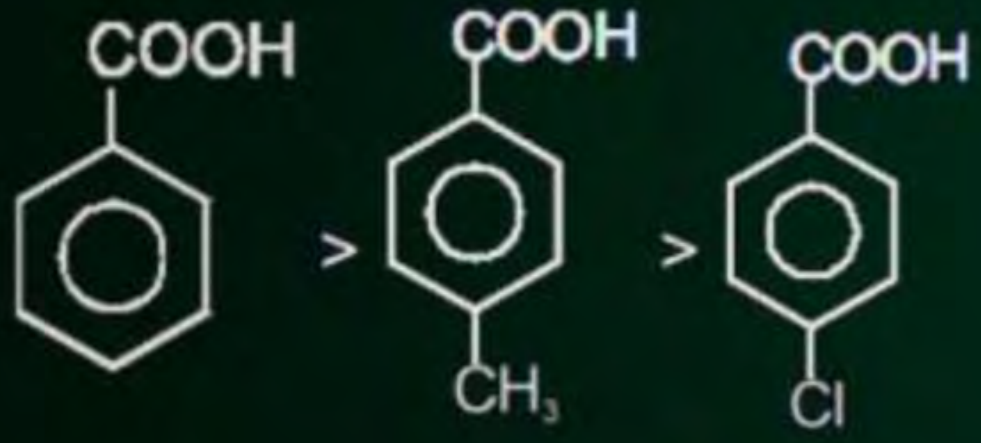
B


O
C
OH
O₂N
>
O
C – OH
CH₃O
>
O
C – OH

C


COOH
OH
OH
>
COOH
OH
>
COOH

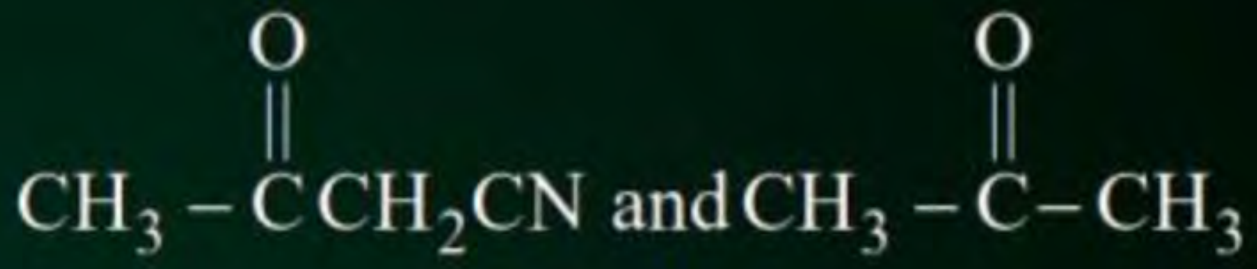
D


COOH
>
COOH
CH₃
>
COOH
Cl

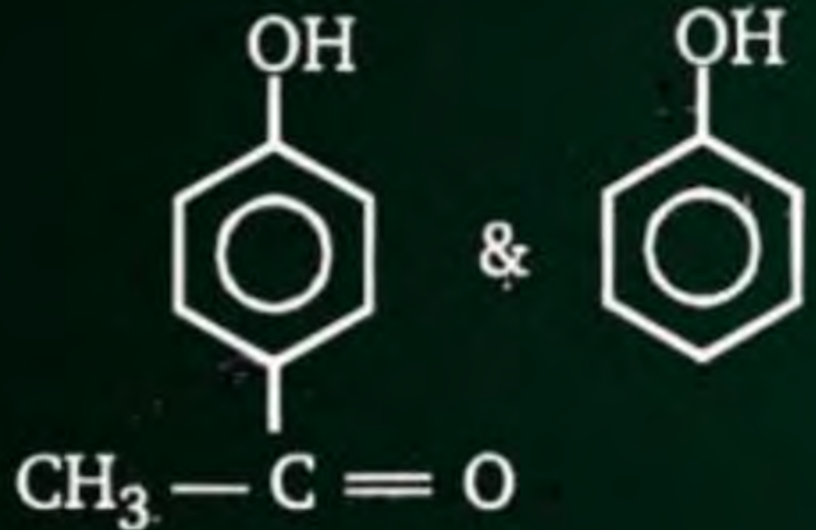
QUESTION 06

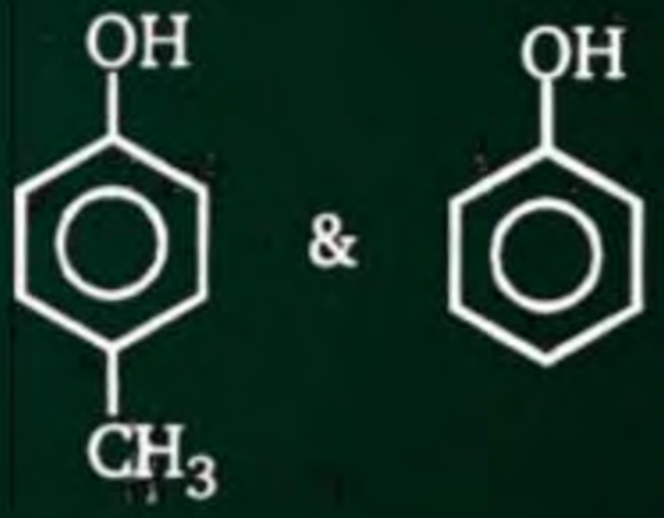
Among the given pairs, in which pair second compound is more acidic than first ?

A $BrCH_2NO_2$ and CH_3CH_3

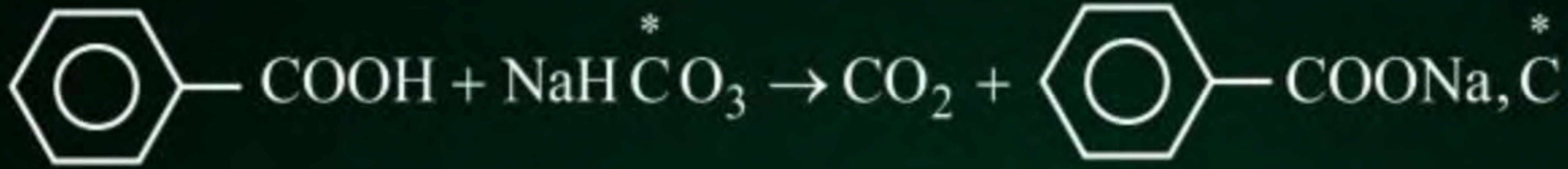
B 

$CH_3-\overset{O}{\overset{\|}{C}}CH_2CN$ and $CH_3-\overset{O}{\overset{\|}{C}}-CH_3$

C 

D 

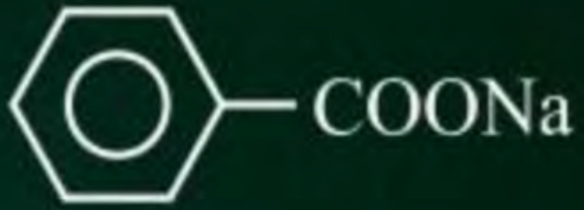
QUESTION 07


COOH + NaH$\overset{*}{C}O_3 \rightarrow CO_2$ +
COONa, $\overset{*}{C}$

is with the product:

(A) CO_2

(B)

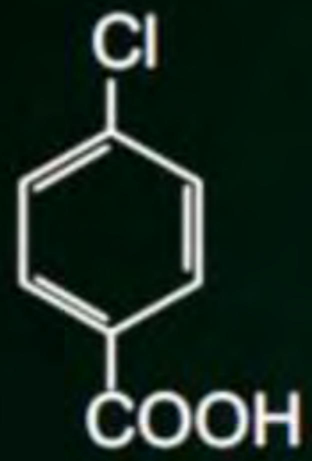


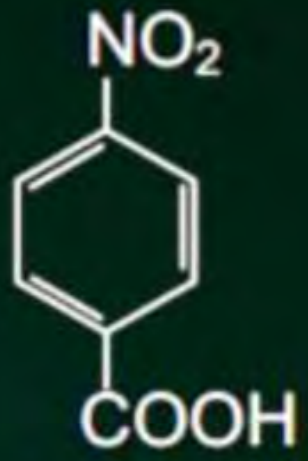
(C) Both (A) and (B)

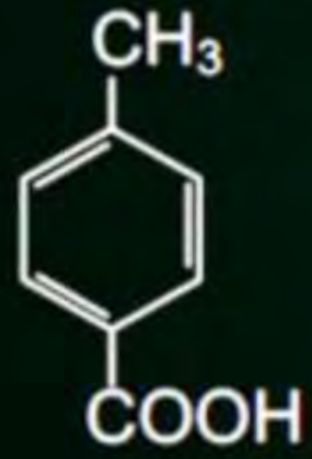
(D) None of these

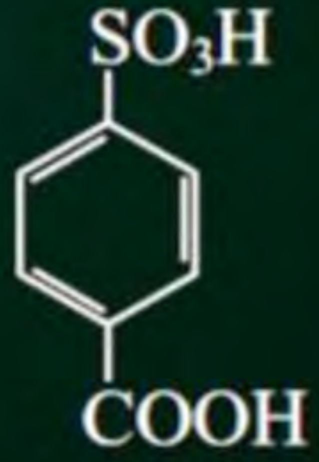
QUESTION 08

Which of the following compounds is a weaker acid as compared to benzoic acid ?

A


B


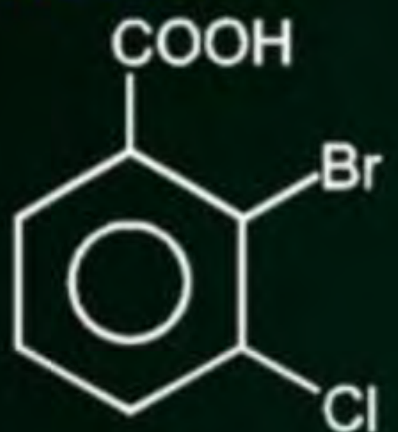
C


D


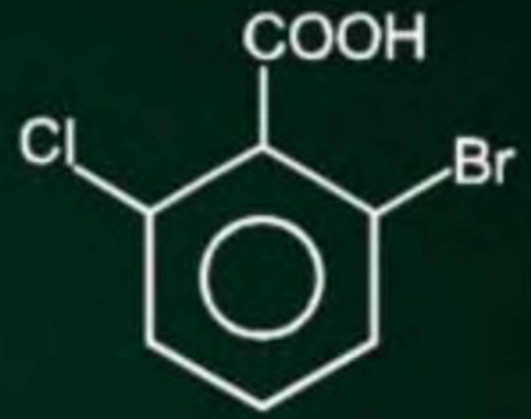
QUESTION 09

(X) ($C_6H_3ClBrCOOH$) are a dihalosubstituted benzoic acids. The strongest acid among all isomers is:

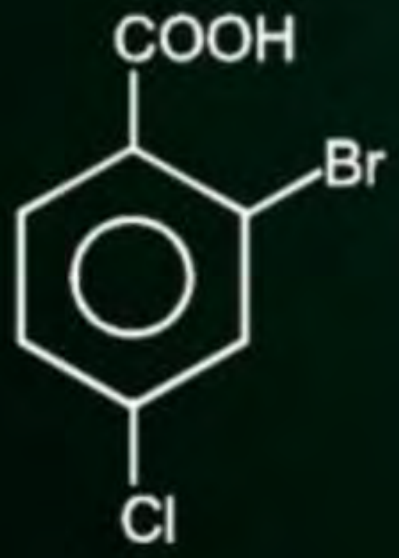
A



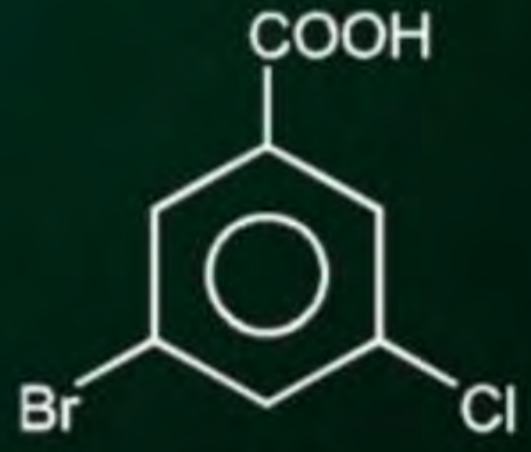
B



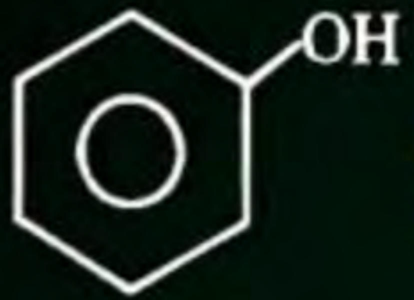
C



D



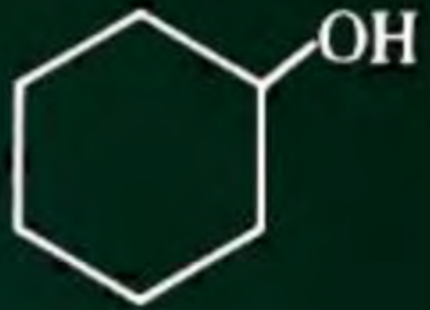
QUESTION 10



is more acidic than

(A) H_2O

(B)



(C) $R-C\equiv C-H$

(D) All of these

ANSWER KEY

1. C
2. C
3. C
4. A
5. C
6. D
7. A
8. C
9. B
10. D

Home Work From PW Module (Yakeen NEET)

Parikshit: Q 05, 06, 12, 22, 23

Thank you!"

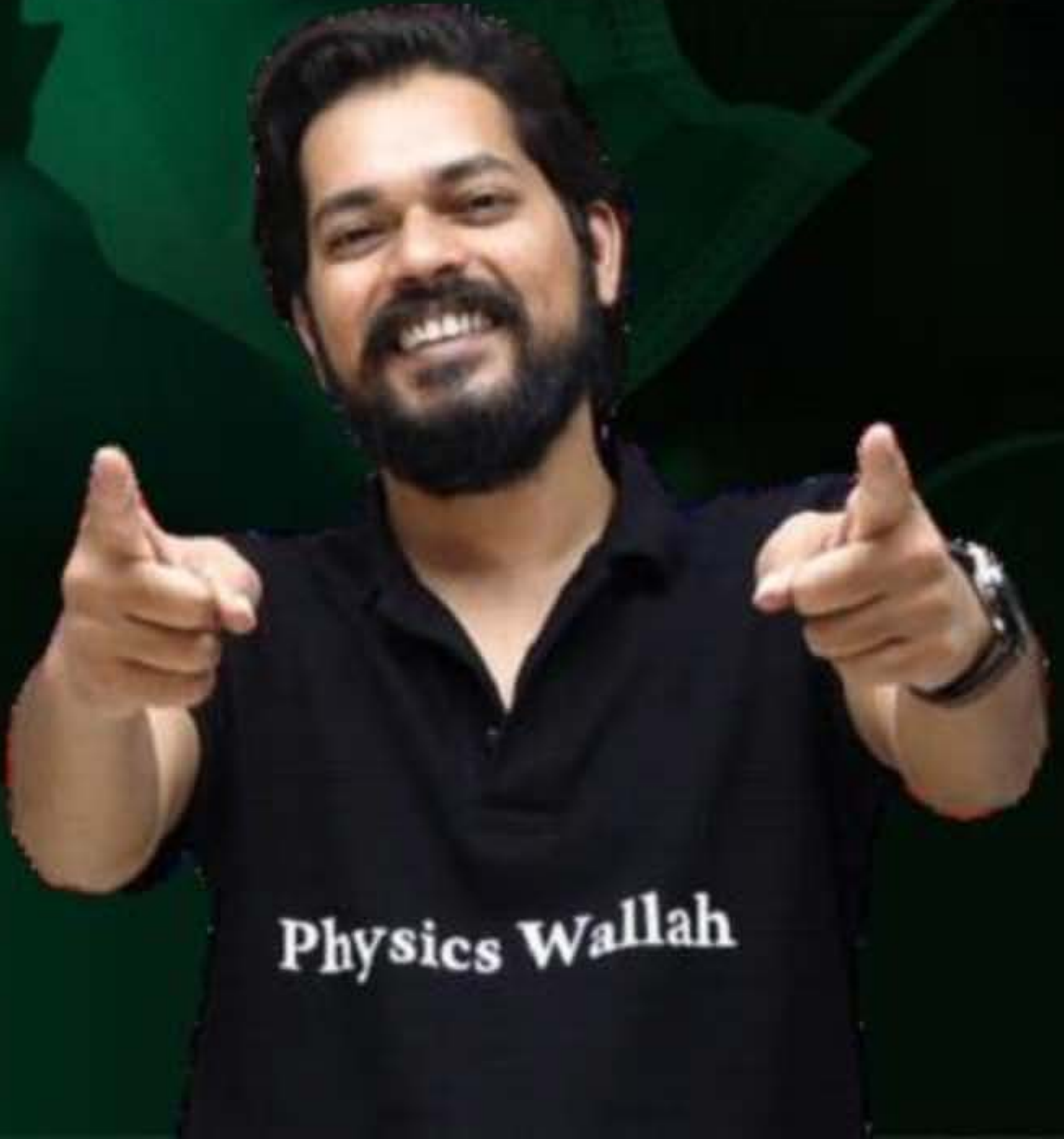
YAKEEN 2.0

FOR NEET 2025

Lecture- 11 | **Organic Chemistry**

Some Basic Principles and Techniques (GOC)

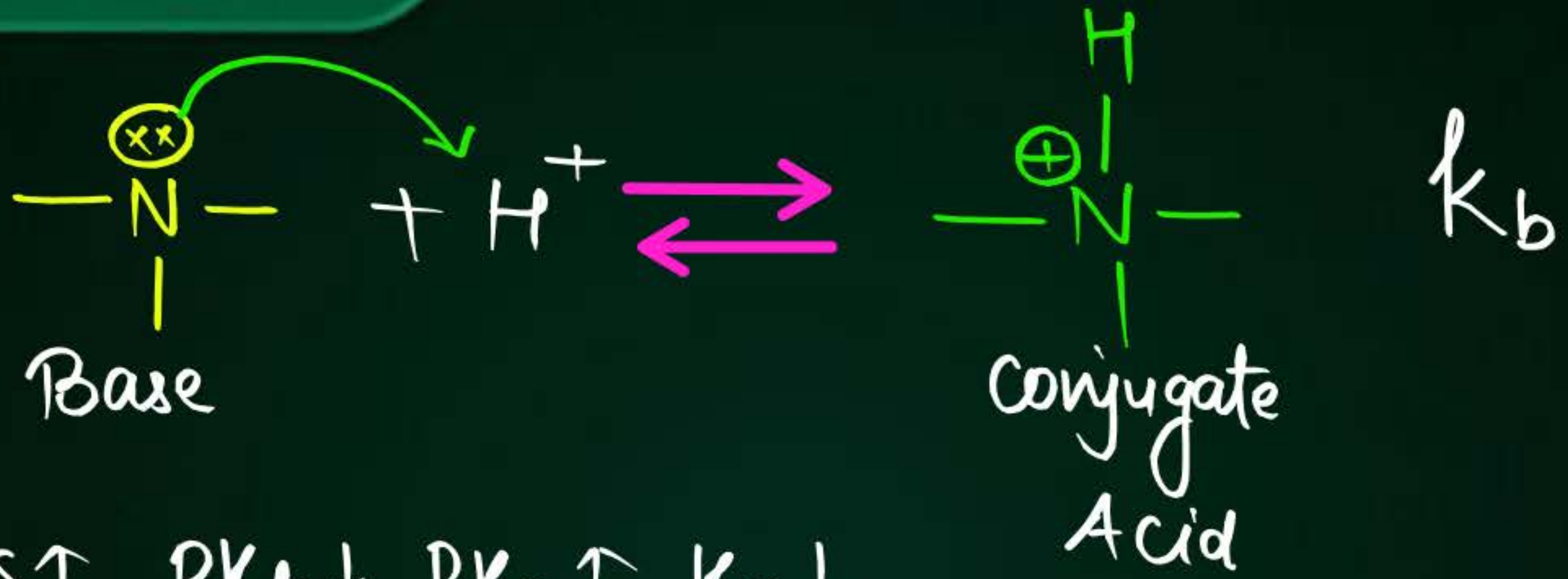
By- Pankaj Sir(POPU MAMA)


Physics Wallah

Topics *to be covered*

1. Basic Strength ✓
2. Practice

Basic Strength

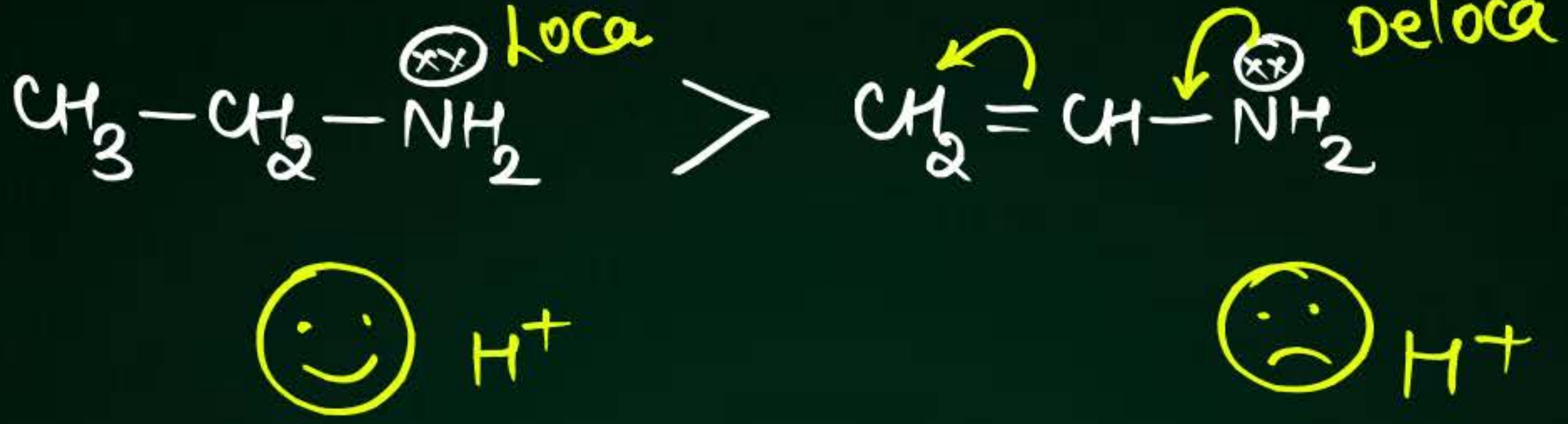


Base
Conjugate Acid
K_b

$K_b\uparrow$ B.S↑ $pK_b\downarrow$ $pK_a\uparrow$ $K_a\downarrow$

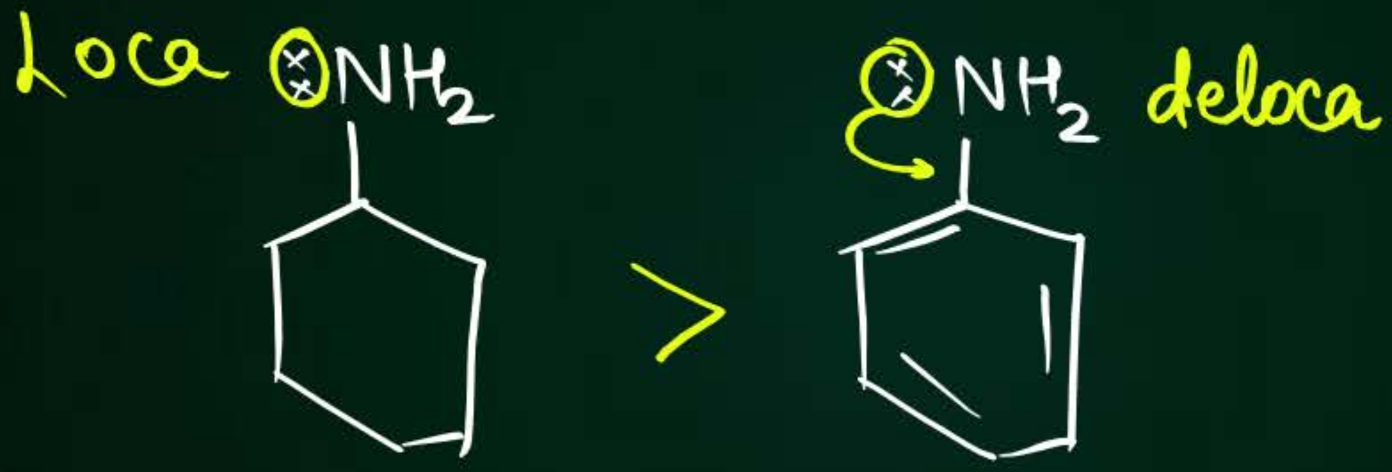
$[\bar{O}H]\uparrow$ B.S↑ $p^{OH}\downarrow$, $p^{H}\uparrow$ $[H^+]\downarrow$

1. Availability of lone pair on Nitrogen, more will be the basicity.



$CH_3-CH_2-\ddot{N}H_2 > CH_2=CH-\ddot{N}H_2$

Loca
Deloca
H+
H+



Loca
NH2
>
NH2
deloca

B.S Compare Karne Ka Sateek Tareeka

✓ ① Loca > Deloca
L P   L.P

✓ ② stability of Conjugate Acid

a) Resonance

b) Hybridisation

③ effects

$B.S \propto +M, +H, +I \propto \frac{1}{-M, -H, -I}$

④ Solvation

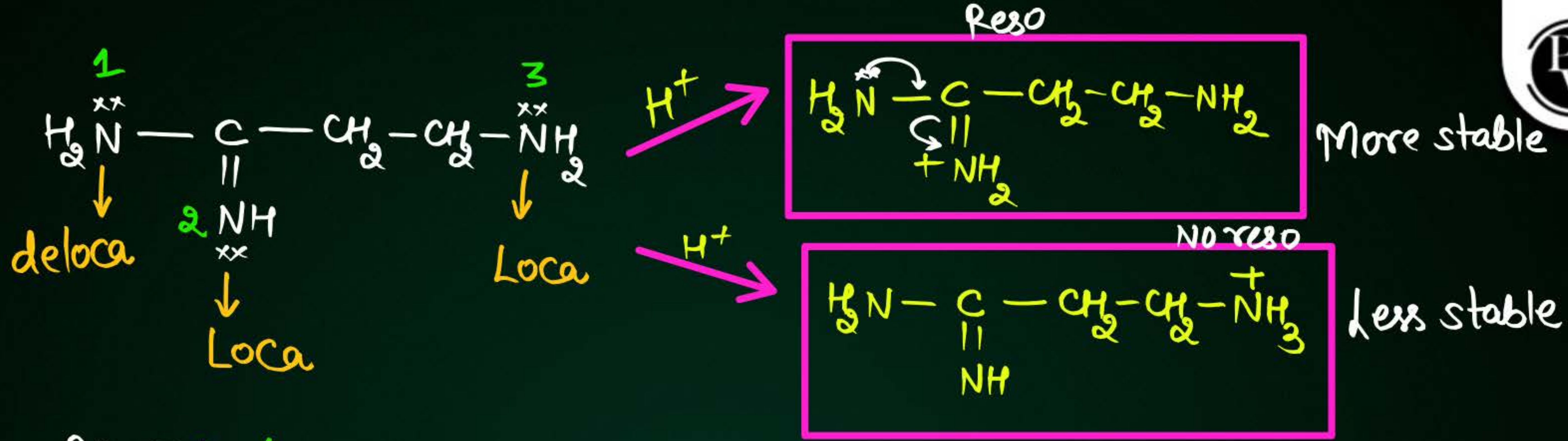
$R = Me \quad 2° > 1° > 3°$

$R = Et \quad 2° > 3° > 1°$

In aq media

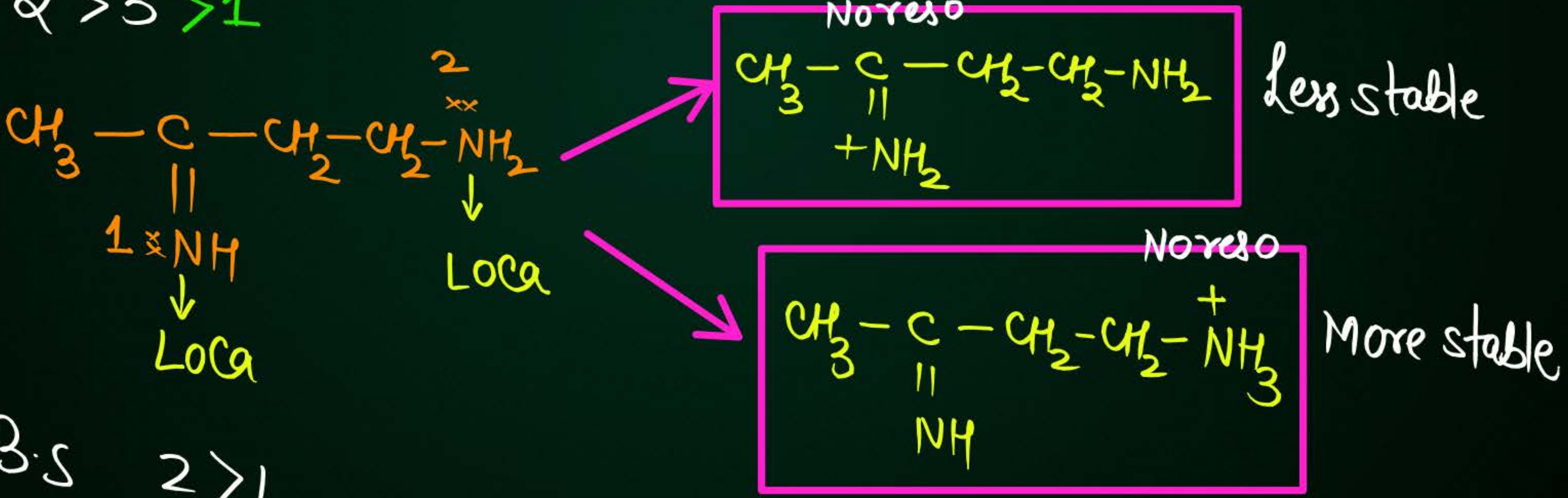
Always $3° > 2° > 1°$ (gas phase)

Q/


1
3
$H_2\ddot{N}-C(=NH)-CH_2-CH_2-\ddot{N}H_2$
2 NH
deloca
Loca
Loca
H+
H+
Reso
$H_2\ddot{N}-C(=\overset{+}{N}H_2)-CH_2-CH_2-NH_2$
More stable
No reso
$H_2N-C(=NH)-CH_2-CH_2-\overset{+}{N}H_3$
Less stable

B.S $2>3>1$

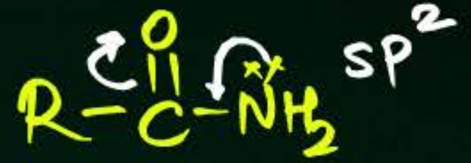
Q/


2
$CH_3-C(=NH)-CH_2-CH_2-\ddot{N}H_2$
1
Loca
Loca
No reso
$CH_3-C(=\overset{+}{N}H_2)-CH_2-CH_2-NH_2$
Less stable
No reso
$CH_3-C(=NH)-CH_2-CH_2-\overset{+}{N}H_3$
More stable

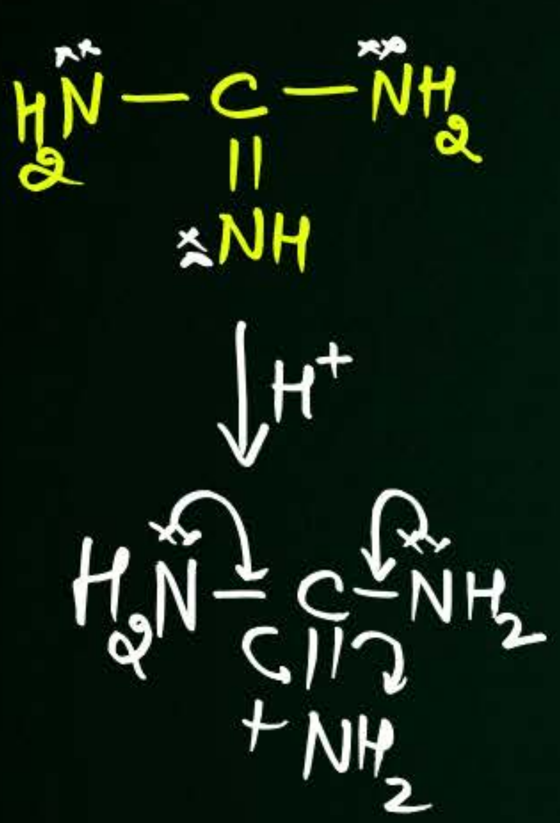
B.S $2>1$

order

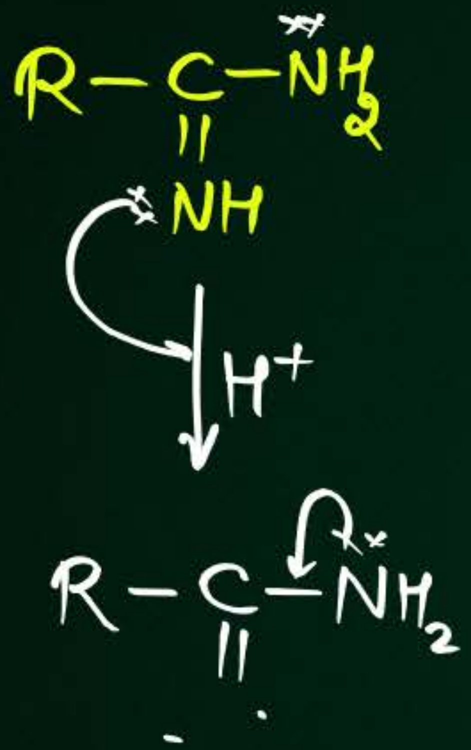
Guanidine > Amidine > Amine > imine > Amide > cyanide



$R-C(=O)-\ddot{N}H_2$ sp^2

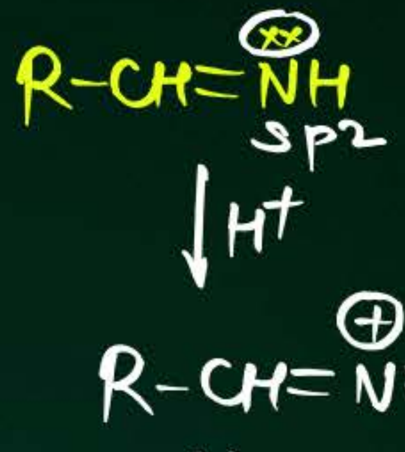


2 Reso



$R\ddot{N}H_2 > Ph\ddot{N}H_2$

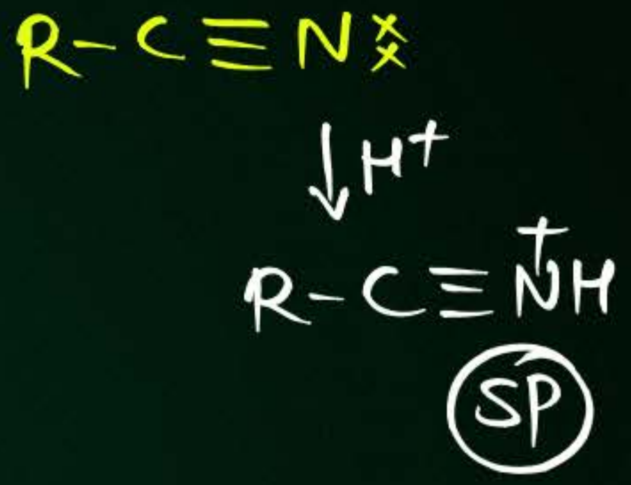
Loca deloca



sp^2

No reso

Hybri ✓

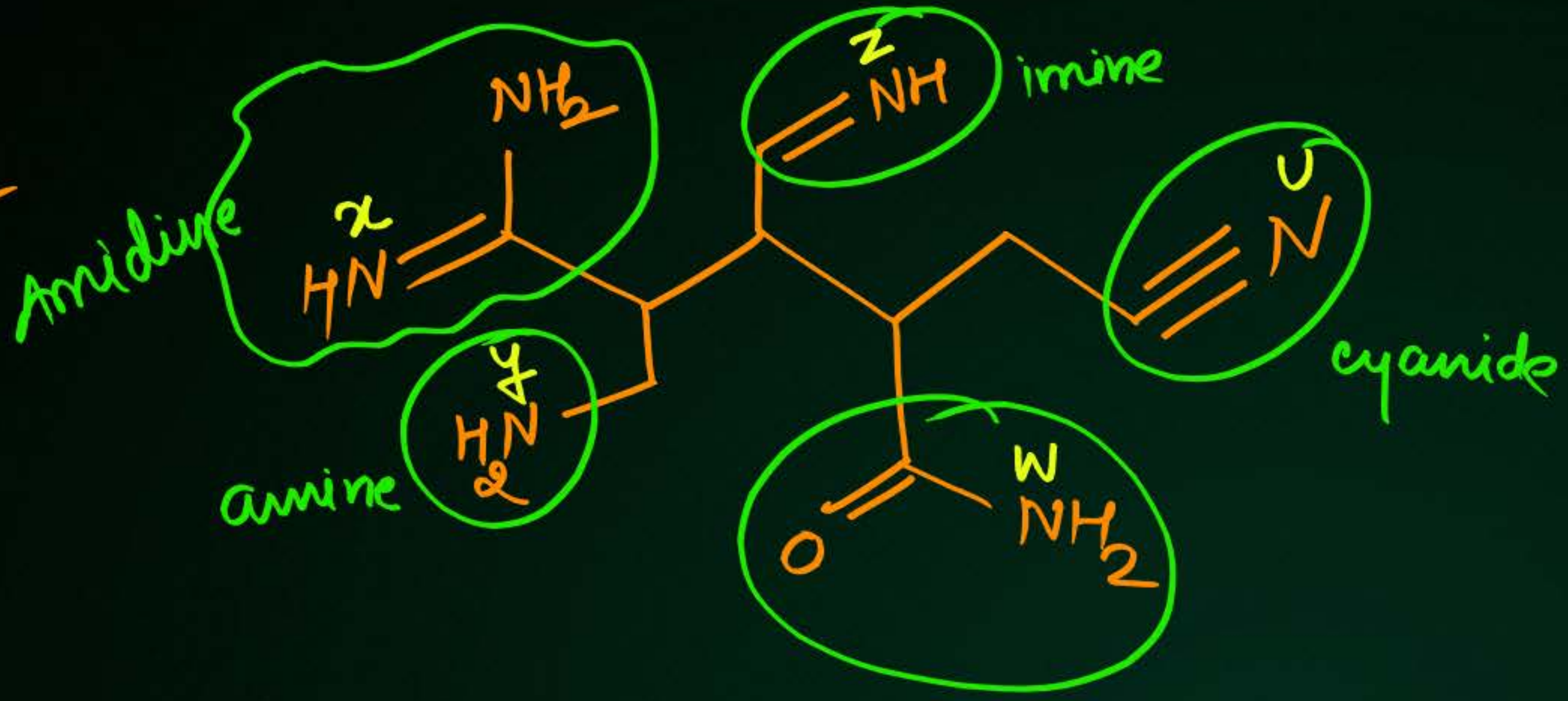


+ OMG

PHK

DKHK

Q



Amidine
x
HN
NH2
z
NH
imine
U
N
cyanide
y
H2N
amine
w
O
NH2
amide

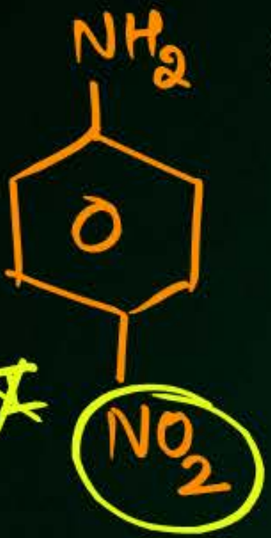
$$\boxed{x > y > z > w > U}$$

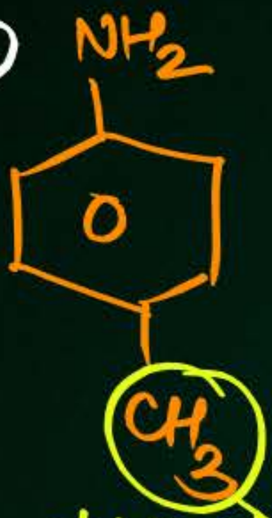
Effects

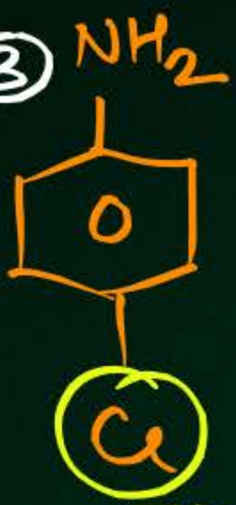
Benzene derivative

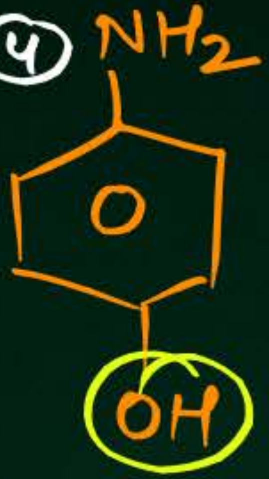
$BS \propto +M, +H, +I \propto \frac{1}{-M, -H, -I}$

Q①

①

−M > ~~I~~

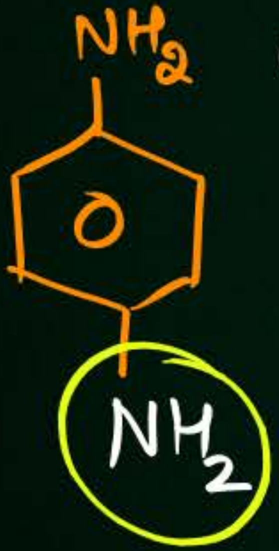
②

+H > ~~I~~

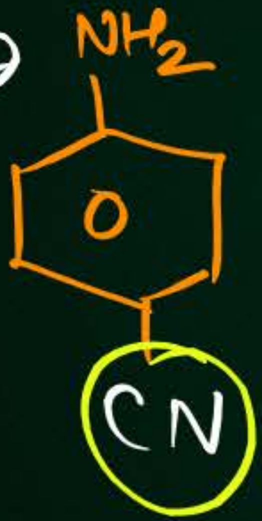
③

−I > ~~+M~~

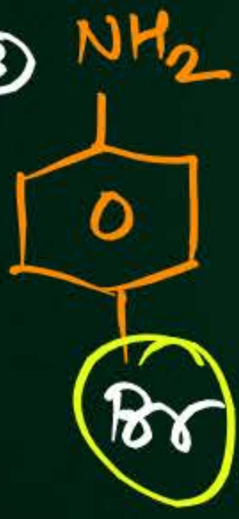
④

+M > ~~I~~

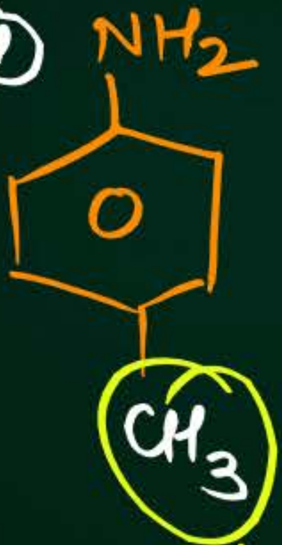
④ > ② > ③ > ①

Q②

①

+M > ~~I~~

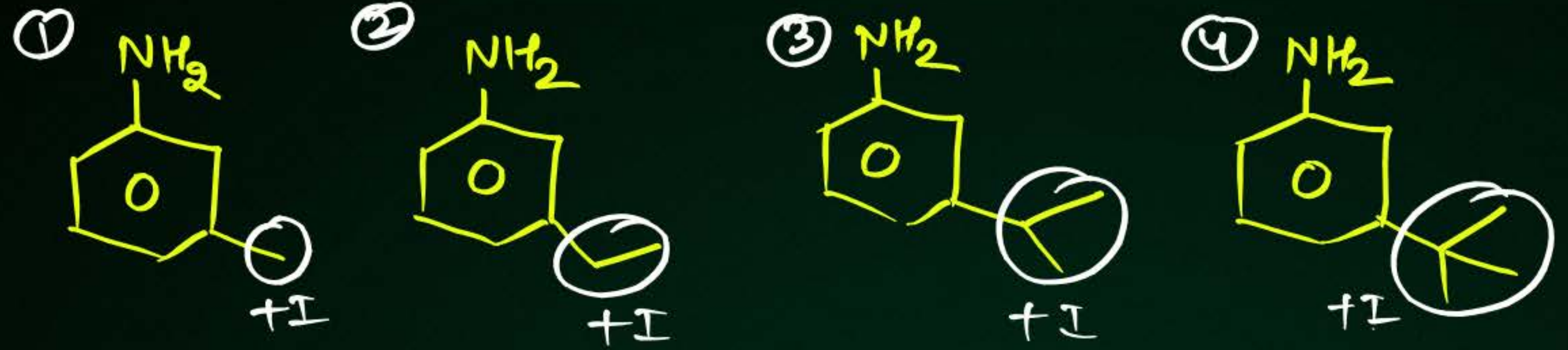
②

−M > ~~I~~

③

−I > ~~+M~~

④

+H > ~~I~~

① > ④ > ③ > ②

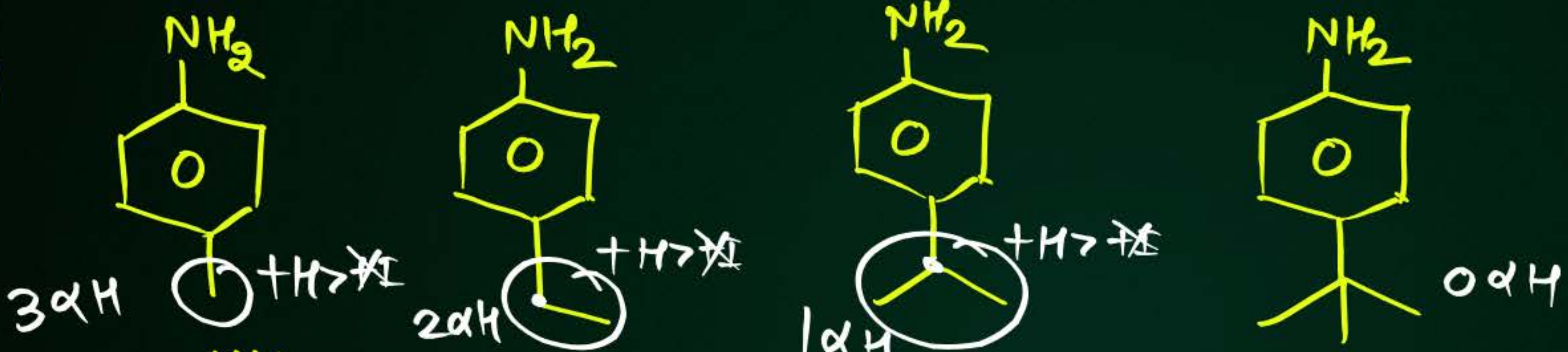
③



①
NH2
+I
②
NH2
+I
③
NH2
+I
④
NH2
+I

4>3>2>1

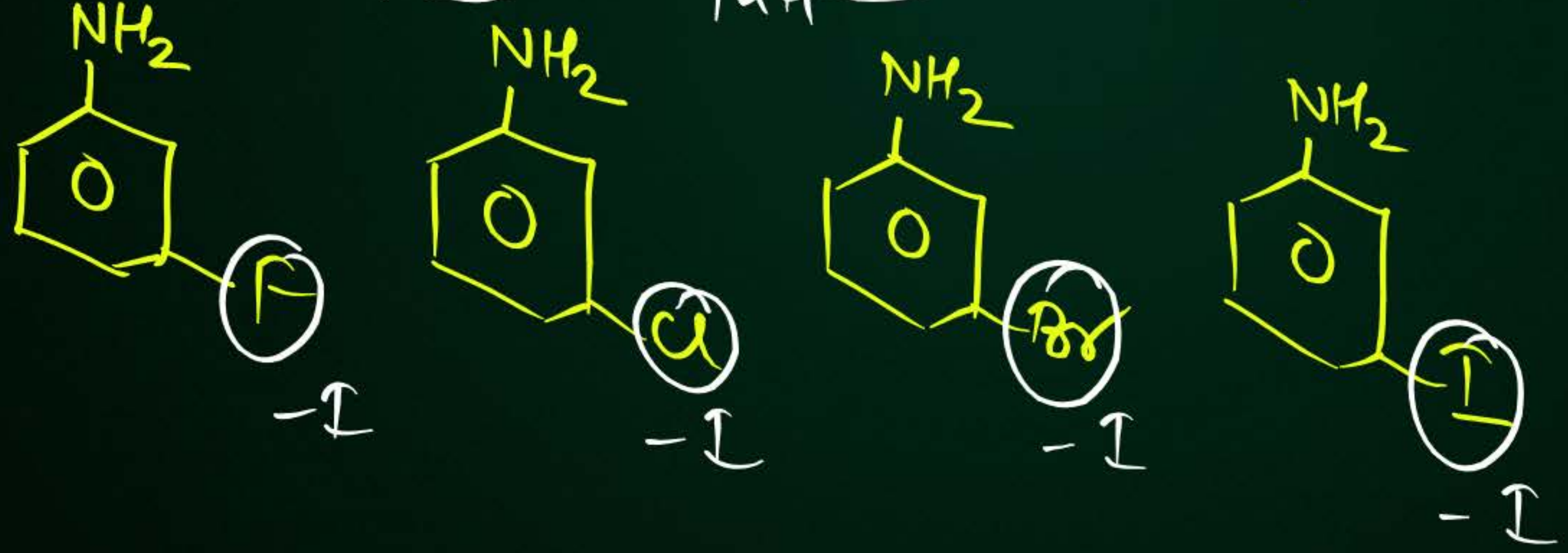
④



NH2
3αH
+H > +I
NH2
2αH
+H > +I
NH2
1αH
+H > +I
NH2
0αH

1>2>3>4

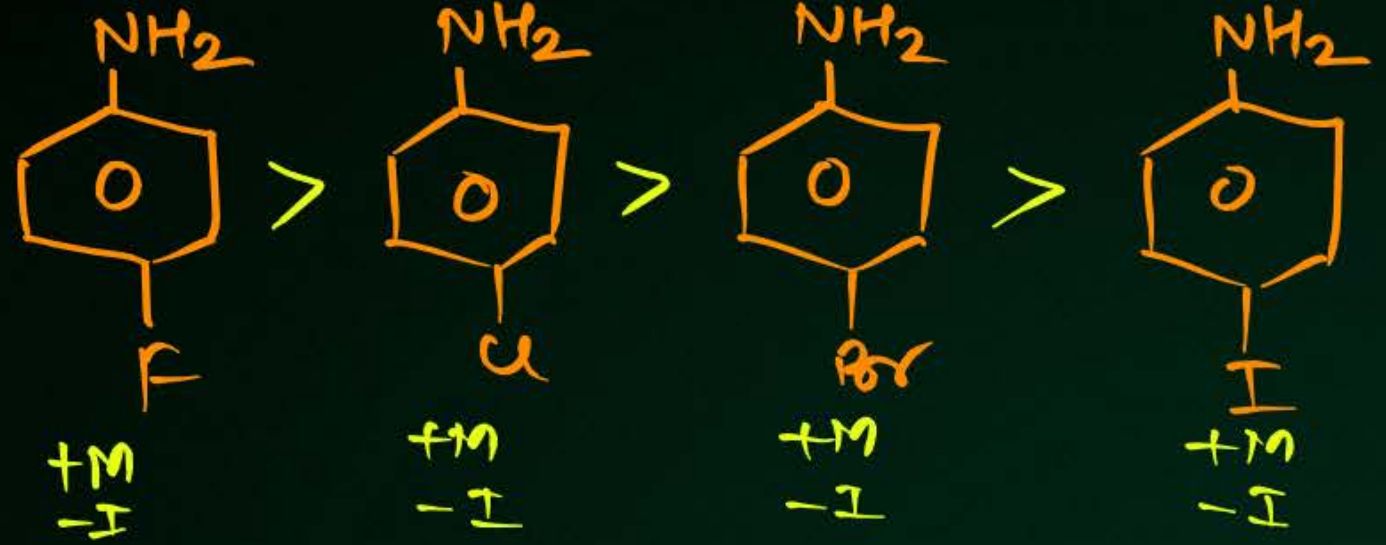
⑤



NH2
F
-I
NH2
Cl
-I
NH2
Br
-I
NH2
I
-I

4>3>2>1

⑥



NH2
NH2
NH2
NH2
F
Cl
Br
I
+M
-I
+M
-I
+M
-I
+M
-I

Overall withdrawing

$F < Cl < Br < I$

$\boxed{1 > 2 > 3 > 4}$

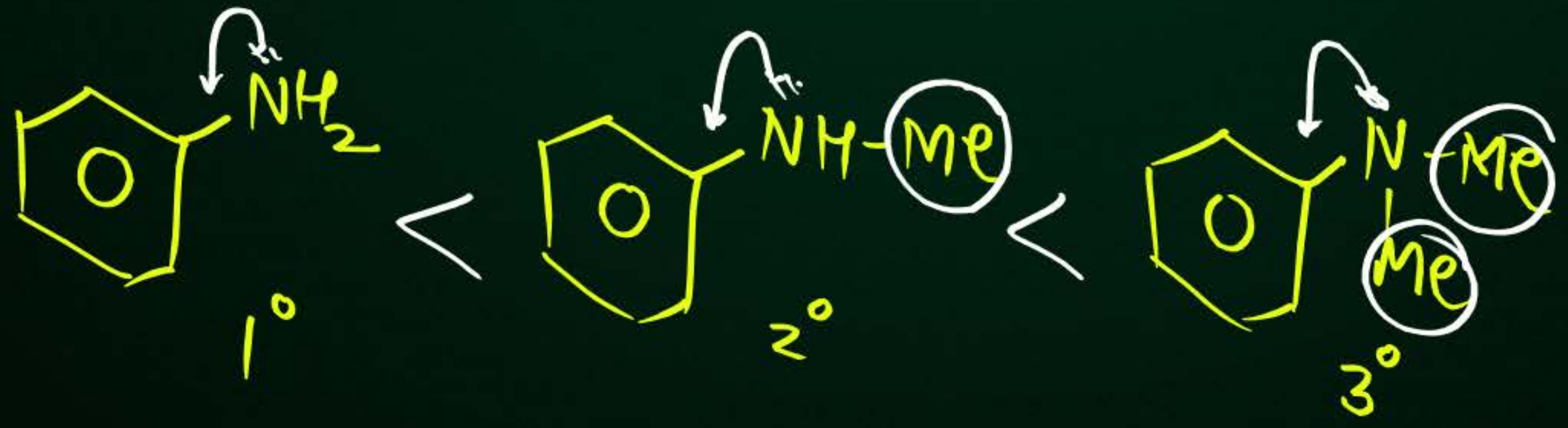
⑦ $Ph-\ddot{N}H_2 > Ph_2\ddot{N}H > Ph_3\ddot{N}$

1° 2° 3°

⑧ $CH_3-\ddot{N}H_2 < (CH_3)_2\ddot{N}H < (CH_3)_3\ddot{N}$ (gas phase)

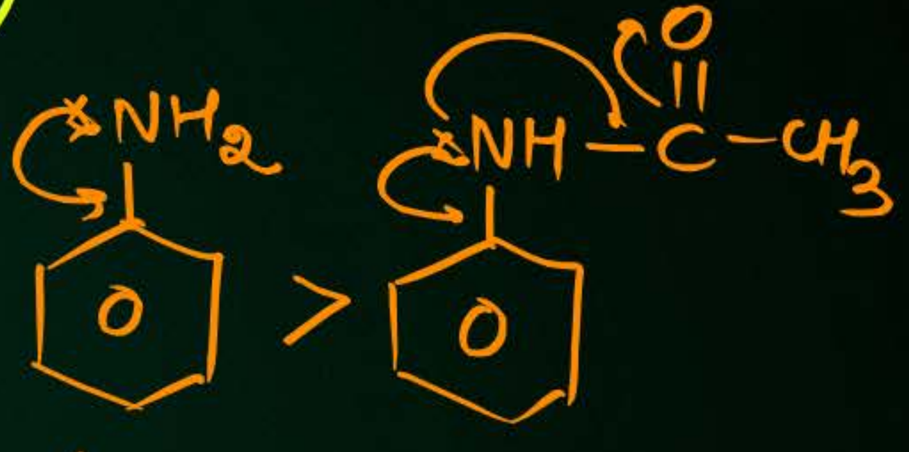
1° 2° 3°

⑨



NH2
NH-Me
N-Me
Me
1°
2°
3°

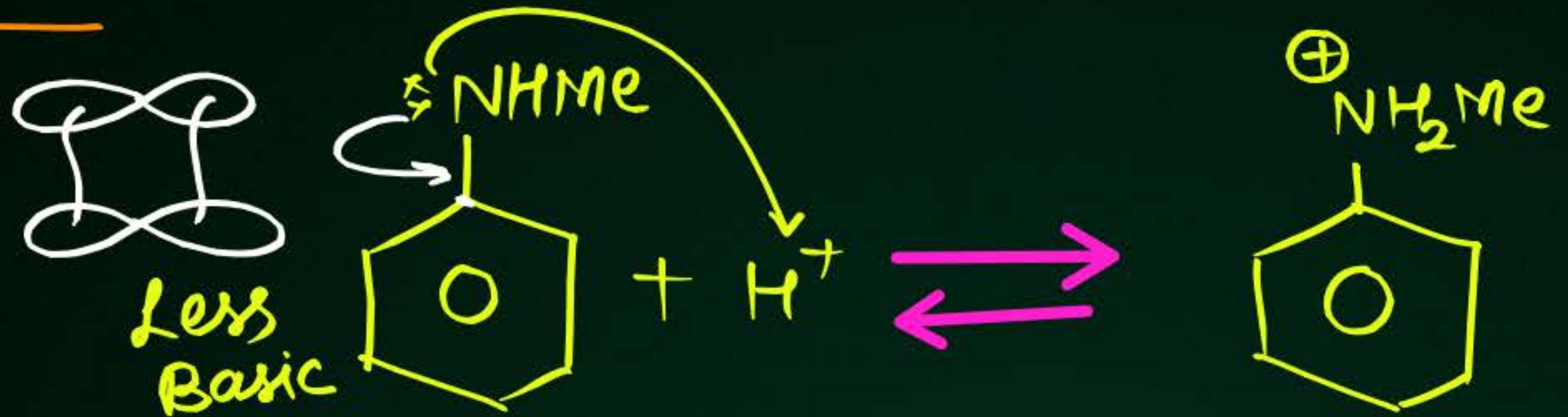
⑩



NH2
NH-C-CH3
O

Amine Amide

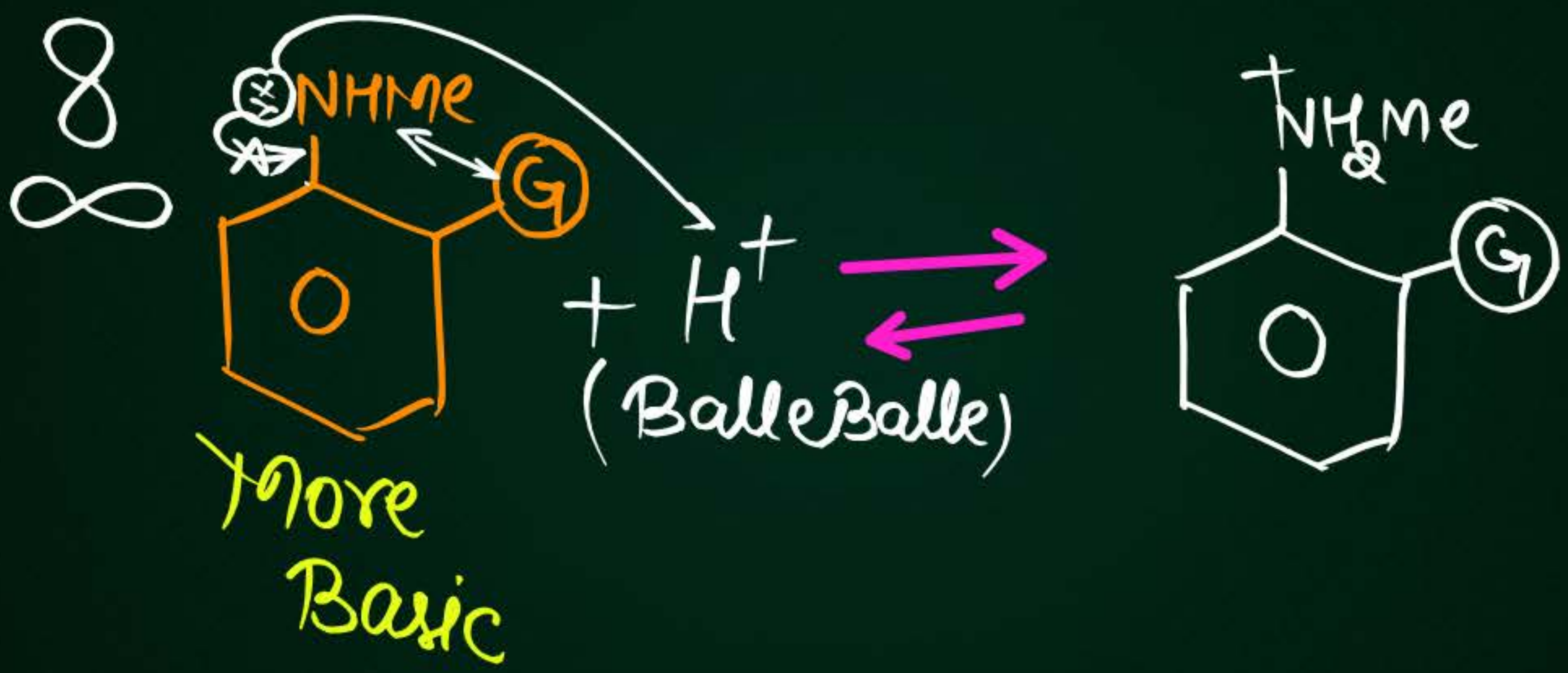
S.I.R effect 3° & 2° Aro amine $(3^\circ > 2^\circ)$


NHMe
Less Basic
+ H⁺
⊕NH₂Me

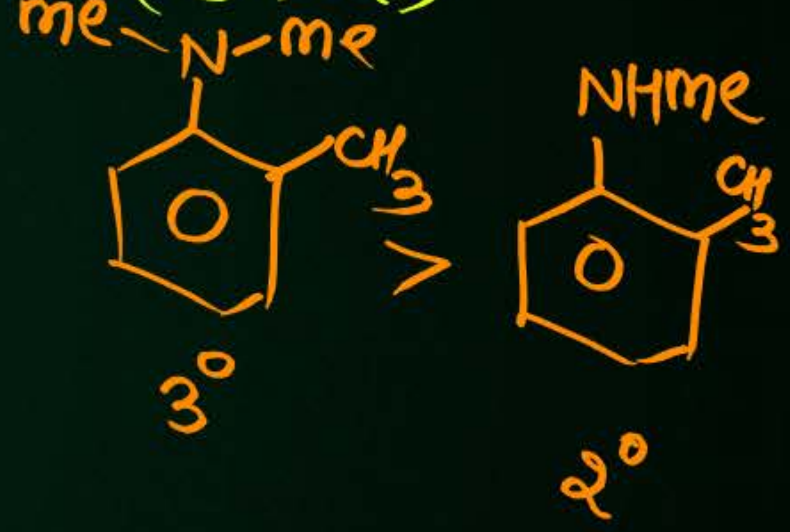
$G \neq H, D, T, F, OH, NH_2$
CN etc

iske alawa
saare bulky
man lenge

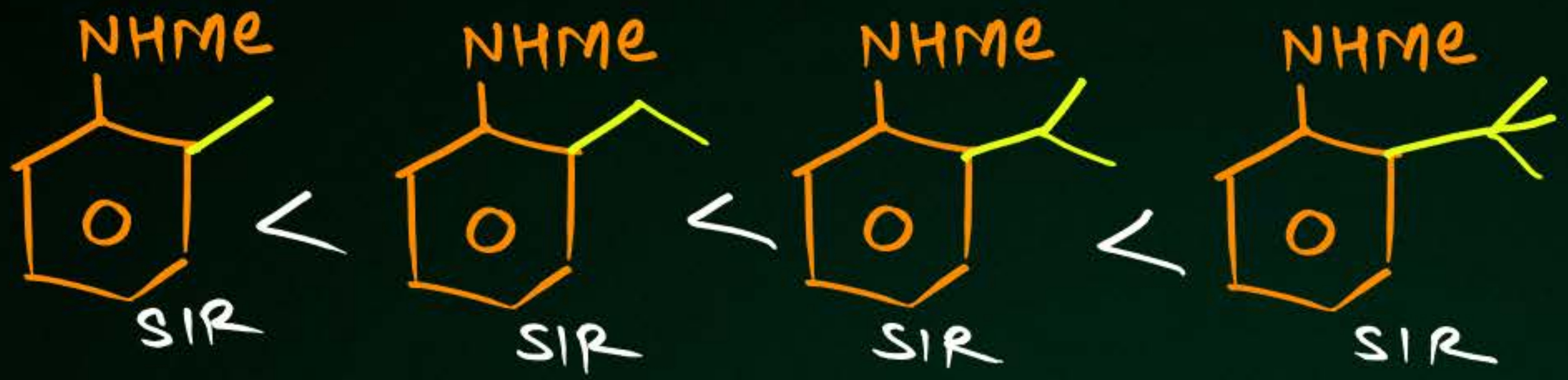
$R, NO_2, COOH, COOR, COCl$
etc


NHMe
G
More Basic
+ H⁺
(BalleBalle)
⁺NH₂Me
G

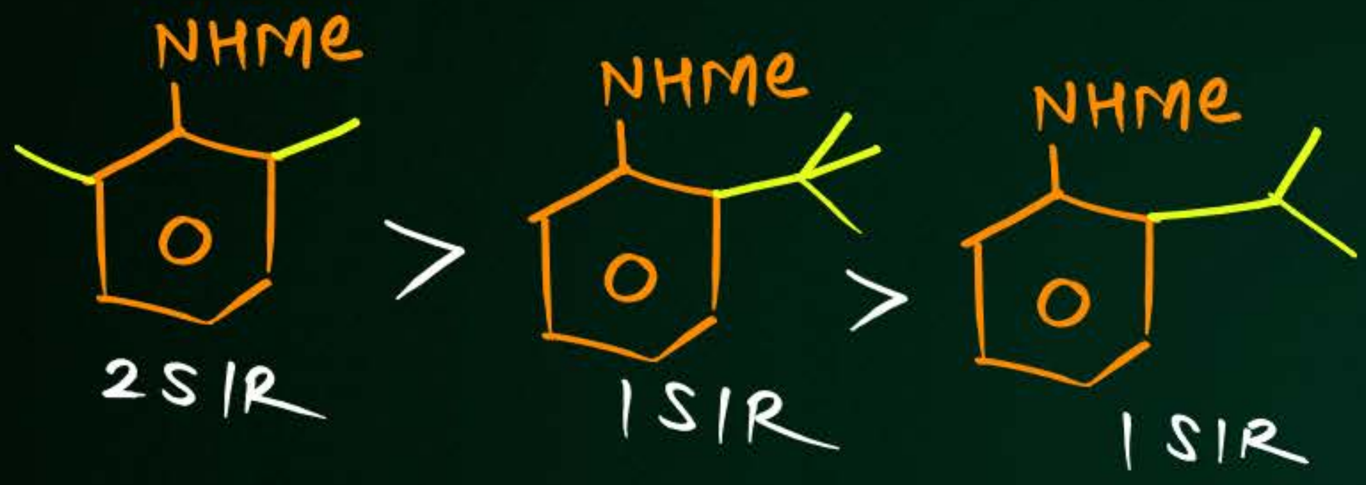
Due to SIR effect
B.S in 2° & 3°
aro amines increases
$(3^\circ > 2^\circ)$


me-N-me
CH₃
>
NHMe
CH₃
3°
2°

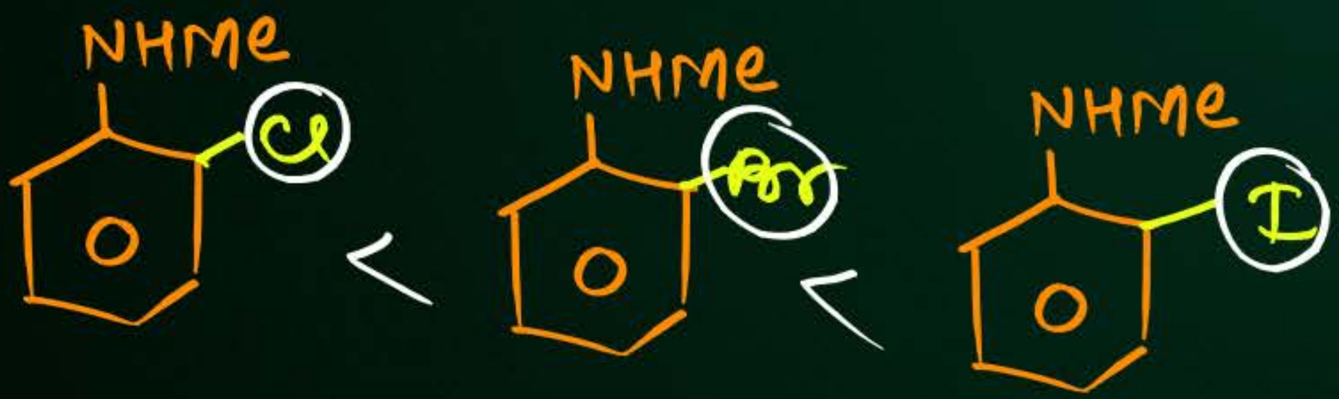
Q/ ①


NHMe
SIR
<
NHMe
SIR
<
NHMe
SIR
<
NHMe
SIR

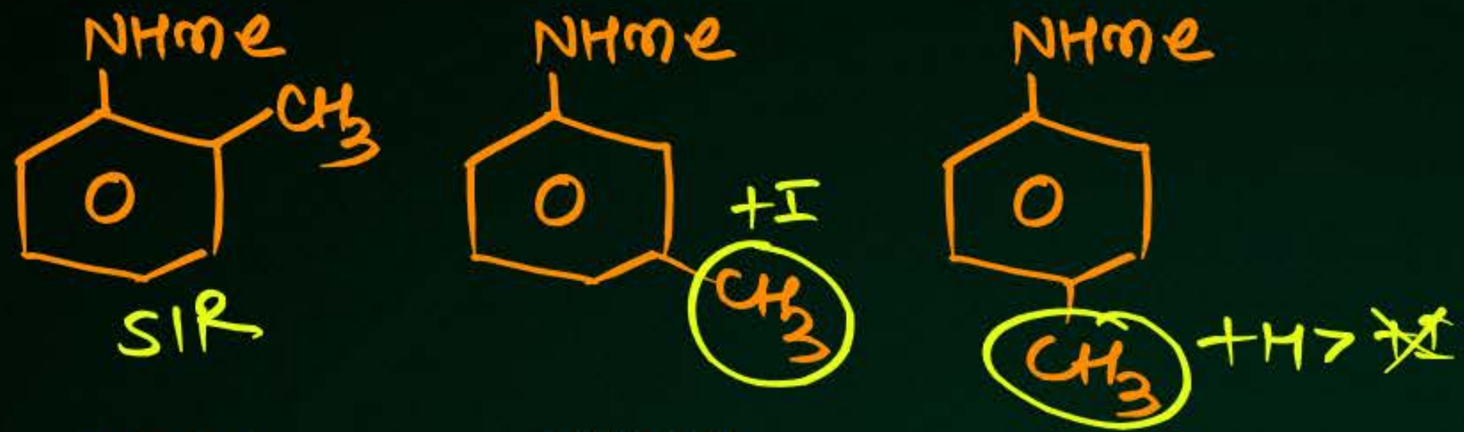
②


NHMe
2 SIR
>
NHMe
1 SIR
>
NHMe
1 SIR

③


NHMe
Cl
<
NHMe
Br
<
NHMe
I

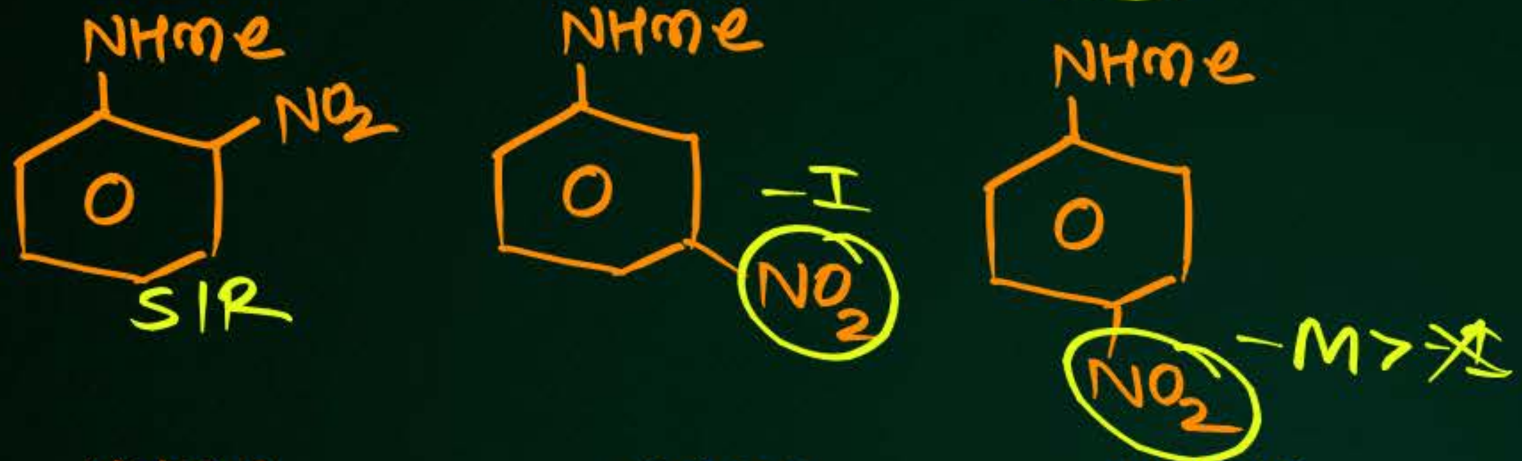
④



NHme
CH3
SIR
NHme
+I
CH3
NHme
CH3
+H > +I

1 > 3 > 2

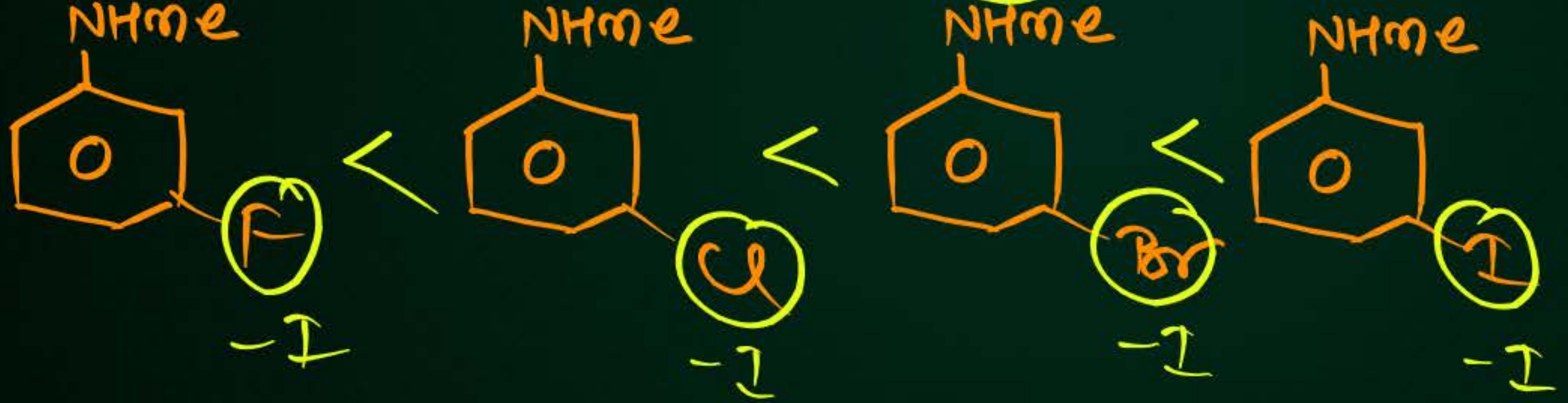
⑤



NHme
NO2
SIR
NHme
-I
NO2
NHme
NO2
-M > -I

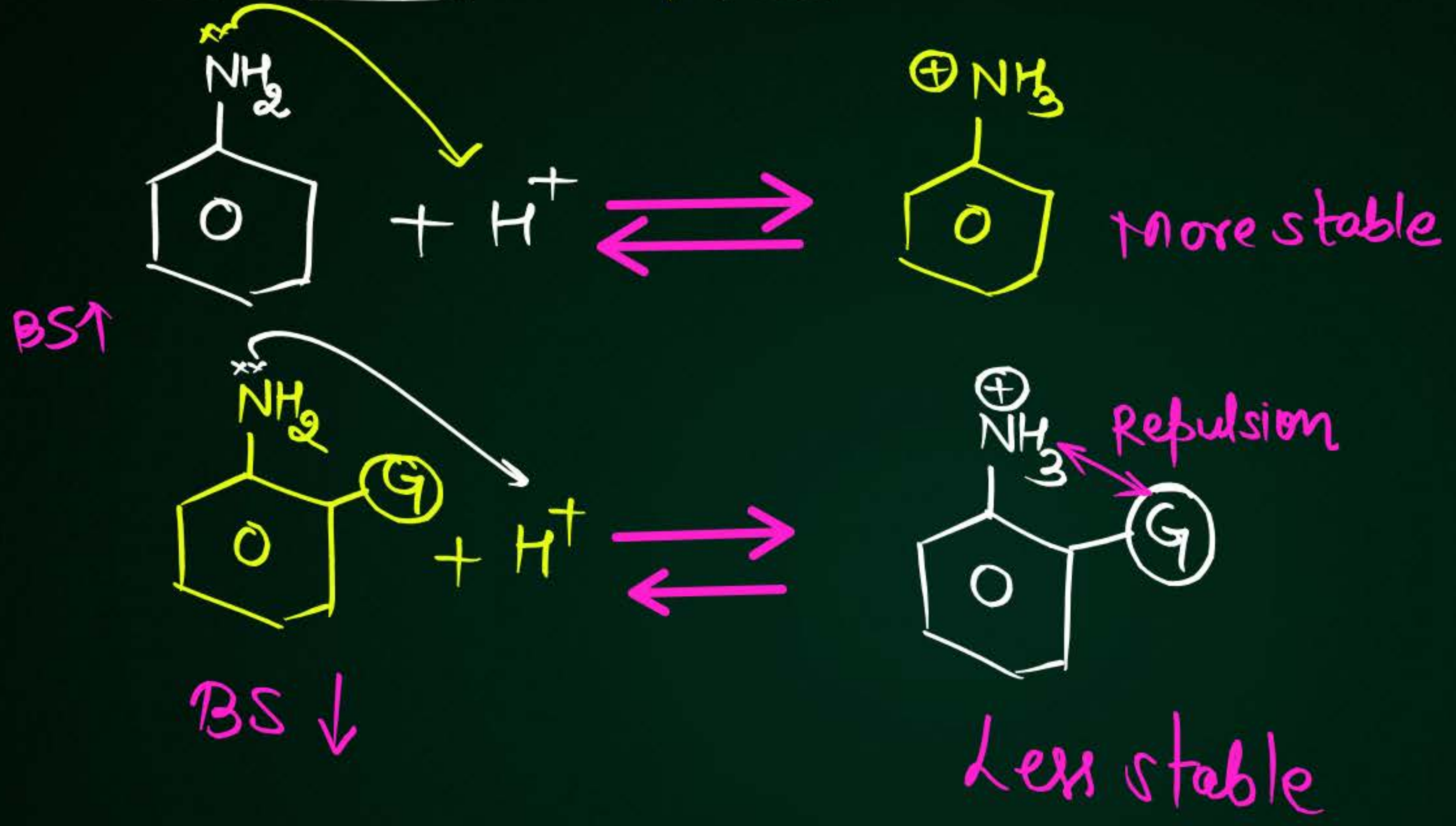
1 > 2 > 3

⑥



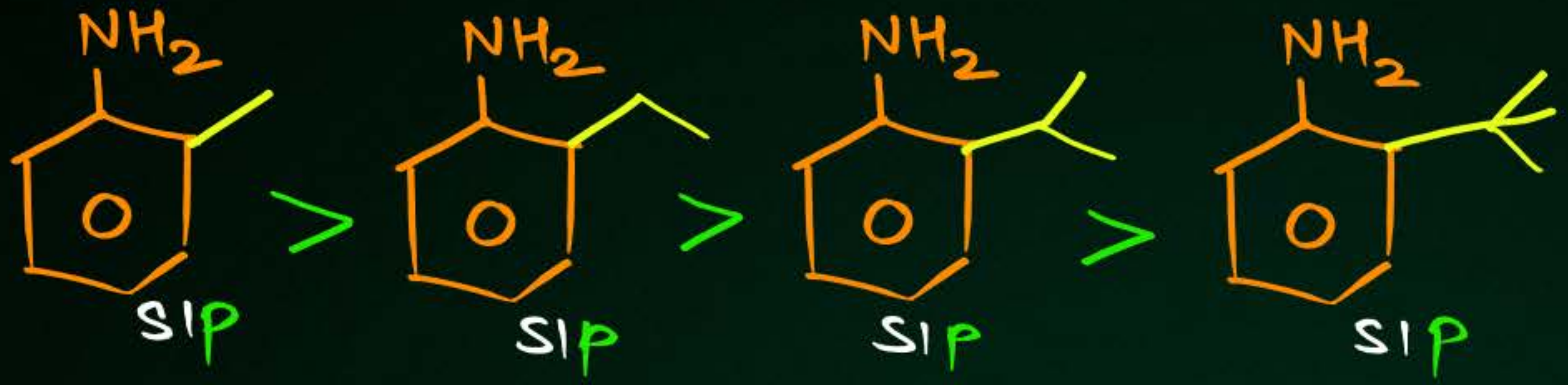
NHme
F
-I
<
NHme
Cl
-I
<
NHme
Br
-I
<
NHme
I
-I

S.I.P steric inhibition in protonation (Aro 1° amine)

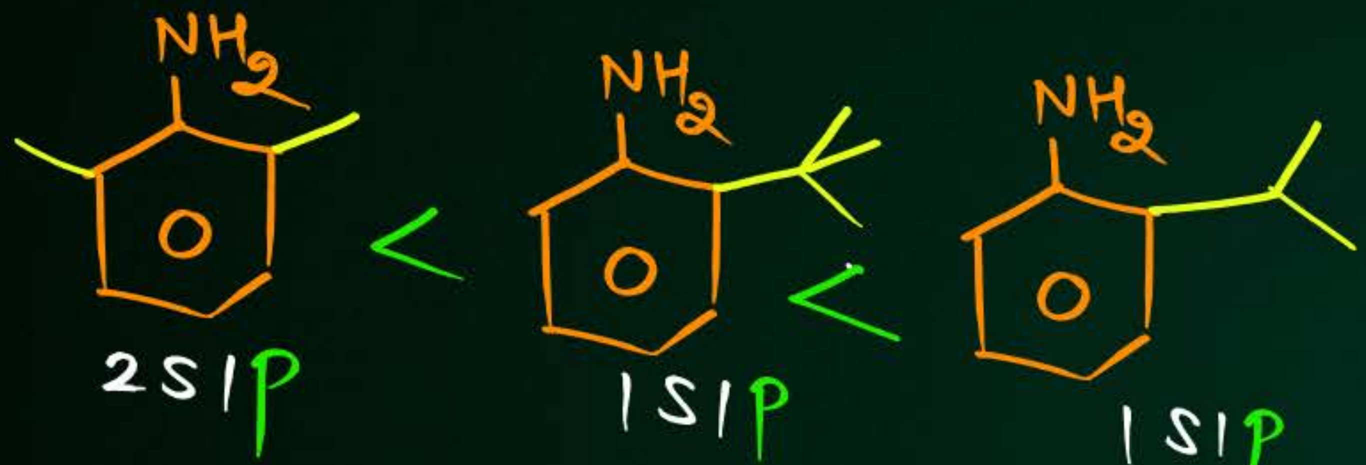

NH2
+ H+
⊕NH3
more stable
BS↑
NH2
G
+ H+
⊕
NH3
Repulsion
G
BS ↓
Less stable

Due to SIP effect BS of aro 1° amine decreases

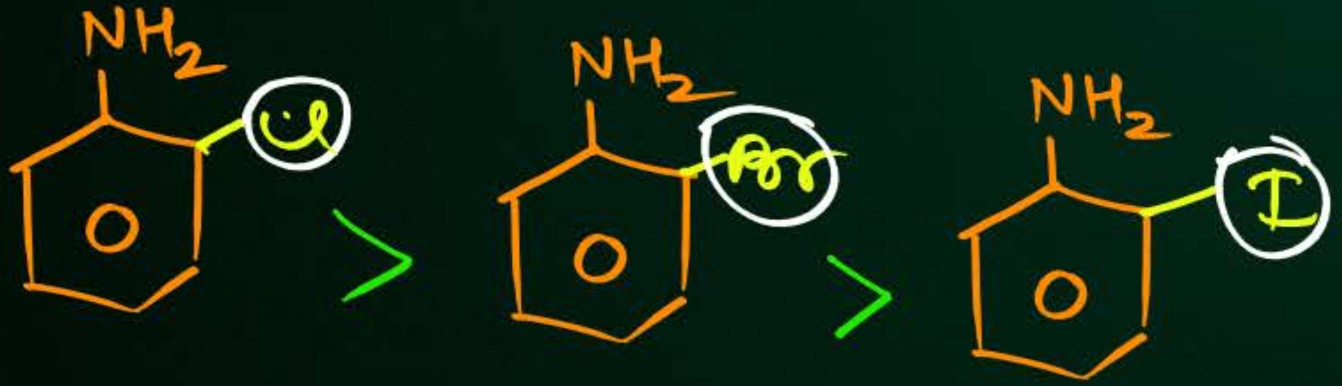
Q/ ①


NH2
SIP
>
NH2
SIP
>
NH2
SIP
>
NH2
SIP

②


NH2
2SIP
<
NH2
1SIP
<
NH2
1SIP

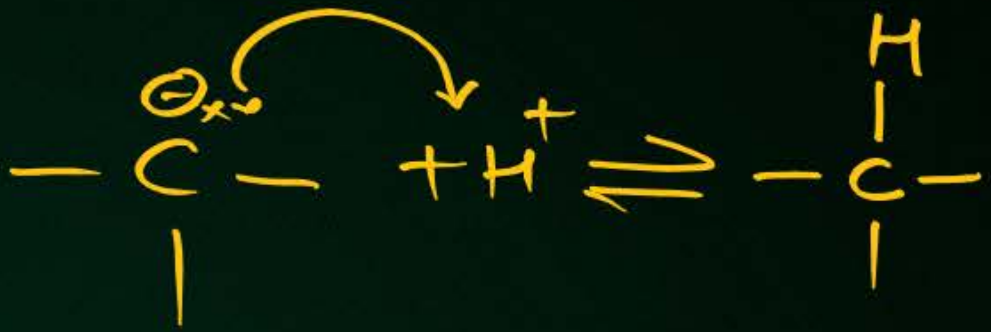
③


NH2
Cl
>
NH2
Br
>
NH2
I

Carbanion Bases

Stability of $\overset{\ominus}{C}$ ✓

[BB > ArO > R > H > I]



$$-\overset{\ominus}{\underset{|}{C}}- + H^+ \rightleftharpoons -\overset{H}{\underset{|}{\overset{|}{C}}}-$$

$$\boxed{\text{Basic strength} \propto \frac{1}{\text{Stability of } \overset{\ominus}{C}}}$$

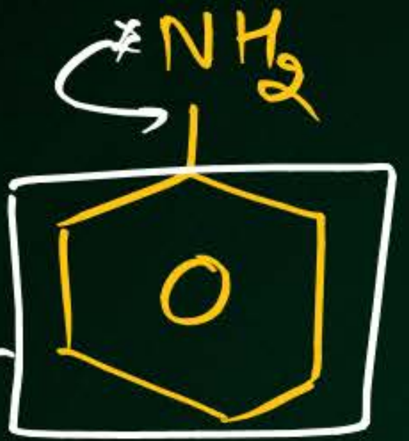
Q ① $CH_3-\overset{\ominus}{C}H_2$ ② $CH_2=\overset{\ominus}{C}H$ ③ $CH\equiv\overset{\ominus}{C}$

Stability ① < ② < ③

B.S ① > ② > ③

Imp example

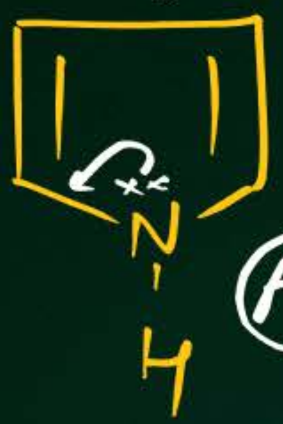
①



$6\pi e^{\ominus}$
(π Bond)
Aro

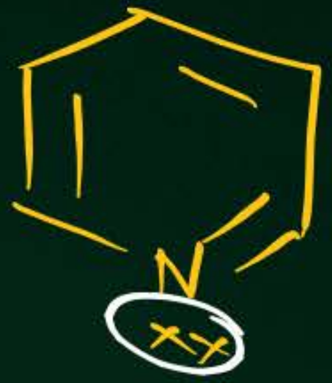
②

$6\pi e^{\ominus}$
$\uparrow$
$4\pi e^{\ominus} + 2\pi e^{\ominus}$
(π Bond) (LP)



Aro

③



3 > 1 > 2

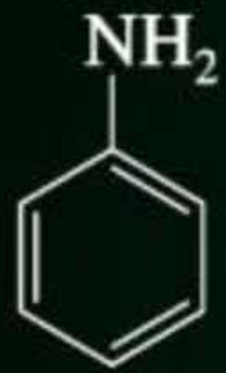
QUESTION

−M power

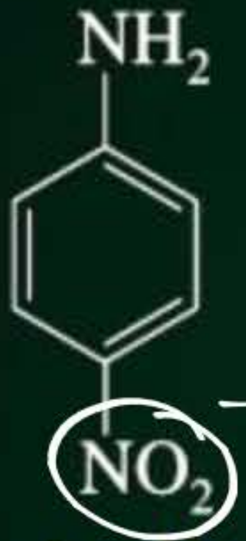
$-NO_2 > -CN$

Consider the following compounds:

(I)

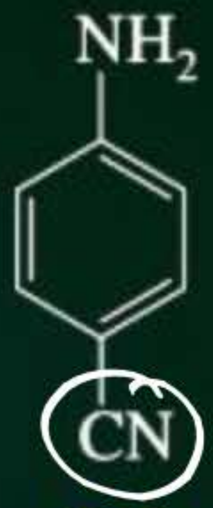


(II)



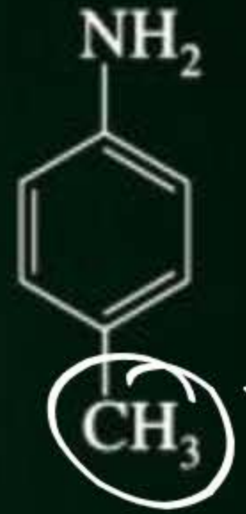
−M > I

(III)



−M > I

(IV)



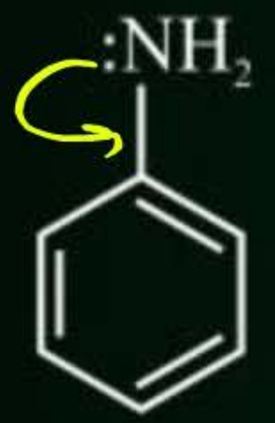
+H > I

Arrange these compounds in decreasing order of their basicity:

- (A) I > II > III > IV
- (B) II > III > I > IV
- (C) IV > I > III > II
- (D) IV > I > II > III

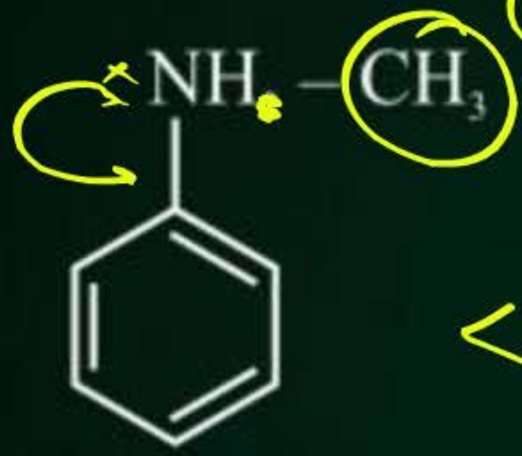
QUESTION

The decreasing order of basicity of following aniline derivatives is:



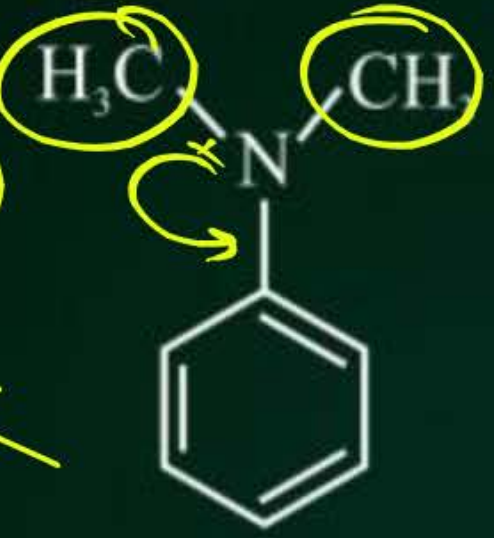
(X)

<



(Y)

<



(Z)

A $X > Y > Z$

B $Y > Z > X$

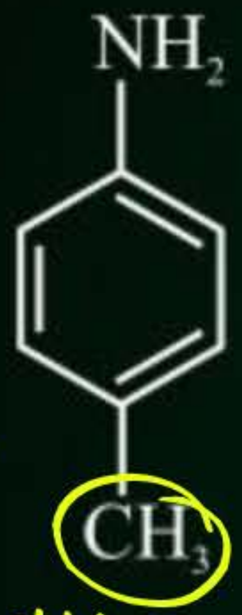
[✓ **C**] $Z > Y > X$

D $X > Z > Y$

QUESTION

The decreasing order of basicity of following aniline derivatives is:

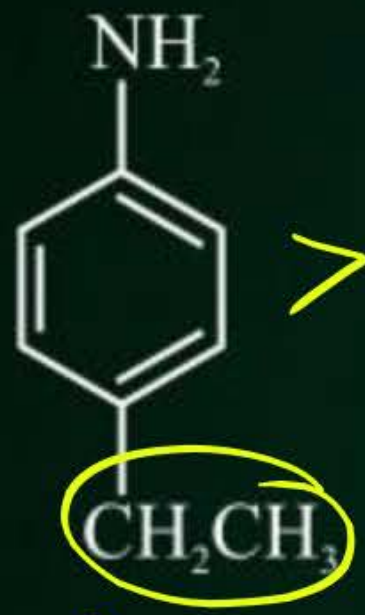
+H > +I



3αH

(P)

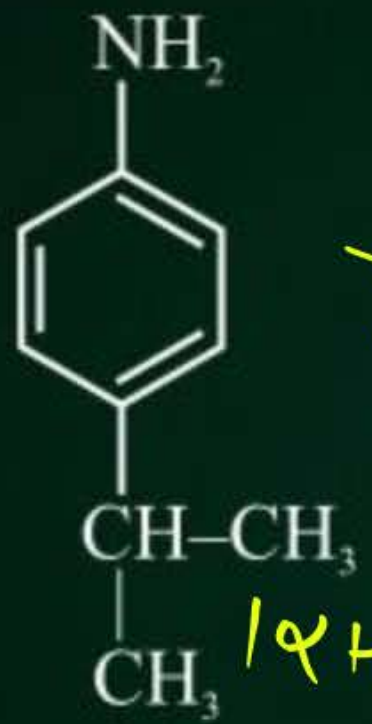
>



2αH

(Q)

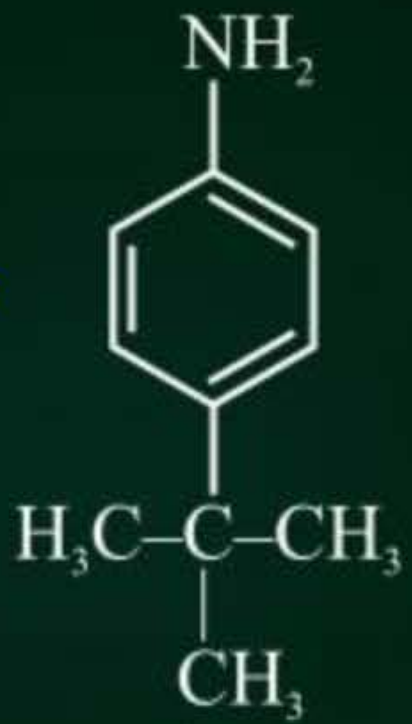
>


NH$_2$
CH–CH$_3$
CH$_3$

1αH

(R)

>


NH$_2$
H$_3$C–C–CH$_3$
CH$_3$

0αH

(S)

[✓ A] P > Q > R > S

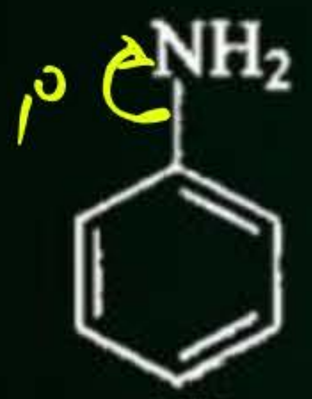
B Q > S > R > P

C S > R > Q > P

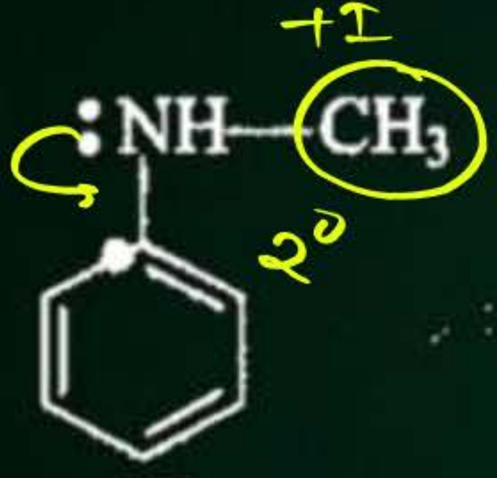
D R > S > Q > P

QUESTION

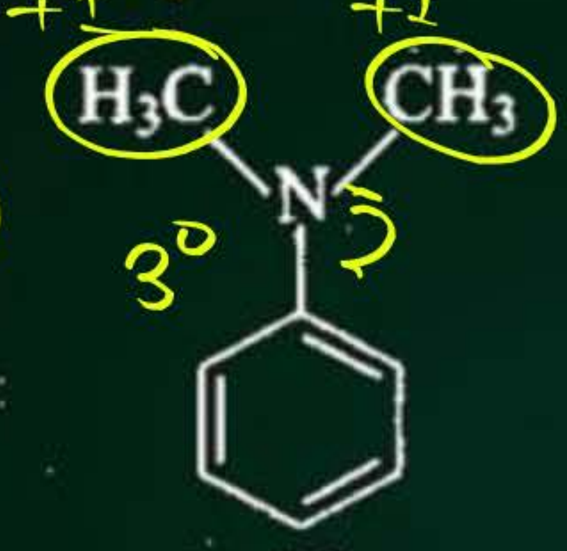
The decreasing order of basicity of following aniline derivatives is:



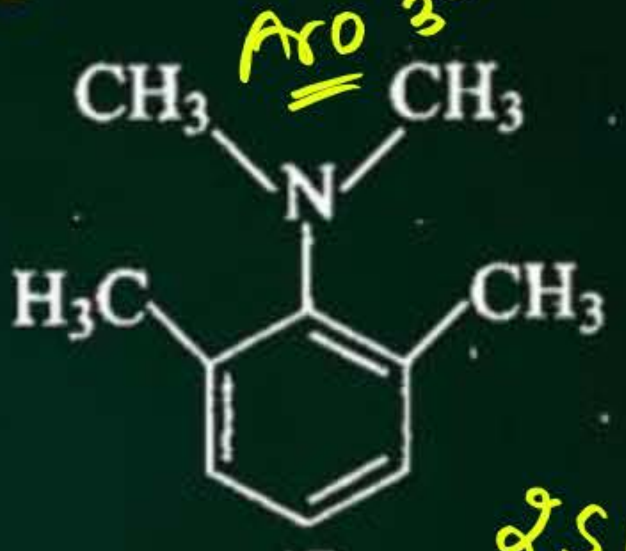
(P)



(Q)


+I
H$_3$C
+I
CH$_3$
N
3°

(R)


Aro 3°
CH$_3$
CH$_3$
N
H$_3$C
CH$_3$

(S)

2SIR

A R > S > Q > P

B P > Q > R > S

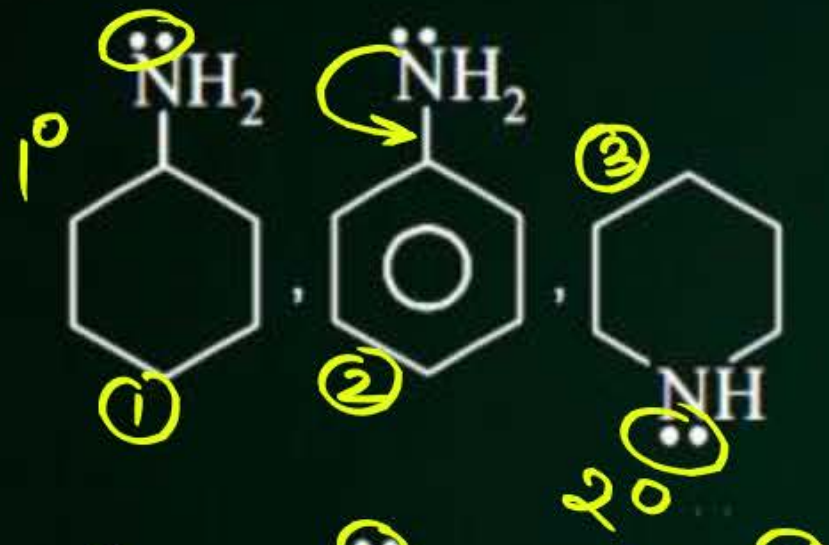
C R > Q > P > S

[✓ D] S > R > Q > P

QUESTION

Write decreasing order of basic strength of following:

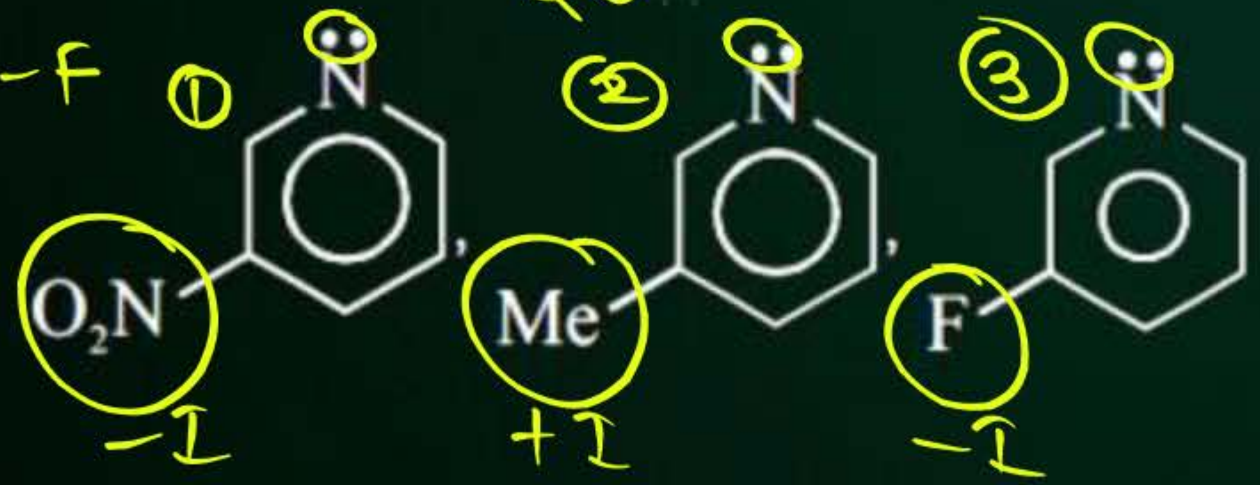
A



③ > ① > ②

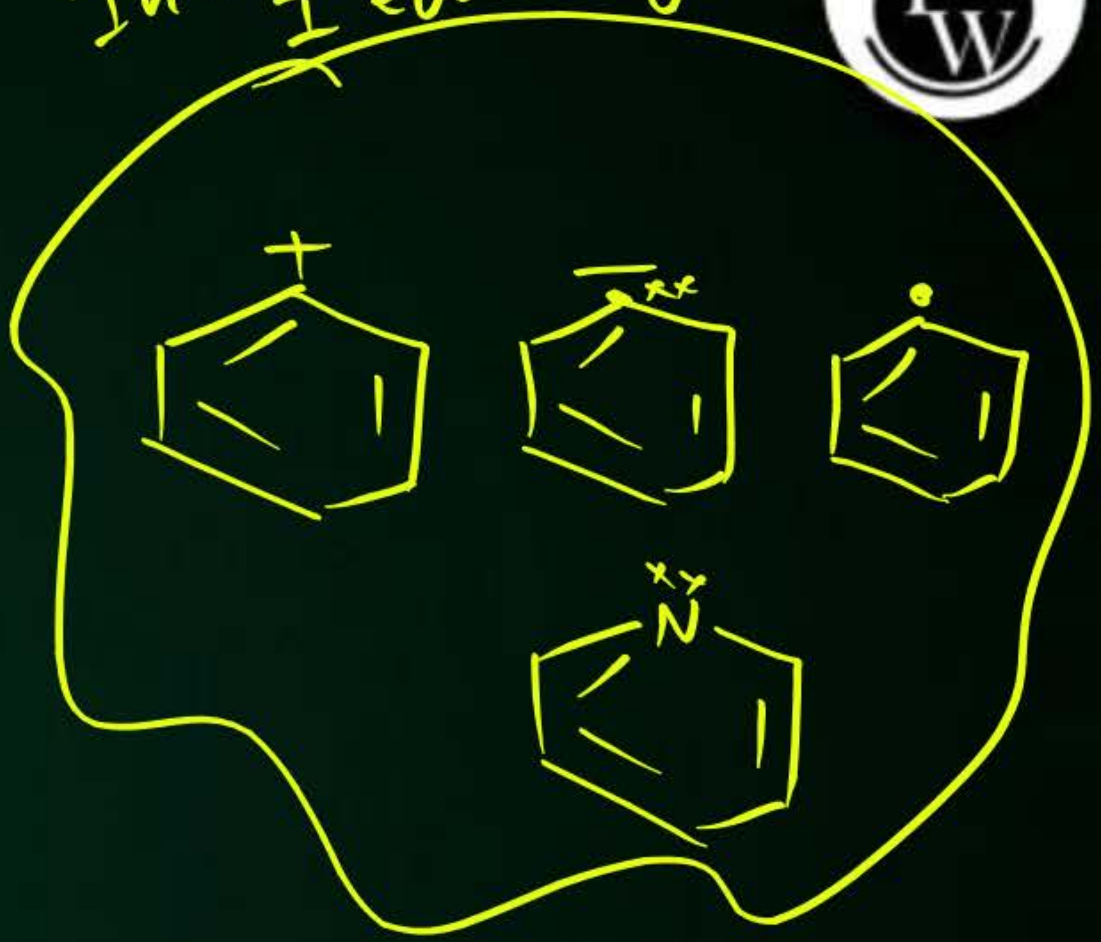
B

-I
$-NO_2 > -F$



$\boxed{2 > 3 > 1}$

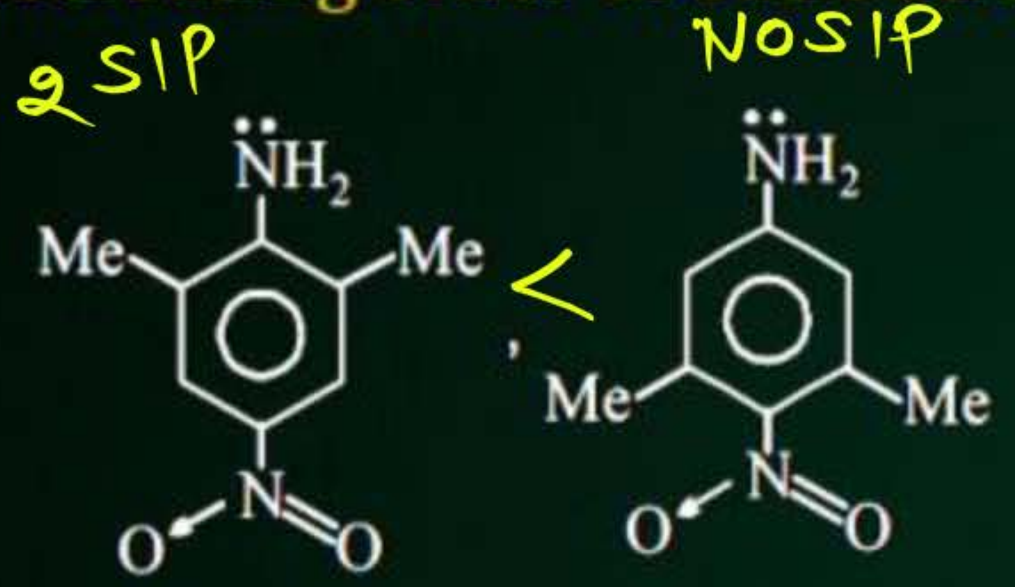
In sab main I effect Lag ta



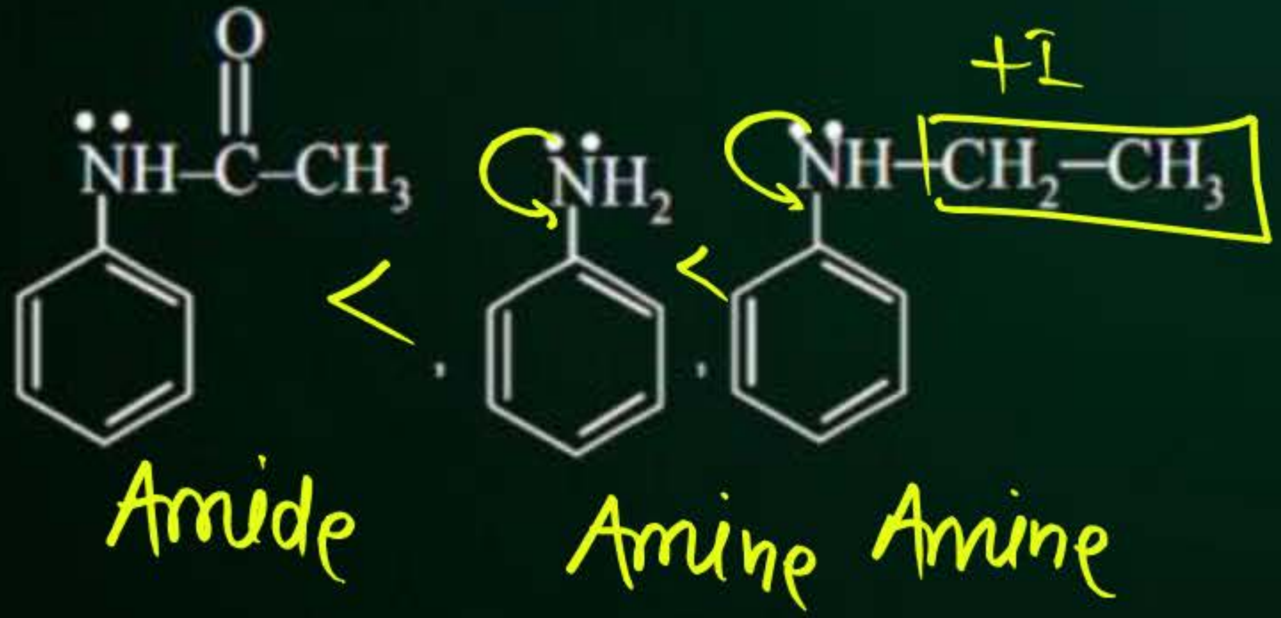
QUESTION

Write decreasing order of basic strength of following:

A


2 SIP
NO SIP
NH2
Me
Me
<
NH2
Me
Me
N
O
O
N
O
O

B

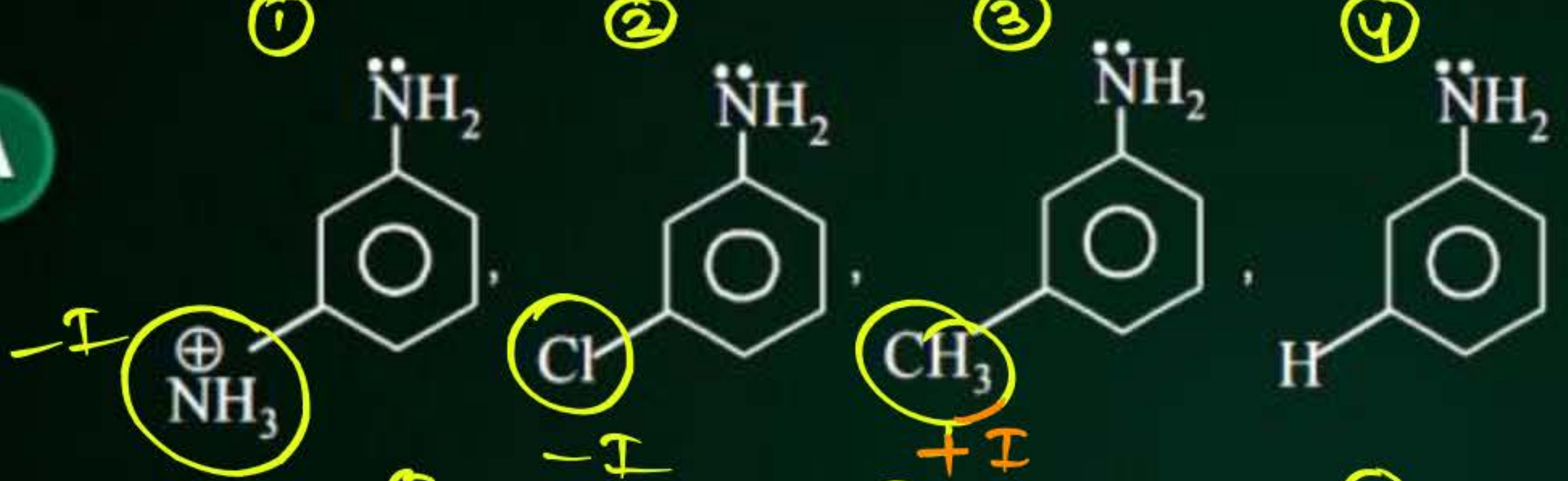

O
NH–C–CH3
<
NH2
<
+I
NH–CH2–CH3
Amide
Amine
Amine

QUESTION

$-I$ power $-\overset{+}{N}H_3 > -Cl$

Write decreasing order of basic strength of following:

A

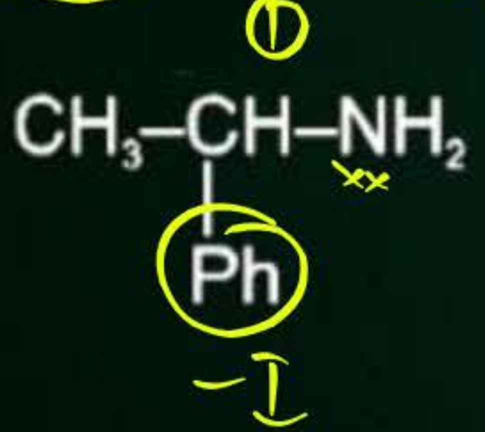


①
②
③
④
$\ddot{N}H_2$
$\ddot{N}H_2$
$\ddot{N}H_2$
$\ddot{N}H_2$
$-I$
$\overset{\oplus}{N}H_3$
Cl
$-I$
CH_3
$+I$
H

$3 > 4 > 2 > 1$

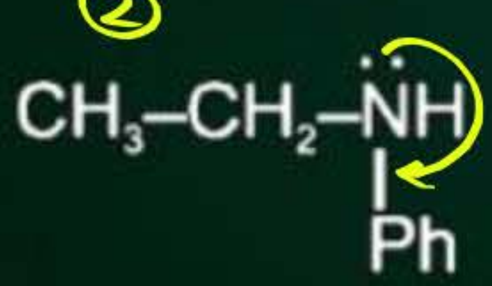
B

①



$CH_3-\underset{Ph}{CH}-NH_2$

②



$CH_3-CH_2-\underset{Ph}{\ddot{N}H}$

③ $Ph-CH_2-CH_2-\ddot{N}H_2$

$-I$

$3 > 1 > 2$

Home Work

QUESTION 01

Consider the basicity of the following aromatic amines:

(I) Aniline

(II) p-nitroaniline

(III) p-methoxyaniline

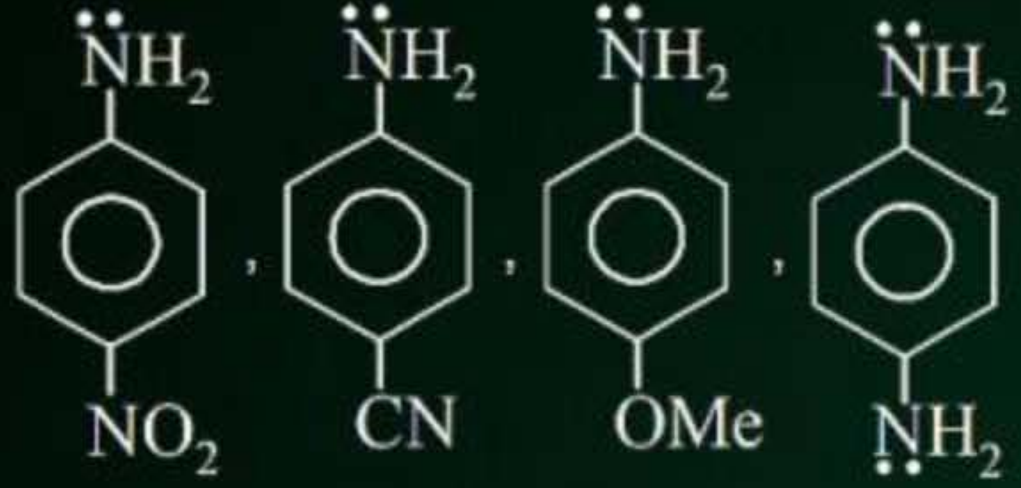
(IV) p-methylaniline

The correct order of decreasing basicity is:

- **A** III > IV > I > II
- **B** III > IV > II > I
- **C** I > II > III > IV
- **D** IV > III > II > I

QUESTION 02

Write decreasing order of basic strength of following:



NH2
NO2
NH2
CN
NH2
OMe
NH2
NH2

A) III > IV > I > II

B) IV > II > III > I

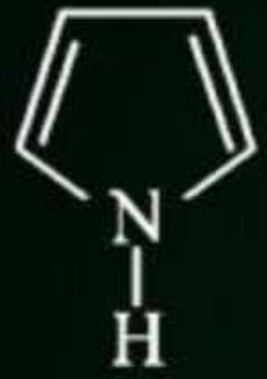
C) I > II > III > IV

D) IV > III > II > I

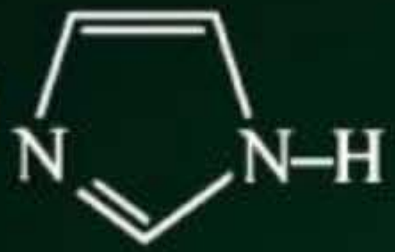
QUESTION 03

Which one of the following is least basic in character?

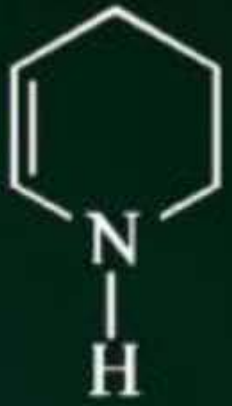
(A)



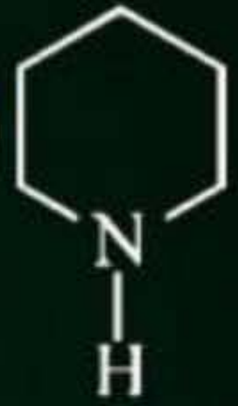
(B)



(C)

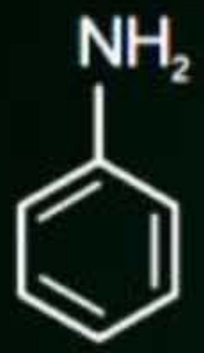


(D)

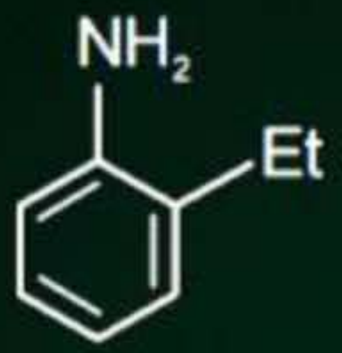


QUESTION 04

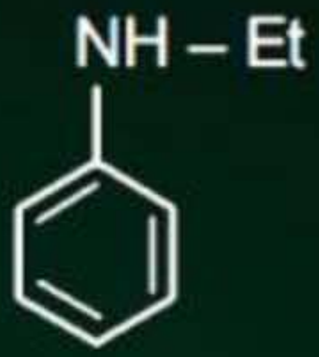
Correct basic strength order is:



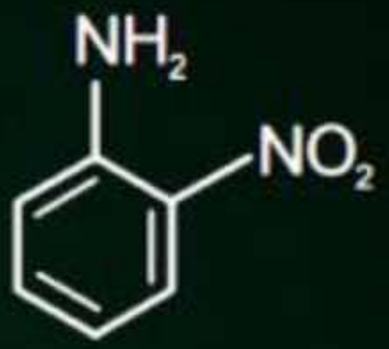
p



q



r



s

A $r > q > p > s$

B $r > p > q > s$

C $q > r > p > s$

D $r > q > s > p$

QUESTION 05

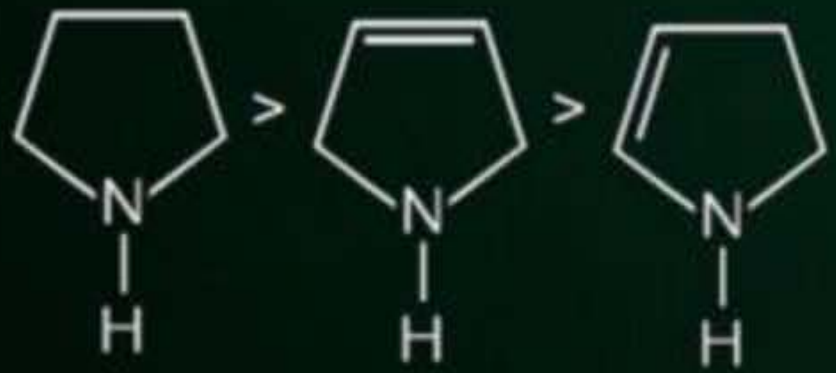
Which of the following is incorrect for basic strength?

(A) $(CH_3)_2NH > (CH_3)_3N > CH_3NH_2 > NH_3$ (In Aq. Medium)

(B) $(C_2H_5)_2NH > (C_2H_5)_3N > C_2H_5NH_2 > NH_3$ (In Aq. Medium)

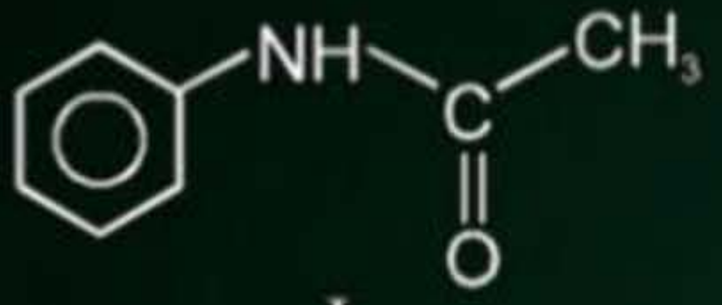
(C) $PhNH_2 > Ph_2NH > Ph_3N$

(D)

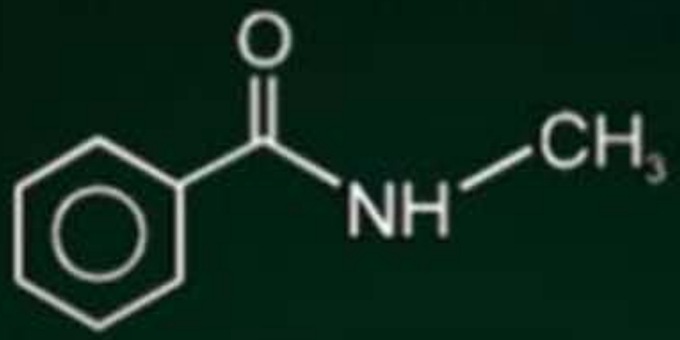


QUESTION 06

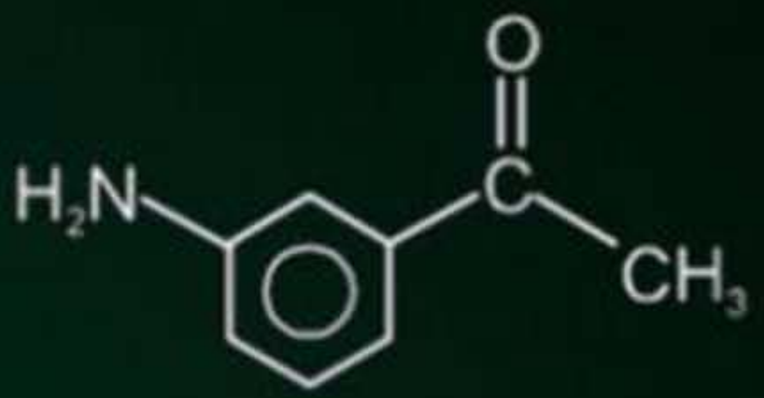
Select the basic strength order of following molecules?



I



II



III

A III > II > I

B II > III > I

C I > III > II

D III > I > II

QUESTION 07

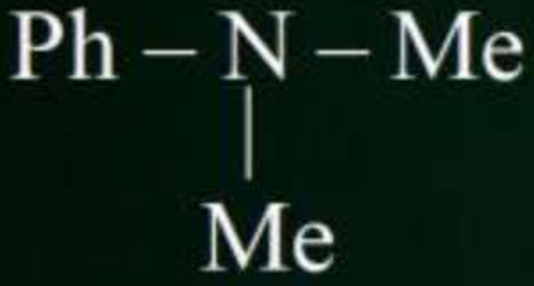
Order of basic strength

$Ph-NH_2$

(A)

$Ph-NH-Me$

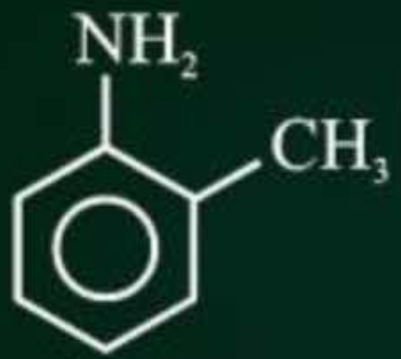
(B)



$Ph-\underset{\displaystyle Me}{\underset{|}{N}}-Me$

(C)

[redacted]



[redacted]

(D)

A A > B > C > D

B B > A > C > D

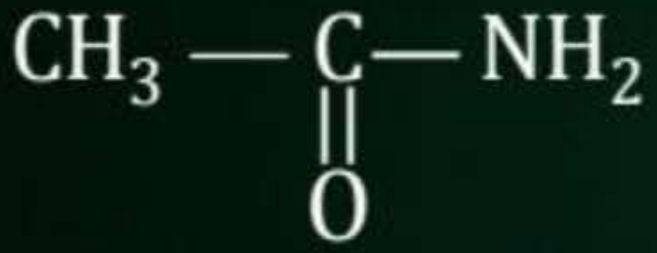
C C > B > A > D

D C > B > D > A

QUESTION 08

Which among the following is least basic?

A $CH_2=CH-NH_2$

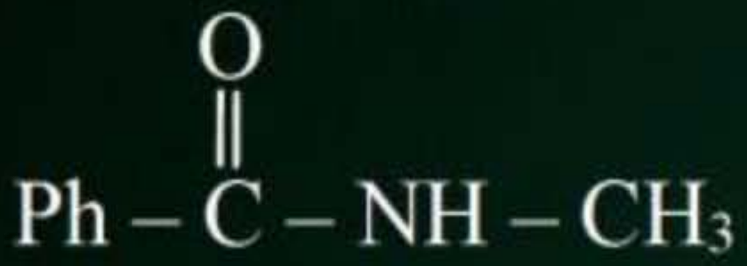
B 
$CH_3-\underset{\underset{O}{\|}}{C}-NH_2$

C CH_3-NH_2

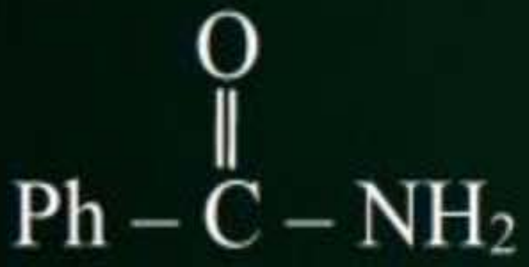
D $Cl-CH_2-NH_2$

QUESTION 09

The strongest base is:

A

$Ph-\overset{\overset{O}{\parallel}}{C}-NH-CH_3$

B $Ph-NH_2$

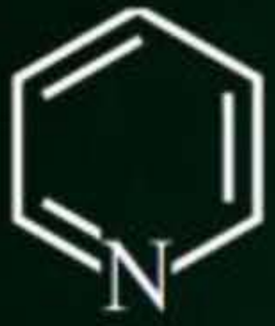
C

$Ph-\overset{\overset{O}{\parallel}}{C}-NH_2$

D $Ph-NH-CH_3$

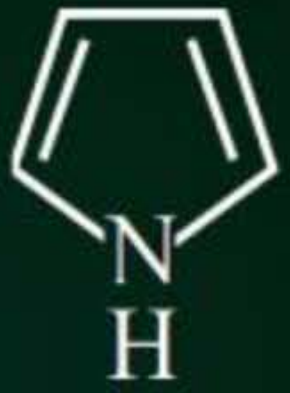
QUESTION 10

Among the following compounds, the most basic compound is:

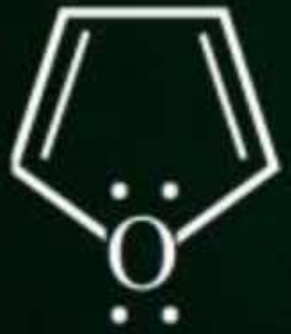
A



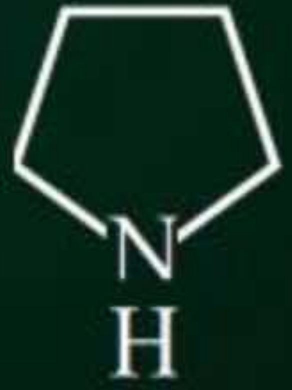
B



C



D



ANSWER KEY

1. A
2. D
3. A
4. B
5. A
6. A
7. C
8. B
9. D
10. D

Home Work From PW Module (Yakeen NEET)

Prarambh: Q 135, 140

Parikshit: Q 20, 27

Thank you!!

GOC PYQs

H.W discussion

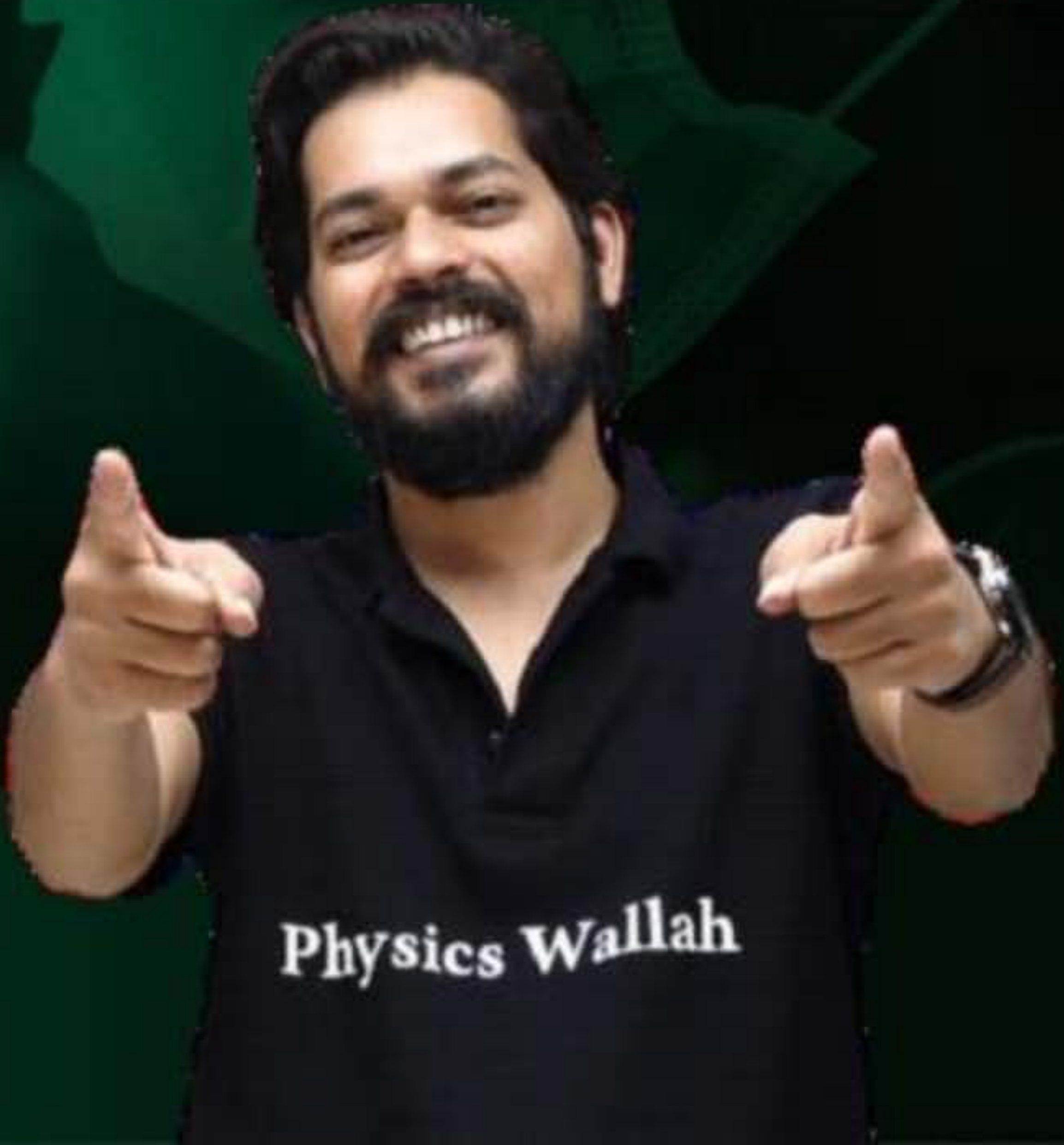
YAKEEN 2.0

FOR NEET 2025

Lecture- 12 **Organic Chemistry**

Some Basic Principles and Techniques (GOC)

By- Pankaj Sir(POPU MAMA)


Physics Wallah

Topics *to be covered*

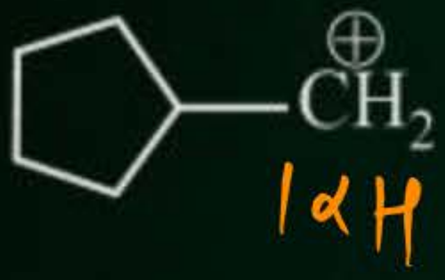
1. NEET/AIPMT & JEE Mains PYQs Discussion
2. Practice

NEET PYQs

QUESTION (NEET 2024)

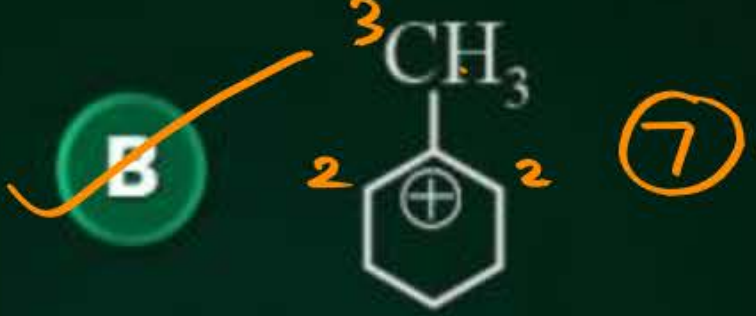
The most stable carbocation among the following is:

A

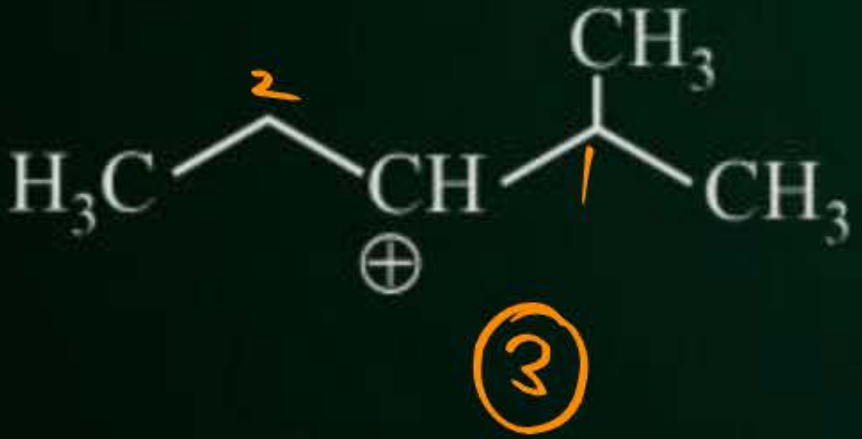


$\overset{\oplus}{C}H_2$
1αH

B

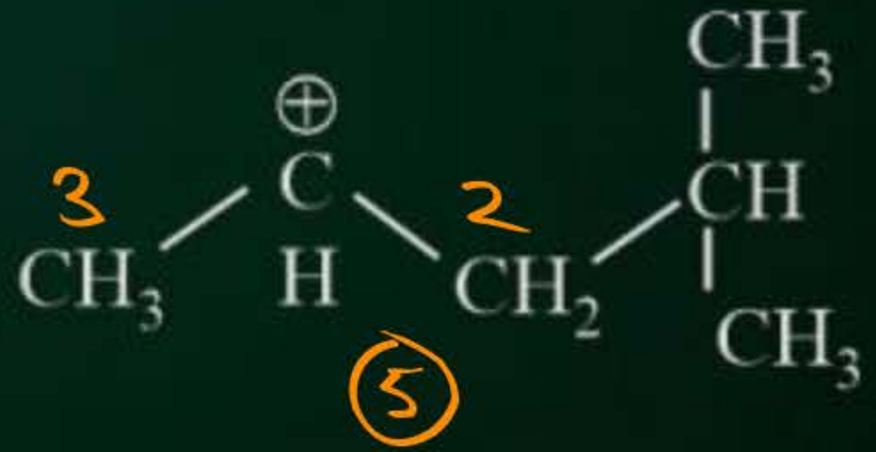


C



H_3C
2
CH
⊕
1
CH_3
CH_3
③

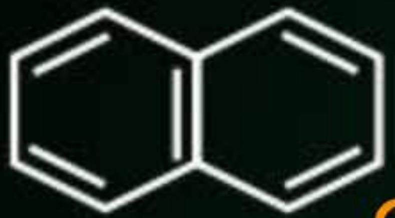
D

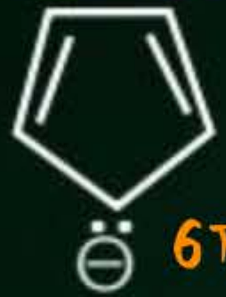


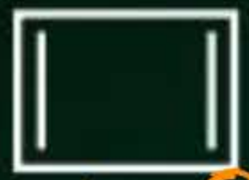
3
CH_3
⊕
C
H
2
CH_2
CH
CH_3
CH_3
⑤

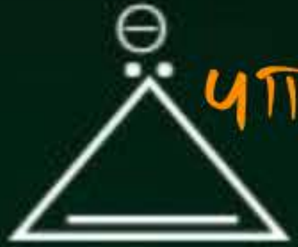
QUESTION (NEET 2023)

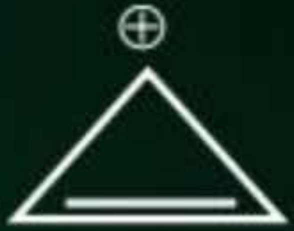
Consider the following compounds/species:

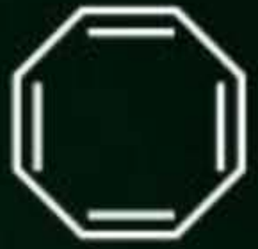

I ✓ $10\pi e^{\ominus}$

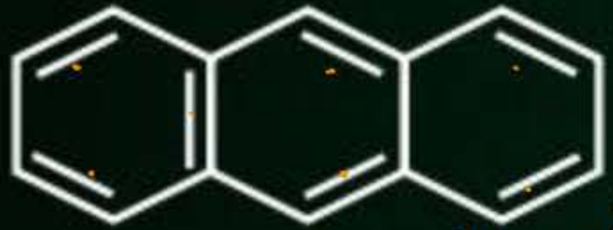

II ✓ $6\pi e^{\ominus}$


III ✗ $4\pi e^{\ominus}$


IV ✗ $4\pi e^{\ominus}$


V ✓ $2\pi e^{\ominus}$


VI ✗ nonplanar tublike


VII ✓ $14\pi e^{\ominus}$

The number of compounds/species which obey Huckel's rule is..........

(A) 5

(B) 4 ✓

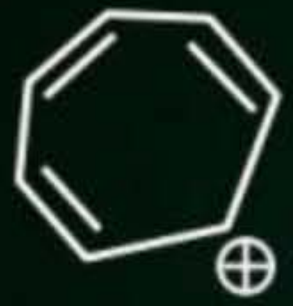
(C) 6

(D) 2

QUESTION (NEET 2022)

Which compound amongst the following is not a aromatic compound?

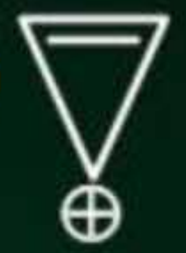
A



6$\pi e^{\ominus}$

Ⓐ

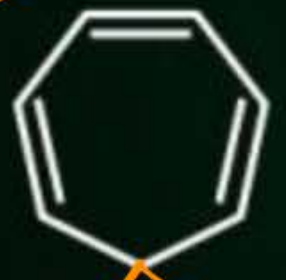
B



2$\pi e^{\ominus}$

Ⓐ

C ✓

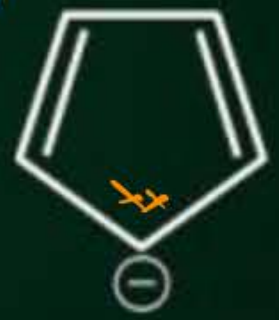


H H

sp^3

non planar

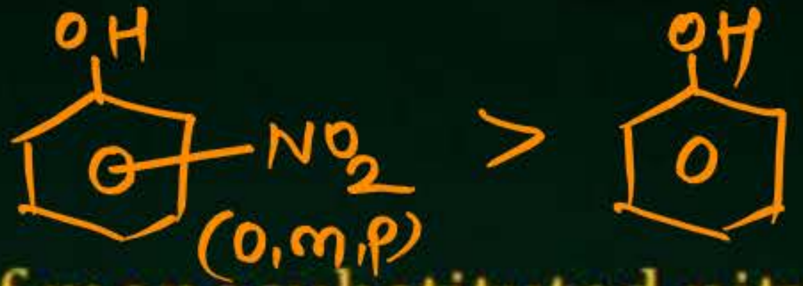
D



6$\pi e^{\ominus}$

A

QUESTION (NEET 2022)



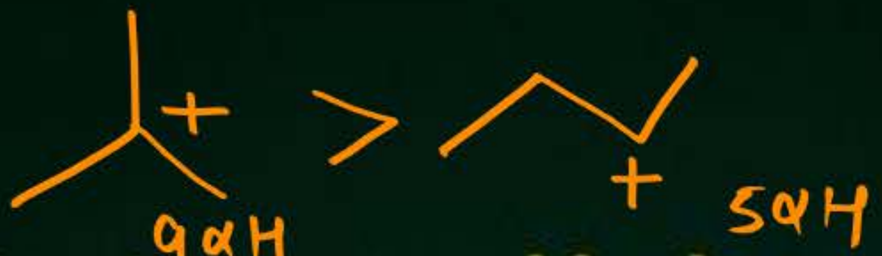
POM

Statement I: The acidic strength of monosubstituted nitrophenol is higher than Phenol because of electron withdrawing nitro group.

Statement II: o-nitrophenol, m-nitrophenol, p-nitrophenol will have same acidic strength as they one nitro group attached to the phenolic ring.

- **A** Both Statement I and Statement II are incorrect.
- **B** Both Statement I and Statement II are correct.
- **C** Statement I is correct and Statement II is incorrect.
- **D** Statement I is incorrect and Statement II is correct.

QUESTION (NEET 2020)



A tertiary butyl carbocation is more stable than a secondary butyl carbocation because of which of the following?

A + R effect of $-CH_3$ groups

B – R effect of $-CH_3$ groups

[✓ C] Hyperconjugation

D – I effect of $-CH_3$ groups

QUESTION (NEET 2019)

The most stable carbocation, among the following is:

(A) $CH_3-\overset{\checkmark}{C}H_2-\overset{\oplus}{C}H_2$ 2αH

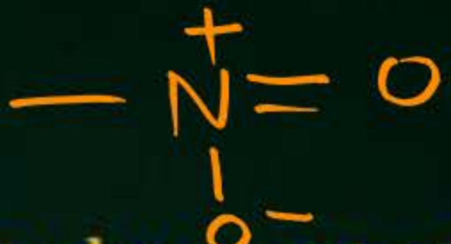
(B) $(CH_3)_3C-\overset{\oplus}{C}H-\overset{\checkmark}{C}H_3$ 3αH

(C) $CH_3-\overset{\checkmark}{C}H_2-\overset{\oplus}{C}H-\overset{\checkmark}{C}H_2-CH_3$ 4αH

[✓ (D)] $\overset{\checkmark}{C}H_3-\overset{\oplus}{C}H-\overset{\checkmark}{C}H_2-CH_2-CH_3$

5αH

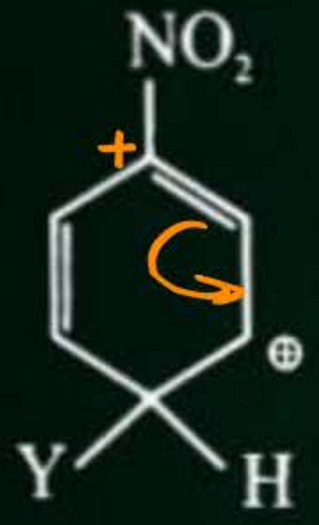
QUESTION (NEET 2018)



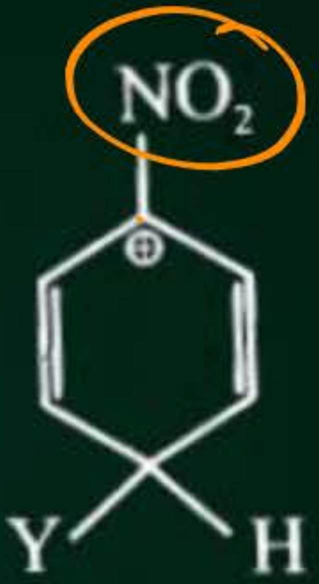
$$-\overset{+}{N}(-O^-)=O$$

Which of the following carbocations is expected to be most stable?

A ✗

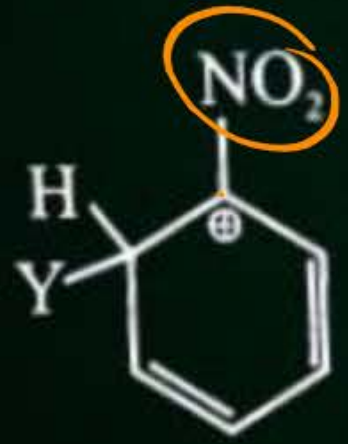


B ✗

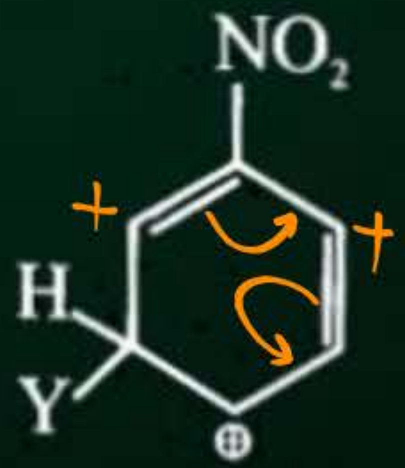


ewg

C ✗



[✓ **D**]



QUESTION* (NEET 2017)

$F > OR > -NH_2$

$-NR_2$

Which of the following is correct with respect to $\underbrace{\textbf{-I}\text{ effect}}$ of the substituents? (R = alkyl)

[✓ A] $-NH_2 < -OR < -F$

[✓ B] $-NR_2 < -OR < -F$

C $-NR_2 > -OR > -F$

D $-NH_2 > -OR > -F$

QUESTION (NEET 2017)

$\underbrace{\%\,s \uparrow \quad en \uparrow}$

Alkyne > Alkene > Alkane

Which one is the correct order of acidity?

(A) ✓ $\overset{-}{C}\overset{+}{H} \equiv \overset{-}{C}\overset{+}{H} > CH_3 - C \equiv \overset{-}{C}\overset{+}{H} > CH_2 = CH_2 > CH_3 - CH_3$

(B) $CH \equiv CH > CH_2 = CH_2 > CH_3 - C \equiv CH > CH_3 - CH_3$

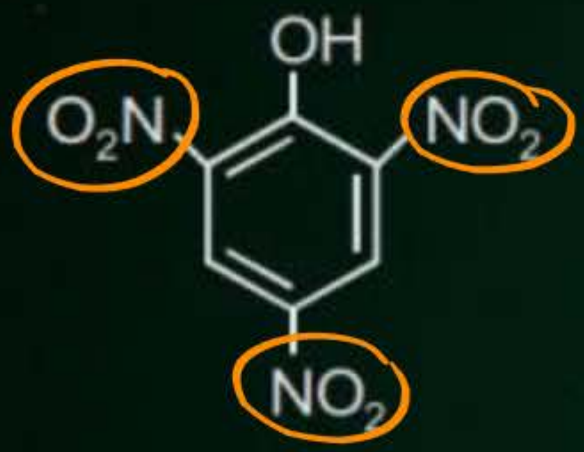
(C) $CH_3 - CH_3 > CH_2 = CH_2 > CH_3 - C \equiv CH > CH \equiv CH$

(D) $CH_2 = CH_2 > CH_3 - C \equiv CH > CH_3 - CH_3 > CH \equiv CH$

QUESTION (NEET 2017)

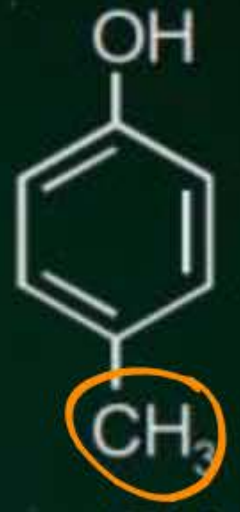
Which one is the most acidic compound?

✓ A



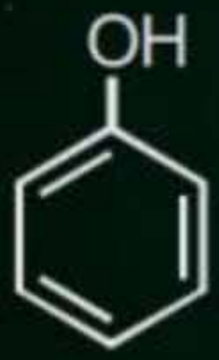
OH
O_2N
NO_2
NO_2

B



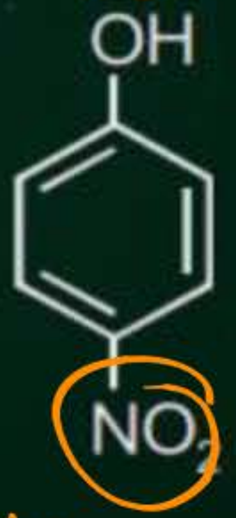
+M

C



A>D>C>B

D

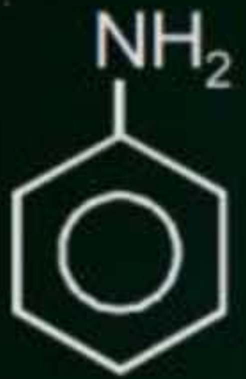


-M

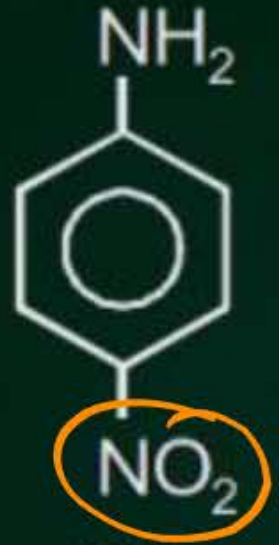
QUESTION (NEET 2017)

The correct increasing order of basic strength for the following compounds is:

I



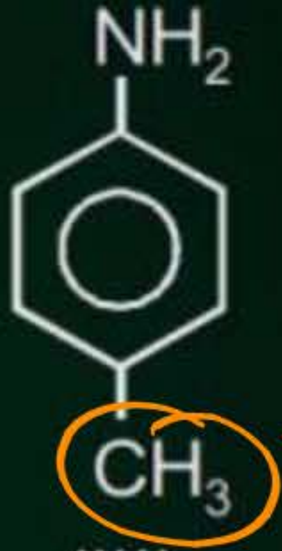
II



- M > ~~-I~~

(II)

III



+H > ~~+I~~

(III)

[✓ A] III > I > II

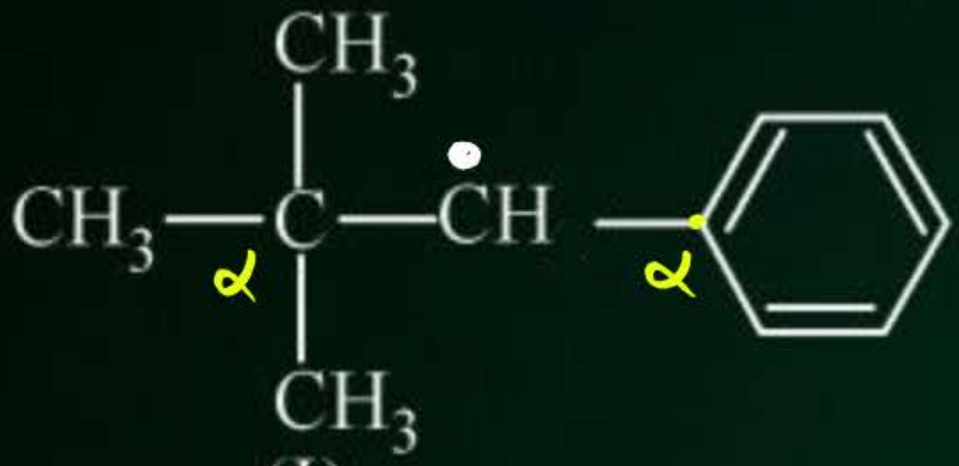
B III > II > I

C II > I > III

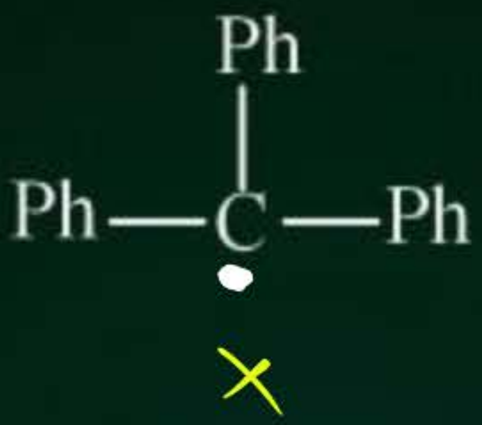
D II > III > I

QUESTION (NEET 2015)

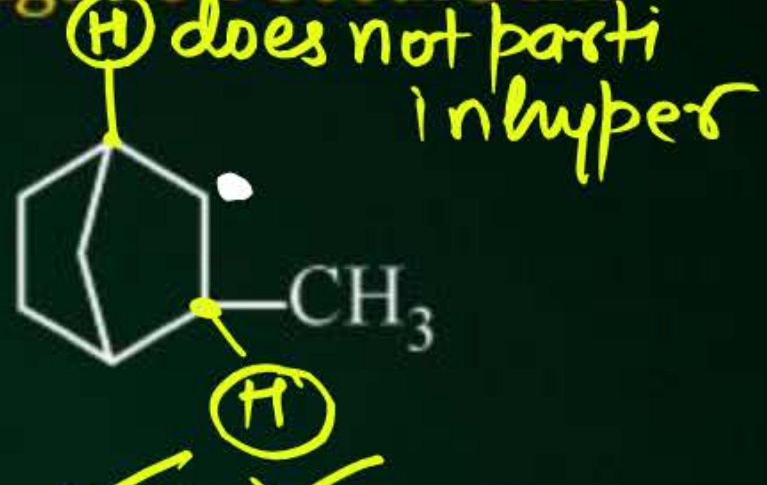
Consider the following compounds, Hyperconjugation occurs in:


CH3
CH3
C
CH
CH3
α
α

(I) ×



(II)


H does not parti
in hyper
CH3
H

(III) ✓

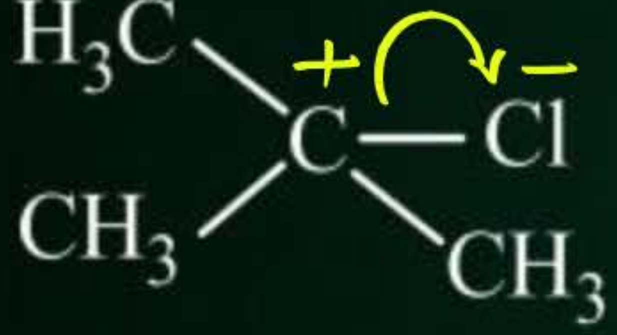
- A II only
- [✓ B] III only
- C I and III
- D I only

QUESTION (NEET 2015)

In which of the following compounds, the C – Cl bond ionization shall give most stable carbonium ion?

(A) ✓

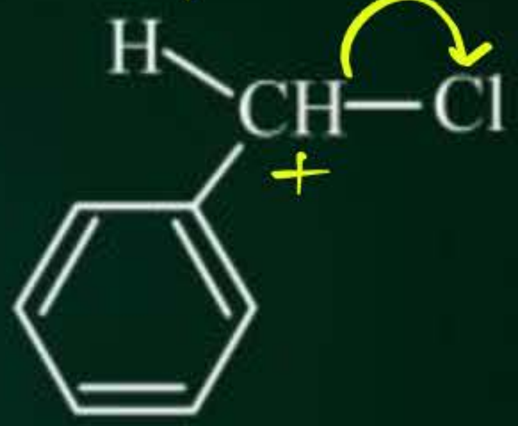
9αH



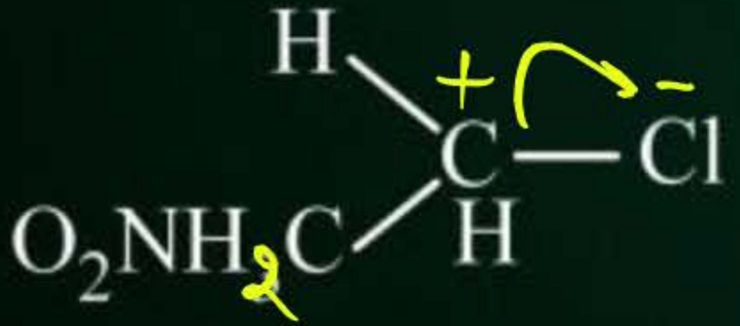
H_3C
CH_3
C
Cl
CH_3
+
−

(B)

1 Ring reso



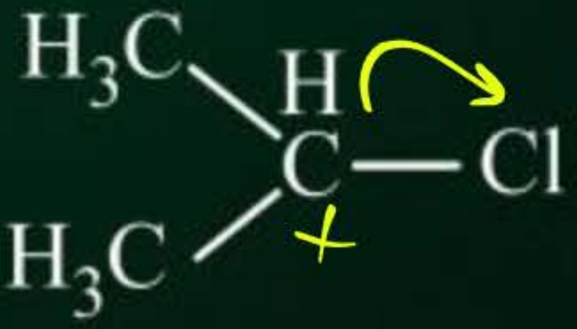
(C)



H
C
Cl
O_2NH_2C
H
+
−

2αH

(D)



H_3C
H
C
Cl
H_3C
+

6αH

QUESTION (NEET 2013)

$E < D < C < A < B$

Arrange the following in increasing order of stability

(A) $(\overset{6}{CH_3})_2\overset{\oplus}{C}-\overset{2}{CH_2}CH_3$ 8αH

(B) $(CH_3)_3-\overset{\oplus}{C}$ 9αH

(C) $(\overset{6}{CH_3})_2-\overset{\oplus}{C}H$ 6αH

(D) $CH_3-\overset{\oplus}{C}H_2$ 3αH

(E) $\overset{\oplus}{C}H_3$ 0 αH

A $E < D < C < B < A$

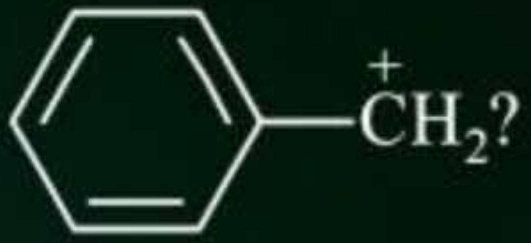
[✓ B] $E < D < C < A < B$

C $D < E < C < A < B$

D $A < E < D < C < B$

QUESTION (NEET 2013)

What is the hybridization state of benzyl carbonium ion


$\overset{+}{C}H_2$?

A sp^3

[✓ B sp^2]

C spd^2

D sp^2d

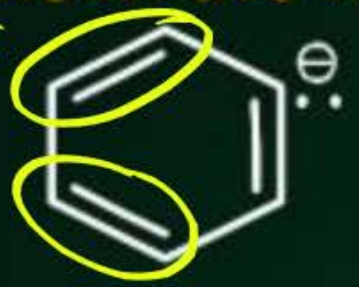
QUESTION (AIPMT 2008)

a>b>c>d

The stability of carbanions in the following:

(a) $RC \equiv \overline{C}\,{}^{\times}_{\times}$

(b)



(c) $\overset{+I}{\boxed{R}}_2C = C\overline{H}$

(d) $R_3C - C\overline{H}_2$

is in the order of:

[✓ A] (a) > (b) > (c) > (d)

B (b) > (c) > (c) > (a)

C (d) > (b) > (c) > (a)

D (a) > (c) > (b) > (d)

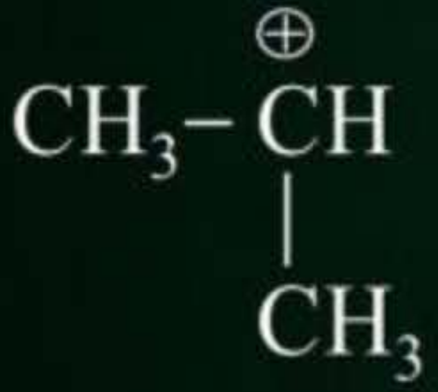
QUESTION (AIPMT 2005)

Which amongst the following is the most stable carbocation?

(A) $\overset{\oplus}{C}H_3$ 0αH

(B) $CH_3\overset{\oplus}{C}H_2$ 3αH

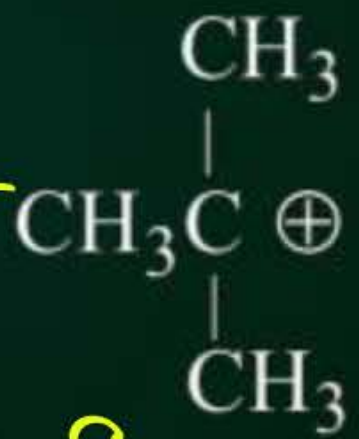
(C)



$CH_3-\underset{CH_3}{\underset{|}{\overset{\oplus}{C}H}}$

6αH

✓ (D)



$CH_3\overset{CH_3}{\overset{|}{\underset{\underset{CH_3}{|}}{C}}}\oplus$

9αH

QUESTION (AIPMT 2003)

Which of the following orders of acid strength is correct ?

(A) $RCOOH > ROH > HOH > HC \equiv CH$

✓ (B) $\underline{\underline{RCO\overset{-}{O}\overset{+}{H}}} > \underline{\underline{H\overset{-}{O}\overset{+}{H}}} > \underline{\underline{\underset{+I}{R}\overset{-}{O}\overset{+}{H}}} > \underline{\underline{HC \equiv \overset{-}{C}\overset{+}{H}}}$

(C) $RCOOH > HOH > HC \equiv CH > ROH$

(D) $RCOOH > HC \equiv CH > HOH > ROH$

QUESTION (AIPMT 1998)

Which one of the following order is correct regarding the –I effect of the substituents?

(A) $-NR_2 < -OR > -F$

(B) $-NR_2 > -OR > -F$

[✓ (C)] $\underbrace{\overset{-NH_2}{-NR_2} < -OR < -F}$

(D) $-NR_2 > -OR < -F$

QUESTION (AIPMT 1996)

Huckel's rule states that a monocyclic conjugated compound will be aromatic if it contains

A $(4n+2\pi)$ electrons

B $(4\pi+2n)$ electrons

C 4π electrons

[✓ D] $\underbrace{(4n+2)\pi}$ electrons

QUESTION (AIPMT 1991)

C>D>B>A

Which of the following is the most stable carbocation (carbonium ion)?

3αH

A $CH_3\overset{+}{C}H_2$

6αH

B $(CH_3)_2\overset{+}{C}H$

[✓ **C**] $(CH_3)_3\overset{+}{C}$

9αH

1 Ring reso

D $C_6H_5\overset{+}{C}H_2$

JEE Mains PYQs

QUESTION (JEE Mains 1st Feb 2024, Evening Shift)

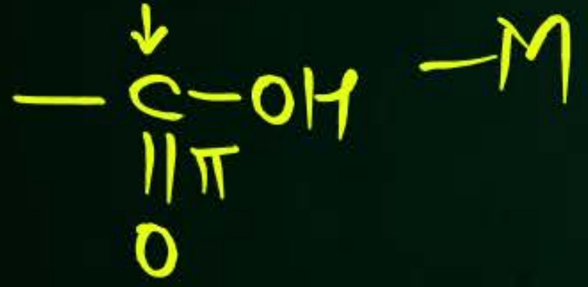
The functional group that shows negative resonance effect is: $-R$

$\boxed{-M}$

(A) $-\overset{\times\times}{N}H_2$ $+M$

(B) $-\overset{\times\times}{O}H$ $+M$

(C) $-COOH$ ✓

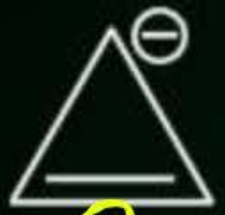


$$-\overset{\downarrow}{\underset{\underset{O}{\|\pi}}{C}}-OH \quad -M$$

(D) $-\overset{\times\times}{O}R$ $+M$

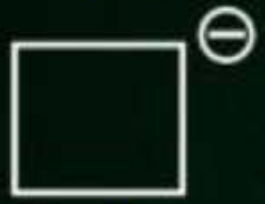
QUESTION (JEE Mains 4th April 2024, Evening Shift)

Correct order of stability of carbanion is:

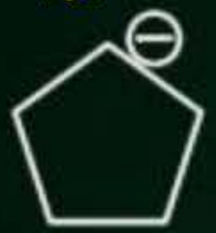

a

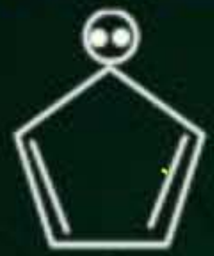
$4\pi e^{\ominus}$
AA

NA


b

NA


c


d

$6\pi e^{\ominus}$
A

A) $c > b > d > a$

B) $a > b > c > d$

C) $d > a > c > b$

[✓ D)] $d > c > b > a$

QUESTION (JEE Mains 4th April 2024, Morning Shift)

What will be the decreasing order of basic strength of the following conjugate bases ?

$^{-}OH, R\bar{O}, CH_3CO\bar{O}, C\bar{l}$

$H_2O \quad ROH \quad CH_3COOH \quad HCl$

A $C\bar{l} > OH > R\bar{O} > CH_3CO\bar{O}$

A.S $ROH < H_2O < CH_3COOH < HCl$

[✓ B] $R\bar{O} >^{-} OH > CH_3CO\bar{O} > C\bar{l}$

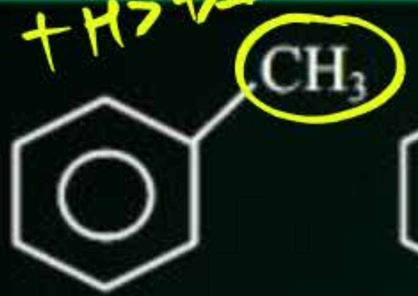
B.S $R\bar{O} > \bar{O}H > CH_3CO\bar{O} > Cl^-$

C $^{-}OH > R\bar{O} > CH_3CO\bar{O} > C\bar{l}$

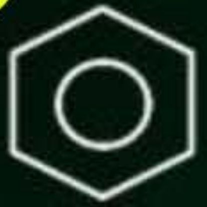
D $C\bar{l} > R\bar{O} >^{-} OH > CH_3CO\bar{O}$

QUESTION (JEE Mains 6th April 2024, Evening Shift)

+H > ~~I~~

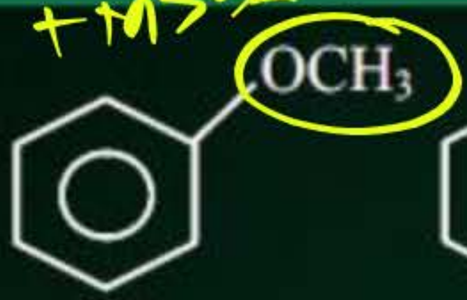


(I)

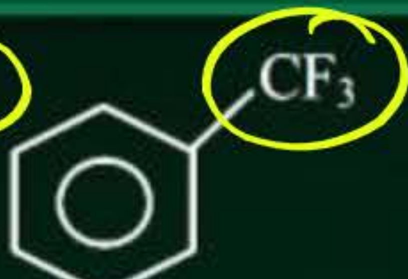


(II)

+M > ~~I~~



(III)



(IV)

−H > ~~I~~

$e^{\ominus}$ density $\propto$ edg

$\propto \frac{1}{ewg}$

The **correct** arrangement for decreasing order of electron density for above compounds

A (IV) > (I) > ~~(II)~~ > (III)

✓ **B** (III) > (I) > (II) > (IV)

C (II) > (IV) > ~~(III)~~ > (I)

D (III) > (IV) > (II) > (I)

QUESTION (JEE Mains 8th April 2024, Evening Shift)

The correct sequence of acidic strength of the following aliphatic acids in their decreasing order is:

CH_3CH_2COOH, CH_3COOH, $CH_3CH_2CH_2COOH$, $HCOOH$

+I ↑
AS ↓

[✓ A] $HCOOH > \underline{CH_3}COOH > \underbrace{CH_3CH_2}COOH > \underbrace{CH_3CH_2CH_2}COOH$

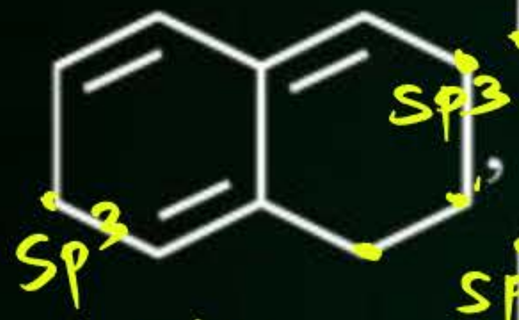
B $HCOOH > CH_3CH_2CH_2COOH > CH_3CH_2COOH > CH_3COOH$

C $CH_3CH_2CH_2COOH > CH_3CH_2COOH > CH_3COOH > HCOOH$

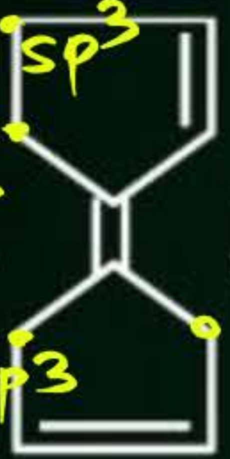
D $CH_3COOH > CH_3CH_2COOH > CH_3CH_2CH_2COOH > HCOOH$

QUESTION (JEE Mains 8th April 2024, Evening Shift)

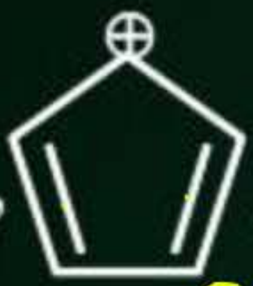
Total number of aromatic compounds among the following compounds is ___1___.



NA

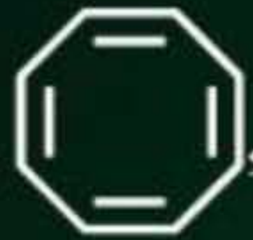


NA



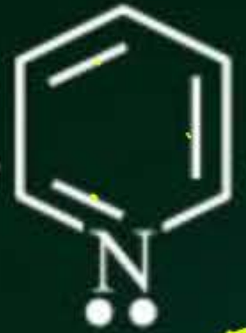
$4\pi e^{\ominus}$

AA



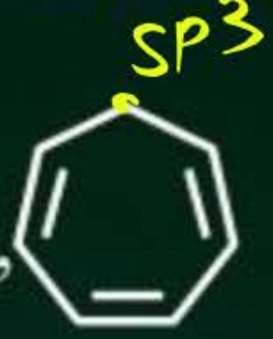
NA

tublike



$6\pi e^{\ominus}$

A

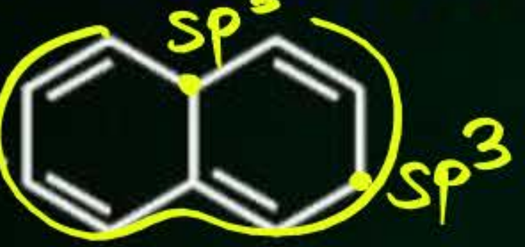


NA

QUESTION (JEE Mains 8th April 2024, Evening Shift)

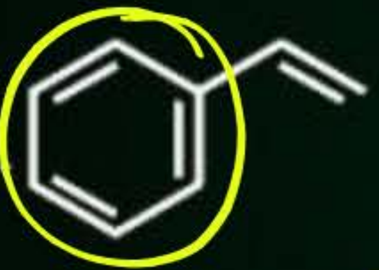
Which of the following are aromatic?

A.



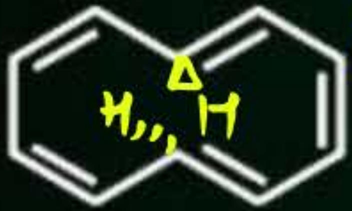
NA

✓ B.



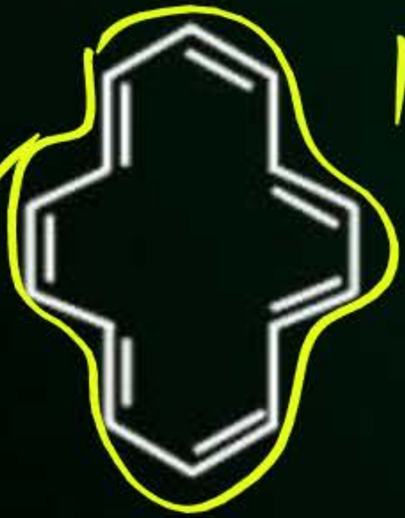
A

C.



[10]-Annulene
NA

✓ D.



$14\pi e^{\ominus}$

A

[✓ A B and D only]

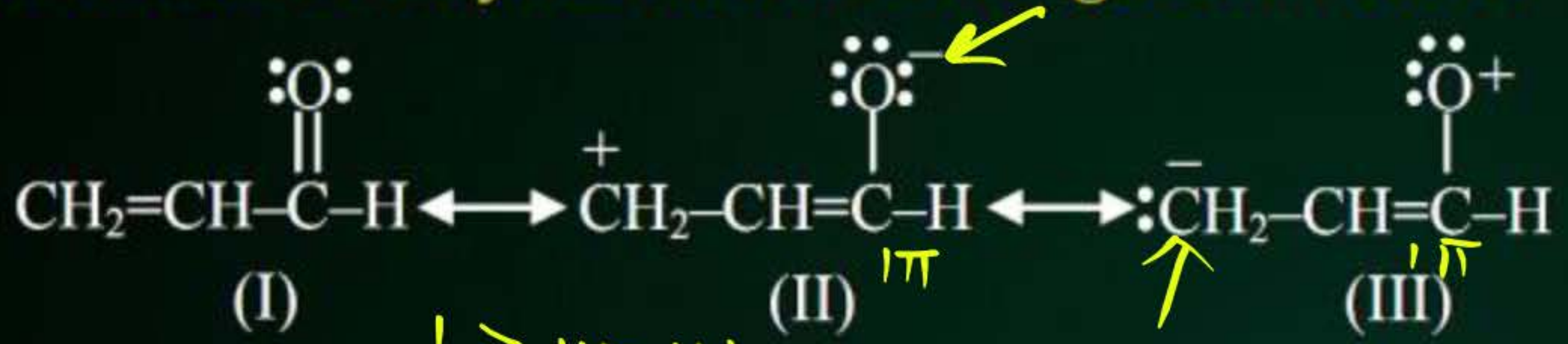
B A and C only

C A and B only

D C and D only

QUESTION (JEE Mains 9th April 2024, Morning Shift)

Relative stability of the contributing structures is:



$$CH_2{=}CH{-}\overset{:\ddot{O}:}{\overset{\|}{C}}{-}H \longleftrightarrow \overset{+}{C}H_2{-}CH{=}\overset{:\ddot{O}:^-}{\overset{|}{C}}{-}H \longleftrightarrow :\overset{-}{C}H_2{-}CH{=}\overset{:\ddot{O}^+}{\overset{|}{C}}{-}H$$

(I) (II) (III)

I > II > III

A (I) > (III) > (II)

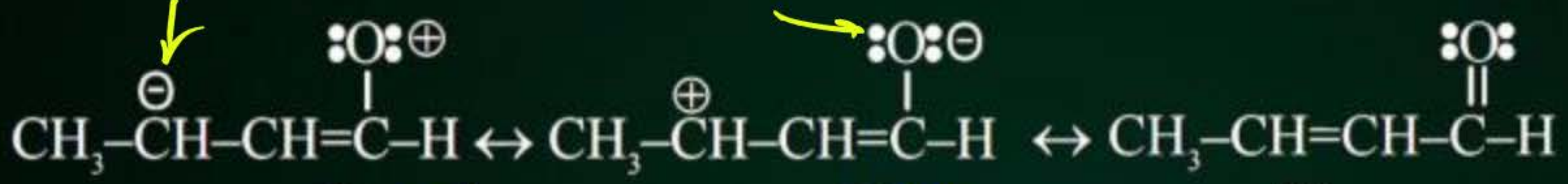
[✓ **B** (I) > (II) > (III)]

C (II) > (I) > (III)

D (III) > (II) > (I)

QUESTION (JEE Mains 9th April 2024, Evening Shift)

The correct stability order of the following resonance structures of $CH_3-CH=CH-CHO$ is:



$$CH_3-\overset{\ominus}{C}H-CH=\overset{\overset{:\ddot{O}:^{\oplus}}{|}}{C}-H \leftrightarrow CH_3-\overset{\oplus}{C}H-CH=\overset{\overset{:\ddot{O}:^{\ominus}}{|}}{C}-H \leftrightarrow CH_3-CH=CH-\overset{\overset{:\ddot{O}:}{\|}}{C}-H$$

I 1π II 1π III

III > II > I

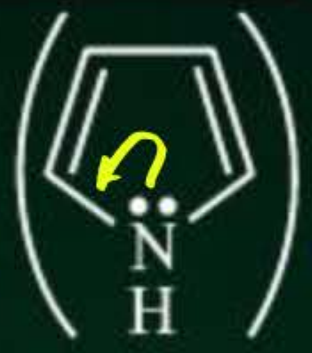
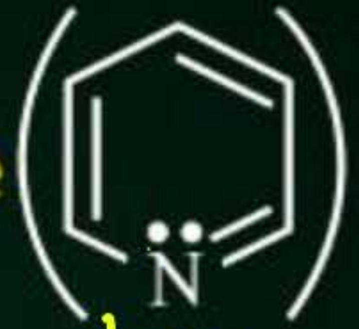
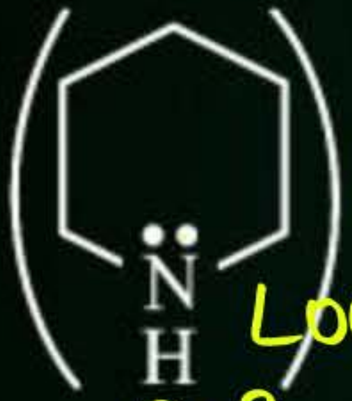
(A) II > III > I

(B) III > II > I

(C) I > II > III

(D) II > I > III

QUESTION (JEE Mains 9th April 2024, Evening Shift)

Correct order of basic strength of Pyrrole  , Pyridine  and Piperidine  is:

deloca

Loca

sp^2

Loca

Sp^3

[✓ A] Piperidine > Pyridine > Pyrrole

B Pyrrole > Pyridine > Piperidine

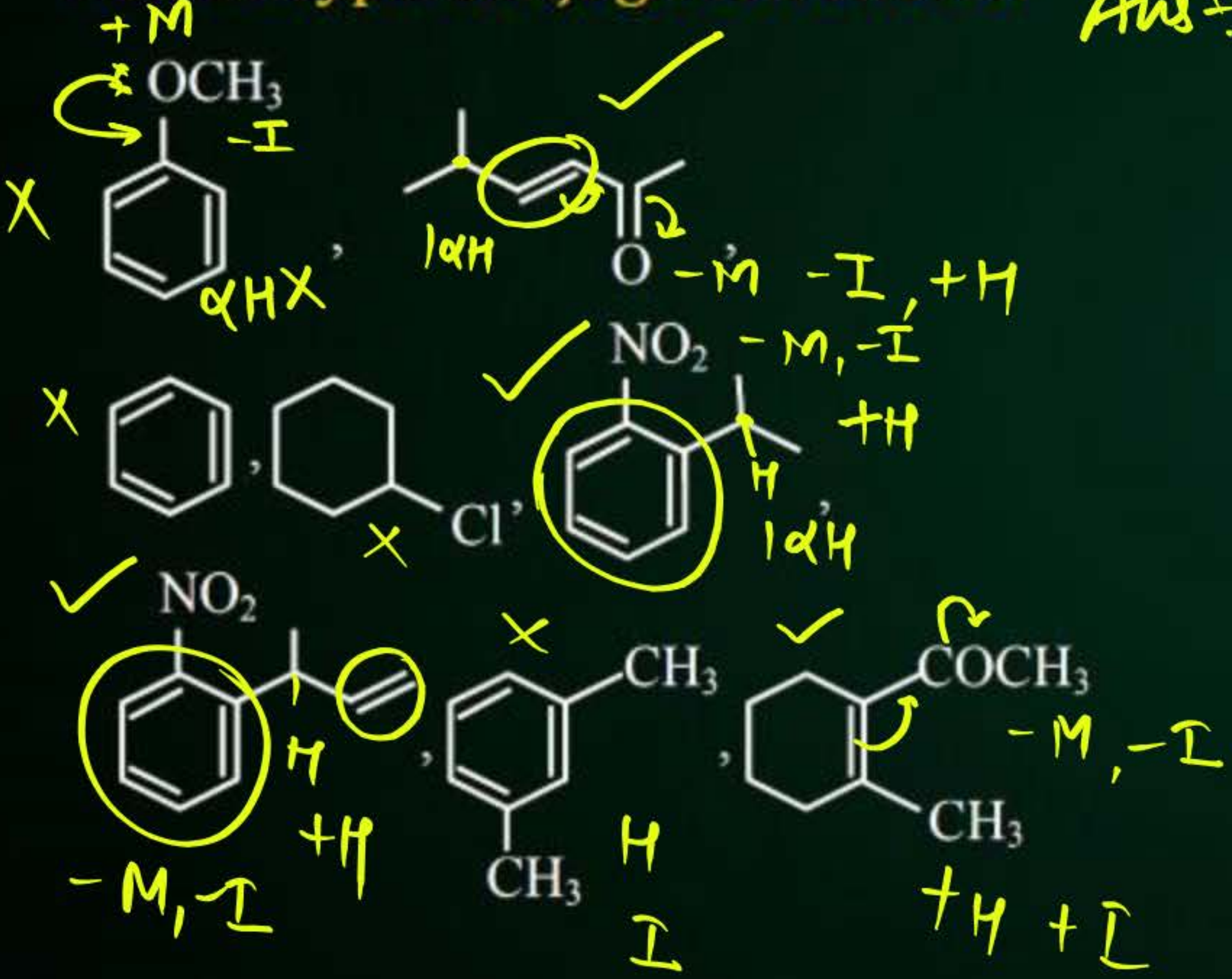
C Pyridine > Piperidine > Pyrrole

D Pyrrole > Piperidine >Pyridine

QUESTION (JEE Mains 9th April 2024, Morning Shift)

How many compounds among the following compounds show inductive, mesomeric as well as hyperconjugation effects?

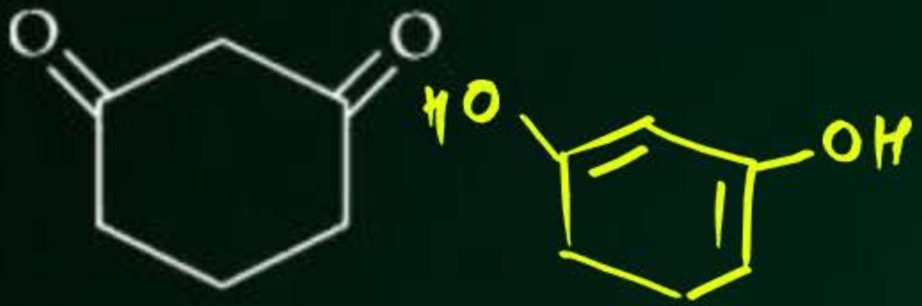
Ans:- ④

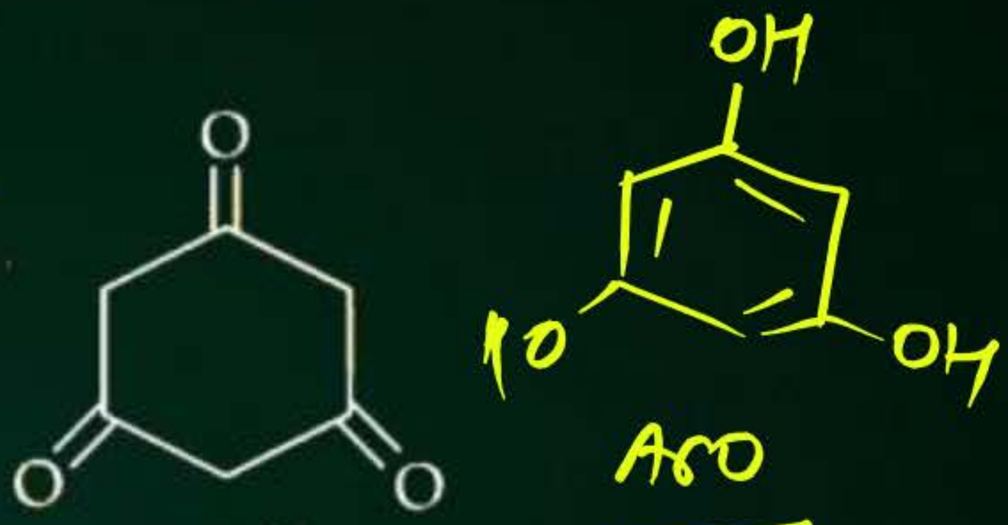


+M
OCH$_3$
-I
X
αH X
1αH
O
-M -I, +H
NO$_2$
-M, -I
+H
H
1αH
X
X
Cl
NO$_2$
H
+H
-M, -I
X
CH$_3$
CH$_3$
H
I
COCH$_3$
-M, -I
CH$_3$
+H +I

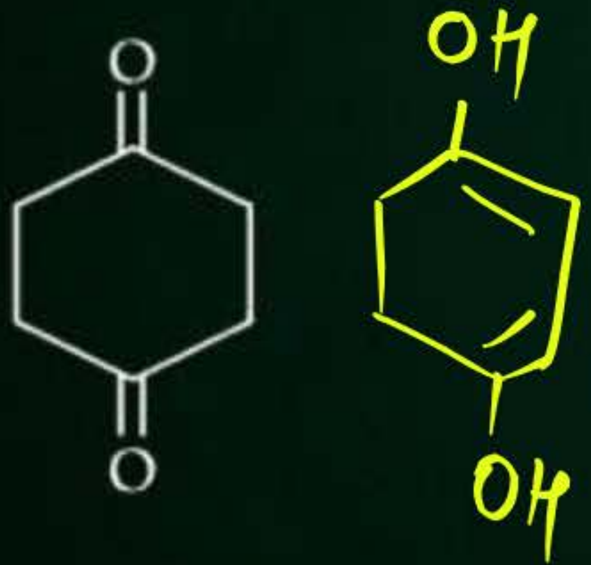
QUESTION (JEE Mains 27th January 2024, Morning Shift)

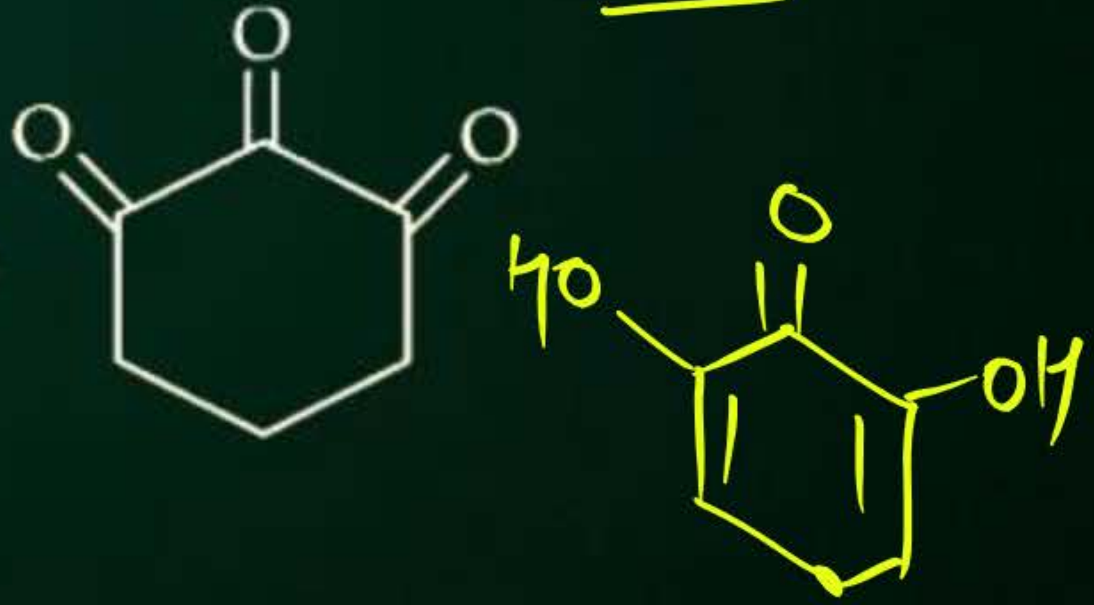
Highest enol content will be shown by:

A


B ✓


Aro

C


D


QUESTION (JEE Mains 27th January 2024, Morning Shift)

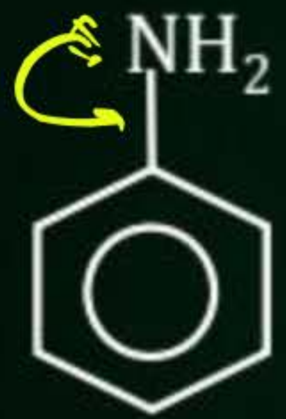
H^+ acceptor

Which of the following is strongest Bronsted base?

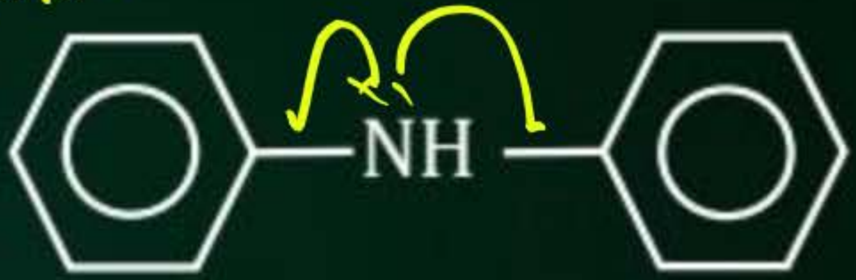
or

(Lewis base)
L.P donor

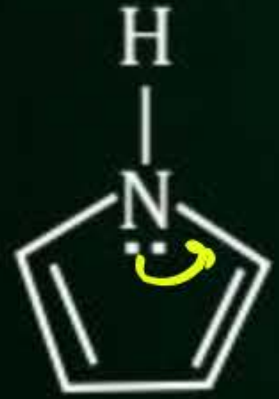
A



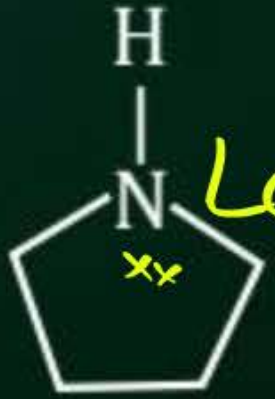
B



C



D ✓



Loca

Homework

QUESTION (JEE Mains 31st January 2024, Morning Shift)

Given below are two statements: One is labelled as Assertion A and the other is labelled as Reason R:

Assertion A: pK_a value of phenol is 10.0 while that of ethanol is 15.9.

Reason R: Ethanol is stronger acid than phenol.

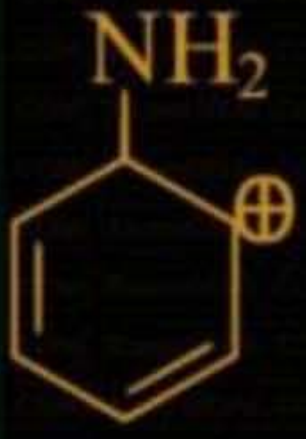
In the light of the above statements, choose the correct answer from the options given below:

- **A** A is true but R is false.
- **B** A is false but R is true.
- **C** Both A and R are true and R is the correct explanation of A.
- **D** Both A and R are true but R is NOT the correct explanation of A.

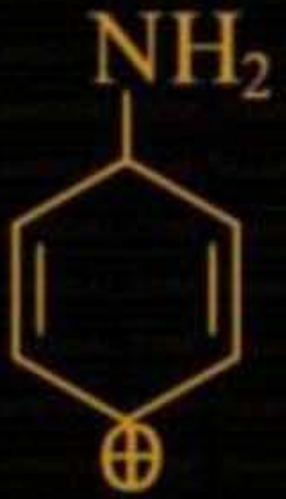
Ans. (A)

QUESTION [30 January Shift I JEE Mains 2023]

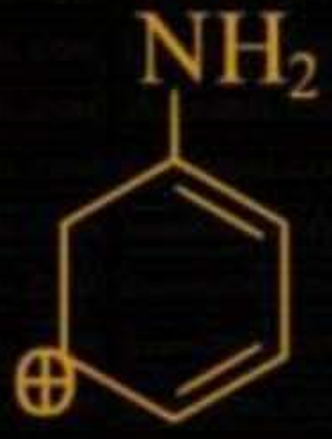
The most stable carbocation for the following is:



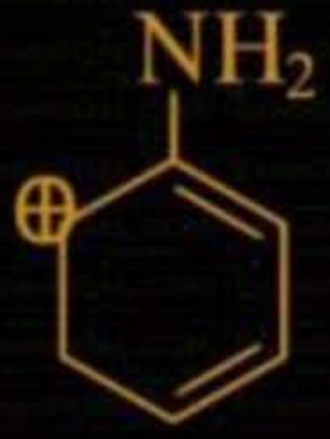
a



b



c



d

(A) c

(B) d

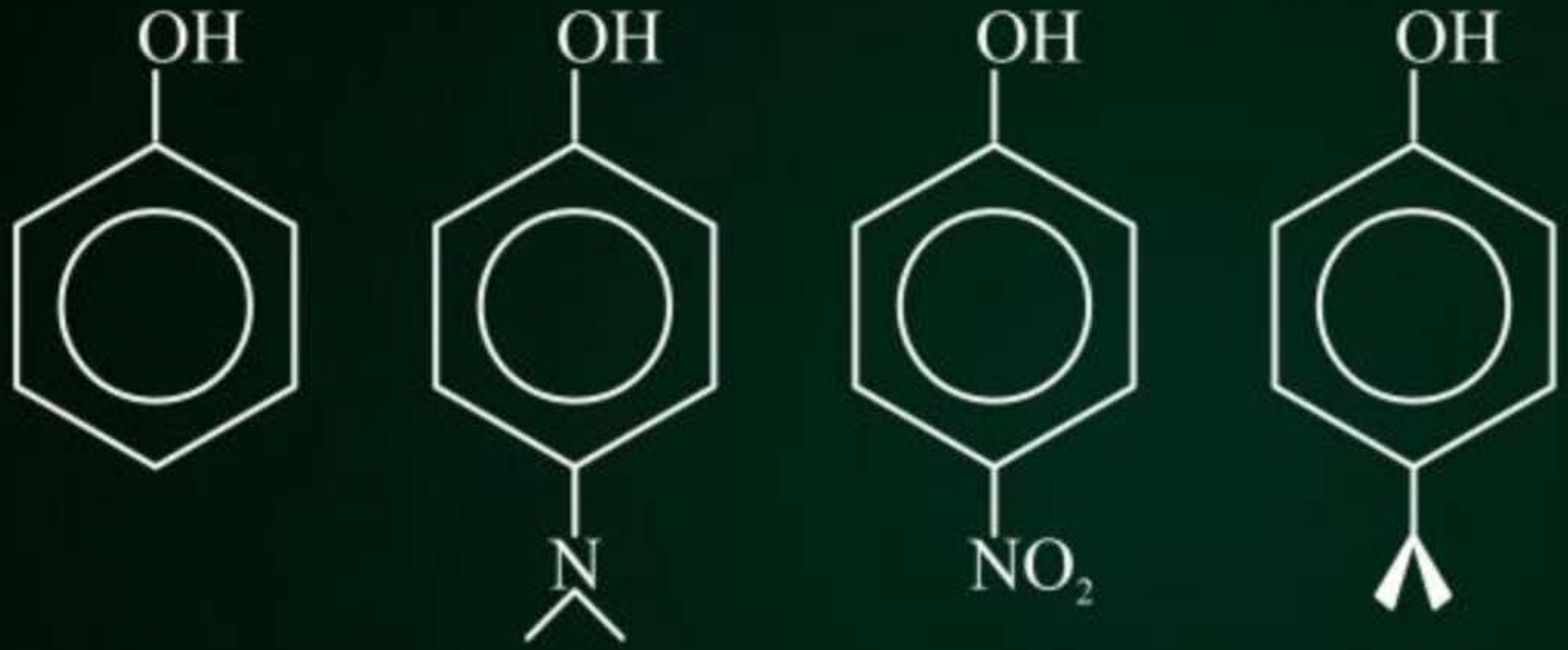
(C) b

(D) a

Ans. (A)

QUESTION [30 January Shift II JEE Mains 2023]

The correct order of pK_a values for the following compounds is:



A (iii), (i), (iv), (ii)

B (ii), (iv), (i), (iii)

C (ii), (i), (iv), (iii)

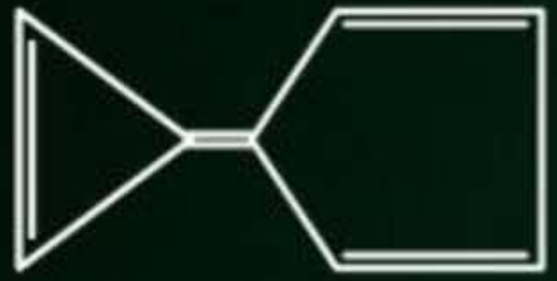
D (i), (ii), (iii), (iv)

Ans. (A)

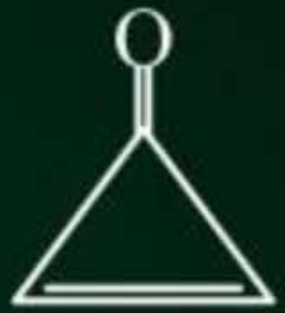
QUESTION [13 April JEE Mains 2023]

Among the following compounds, the one which shows highest dipole moment is:

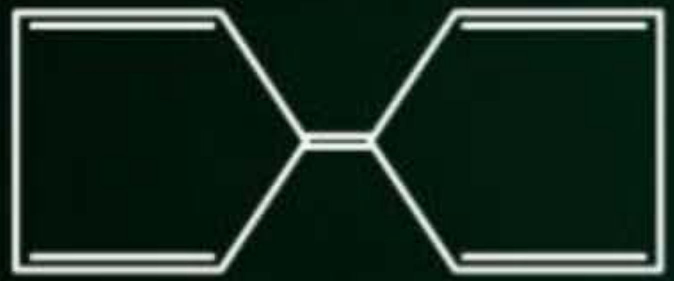
(A)



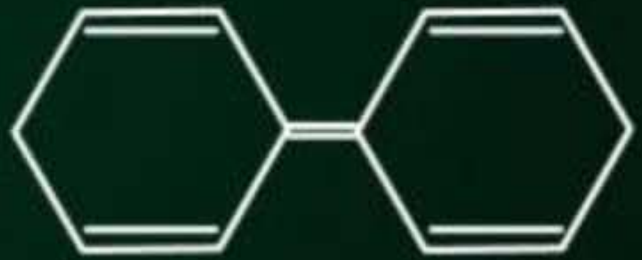
(B)



(C)



(D)



Ans. (A)

QUESTION [13 April JEE Mains 2023]

Given below are two statements:

Statement-I: Tropolone is an aromatic compound and has 8π electrons:

Statement-II: π electrons of $>C = O$ group in tropolone is involved in aromaticity.

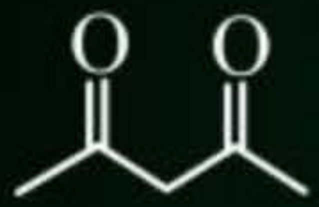
In the light of the above statement, choose the correct answer from the option given below:

- (A) Both Statement-I and Statement-II are true.
- (B) Statement-I is true but Statement-II is false.
- (C) Statement-I is false Statement-II is true.
- (D) Both Statement-I and Statement-II are false.

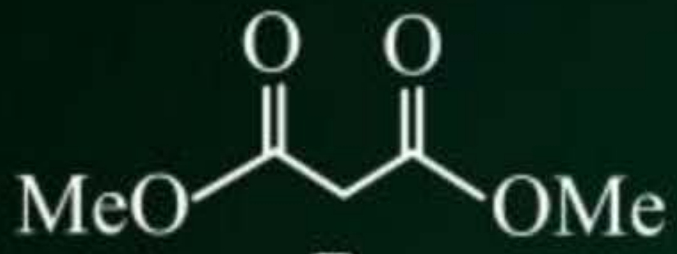
Ans. (B)

QUESTION [24 Jan JEE Mains 2023]

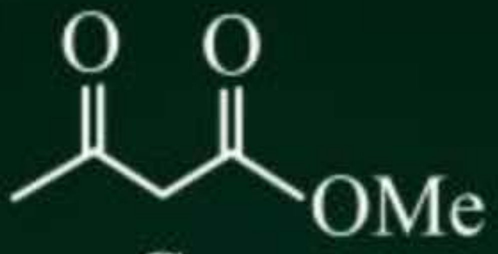
Which will undergo deprotonation most readily in basic medium?



A



B



C

(A) A only

(B) C only

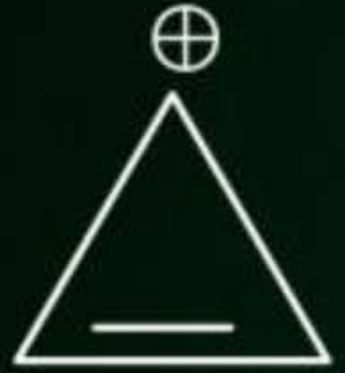
(C) Both A and C

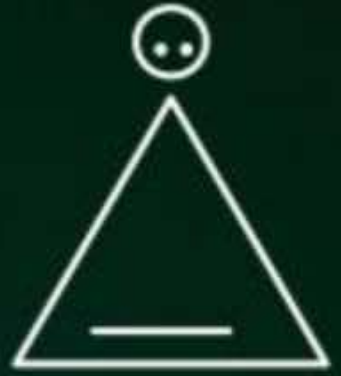
(D) B Only

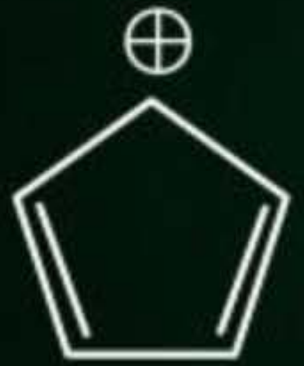
Ans. A

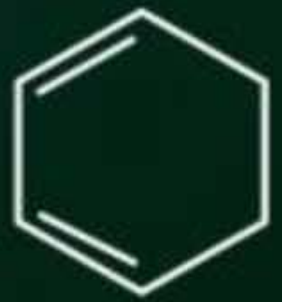
QUESTION [27 June JEE Mains 2022]

Which of the following is most stable?

A


B


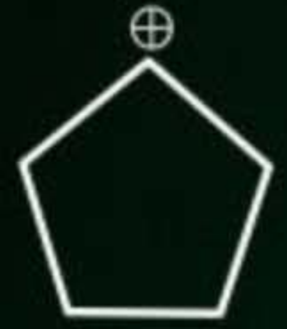
C


D


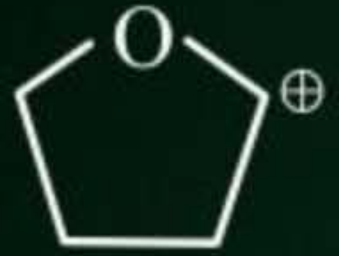
Ans. A

QUESTION [22 June JEE Mains 2022]

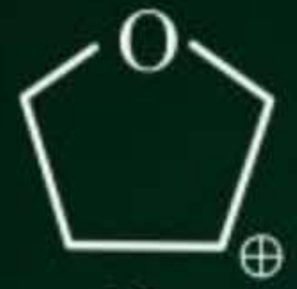
Arrange the following carbocations in decreasing order of stability.



A



B



C

A $A > C > B$

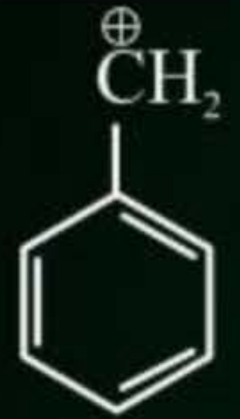
B $B > A > C$

C $C > B > A$

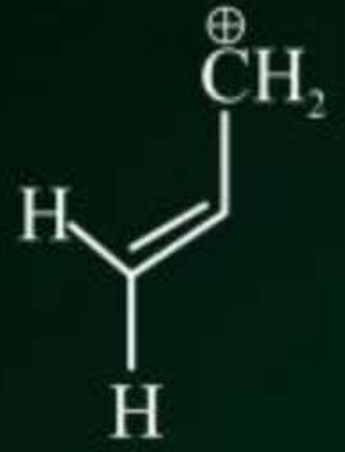
D $C > A > B$

Ans. B

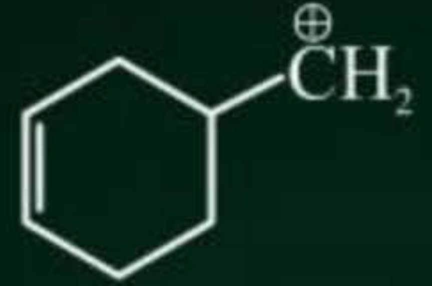
QUESTION [29 July JEE Mains 2022]


$\overset{\oplus}{C}H_2$

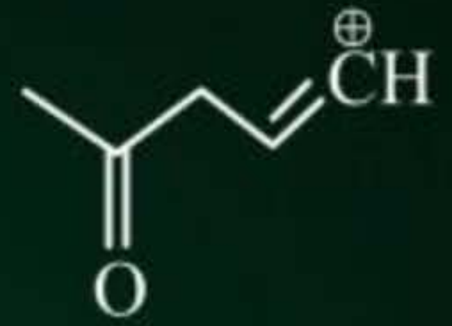
(A)


$\overset{\oplus}{C}H_2$
H
H

(B)


$\overset{\oplus}{C}H_2$

(C)


$\overset{\oplus}{C}H$
O

(D)

Among the given species the Resonance stabilized carbocations are:

- **A** (A), (B) and (C) only
- **B** (C) and (D) only
- **C** (A), (B) and (D) only
- **D** (A) and (B) only

Ans. D

QUESTION [22 July JEE Mains 2021]

Given below are two statements:

Statement –I : Hyper conjugation is permanent effect.

Statement–II: Hyper conjugation in ethyl cation $(CH_3 - CH_2)$ involves the overlapping of $C_{sp^2}H_{1s}$ bond with empty 2p orbital of other carbon.

Choose the correct option.

A Statement-I is false but Statement –II is true.

B Statement–I is true but Statement-II is false.

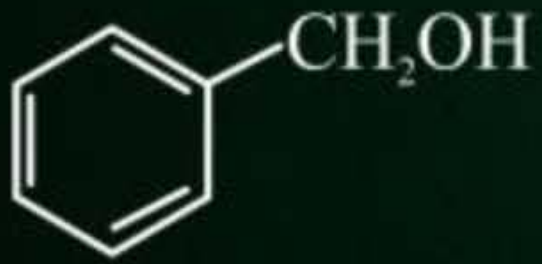
C Both Statement-I and Statement-II are false.

D Both Statement-I and Statement-II are true.

Ans. B

QUESTION [22 July JEE Mains 2021]

Which one of the following compounds does not exhibit resonance?

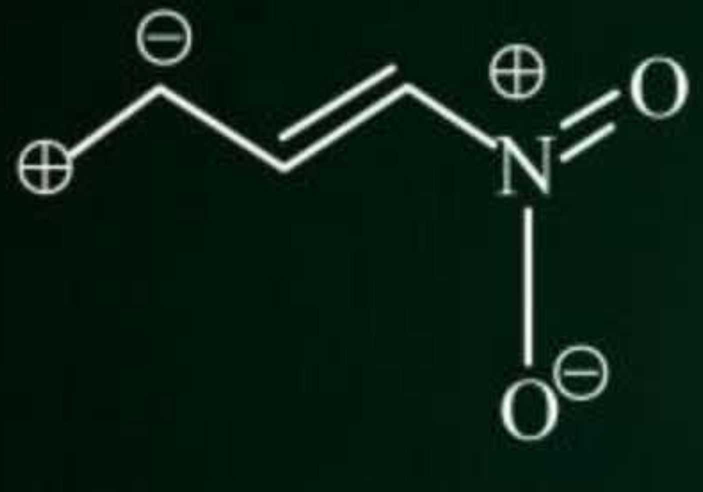
- (A) $CH_3CH_2CH_2CONH_2$
- (B) $CH_3CH_2CH = CHCH_2NH_2$
- (C) $CH_3CH_2OCH = CH_2$
- (D) 

Ans. B

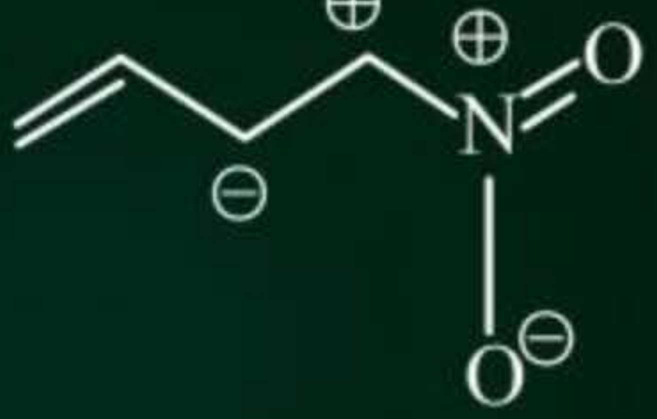
QUESTION [25 July JEE Mains 2021]

Which one among the following resonating structure is not correct?

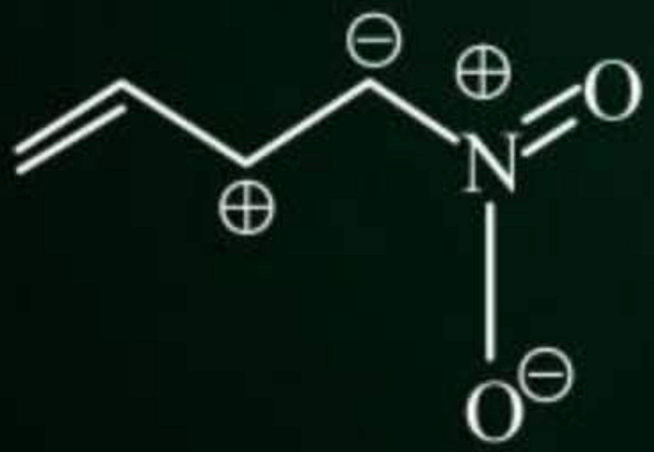
(A)



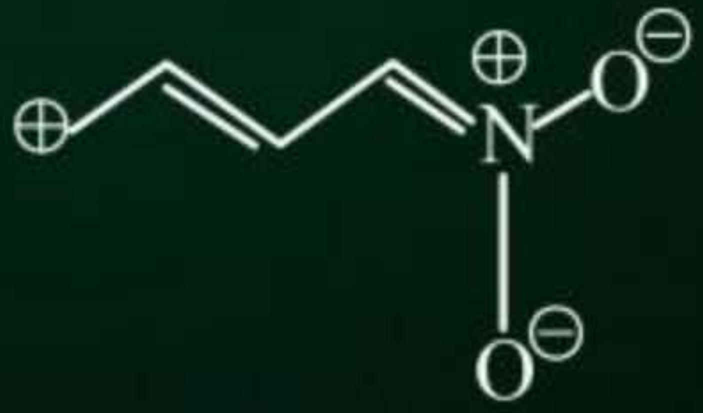
(B)



(C)

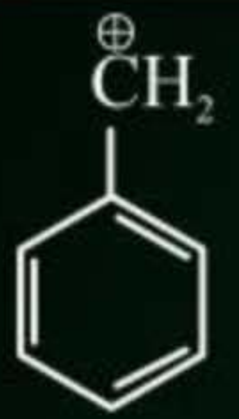


(D)



Ans. B

QUESTION [27 July JEE Mains 2021]



A

$CH_2=\overset{\oplus}{C}H$

B

$H_3C-\overset{\oplus}{C}H_2$

C

$HC\equiv\overset{\oplus}{C}$

D

The correct order of stability of given carbocations is:

Ⓐ $A > C > B > D$

Ⓑ $D > B > C > A$

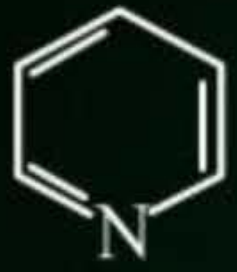
Ⓒ $C > A > D > B$

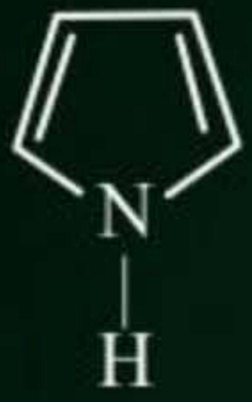
Ⓓ $D > B > A > C$

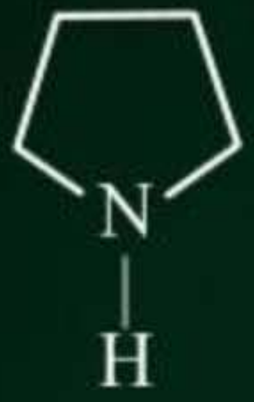
Ans. (A)

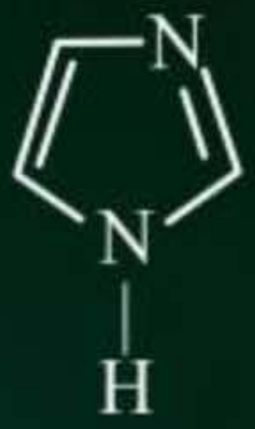
QUESTION [05 Sept JEE Mains 2021]

The increasing order of basicity of the following compound is:


(A)


(B)


(C)


(D)

A (A) < (B) < (C) < (D)

B (D) < (A) < (B) < (C)

C (B) < (A) < (C) < (D)

D (B) < (A) < (D) < (C)

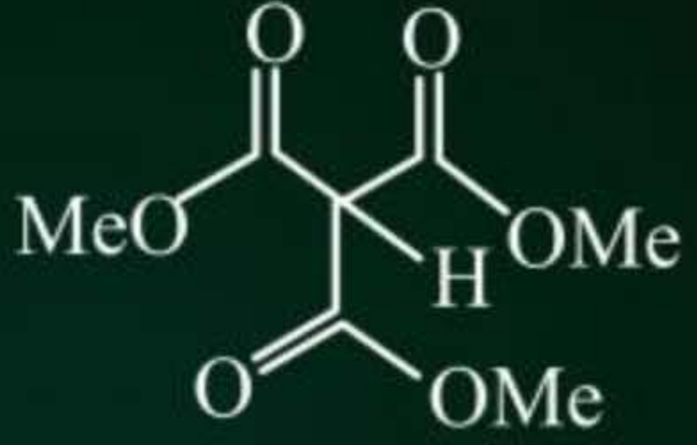
Ans. (C)

QUESTION [03 Sept JEE Mains 2021]

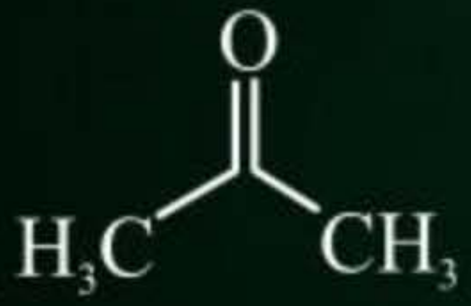
Which one of the following compounds possesses the most acidic hydrogen?

(A) $H_3C-C\equiv C-H$

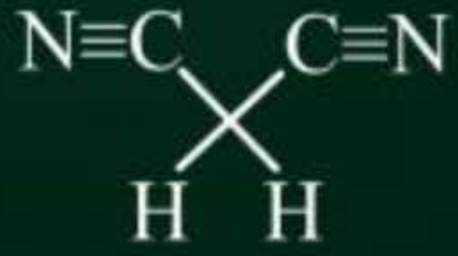
(B)



(C)



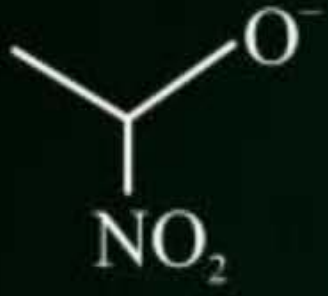
(D)



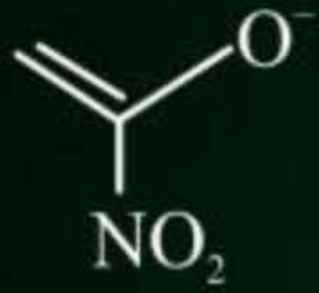
Ans. (B)

QUESTION [07 Jan JEE Mains 2020]

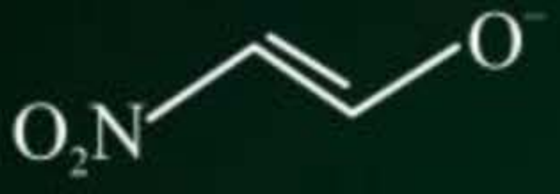
The correct order of stability for the following alkoxides



(A)



(B)



(C)

A (B) > (C) > (A)

B (C) > (A) > (B)

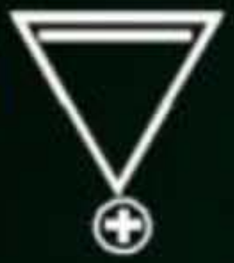
C (C) > (B) > (A)

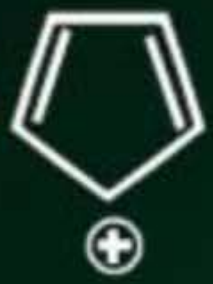
D (B) > (A) > (C)

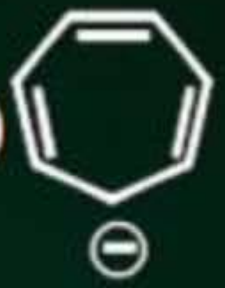
Ans. (C)

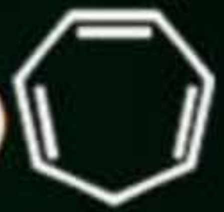
QUESTION [JEE Mains 2019 Online]

Which compound(s) out of the following is/are not aromatic?

(a)


(b)


(c)


(d)


A only b

B b, c & d

C c & d

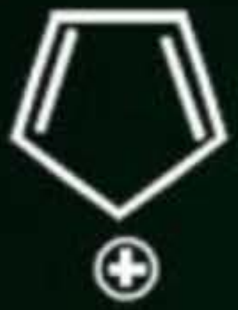
D a & c

Ans. (B)

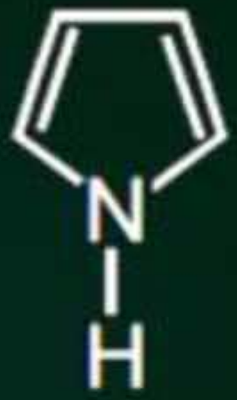
QUESTION [JEE Mains 2019 Online]

Which of the following compound is not aromatic?

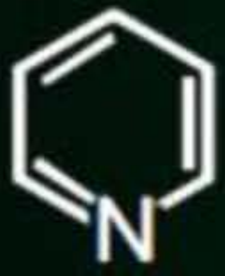
(A)



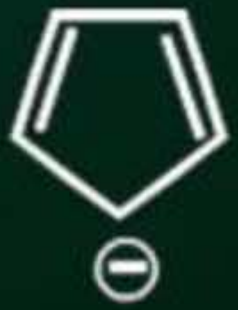
(B)



(C)



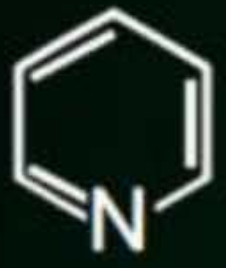
(D)



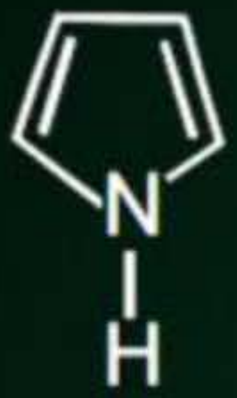
Ans. (A)

QUESTION [JEE Mains 2019 Online]

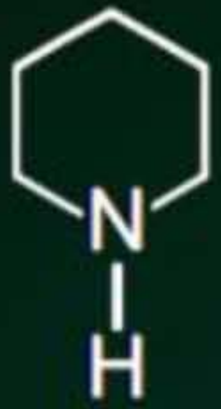
Arrange the following amines in the decreasing order of basicity.



(I)



(II)



(III)

A I > III > II

B III > I > II

C III > II > I

D I > II > III

Ans. (B)

QUESTION [JEE Mains 2019 Online]

The correct decreasing order for acid strength is:

(A) $CNCH_2COOH > O_2NCH_2COOH > FCH_2COOH > ClCH_2COOH$

(B) $FCH_2COOH > NCCH_2COOH > NO_2CH_2COOH > ClCH_2COOH$

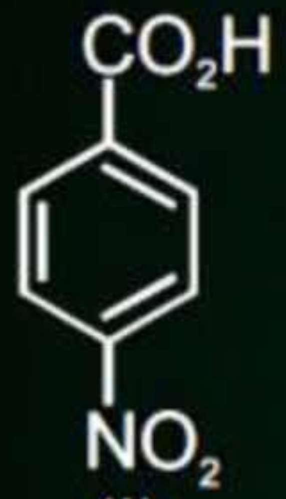
(C) $NO_2CH_2COOH > NCCH_2COOH > FCH_2COOH > ClCH_2COOH$

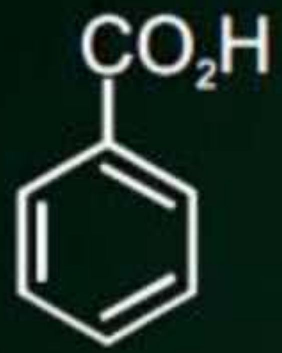
(D) $NO_2CH_2COOH > FCH_2COOH > CNCH_2COOH > ClCH_2COOH$

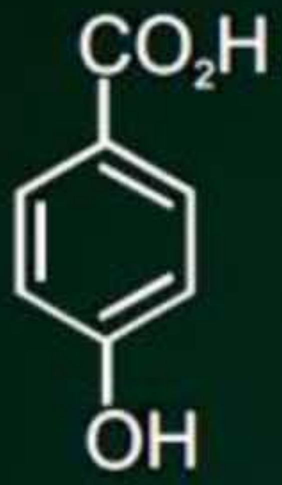
Ans. (C)

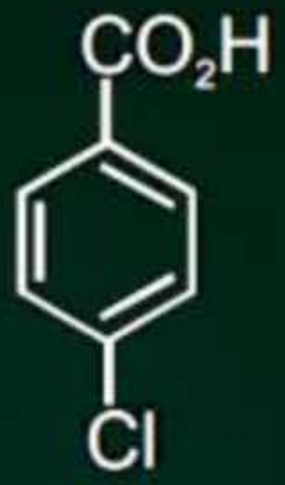
QUESTION [JEE Mains 2018 Online]

The increasing order of the acidity of the following carboxylic acid is:


(I)


(II)


(III)


(IV)

A $I < III < II < IV$

B $IV < II < III < I$

C $II < IV < III < I$

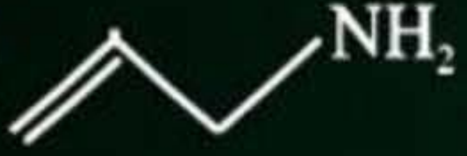
D $III < II < IV < I$

Ans. (D)

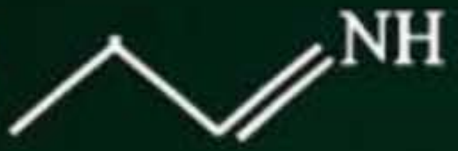
QUESTION [JEE Mains 2018]

The increasing order of basicity of the following compounds is:

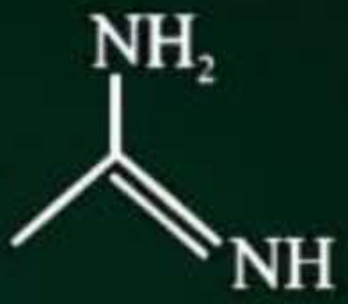
(a)



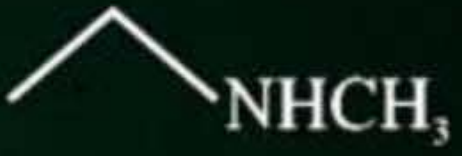
(b)



(c)



(d)



(A) (b) < (a) < (c) < (d)

(B) (b) < (a) < (d) < (c)

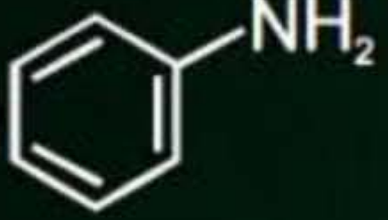
(C) (d) < (b) < (a) < (c)

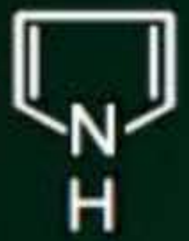
(D) (a) < (b) < (c) < (d)

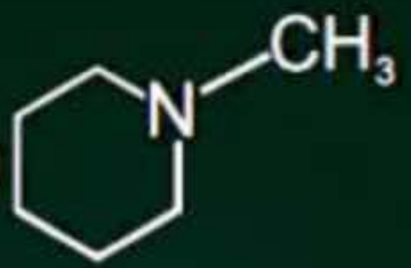
Ans. (B)

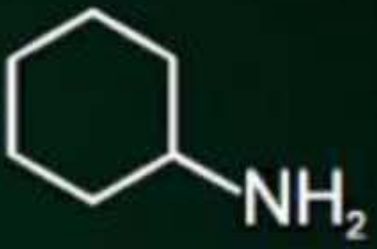
QUESTION [JEE Mains 2017 Online]

Among the following compounds, the increasing order of their basic strength is :

(I)


(II)


(III)


(IV)


A I < II < III < IV

B I < II < IV < III

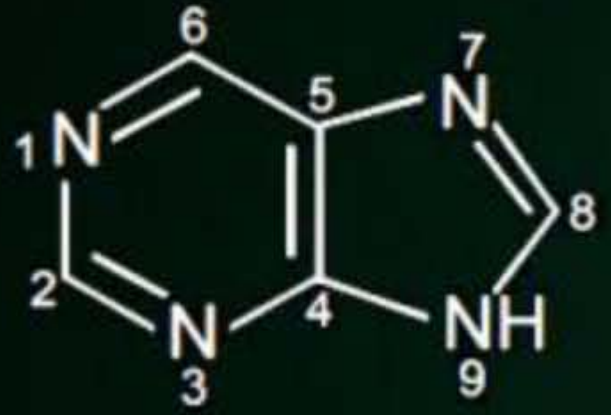
C II < I < III < IV

D II < I < IV < III

Ans. (D)

QUESTION [JEE Mains 2016 Online]

The N which does not contribute to the basicity for the compound is:


6
7
5
N
1 N
8
2
N
4
NH
3
9

(A) N 7

(B) N 1

(C) N 9

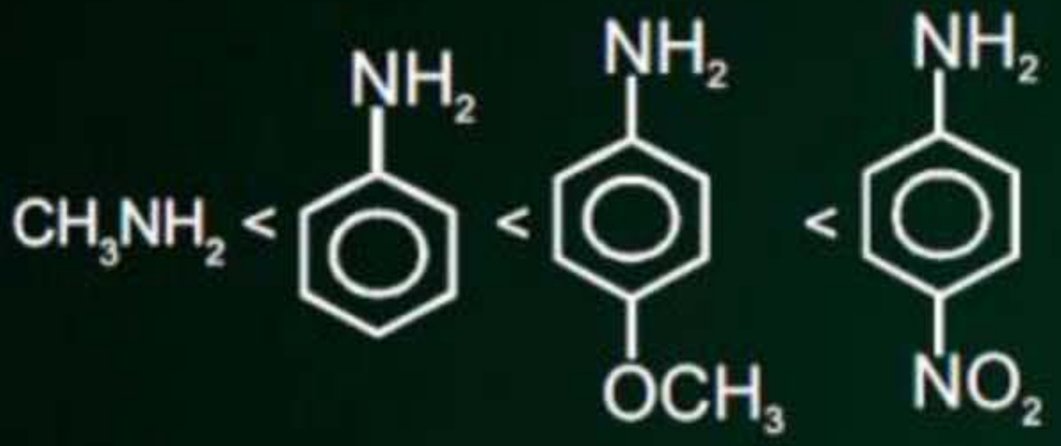
(D) N 3

Ans. (C)

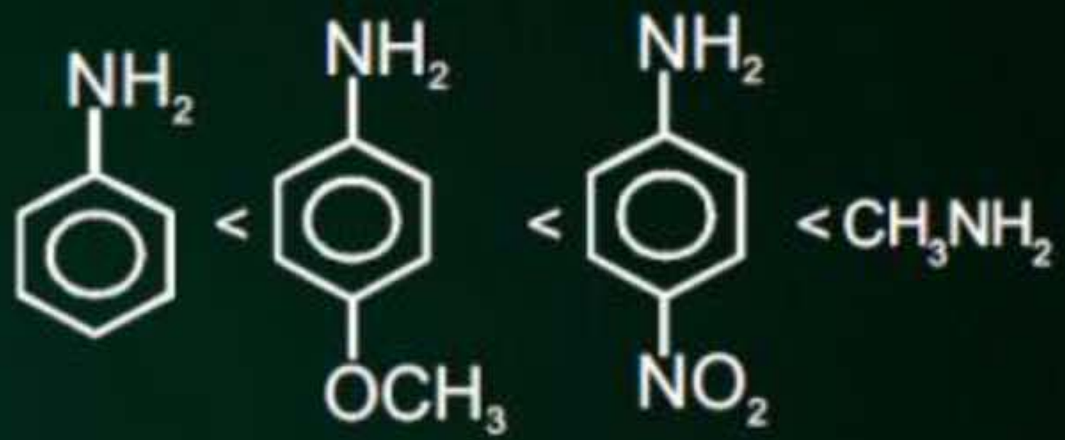
QUESTION [JEE Mains 2015 Online]

Arrange the following amines in the order of increasing basicity:

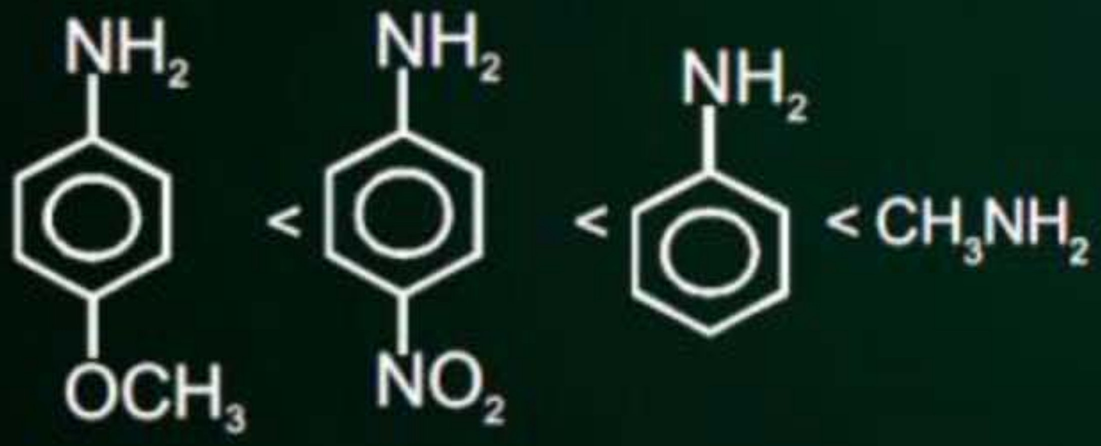
A


CH3NH2 <
NH2
<
NH2
OCH3
<
NH2
NO2

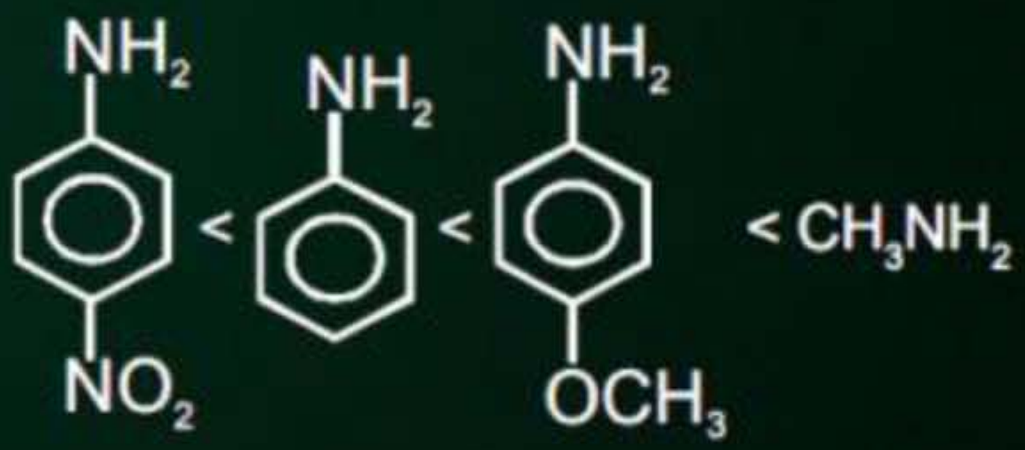
B


NH2
<
NH2
OCH3
<
NH2
NO2
< CH3NH2

C


NH2
OCH3
<
NH2
NO2
<
NH2
< CH3NH2

D


NH2
NO2
<
NH2
<
NH2
OCH3
< CH3NH2

Ans. (D)

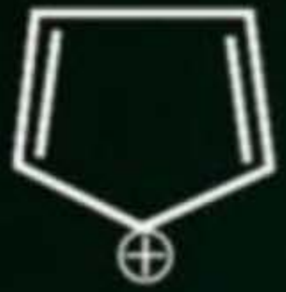
Home Work

discussion of L-07]

QUESTION 01

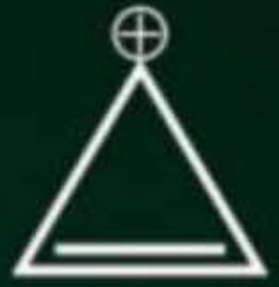
Which of the following compound is aromatic?

A



AA

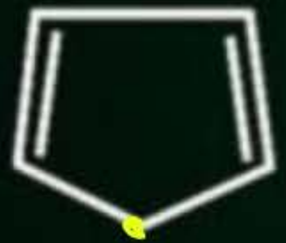
[✓ B]



$2\pi e^{\ominus}$

Ⓐ

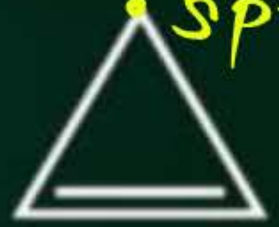
C



NA

sp^3

D



sp^3

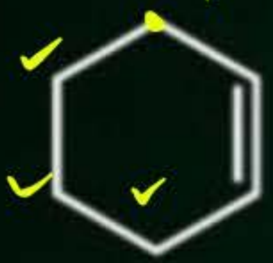
NA

QUESTION 02

Which of the following is aromatic?

A

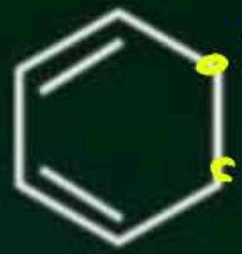
sp^3



NA

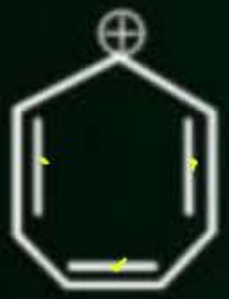
B

NA



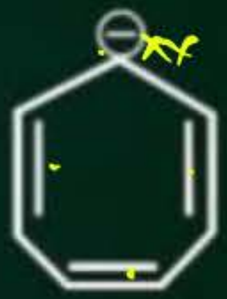
sp^3

[✓ C]



$6\pi e^{\ominus}$

D



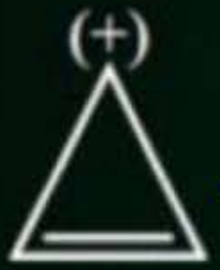
$8\pi e^{\ominus}$

AA

QUESTION ③

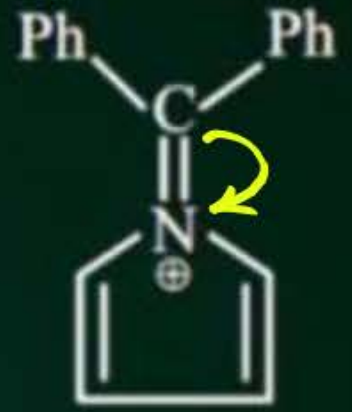
Which is not aromatic?

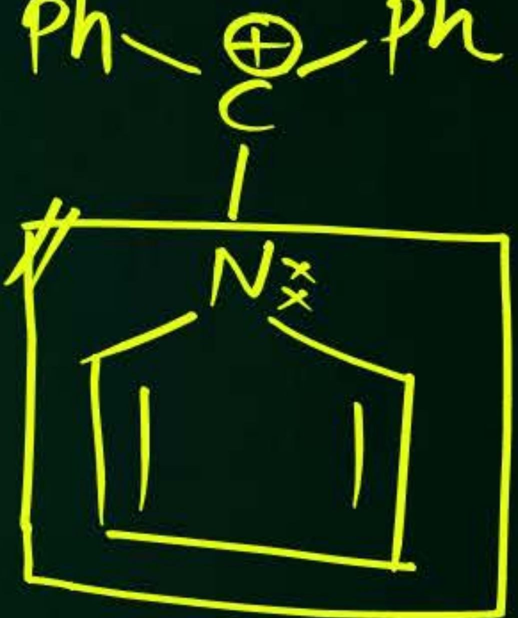
A



A.

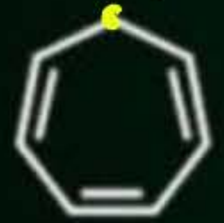
B





C

sp^3



NA

D Both (B) And (C)

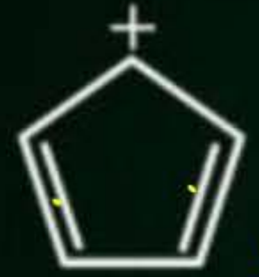
$6\pi e^{\ominus}$

A

QUESTION 04

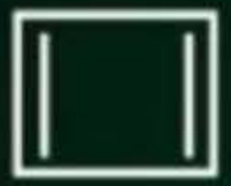
Which of the structures below would be aromatic?

(i)



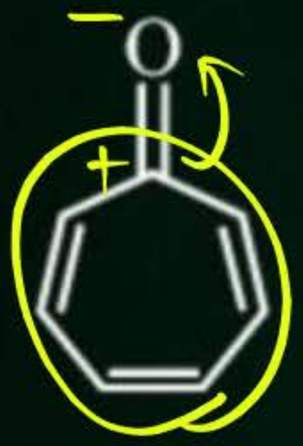
AA

(ii)



AA

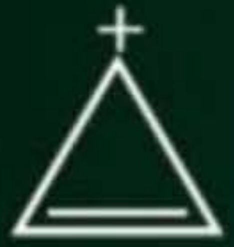
(iii)



6πe⊖

A

(iv)

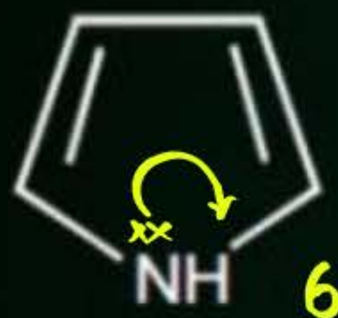


A

- **A** i and iv
- **B** i, iii and iv
- [✓ **C**] iii and iv
- **D** ii

QUESTION 05

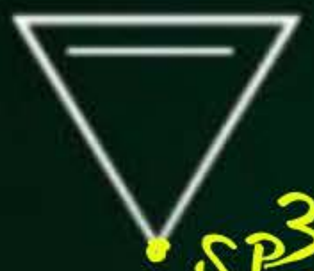
Which of the following structure is aromatic?



I

$6\pi e^{\ominus}$

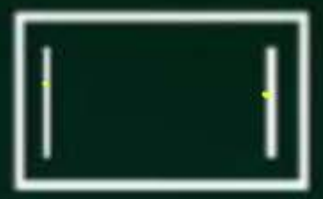
A



II

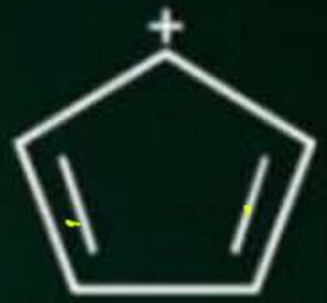
sp^3

NA



III

AA



IV

AA

Ⓐ Structures I and II

[✓ Ⓑ] Structure I only

Ⓒ Structure II only

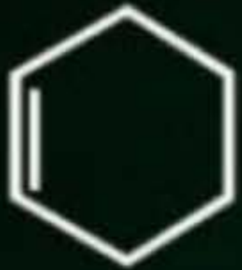
Ⓓ Structure III only

QUESTION ⑥

Anti Aro

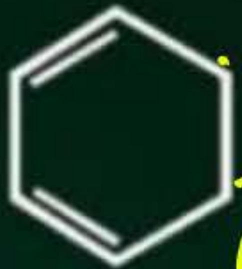
Which is not stable at room temperature?

A



NA

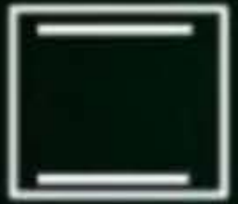
B



sp^3

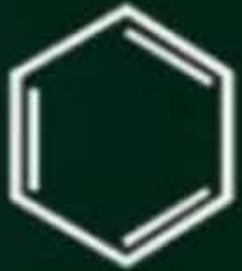
NA

✓ **C**



AA

D

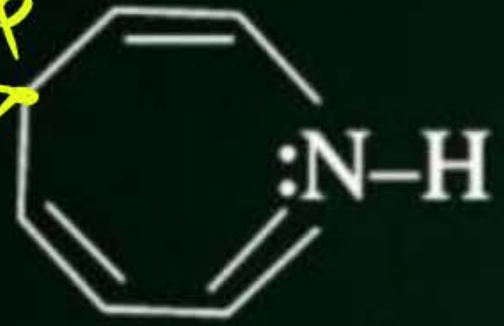


A

QUESTION ⑦

Which of the following is best classified as heterocyclic aromatic compound?

A

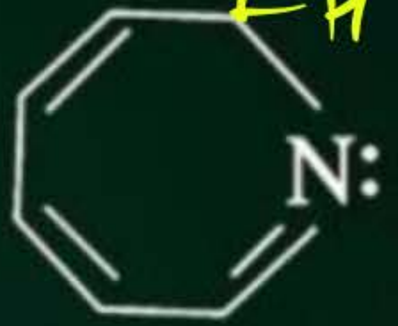


H sp^3

H

×

B

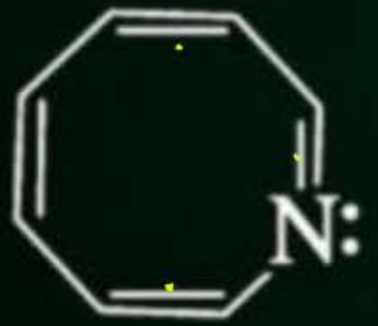


H

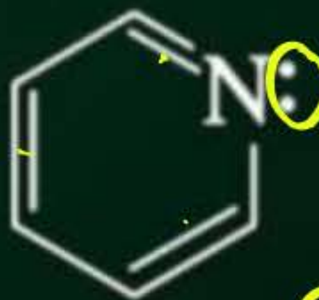
H sp^3

NA

C



✓ **D**



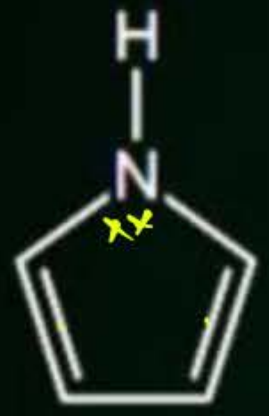
Loca

6πe$^{\ominus}$

A

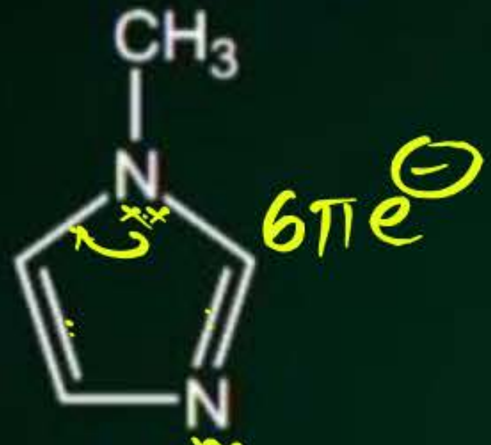
QUESTION 08

Choose the aromatic nitrogen heterocycles.



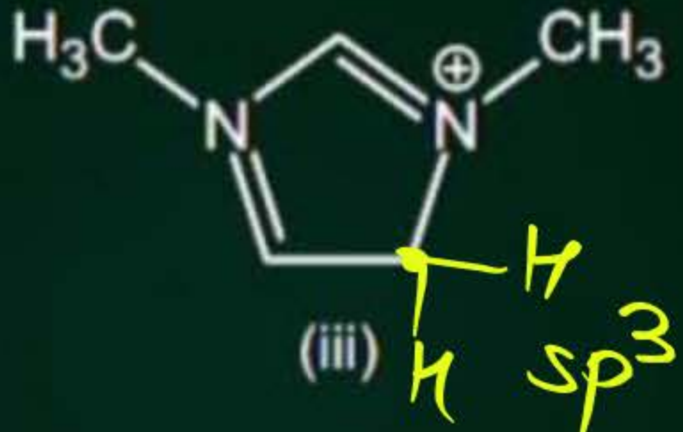
(i) $6\pi e^{\ominus}$

A



(ii) LOCA

A



(iii) sp^3

NA

A i

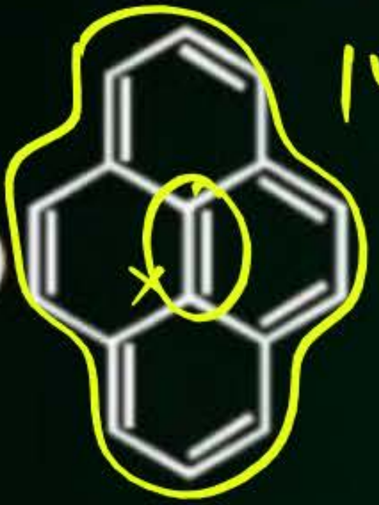
B ii

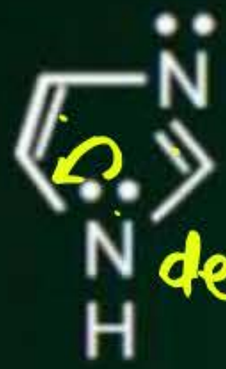
C iii

[✓ **D**] i and ii

QUESTION ⑨

Which of the following is/are an aromatic compound?

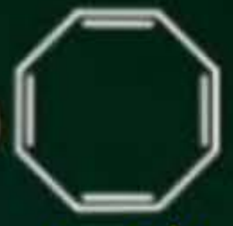
(i)

$14\pi e^{\ominus}$

(ii)

Loca

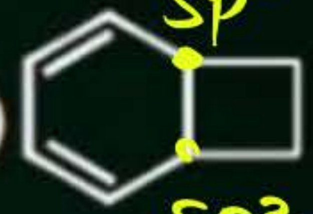
deloca

$6\pi e^{\ominus}$

A

(iii)

tublike

NA

(iv)

sp^3

sp^3

NA

[✓ A] i & ii

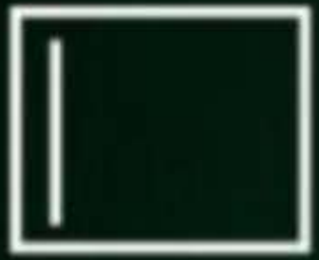
B i & iii

C ii & iii

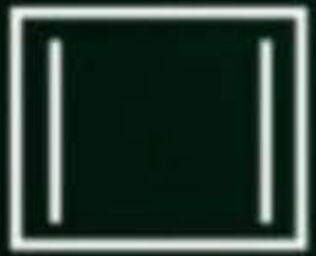
D All of these

QUESTION 10

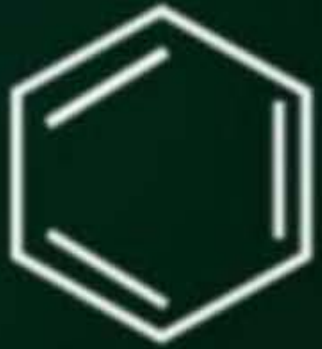
Select the anti-aromatic compound among the following:

A 

B $H_2C=CH-CH=CH_2$

[✓ C] 

AA

D 

ANSWER KEY

1. B
2. C
3. C
4. C
5. B
6. C
7. D
8. D
9. A
10. C

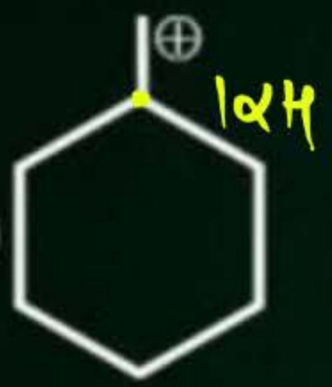
Home Work

Discussion of L-08

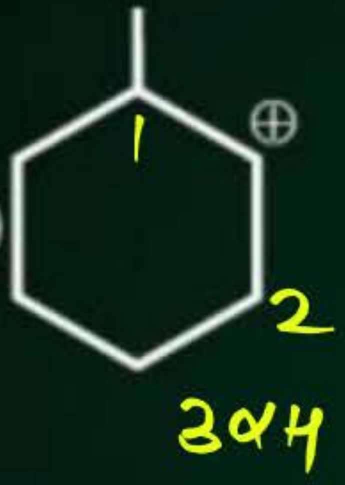
QUESTION 01

Which is the correct stability order of following intermediates:

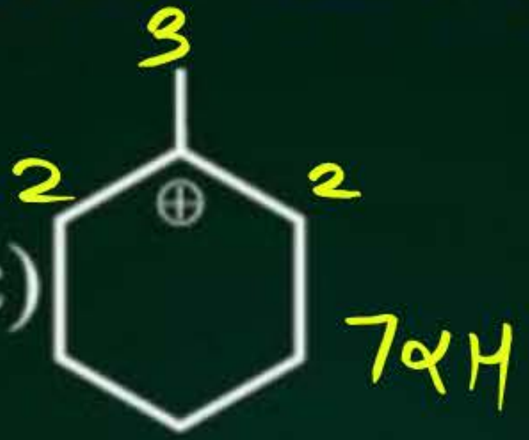
(a)



(b)



(c)



A $a > b > c$

B $a > c > b$

[✓ C] $c > b > a$

D $b > a > c$

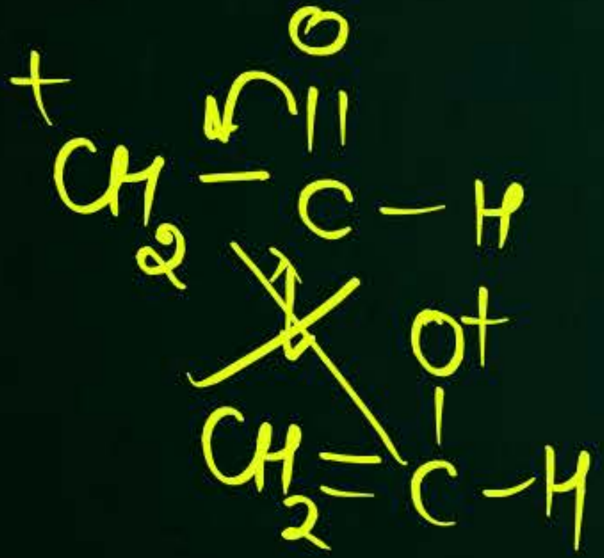
QUESTION 02

The most unstable carbocation is:

(A) $CH_3\overset{\oplus}{C}H_2$ 3α H

(B) $Cl-CH_2-\overset{\oplus}{C}H_2$ 2α H

[✓ (C)] $\overset{\oplus}{C}H_2-CHO$

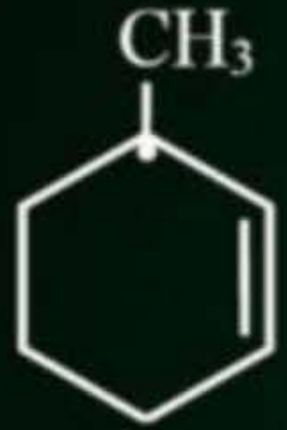


(D) $\overset{\oplus}{C}H_2-\ddot{O}-CH_3$

QUESTION 03

Most stable radical is:

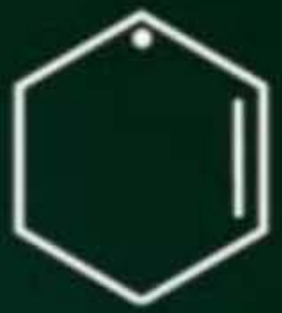
(A)



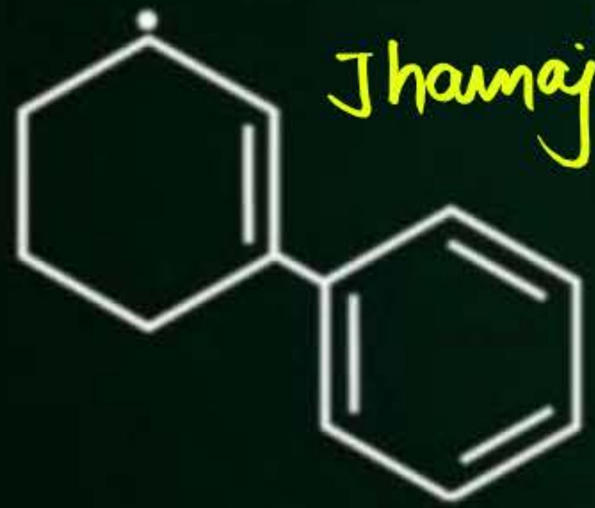
Reso

(B)

Reso

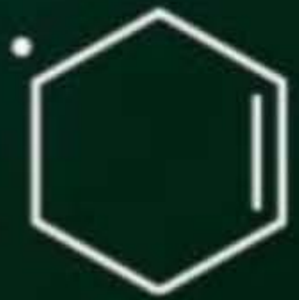


[✓ (C)]



Jhamajhamm

(D)

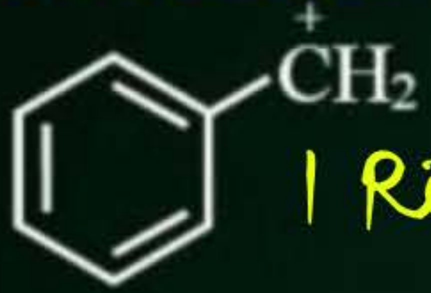


No reso

QUESTION 04

Which of the following options is the correct order of relative stabilities of cations, I, II and III written below (most stable first)?

(I)



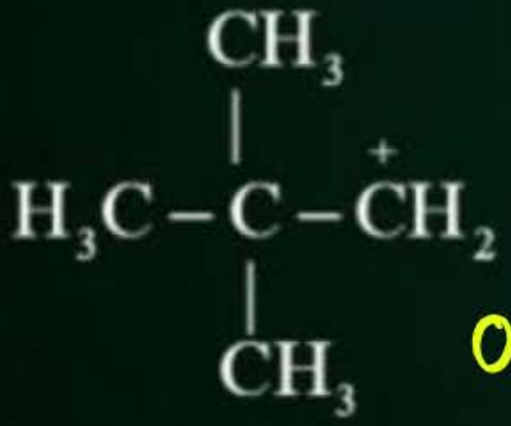
1 Ring reso

(II) $H_2C=CH-CH_2-\overset{+}{C}H-CH_3$

No reso

5αH

(III)



$$H_3C-\underset{CH_3}{\overset{CH_3}{\underset{|}{\overset{|}{C}}}}-\overset{+}{C}H_2$$

0αH

[✓ A] I > II > III

(B) II > III > I

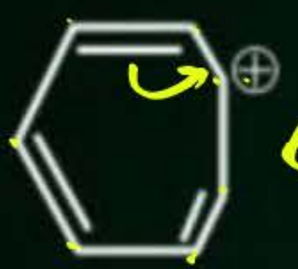
(C) III > I > II

(D) I > III > II

QUESTION 05

Which of the following is most stable carbocation

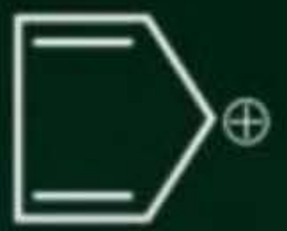
A ✓



$6\pi e^{\ominus}$

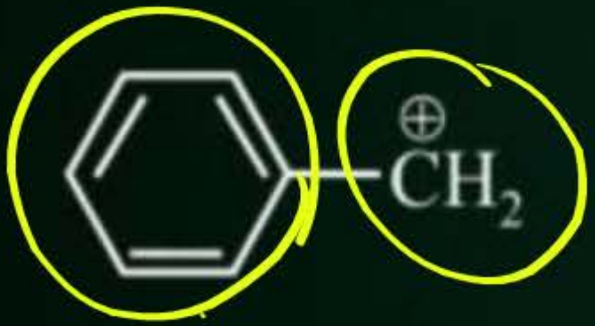
A

B



AA

C



A

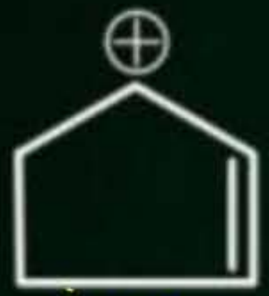
D

$CH_2=CH-\overset{\oplus}{C}H_2$

NA

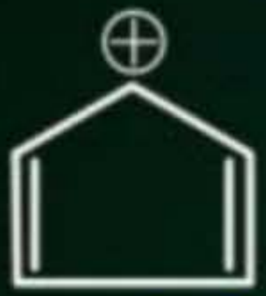
QUESTION 06

Compare the stability of carbocation



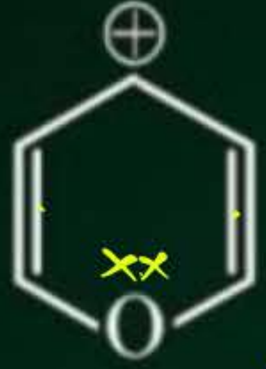
NA

(i)



AA

(ii)



(iii) A

6πe$^\ominus$

A (III) > (II) > (I)

B (II) > (III) > (I)

[✓ C] (III) > (I) > (II)

D (II) > (I) > (III)

QUESTION 07

The most stable radical among all is

A $CH_3CH_2\dot{C}HPh$ 1 Ring Reso

[✓ B] $\underbrace{CH_2=CH}\dot{C}HPh$ 1 Ring + Left side

C $CH_3CH_2\dot{C}(CH_3)_2$ 8αH

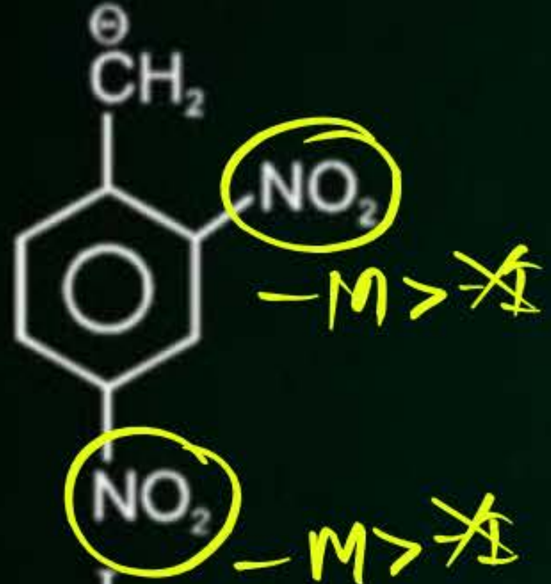
D $CH_2=CH\dot{C}HCH_3$

Left side + 3αH

QUESTION 08

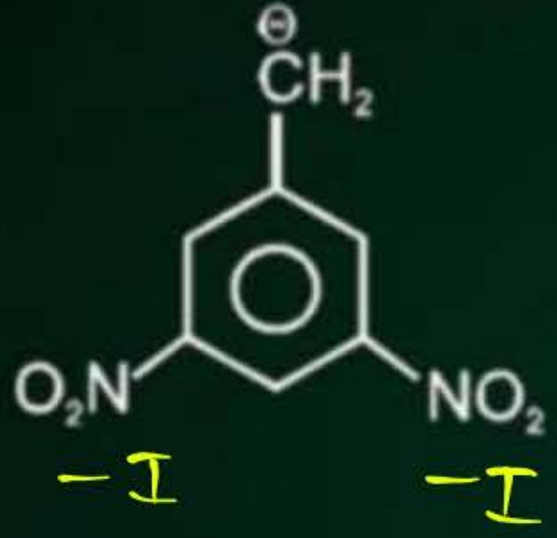
−M power −NO_2 > −CN

Arrange the following carbanions in increasing order of stability:



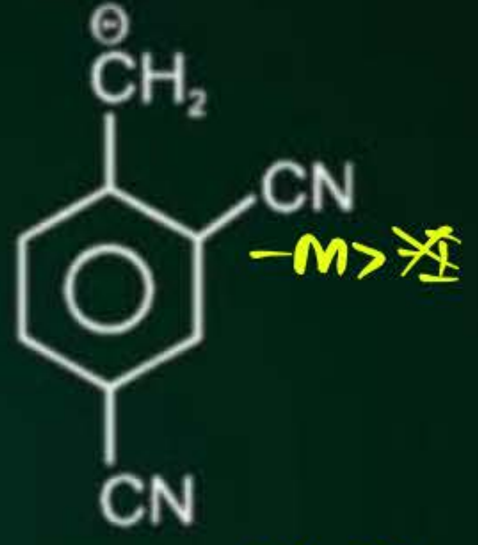
$\overset{\ominus}{C}H_2$
NO_2
−M > −I
NO_2
−M > −I

I



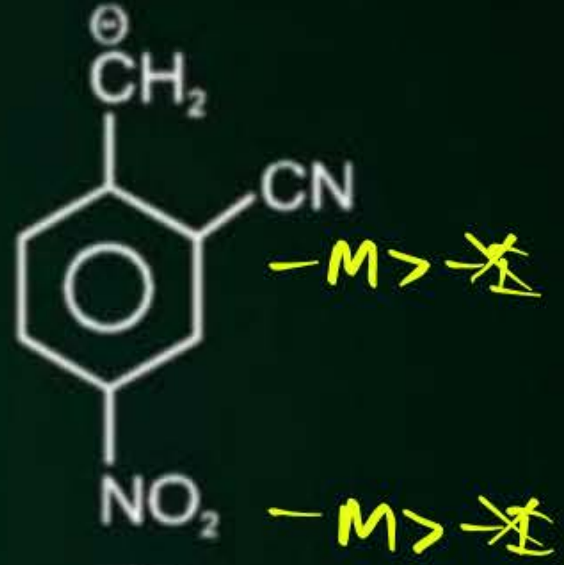
$\overset{\ominus}{C}H_2$
O_2N
NO_2
−I
−I

II



$\overset{\ominus}{C}H_2$
CN
−M > −I
CN

III −M > −I



$\overset{\ominus}{C}H_2$
CN
−M > −I
NO_2
−M > −I

IV

(A) III > IV > I > II

(B) I > III > IV > II

(C) I > II > III > IV

[✓ (D)] I > IV > III > II

QUESTION 09

Arrange the following radicals in decreasing order of stability.

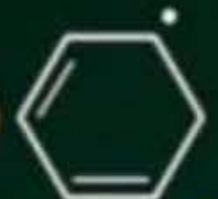
(I) $\dot{C}H_3$

0 αH

(II) $CH_3-\dot{C}H_2$

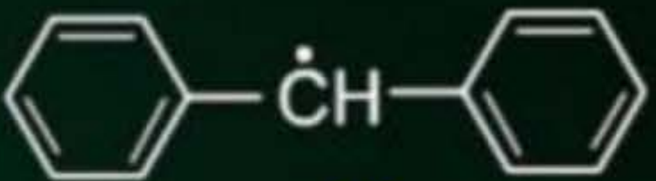
3αH

(III)



reso

(IV)



2 Ring reso

A IV > I > III > II

[✓ B] IV > III > II > I

C I > II > III > IV

D IV > III > I > II

QUESTION 10

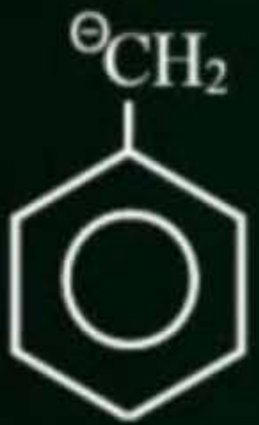
Arrange following carbanions in the stability order:

(a) $CH_2 = CH - CH_2^{\ominus}$ Reso

(b) $CH_2 = CH - CH_2 - CH_2^{\ominus}$ No reso

(c) $CH_2 = CH - CH^{\ominus} - CH = CH_2$

2 Reso

(d) 

1 Ring reso

[✓ A] $d > c > a > b$

B $b > a > c > d$

C $a > b > d > c$

D $c > a > b > d$

ANSWER KEY

1.C
2.C
3.C
4.A
5.A
6.C
7.B
8.D
9.B
10.A

Home Work

discussion of L-09

QUESTION 01

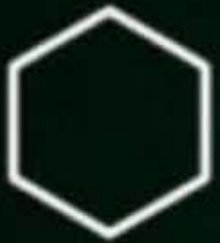
HOC $\propto$ No of 'C'

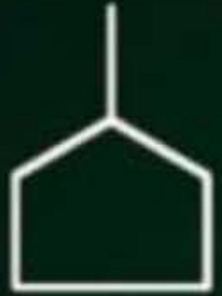
HOC $\propto \frac{1}{\text{Stability}}$

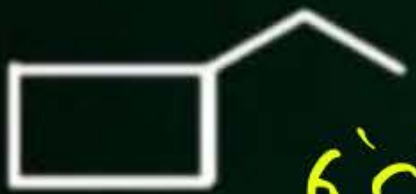
Stability

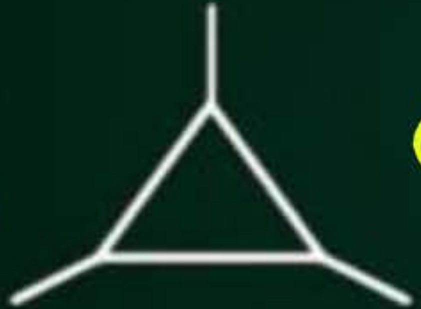
6 > 5 > 4 > 3

The correct order of heat of combustion of the following hydrocarbons is:

(I)

6 'C'

(II)

6 'C'

(III)

6 'C'

(IV)

6 'C'

[✓ A] I < II < III < IV

B I < II < IV < III

C II < I < III < IV

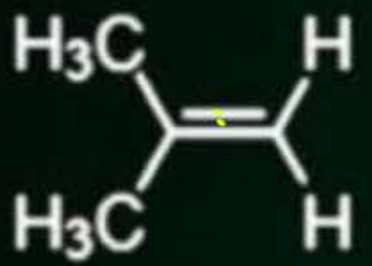
D IV < III < II < I

QUESTION 02

Stability
iso > Trans > cis
HOH iso < Trans < cis

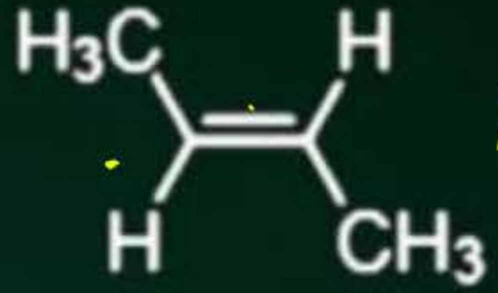
The minimum heat of hydrogenation among the following will be shown by

[✓ A]



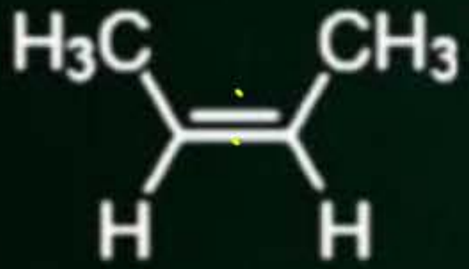
1π

(B)



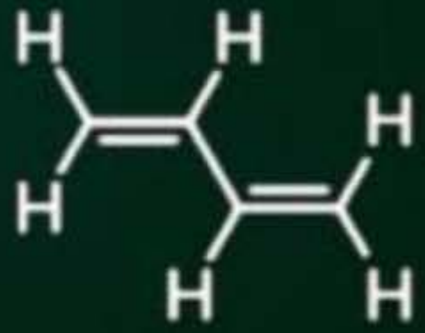
1π

(C)



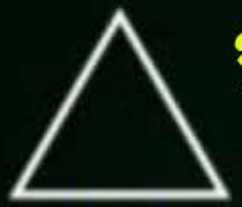
1π

(D)

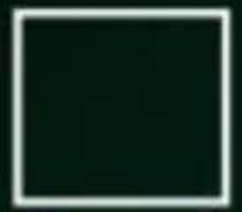


2π

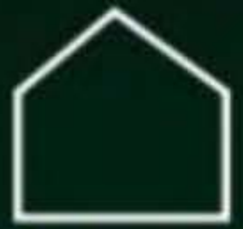
QUESTION 03


3'C'

Cyclopropane
(i)


4'C'

Cyclobutane
(ii)


5'C'

Cyclopentane
(iii)

The correct order of heats of combustion of above compounds is:

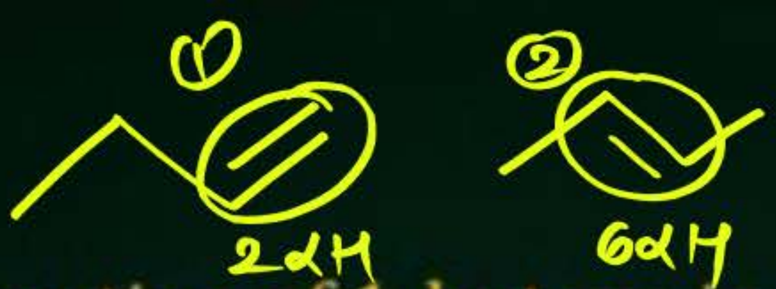
A I > II > III

B II > I > III

[✓ C] III > II > I

D III > I > II

QUESTION 04



① < ② stability
① > ② HOH

Assertion: Heat of hydrogenation of 1-butene is more than 2-butene.

Reason: With 6-αH 2-butene is more stable than 1-butene with only 2-αH.

A ✓ Both Assertion and Reason are correct and Reason is the correct explanation for Assertion.

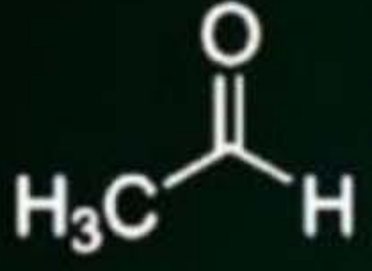
B Both Assertion and Reason are correct but Reason is not the correct explanation for Assertion.

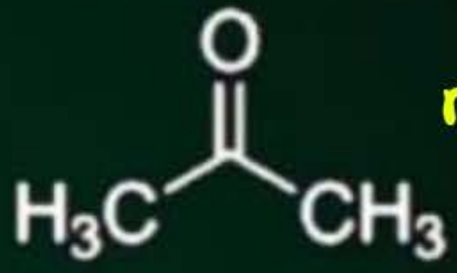
C Assertion is correct but Reason is incorrect.

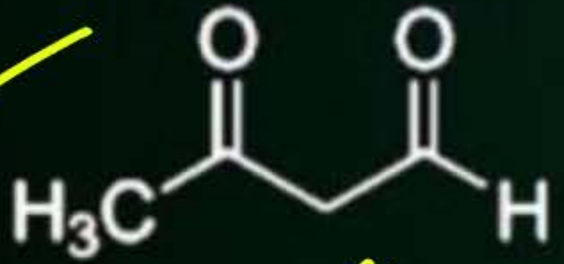
D Both Assertion and Reason are incorrect.

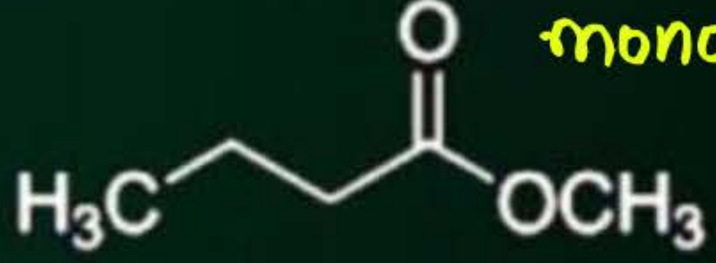
QUESTION 05

From the following compounds which has the highest enol content?

A

mono ald

B

mono keto

[✓ C]

di Ald ket

D

mono ester

QUESTION 06

Which one of the following compounds would have the highest heat of hydrogenation?

1π

[✓ A] $H_2C = CH_2$ $0\alpha H$

1π

B $CH_3{-}CH_2{-}CH = CH_2$

C $H_3C{-}CH = CH - CH_3$

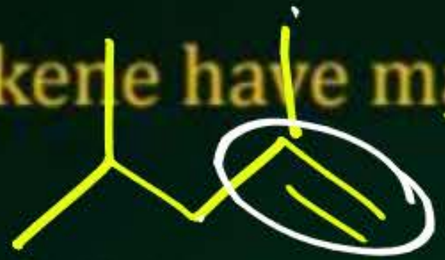
1π

D $(CH_3)_2C = C(CH_3)_2$

1π

QUESTION 07

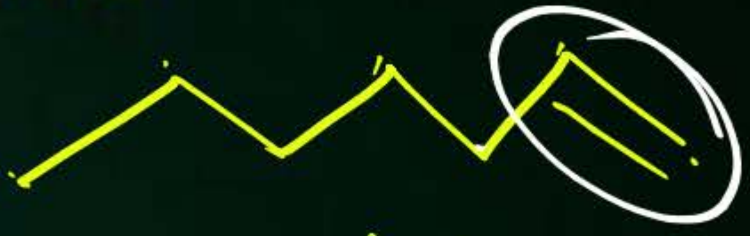
Which of the following alkene have maximum heat of combustion?



A 2, 4-Dimethyl-1-pentene

7 'C' 5αH

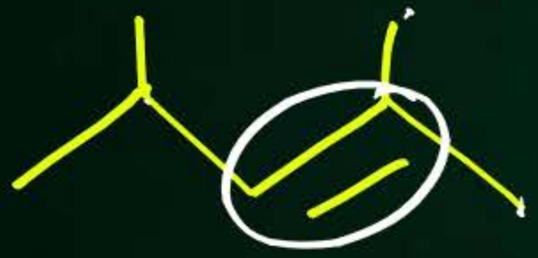
[✓ B] 1-Heptene



7 'C' 2αH

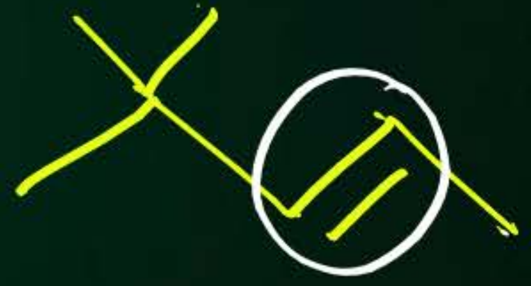
C 2, 4-Dimethyl-2-pentene

D 4, 4-dimethyl-2-pentene



7 'C'

7αH



7 'C'

3αH

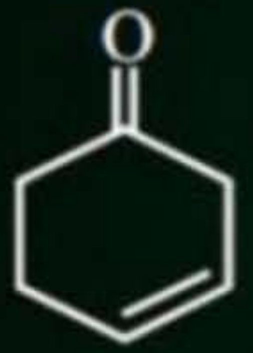
QUESTION 08

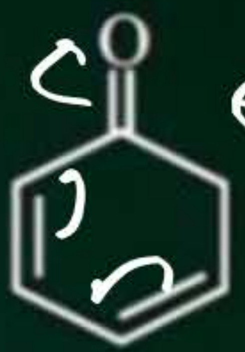
Which of the following compounds will show the maximum 'enol' content?

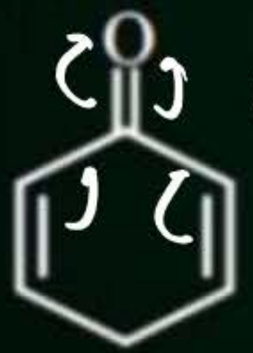
- A CH_3COCH_3 mono keto
- [✓ B] $CH_3COCH_2COCH_3$ diketone
- C $CH_3COCH_2COOC_2H_5$ keto ester
- D $CH_3COCH_2CONH_2$ keto amide

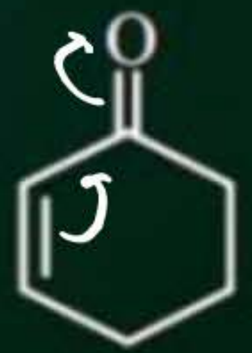
QUESTION 09

Which of the following has highest resonance energy?

A

No reso

[✓ B]

ext reso

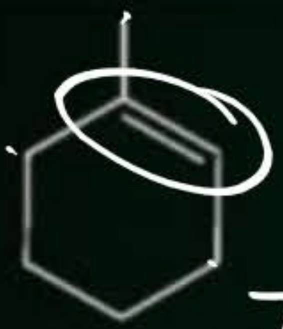
C

cross

D


QUESTION 10

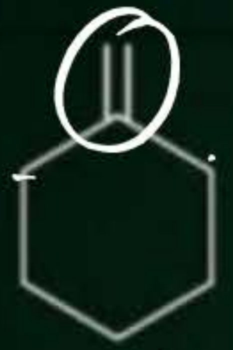
Compare heat of hydrogenation of the following:

(i)



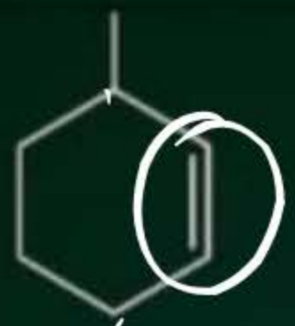
7αH

(ii)



4αH

(iii)



3αH

A i > ii > iii

[✓ **B** iii > ii > i]

C ii > i > iii

D ii > iii > i

ANSWER KEY

1. A
2. A
3. C
4. A
5. C
6. A
7. B
8. B
9. B
10. B

Home Work

Discussion of L-10

QUESTION 01

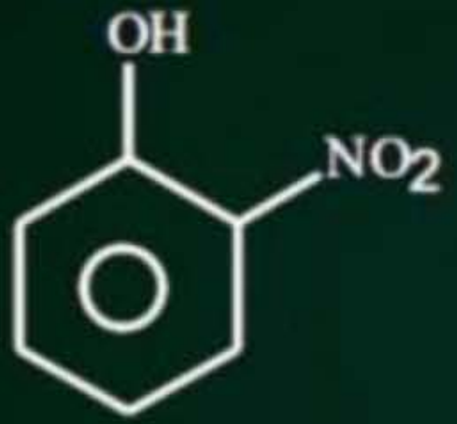
Arrange the following phenols in order of their increasing acidity.

A I > III > II

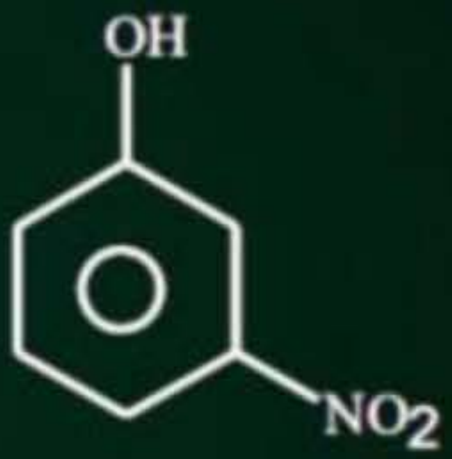
B I > II > III

C [✓ III > I > II]

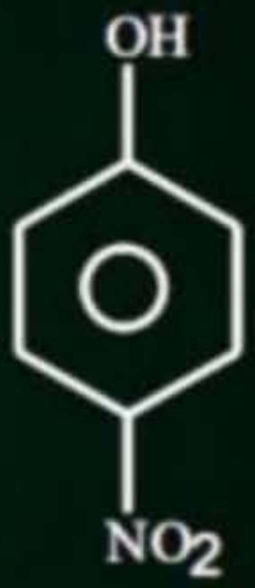
D III > II > I



(I)



(II)



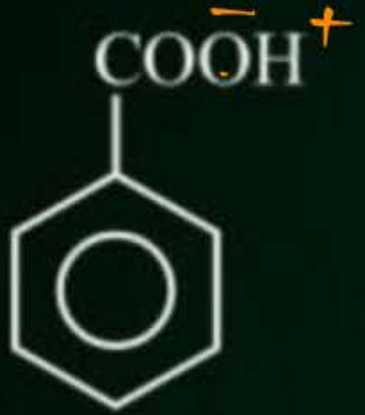
(III)

POM

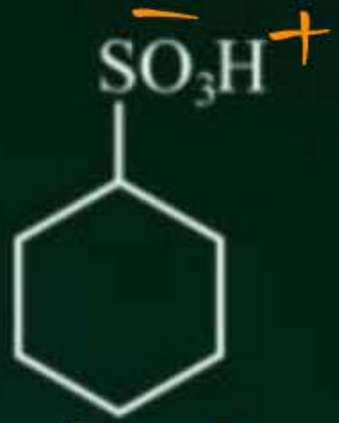
QUESTION 02

Which of the following is least acidic?

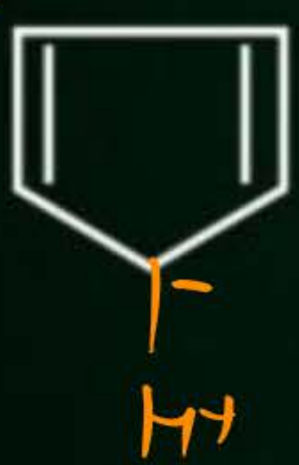
A



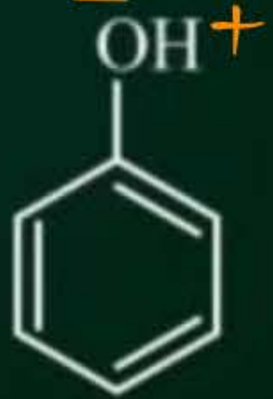
B



C



D



QUESTION 03

Rearrange the following in the increasing order of acidic strength.

(i) Benzoic acid

(ii) p-methoxybenzoic acid

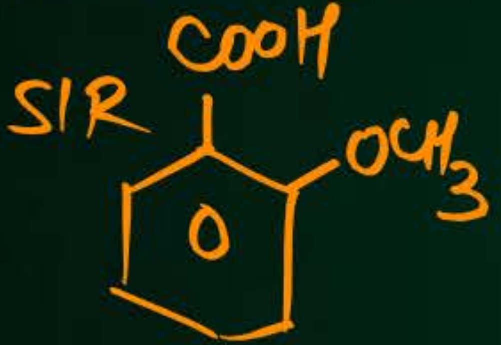
(iii) o-methoxybenzoic acid

A i < ii < iii

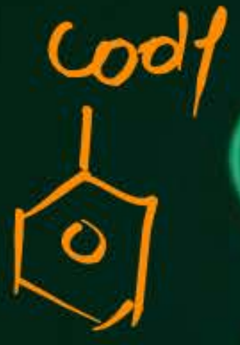
B iii < i < ii

[✓ C] ii < i < iii

D iii < ii < i

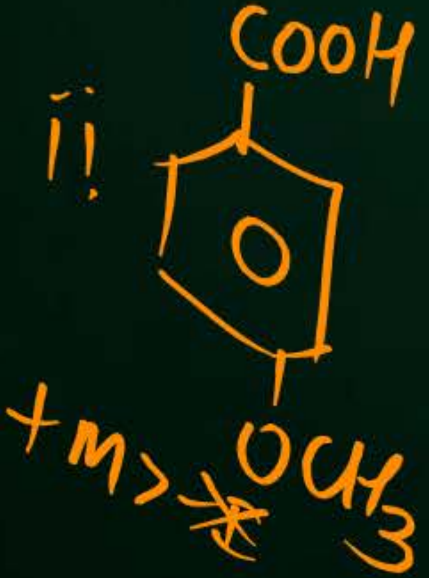

SIR
COOH
OCH3

iii



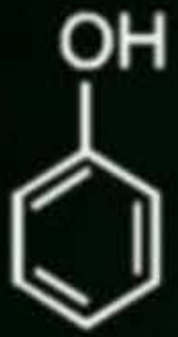
i

ii

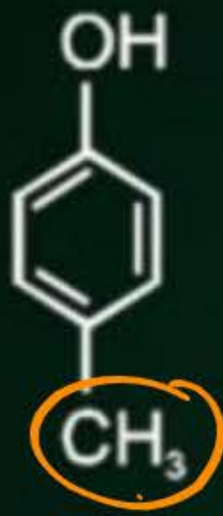


QUESTION 04

The correct order of acid Strength of the following compounds.



I

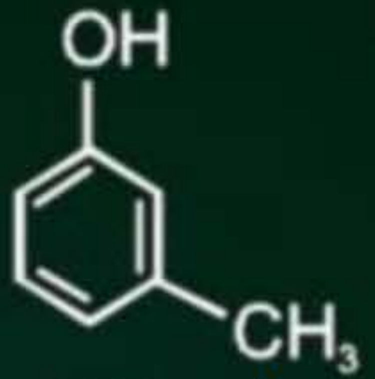


II

+H

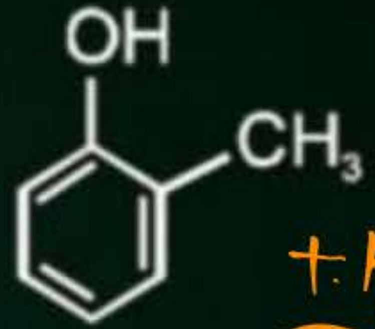
+I

door



III

+I



IV

+H

+I

paas

[✓ A] I > III > II > IV

B II > III > IV > I

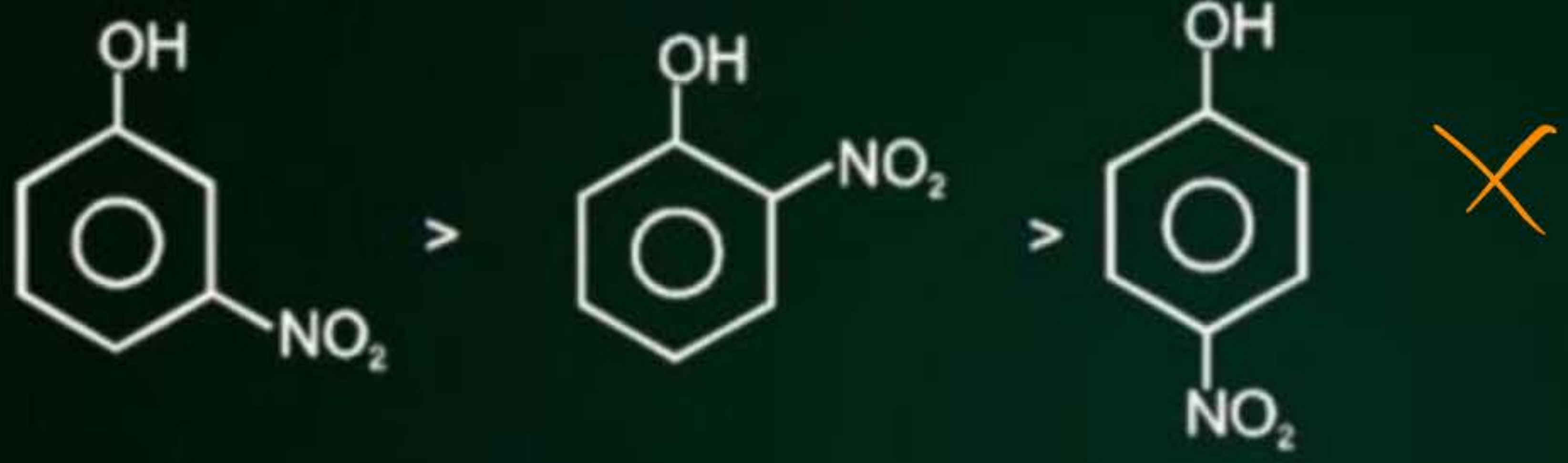
C III > II > IV > I

D I > III > IV > II

QUESTION 05

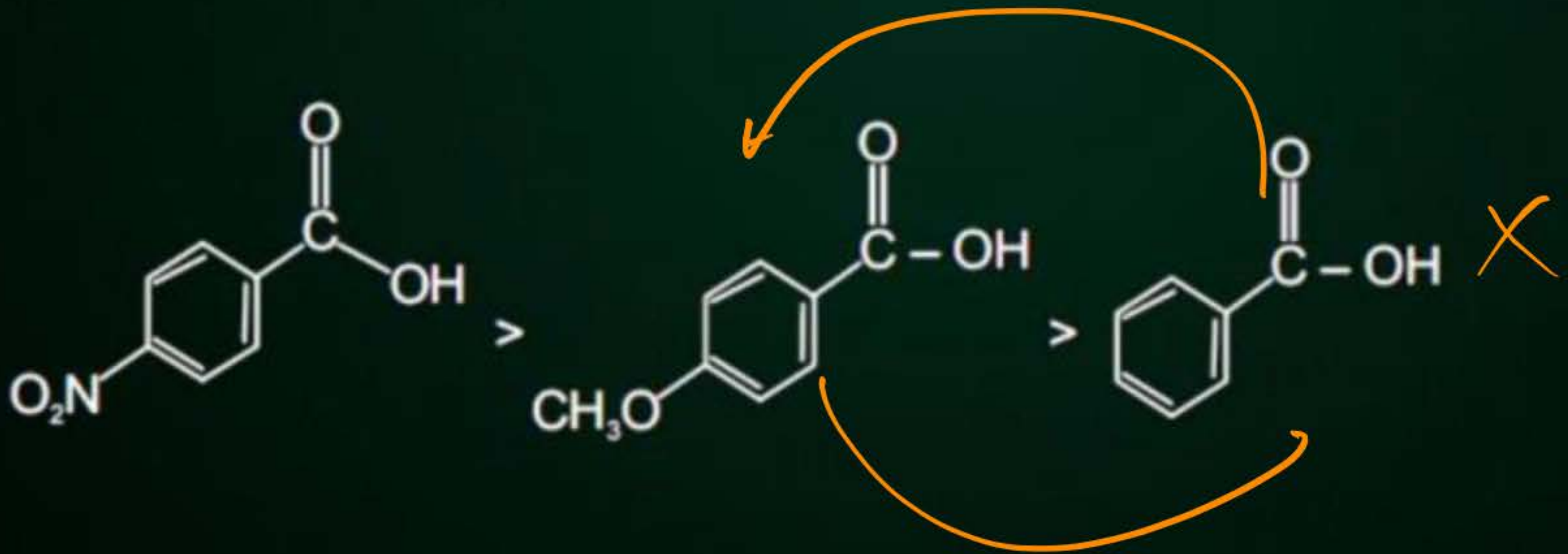
Acidic strength order is correctly mentioned in

A



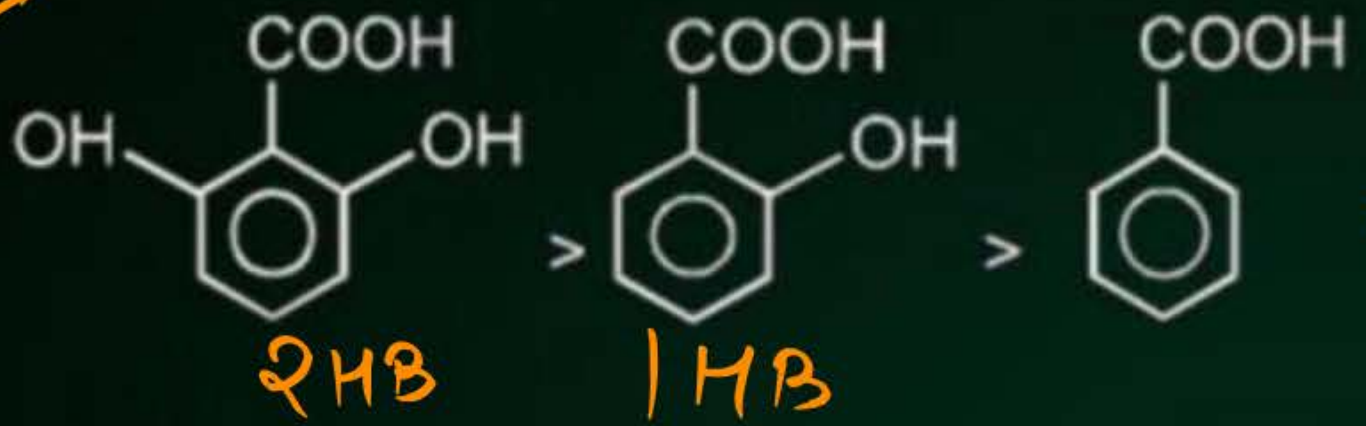
OH
NO₂
>
OH
NO₂
>
OH
NO₂

B



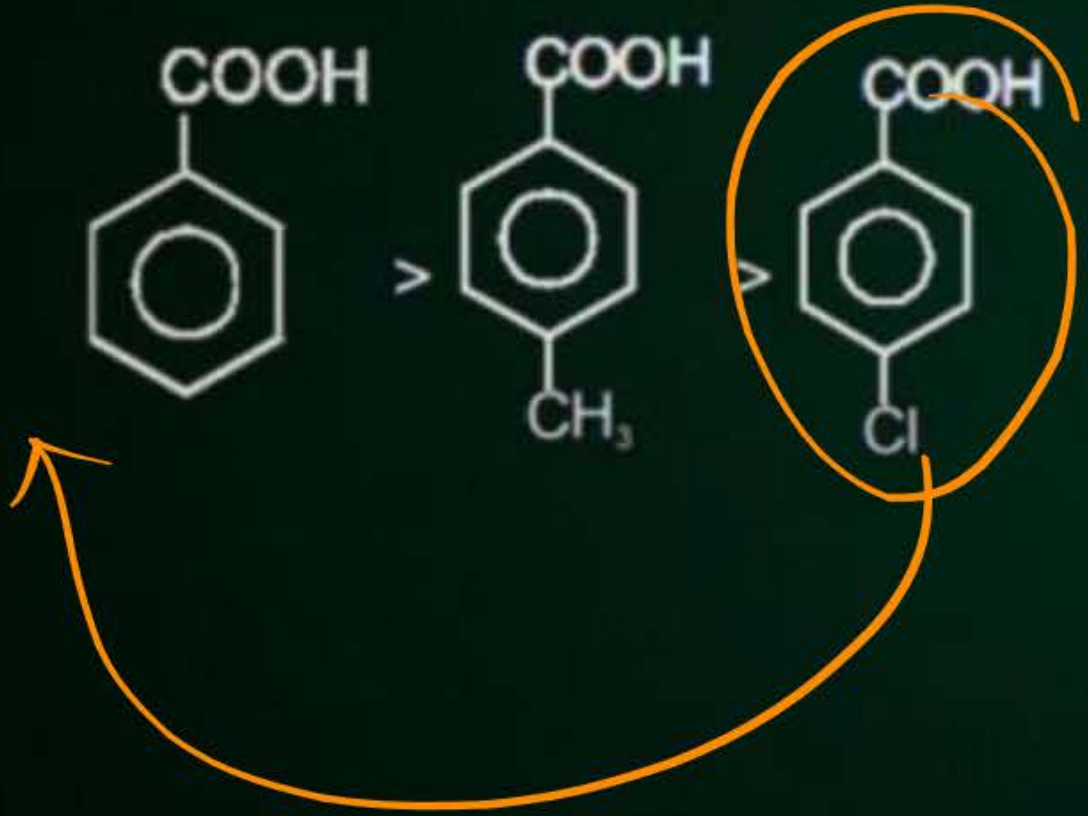
O
C
OH
O₂N
>
O
C – OH
CH₃O
>
O
C – OH

C ✓


COOH
OH
OH
>
COOH
OH
>
COOH
2HB
1HB

✓

D


COOH
>
COOH
CH3
>
COOH
Cl

×

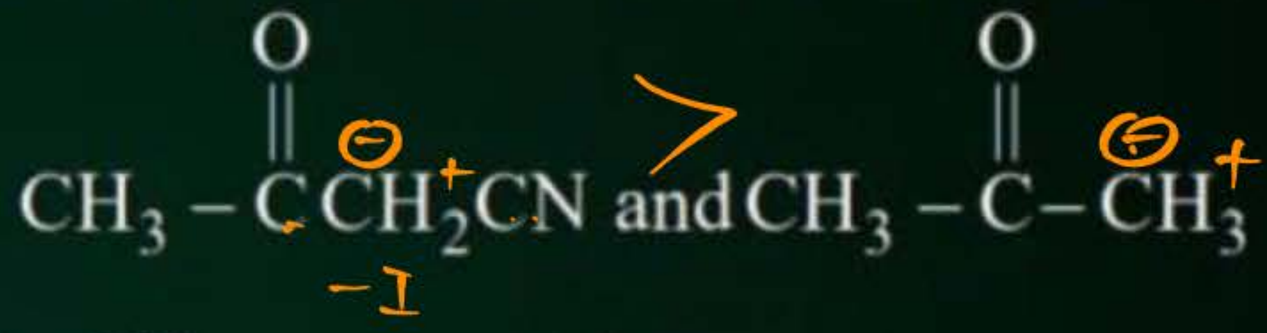
QUESTION 06

Among the given pairs, in which pair second compound is more acidic than first ?

(A) $\underline{\text{Br}}\overset{\ominus}{\text{C}}\text{H}_2^{+}\underline{\text{NO}_2}$ $\overset{>}{\text{and}}$ $\text{CH}_3\overset{\ominus}{\text{C}}\text{H}_3^{+}$

$-I$ $+I$

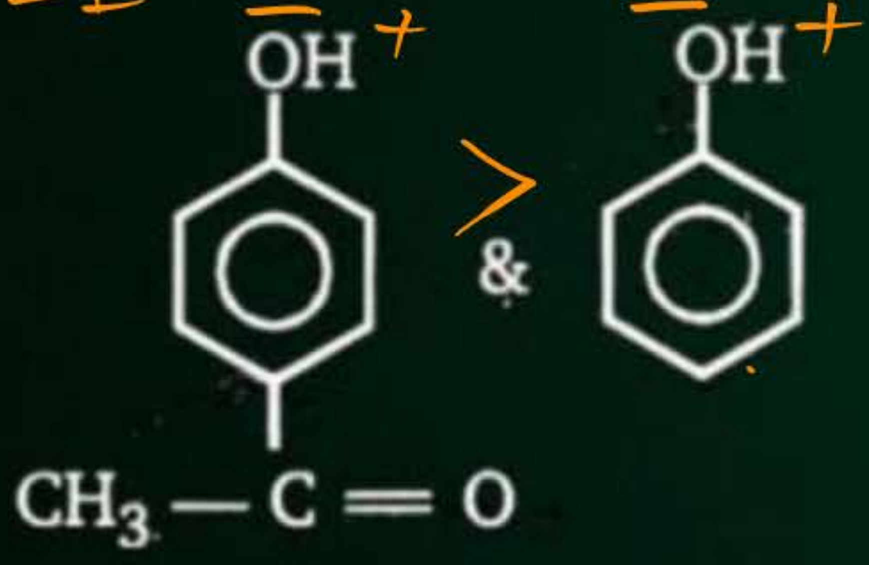
(B)



$\text{CH}_3-\overset{\overset{\text{O}}{\|}}{\text{C}}\overset{\ominus}{\text{C}}\text{H}_2^{+}\text{CN}$ $>$ and $\text{CH}_3-\overset{\overset{\text{O}}{\|}}{\text{C}}-\overset{\ominus}{\text{C}}\text{H}_3^{+}$

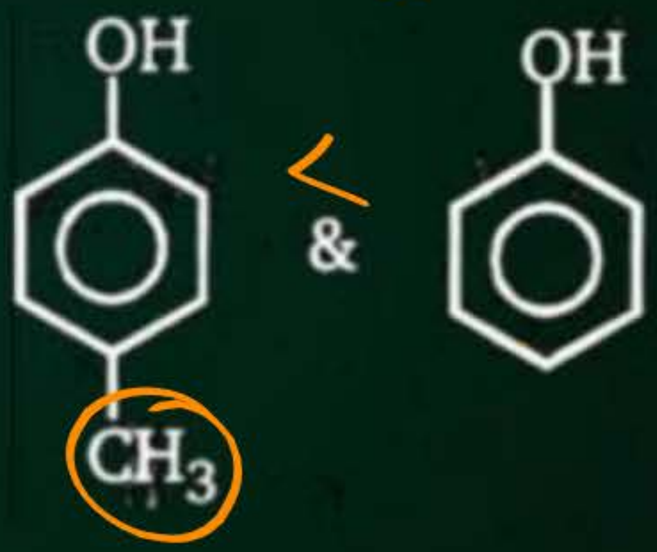
$-I$

(C)



$-M$ $-I$

✓ **(D)**

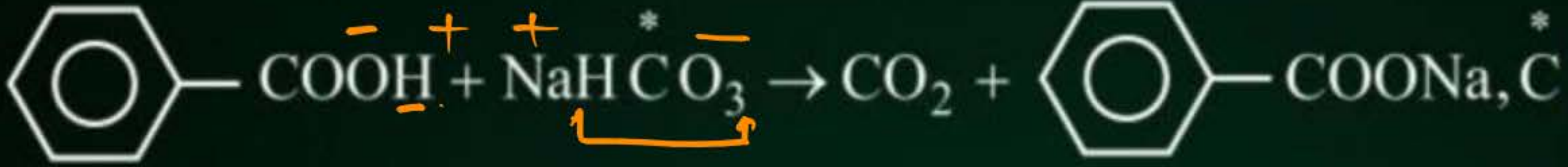


$+M$

$+I$

QUESTION 07

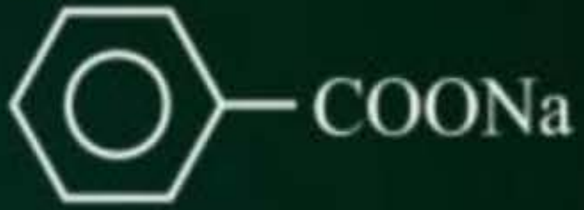
$H_2\overset{*}{C}O_3 \rightarrow \overset{*}{C}O_2 + H_2O$


COOH + NaHCO$_3$ → CO$_2$ + COONa, $\overset{*}{C}$

is with the product:

[✓ A] CO_2

B



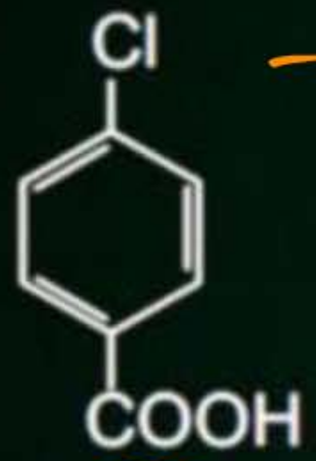
C Both (A) and (B)

D None of these

QUESTION 08

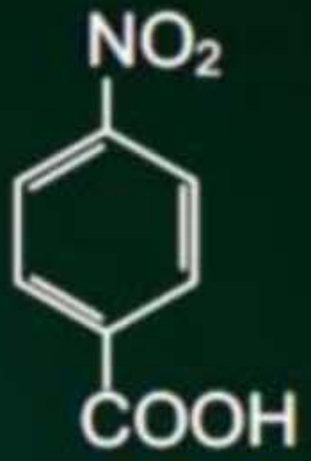
Which of the following compounds is a weaker acid as compared to benzoic acid ?

A



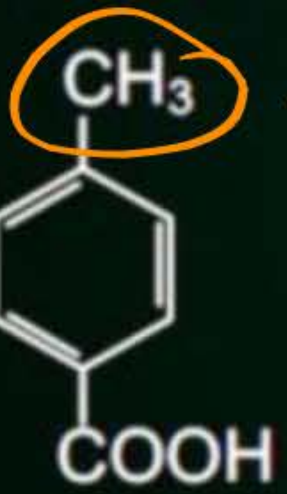
$-I > +M$

B



$-M > -I$

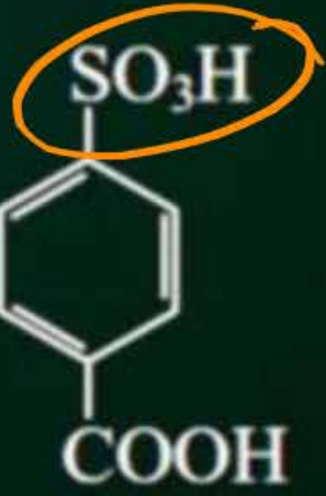
C ✓



$+H$

$+I$

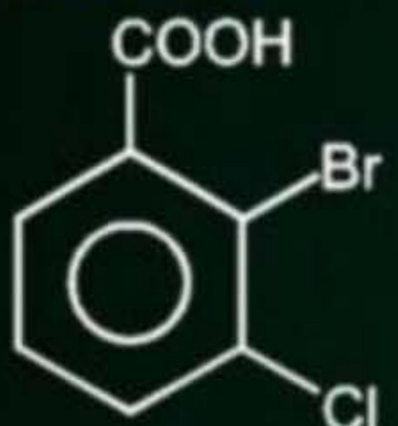
D

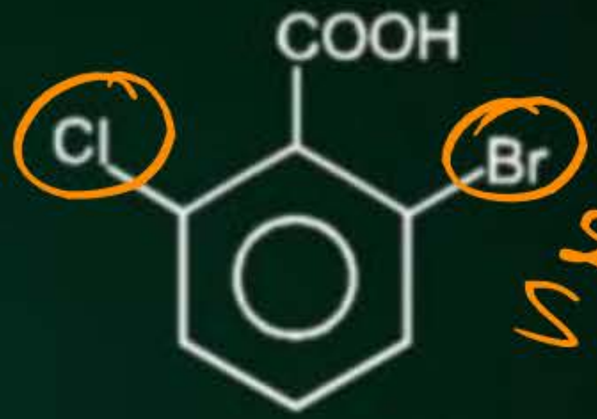


sulphonic

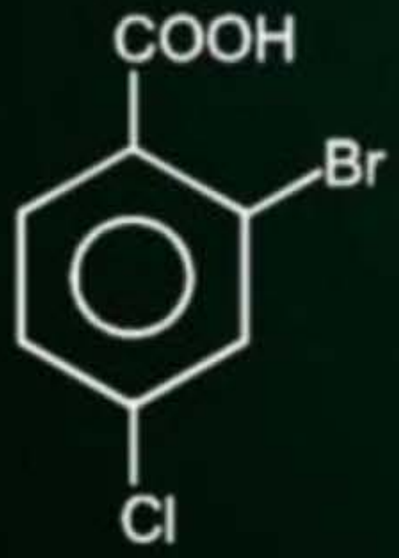
QUESTION 09

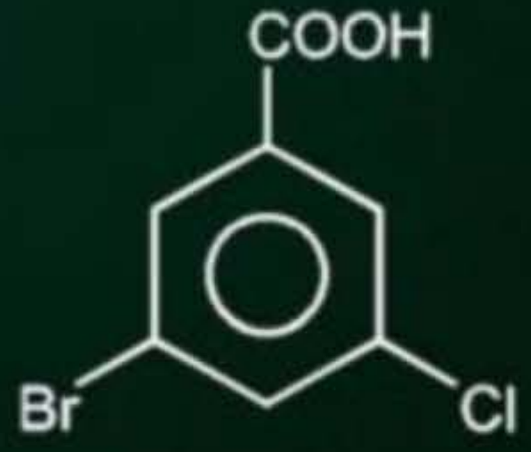
(X) ($C_6H_3ClBrCOOH$) are a dihalosubstituted benzoic acids. The strongest acid among all isomers is:

A


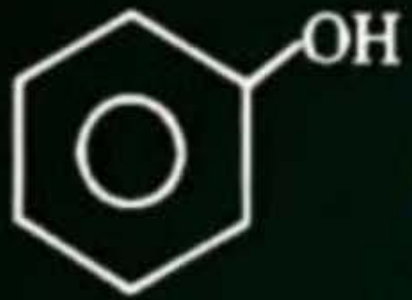
✓ B


2
SIR

C


D


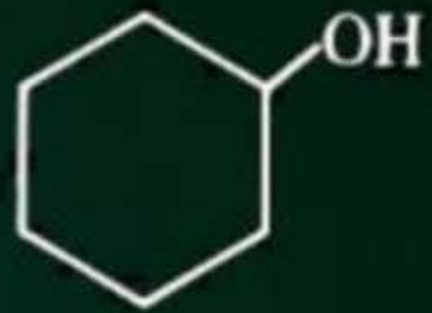
QUESTION 10



is more acidic than

A H_2O

B



C $R-C\equiv C-H$

[✓ **D**] All of these

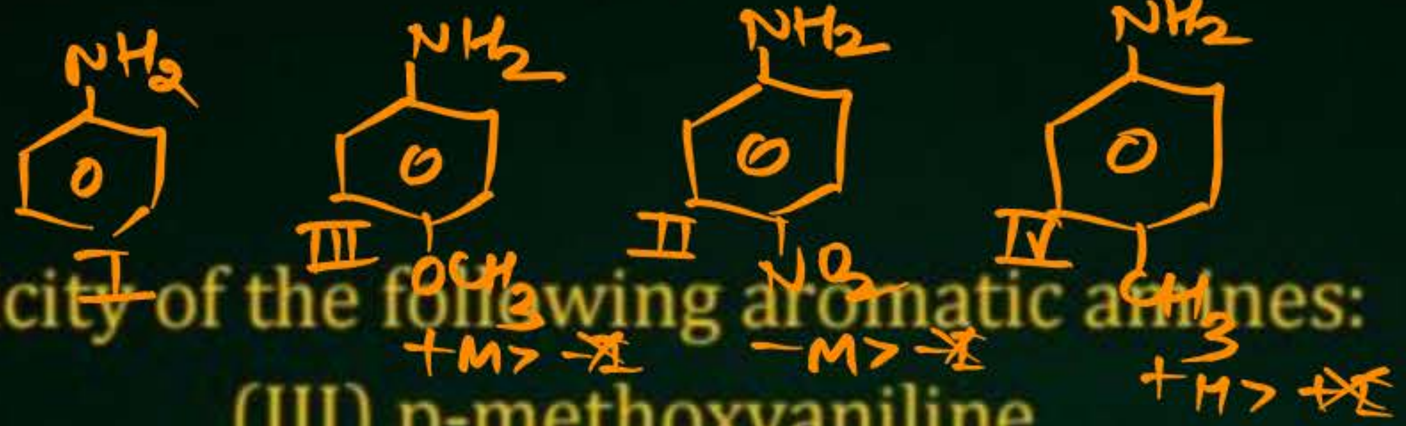
ANSWER KEY

1. C
2. C
3. C
4. A
5. C
6. D
7. A
8. C
9. B
10. D

Home Work

Discussion of L-11

QUESTION 01



I
NH$_2$
III
NH$_2$
OCH$_3$
+M > -I
II
NH$_2$
NO$_2$
-M > -I
IV
NH$_2$
CH$_3$
+H > +I

Consider the basicity of the following aromatic amines:

(I) Aniline (III) p-methoxyaniline

(II) p-nitroaniline (IV) p-methylaniline

The correct order of decreasing basicity is:

[✓ A] III > IV > I > II

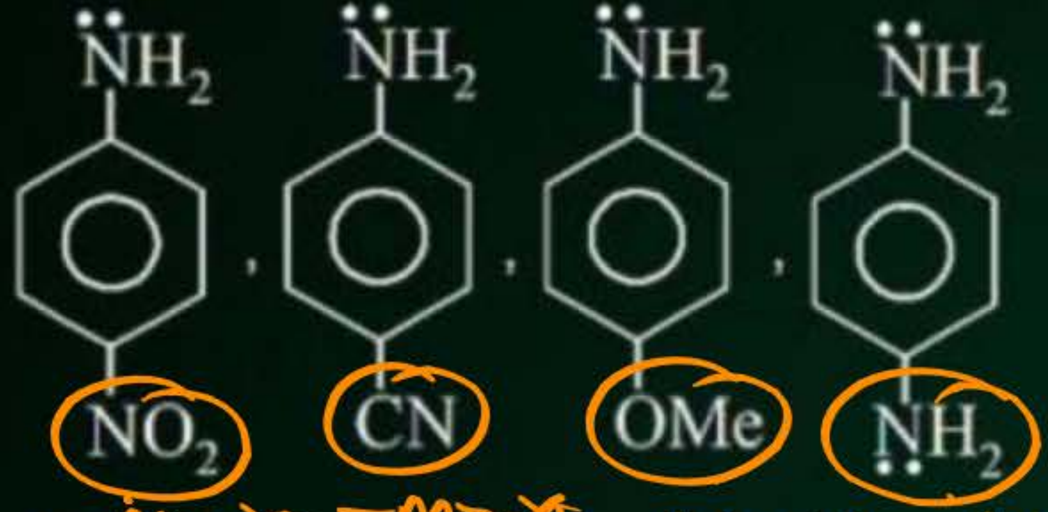
B III > IV > II > I

C I > II > III > IV

D IV > III > II > I

QUESTION 02

Write decreasing order of basic strength of following:



$\ddot{N}H_2$
NO_2
$\ddot{N}H_2$
CN
$\ddot{N}H_2$
OMe
$\ddot{N}H_2$
$\ddot{N}H_2$

$-M > \cancel{-I}$ $-M > \cancel{-I}$ $+M > \cancel{-I}$ $+M > \cancel{-I}$

(A) III > IV > I > II

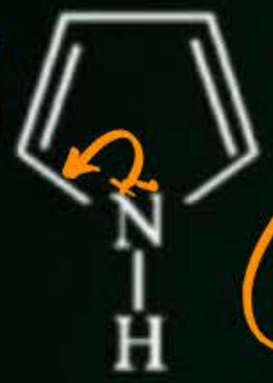
(B) IV > II > III > I

(C) I > II > III > IV

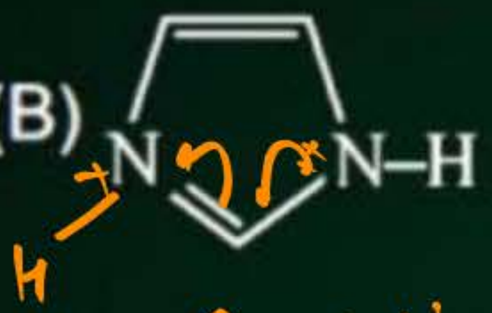
[✓ (D)] IV > III > II > I

QUESTION 03

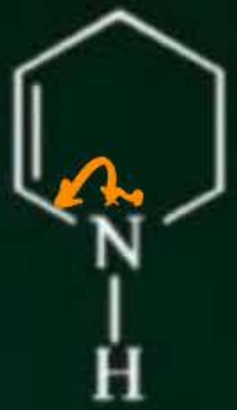
Which one of the following is least basic in character?

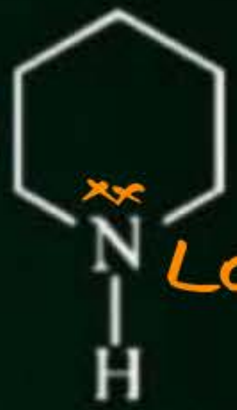
✓(A)


Ⓐ

(B)


Amidine type

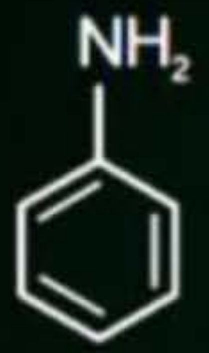
(C)


(D)


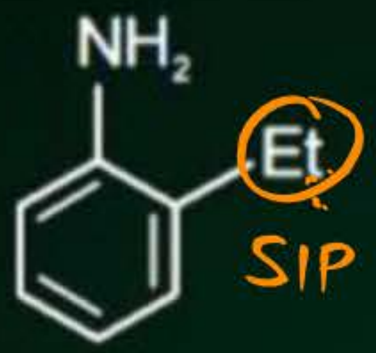
Loca

QUESTION 04

Correct basic strength order is:

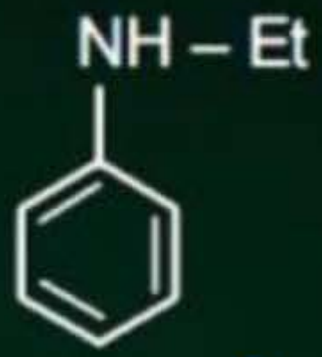

p

1°

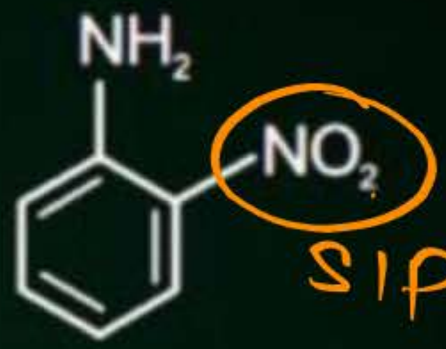

SIP

q

1°


r

2°


SIP

s

1°

A $r > q > p > s$

[✓ B] $r > p > q > s$

C q ~~> r~~ > p > s

D r ~~> q~~ > s > p

QUESTION 05

Which of the following is incorrect for basic strength?

(A) ✓ $(CH_3)_2NH > (CH_3)_3N > CH_3NH_2 > NH_3$ (In Aq. Medium)

2° 3° 1°

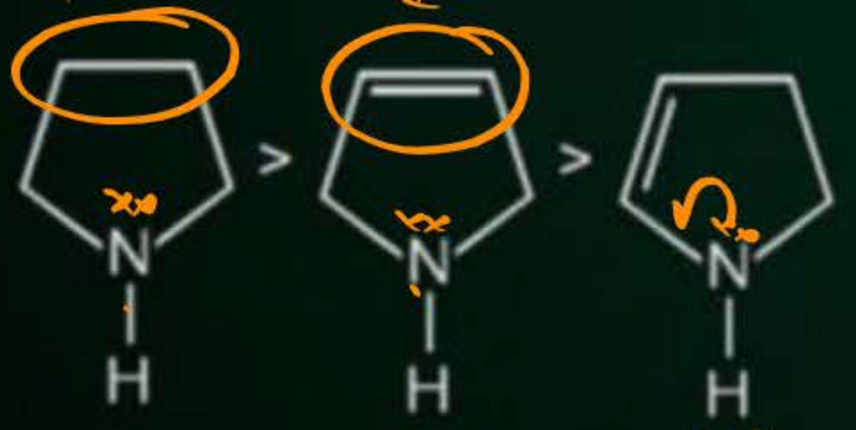
(B) $(C_2H_5)_2NH > (C_2H_5)_3N > C_2H_5NH_2 > NH_3$ (In Aq. Medium)

2 3 1

(C) $PhNH_2 > Ph_2NH > Ph_3N$

+I −I

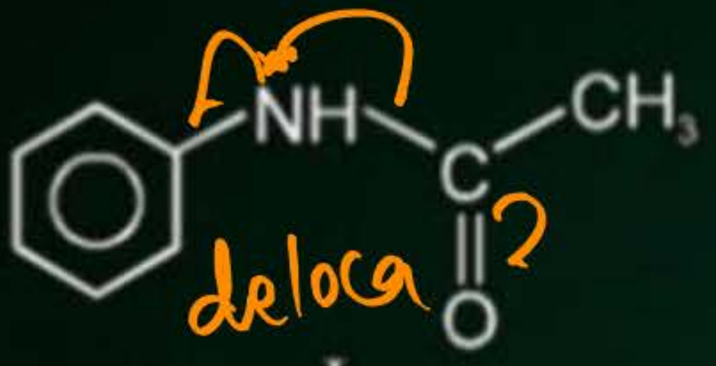
(D)



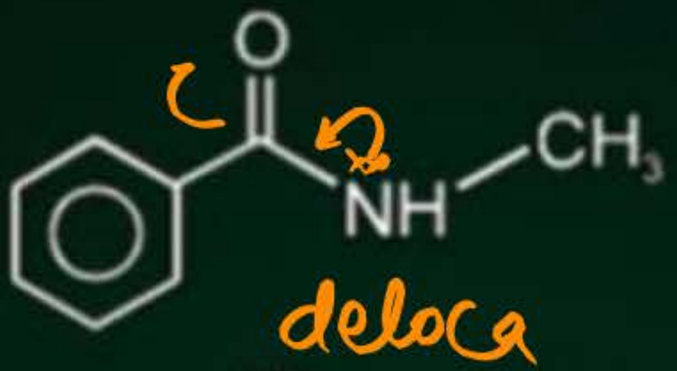
Loca Loca deloca

QUESTION 06

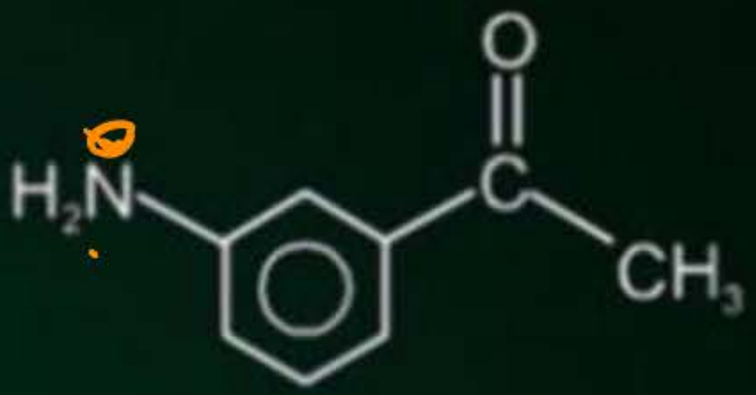
Select the basic strength order of following molecules?


NH
C
CH$_3$
O
deloca ?

I.


O
NH
CH$_3$
deloca

II



III

(A) ✓ III > II > I

(B) II ~~>~~ III > I

(C) I > ~~III~~ > II

(D) III > I > II

QUESTION 07

Order of basic strength

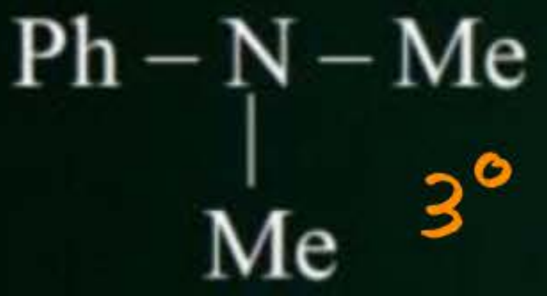
$Ph-NH_2$ 1°

(A)

2°

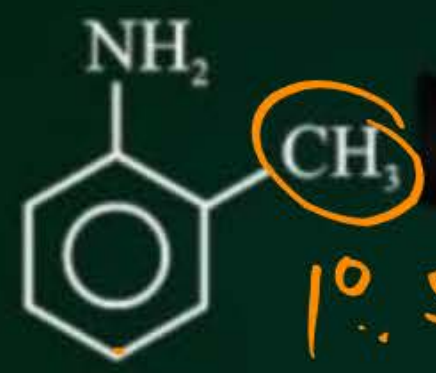
$Ph-NH-Me$

(B)



$Ph-\underset{\underset{Me}{|}}{N}-Me$ 3°

(C)



1°. SIP

(D)

A A > B > C > D

B B > A > C > D

[✓ **C**] C > B > A > D

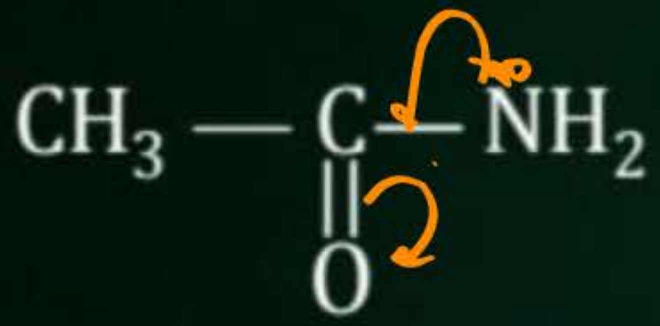
D C > B > D > A

QUESTION 08

Which among the following is least basic?

(A) $CH_2=CH-NH_2$

[✓ (B)]



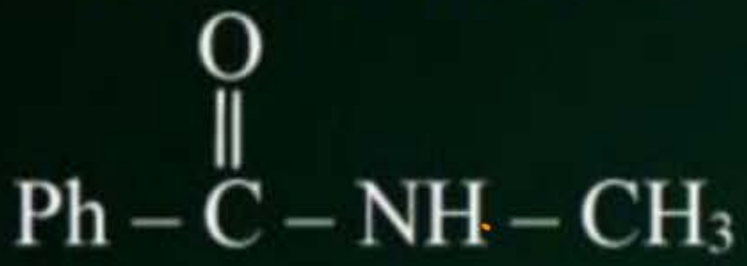
$CH_3-\underset{\underset{O}{\|}}{C}-\ddot{N}H_2$

(C) CH_3-NH_2

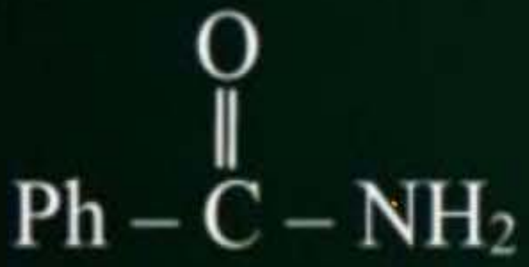
(D) $Cl-CH_2-NH_2$

QUESTION 09

The strongest base is:

A 
$Ph-\overset{\overset{O}{\|}}{C}-NH-CH_3$

B $Ph-NH_2$ 1°

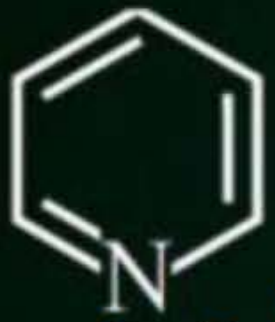
C 
$Ph-\overset{\overset{O}{\|}}{C}-NH_2$

[✓ D] $Ph-NH-CH_3$

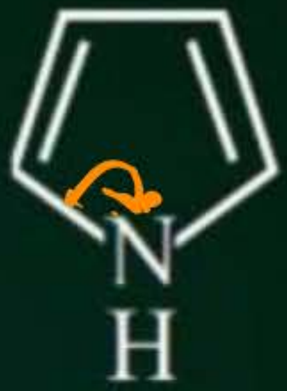
2°

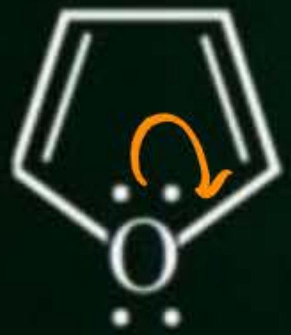
QUESTION 10

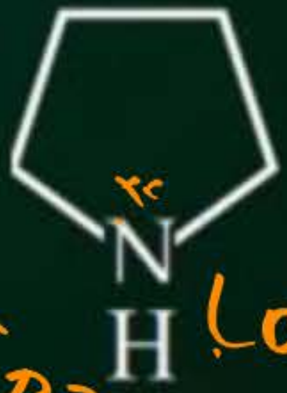
Among the following compounds, the most basic compound is:

A


sp^2

B


C


[✓ D]


sp3

loca

ANSWER KEY

1. A
2. D
3. A
4. B
5. A
6. A
7. C
8. B
9. D
10. D

Thank you!!

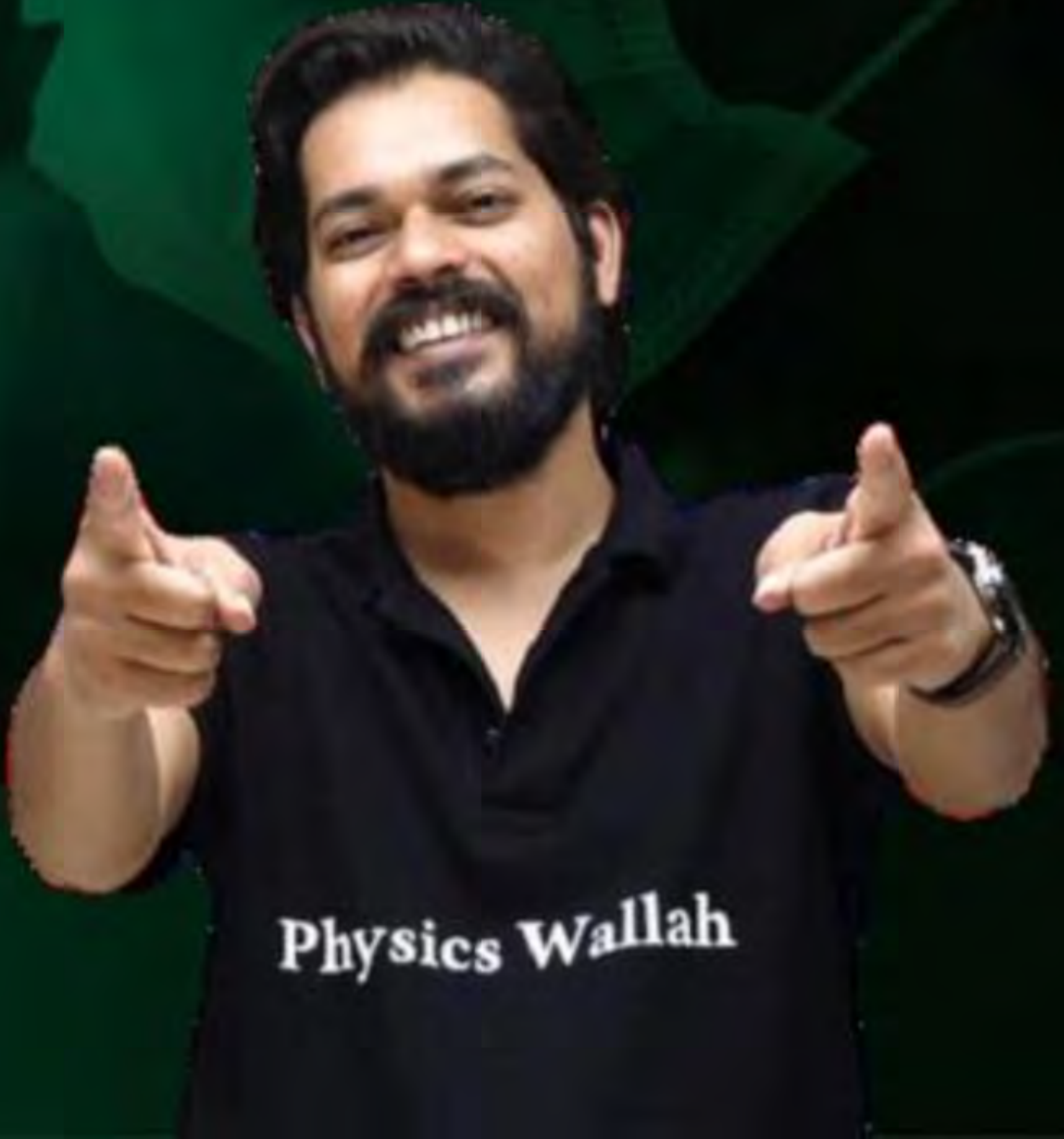
YAKEEN 2.0

FOR NEET 2025

Lecture- 01 | **Organic Chemistry**

Some Basic Principles and Techniques (ISOMERISM)

By- Pankaj Sir(POPU MAMA)


Physics Wallah

Topics *to be covered*

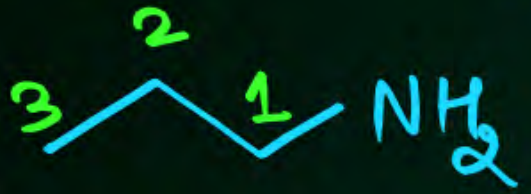
1. Basics/Introduction ✓
2. Types of Isomerism ✓
3. Structural Isomerism ✓
4. Practice ✓

IUPAC naming of amines & amides

↓ suffix-2 amine

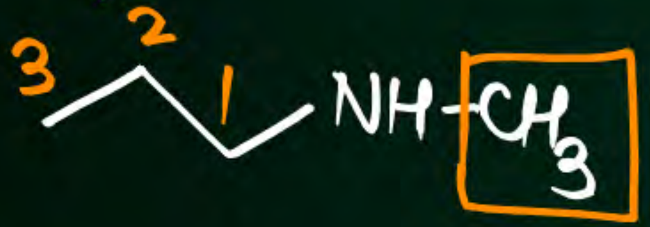
↓ suffix-2 amide

1°



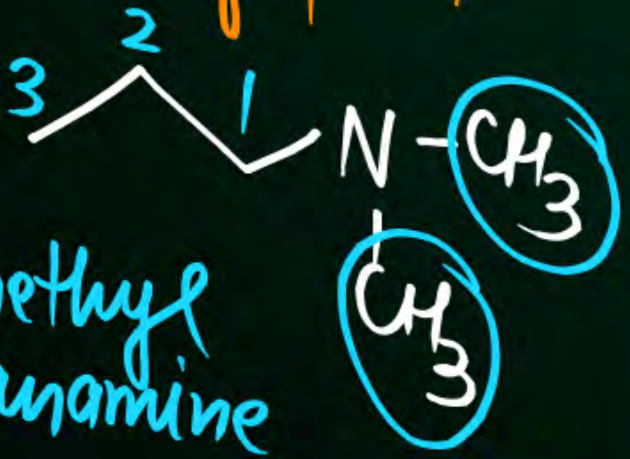
Propan~~e~~-1-amine

2°

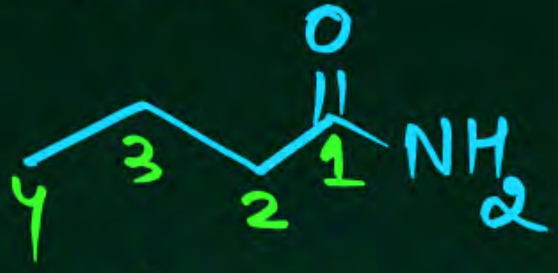


N-methyl propan~~e~~-1-amine

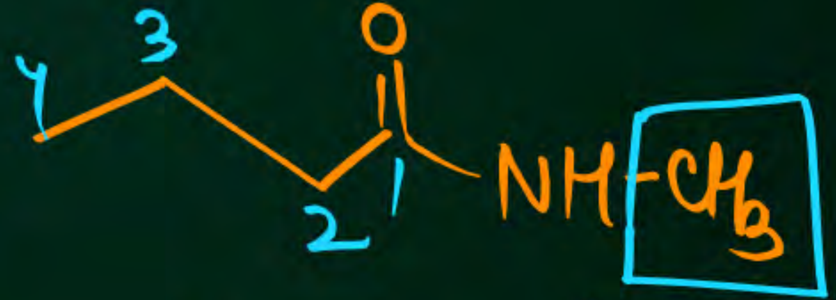
3°


3
2
1
N-CH3
CH3

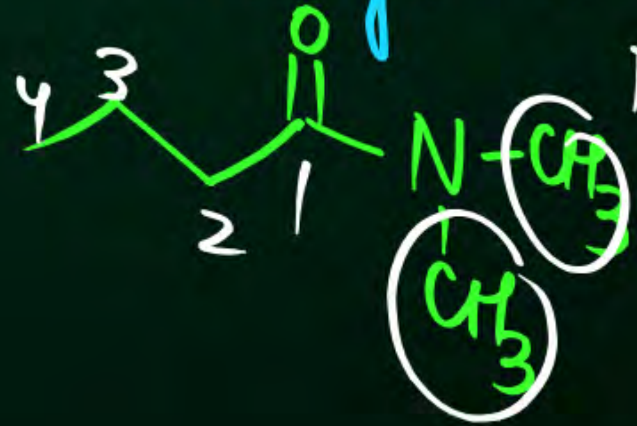
N,N-Dimethyl propanamine



Butan~~e~~-1-amide

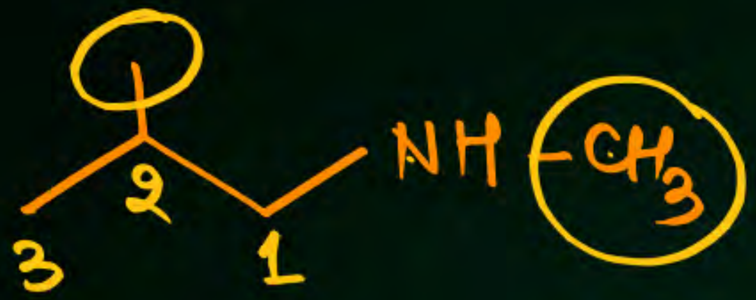

4
3
O
2
1
NH-CH3

N-methyl butan~~e~~-1-amide


4
3
O
2
1
N-CH3
CH3

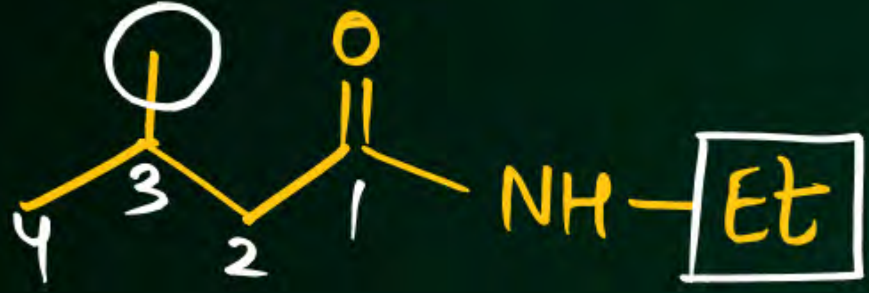
N,N-Dimethyl Butanamide

Q



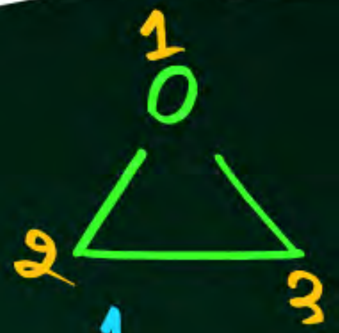
N, 2- dimethyl propanamine

Q

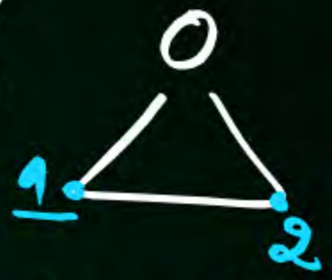


N-Ethyl-3-methyl Butanamide

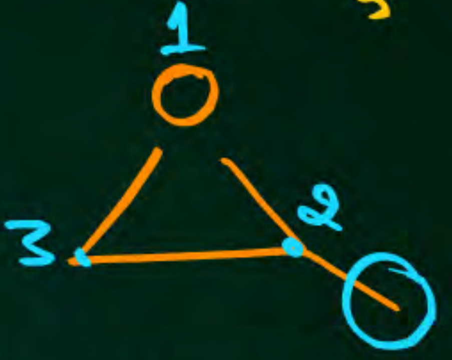
cyclic ether



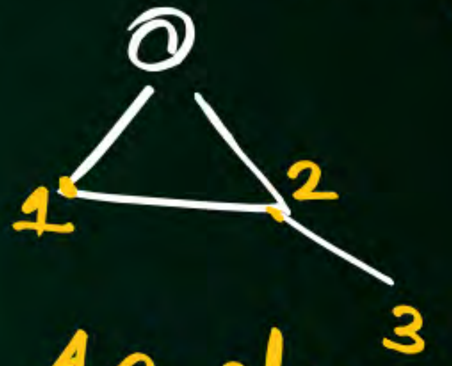
Oxirane



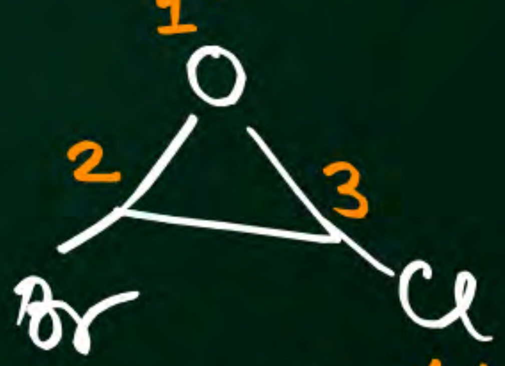
1,2-epoxy ethane



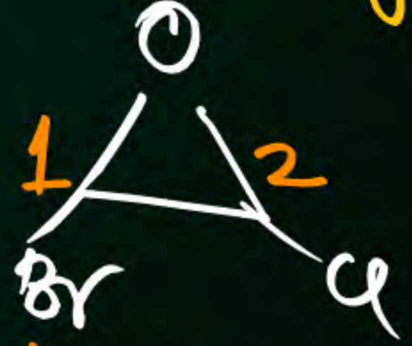
2-methyl oxirane



1,2-epoxy propane

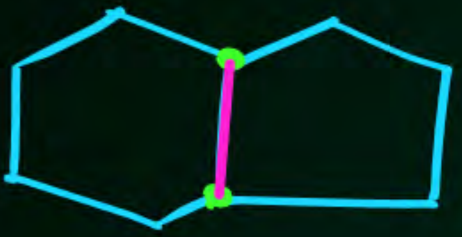


2-Bromo-3-chloro
Oxirane

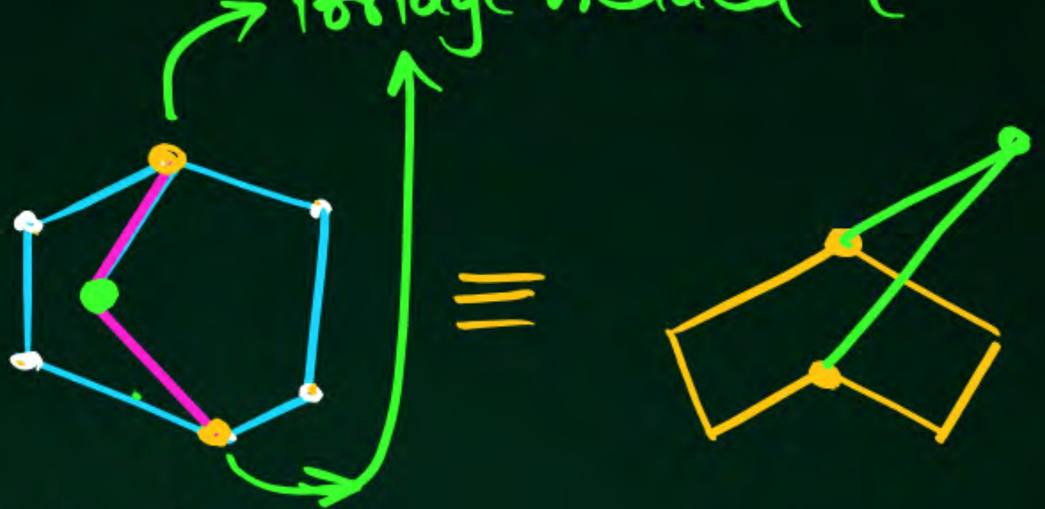


1-Bromo-2-chloro
1,2-epoxy ethane

Bicyclo Compound



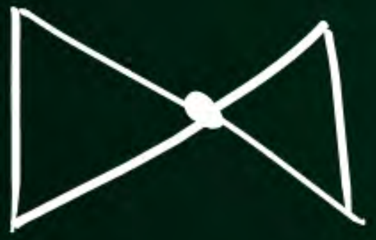
Fused



Bridge headed 'C'
≡

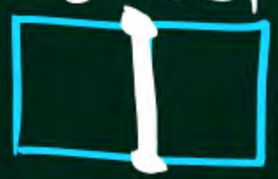
Bridge

Spiro

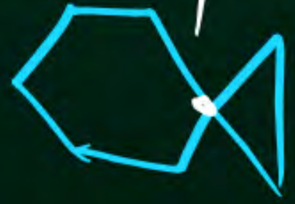


Q find bicyclo & spiro ?

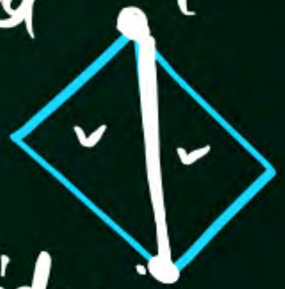
1) fused bicyclo



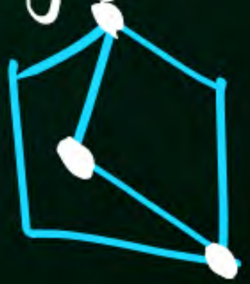
2) spiro



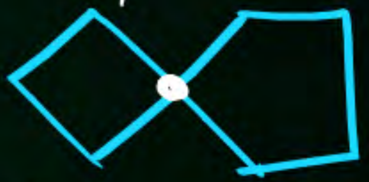
3) fused Bicyclo



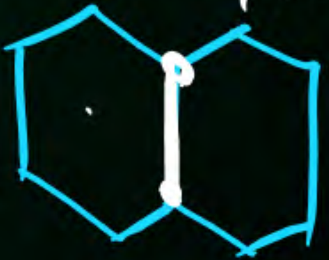
4) Bridge



5) spiro



6) fused bicyclo



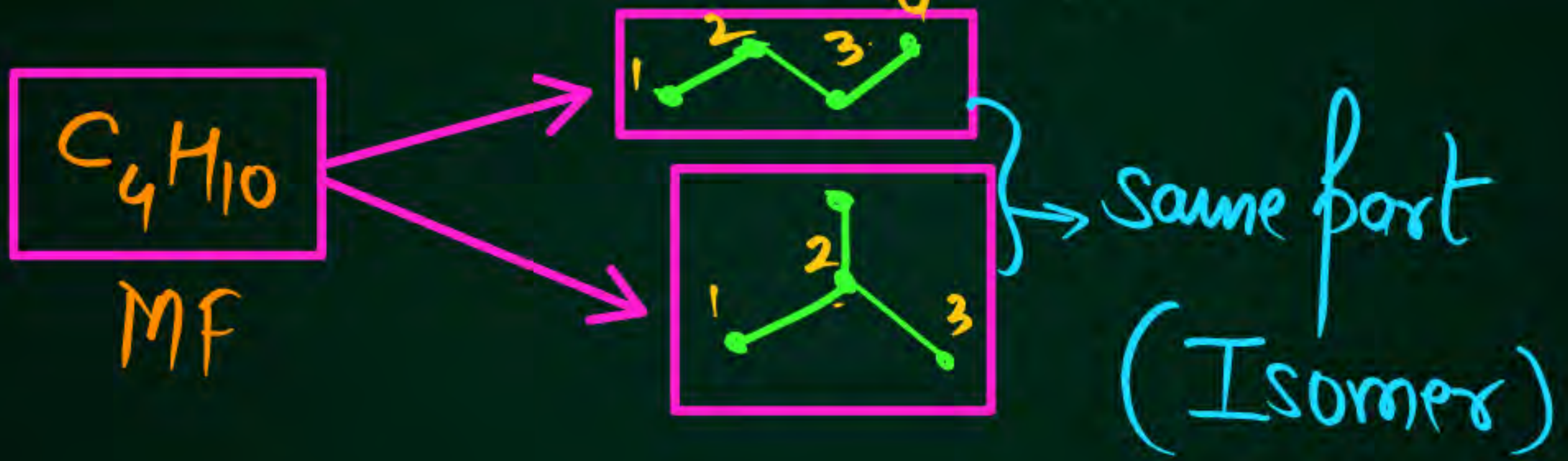
Basics

Isomer = $\boxed{\text{Iso}}$ + $\boxed{\text{Mer}}$

Same Part

For Isomers

M.F Mut Be SAME


C_4H_{10}
MF
1
2
3
4
1
2
3
same part
(Isomer)

ISOMERISM

atleast 1 diff

1. Isomers have same molecular formula but different physical and chemical properties.
2. Compounds having same molecular formula, but different connectivity, different bonding pattern (structural isomerism) or different 3-D relative arrangement (stereoisomerism) are known as isomers.
3. This phenomenon is known as isomerism.
4. Isomers are those which can be separated at room temperature.
5. Isomers always have same Degree of Unsaturation (DU).

(Same M.F)

Isomers (M.F must be same)

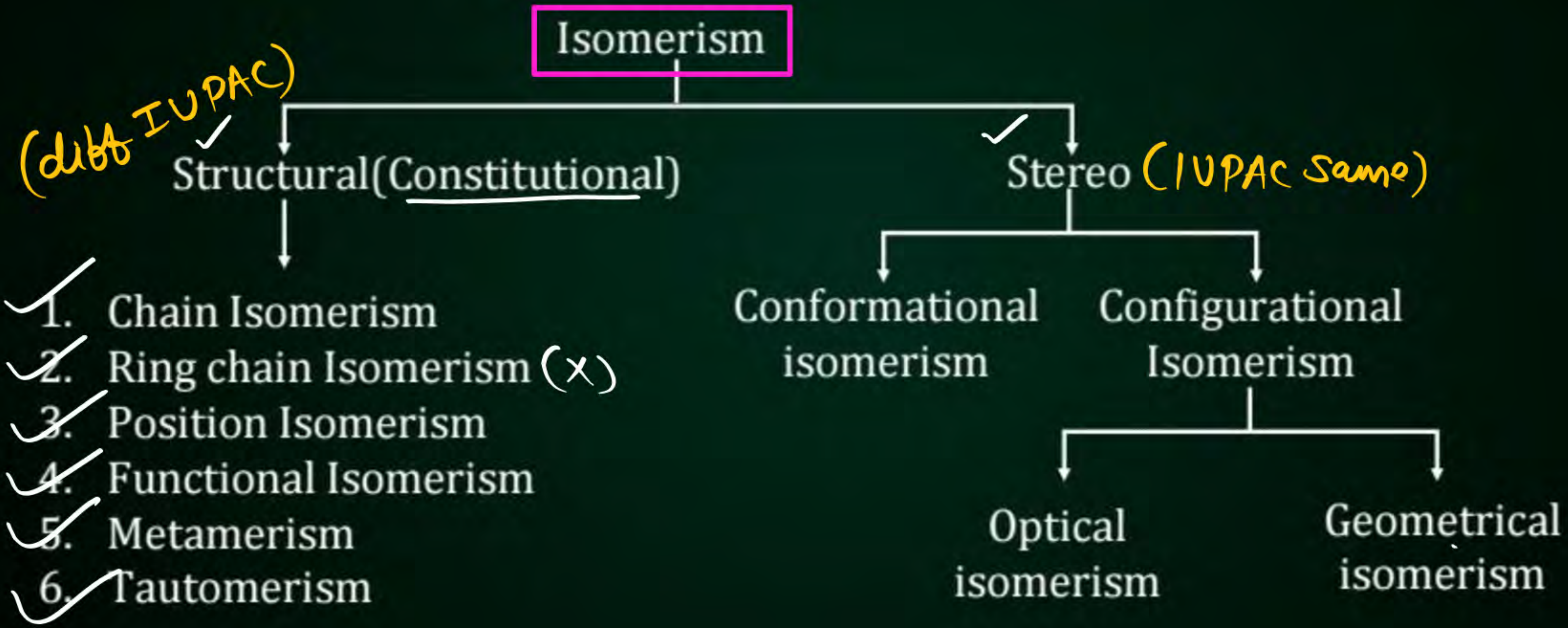
Structural

IUPAC name
diff

Stereo

IUPAC name
Same

Classification



Isomerism

- (diff IUPAC) ✓ Structural(Constitutional)
  1. ✓ Chain Isomerism
  2. ✓ Ring chain Isomerism (x)
  3. ✓ Position Isomerism
  4. ✓ Functional Isomerism
  5. ✓ Metamerism
  6. ✓ Tautomerism
- ✓ Stereo (IUPAC same)
  - Conformational isomerism
  - Configurational Isomerism
    - Optical isomerism
    - Geometrical isomerism

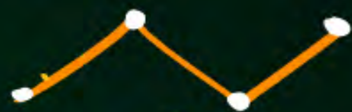
Structural Isomerism ÷ Compounds which have same M.F, but have different struc.

IUPAC name

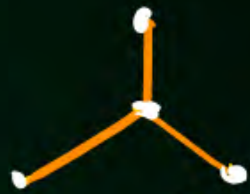
diff

Q structural or not?

✓ 1)

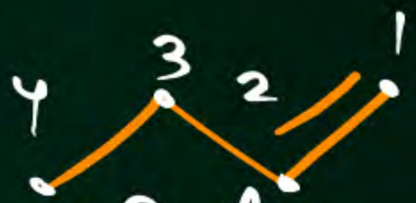


Butane

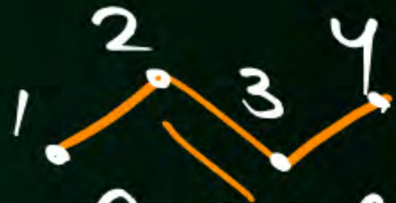


2-methyl propane

✓ 2)

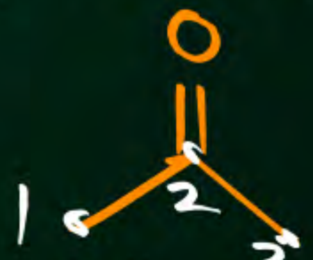


Butene

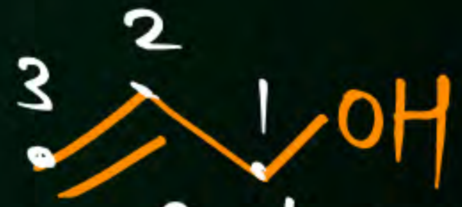


But-2-ene

✓ 3)

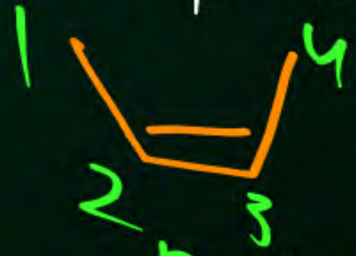


2-Propanone

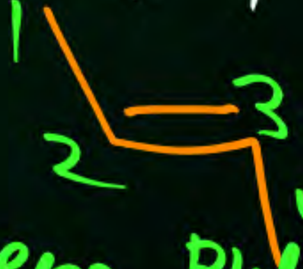


Prop-2-enol

✗ 4)



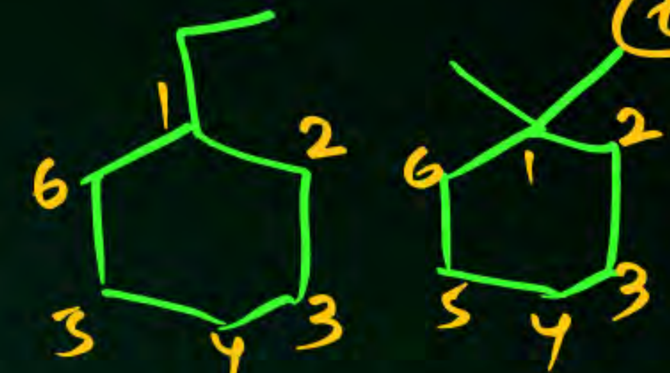
But-2-ene



But-2-ene

1. Chain Isomerism (C·I)

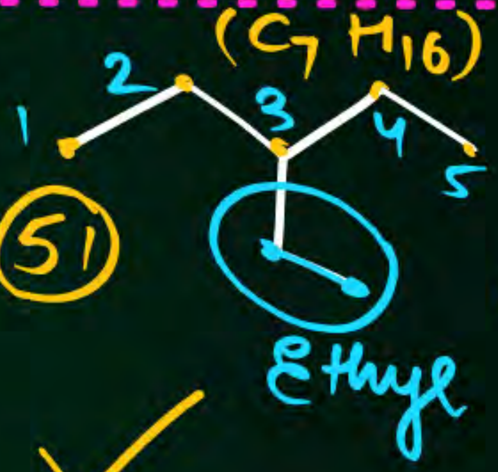
(61)



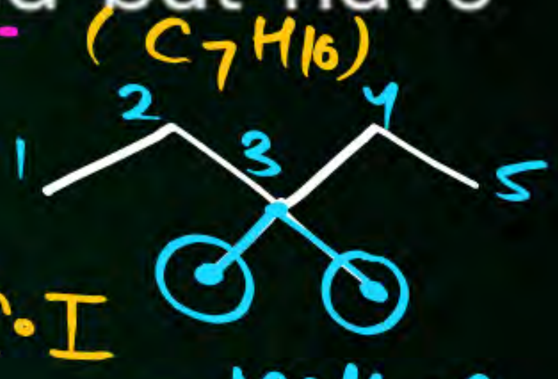
(62)

CI ✓

Definition: Compounds which have same molecular formula but have different parent chain. (or different side chain)



(51)



C·I

Methyle

(52)

Example.

(40)

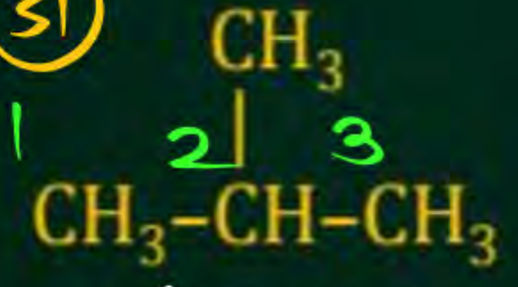
1 2 3 4

$CH_3CH_2CH_2CH_3$;

(C_4H_{10})

Parent chain : 4 'C'

(31)



$$\overset{1}{CH_3}-\overset{\overset{CH_3}{|}}{\underset{2}{CH}}-\overset{3}{CH_3}$$

(C_4H_{10})

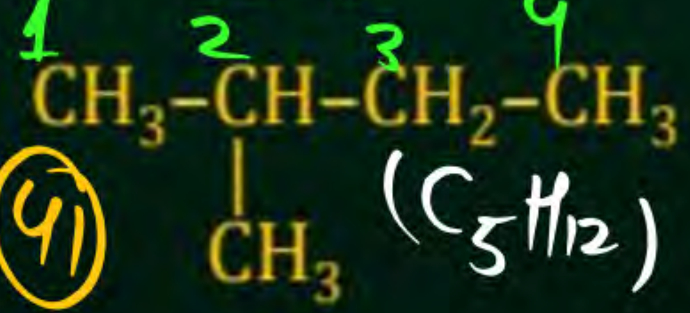
3 'C'

C·I ✓

1 2 3 4 5

$CH_3CH_2CH_2CH_2CH_3$;

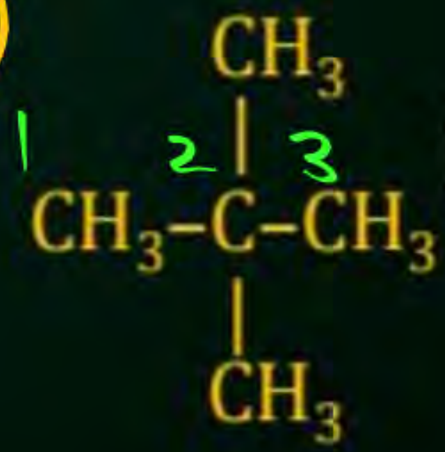
(C_5H_{12}) (50)



$$\overset{1}{CH_3}-\underset{\underset{CH_3}{|}}{\overset{2}{CH}}-\overset{3}{CH_2}-\overset{4}{CH_3}$$

(41) (C_5H_{12}) ;

(32)



$$\overset{1}{CH_3}-\underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{\underset{2}{C}}}-\overset{3}{CH_3}$$

(C_5H_{12})

C·I ✓

2. Position Isomerism

(Same Parent chain)

Definition: Compounds which have same molecular formula but have different position of branch or F.G (double or triple bond).

$-\overset{|}{C}-$, NC, OH, NH_2, SH or

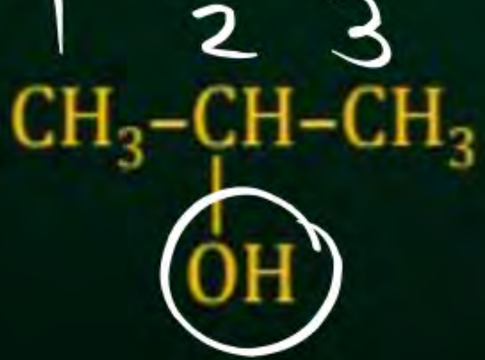
Example.

$\overset{4}{C}H_3\overset{3}{C}H_2\overset{2}{C}H=\overset{1}{C}H_2$; $\overset{4}{C}H_3\overset{3}{C}H=\overset{2}{C}H\overset{1}{C}H_3$ P.I ✓

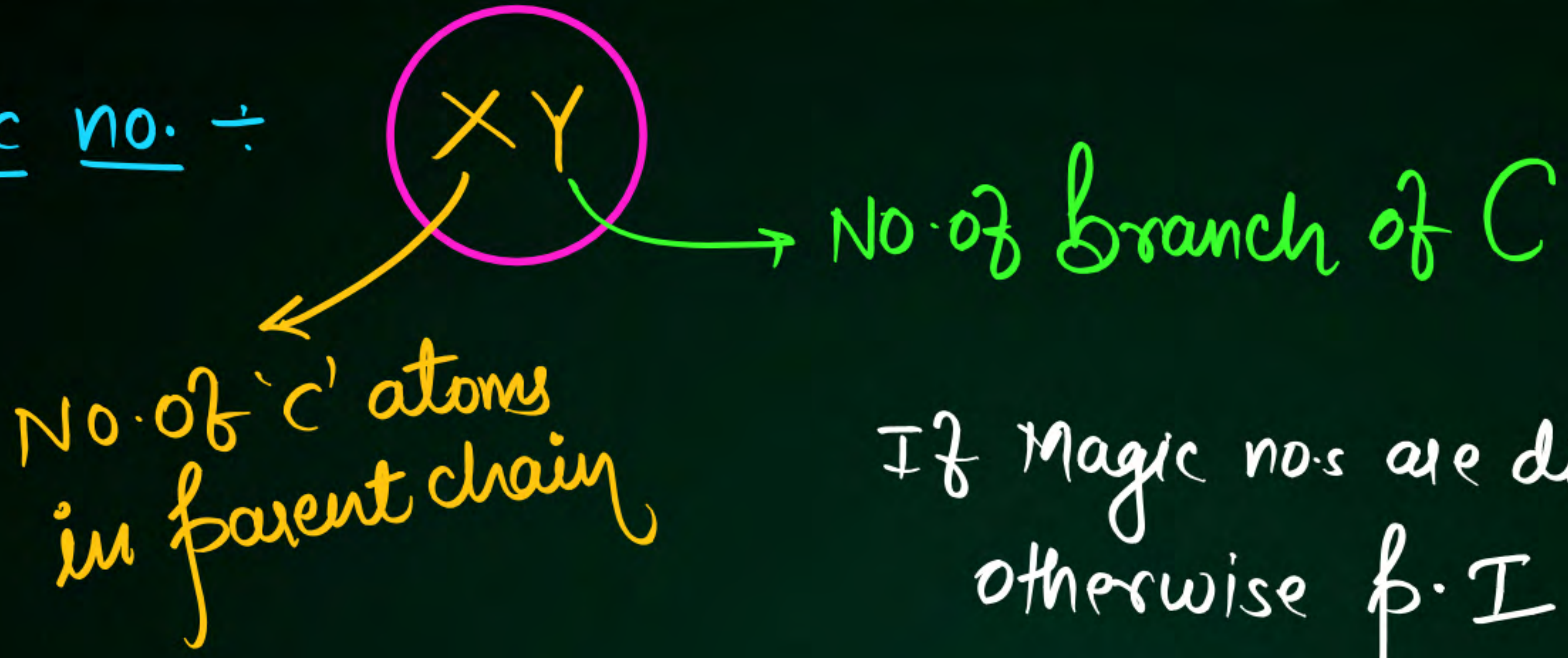
C_4H_8 40 ; 40 C_4H_8

$\overset{3}{C}H_3\overset{2}{C}H_2\overset{1}{C}H_2OH$; 30

30



$\overset{1}{C}H_3-\underset{\displaystyle OH}{\overset{2}{C}H}-\overset{3}{C}H_3$



Magic no. :- XY

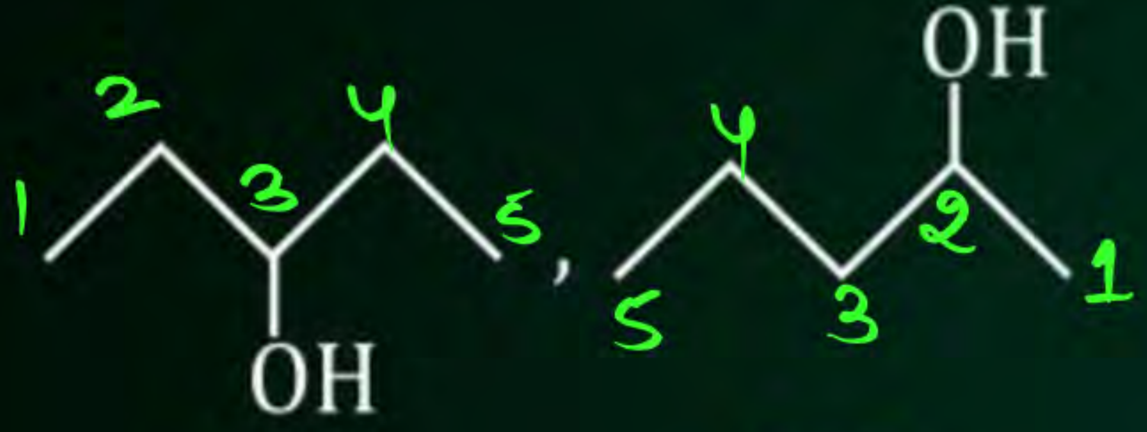
No. of branch of C
No. of 'C' atoms in parent chain

If Magic no.s are diff then C·I
otherwise p·I

QUESTION

Identify whether chain or position isomers.

A

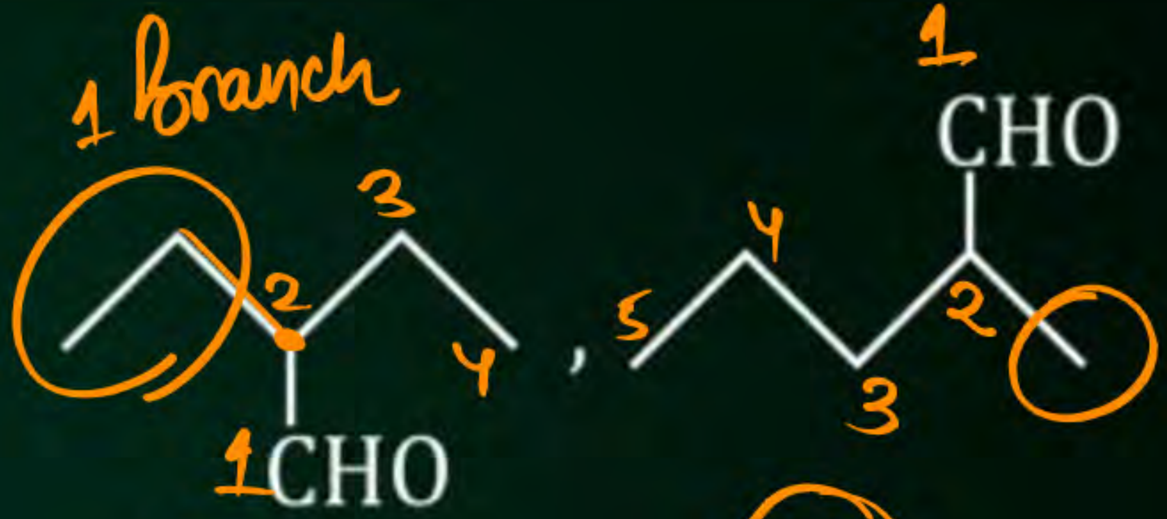

1
2
3
4
5
OH
,
4
5
3
OH
2
1

50

50

P.I

B


1 Branch
3
2
4
1CHO
,
5
4
1
CHO
2
3

41

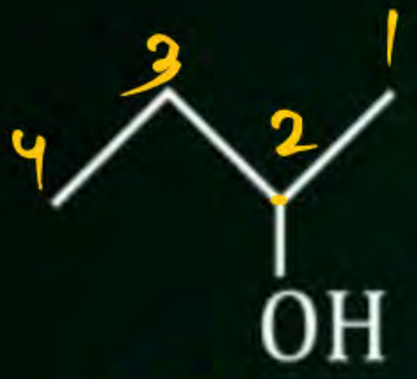
51

C.I

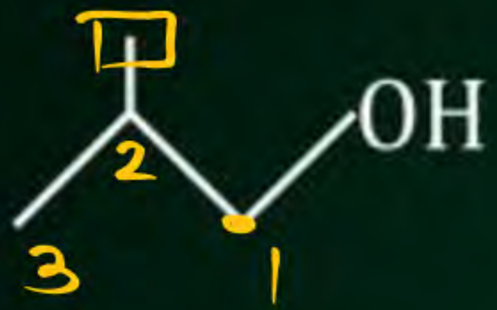
QUESTION

Priority
[C > P]

Identify whether chain or position isomers.



㊵



㉛

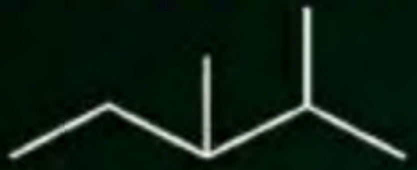
C.I

Home work

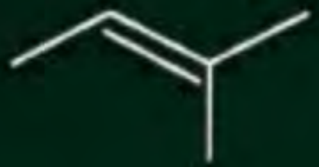
QUESTION

Select the pair of chain isomers among the following:

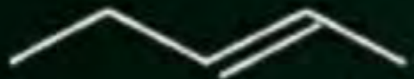
(i)



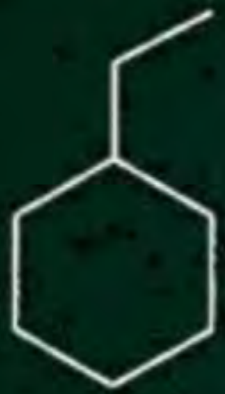
(ii)



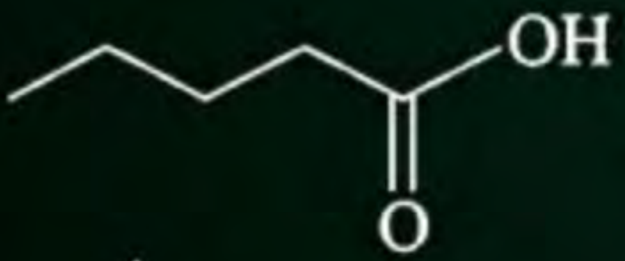
(iii)



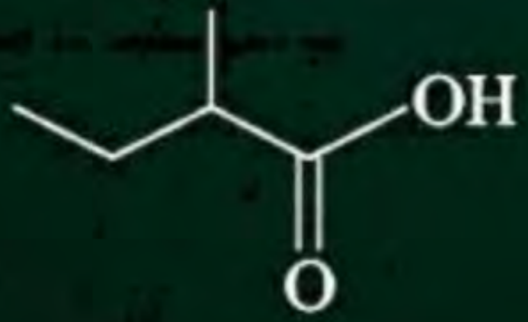
(iv)



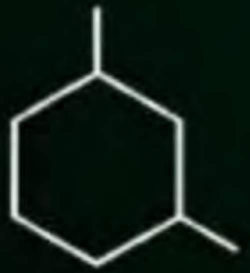
(v)



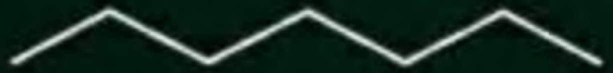
(vi)



(vii)



(viii)



QUESTION (NCERT Exemplar)

Assertion (A): **Pent-1-ene and pent-2-ene are position isomers.**
Reason (R): **Position isomers differ in the position of functional group or a substituent.**

- **A** Both A and R are correct and R is the correct explanation of A.
- **B** Both A and R are correct but R is not the correct explanation of A.
- **C** Both A and R are not correct.
- **D** A is not correct but R is correct.

QUESTION

Compounds having same number and kind of atoms but different arrangement of atoms in their molecules are called:

A allotropes

B isotopes

C isomers

D polymers

QUESTION

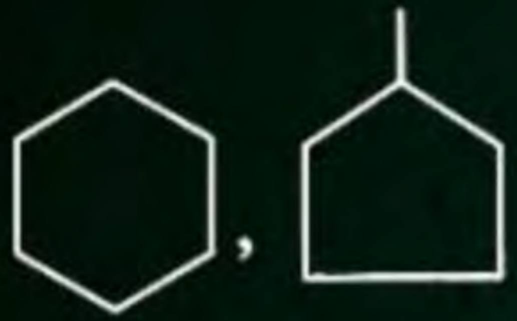
Isomers have essentially identical:

- Ⓐ structural formula
- Ⓑ chemical properties
- Ⓒ molecular formula
- Ⓓ physical properties

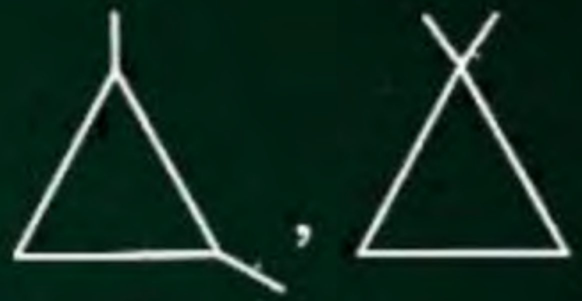
QUESTION

What is the relation between following compounds?

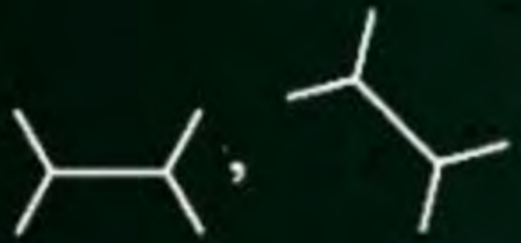
A



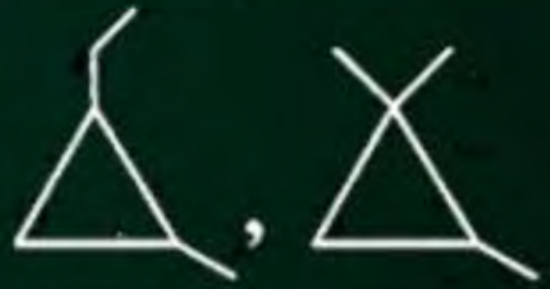
B



C



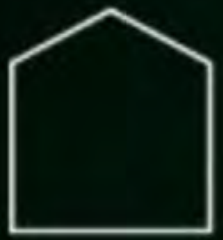
D



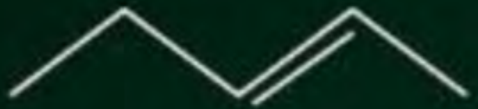
QUESTION

Select pair of chain isomers from the following

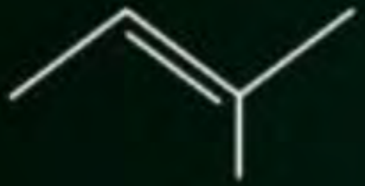
(I)



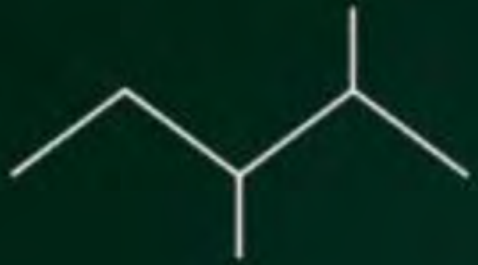
(II)



(III)



(IV)



A I and II

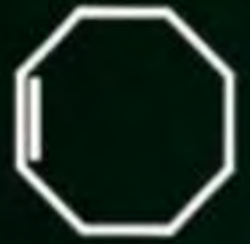
B II and IV

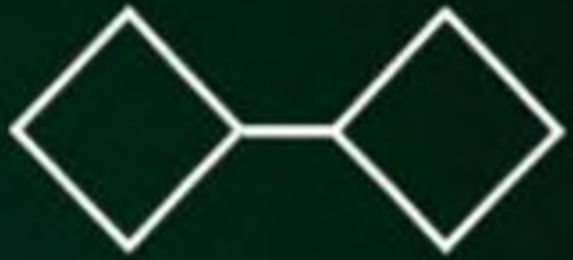
C I and IV

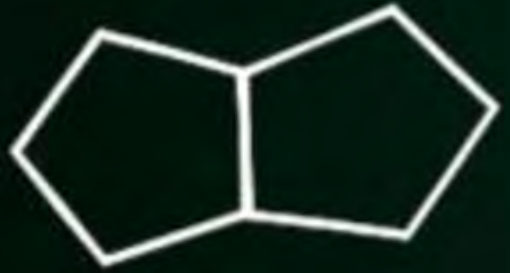
D II and III

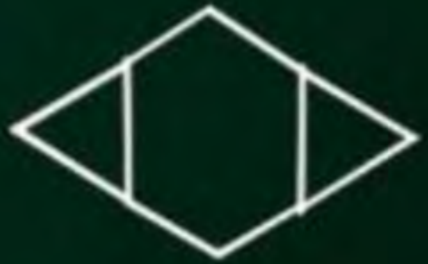
QUESTION

Which one of the following compound is not isomer of others?

(A)


(B)


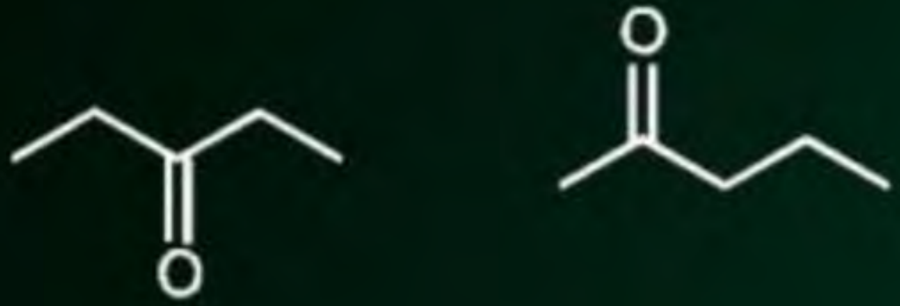
(C)


(D)


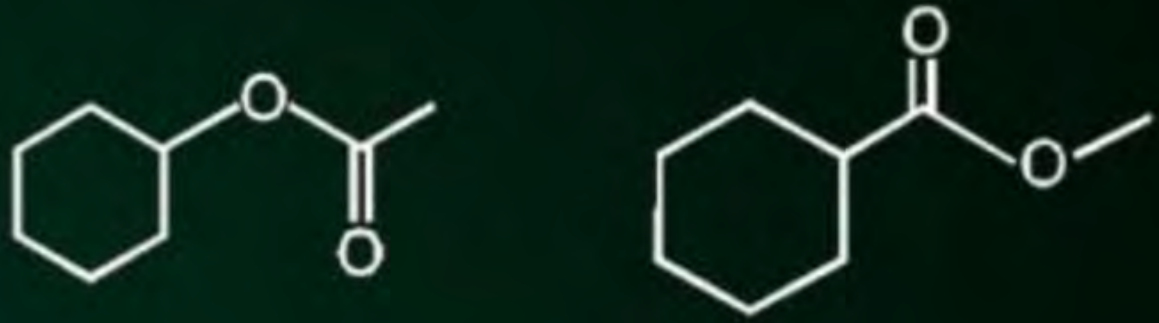
QUESTION

Which of the following pair is identical?

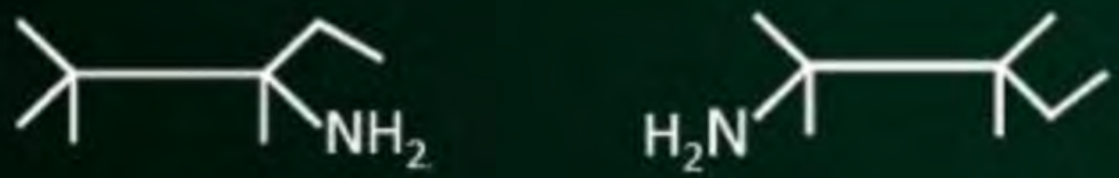
A



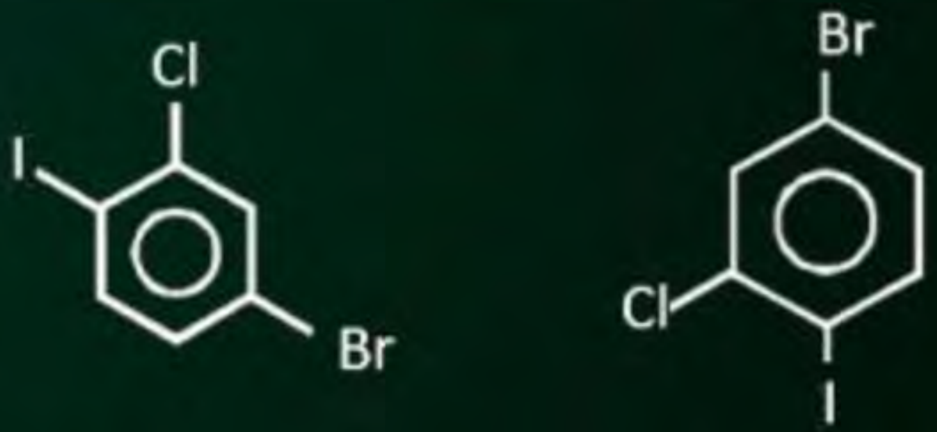
B



C



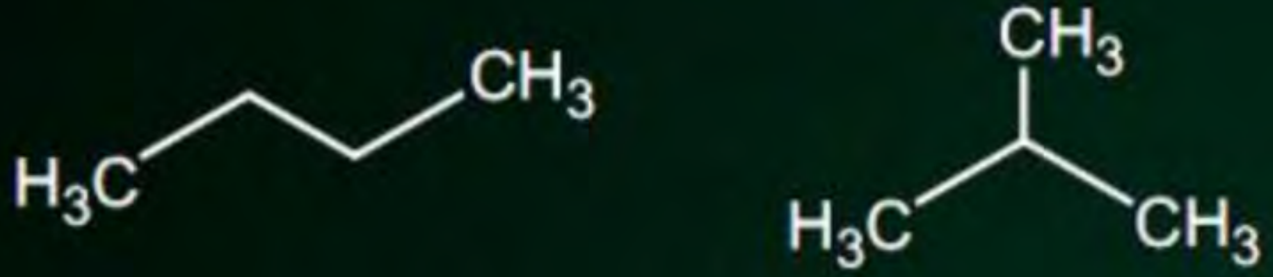
D



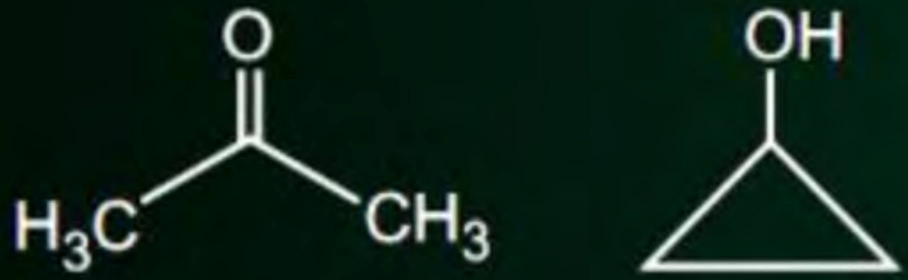
QUESTION

Which of the following pairs of molecules are NOT structural isomers ?

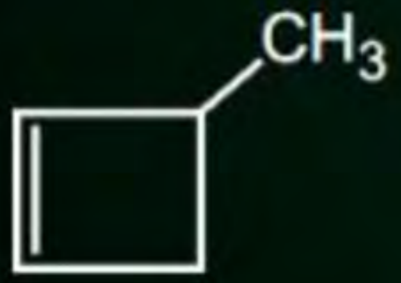
(A)



(B)

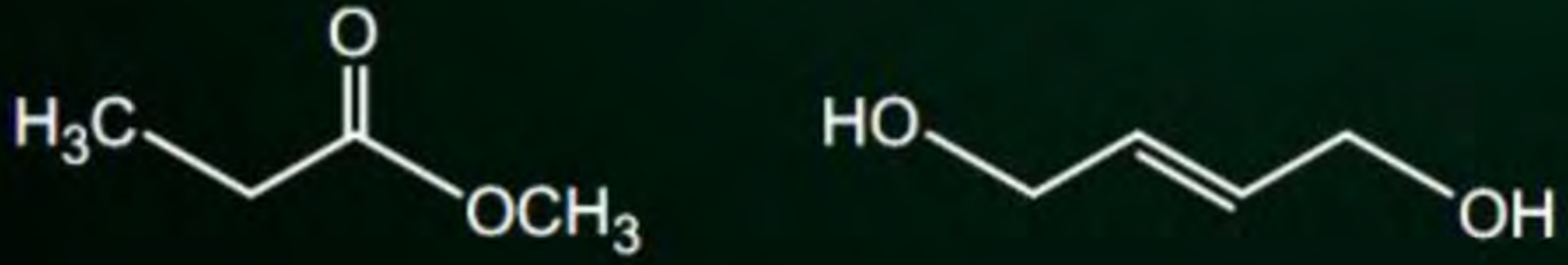


(C)



$H_3C-C\equiv C-CH_3$

(D)



QUESTION 03

Which one of the following is not an isomer of 3-methyl but-1-yne?

(A) Pent-1-yne

(B) Pent-2-yne

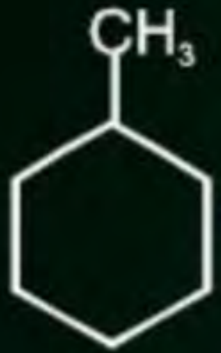
(C) Buta-1,3-diene

(D) Penta-1, 3-diene

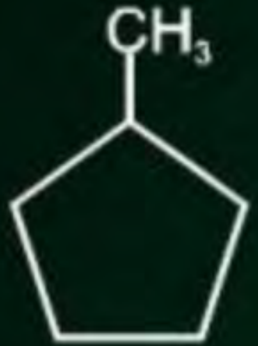
QUESTION 06

Which of the following is a pair of structural isomers?

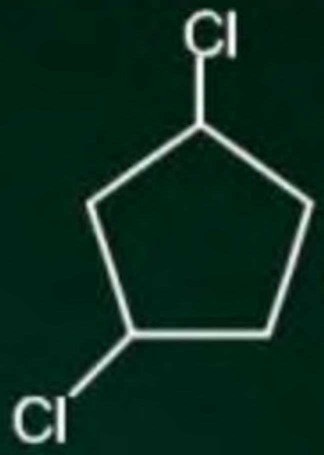
A



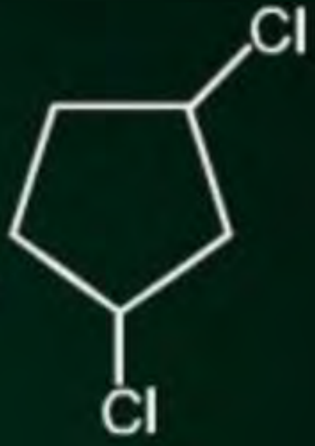
and



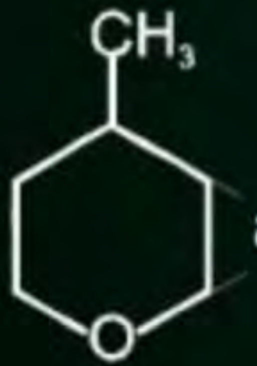
B



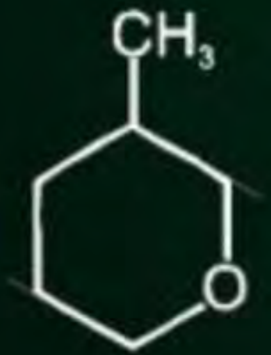
and



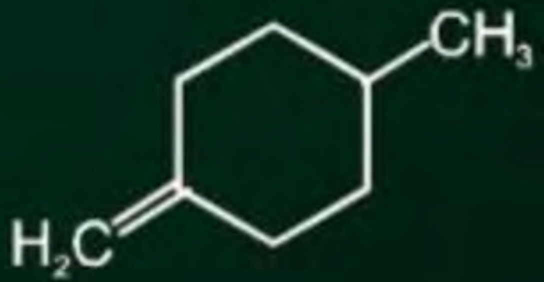
C



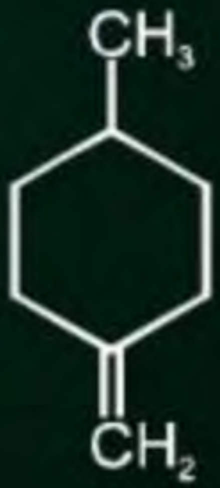
and



D



and



Home Work From PW Module (Yakeen NEET)

Prarambh: Q 60, 61, 78, 79, 80

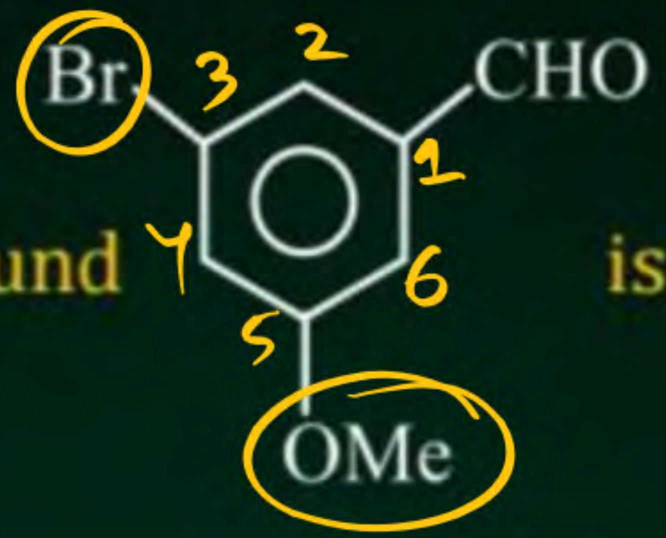
Prabal: Q 11, 12

Home Work

Discussion of L-06

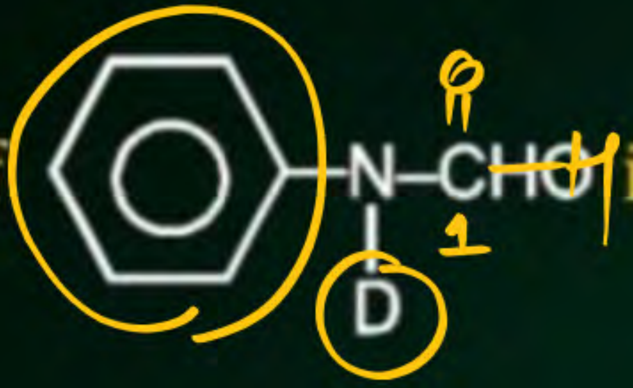
QUESTION 01

Correct IUPAC name for the compound is:



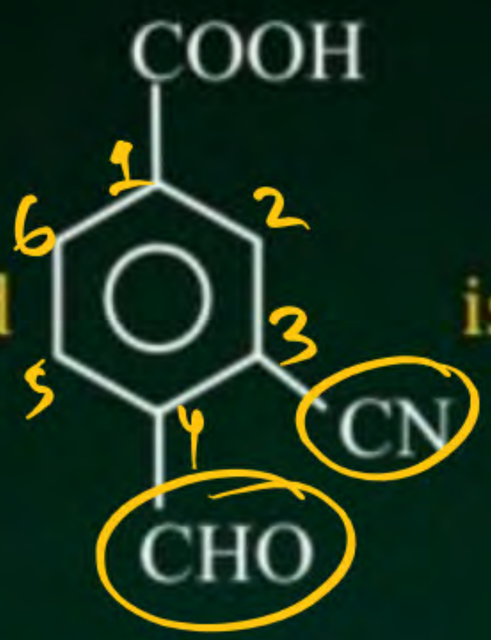
- (A) 3-Methoxy-5-bromo benzenecarbaldehyde
- (B) 3-Formyl-5-bromo phenylmethylether
- (C) 3-Formyl-5-bromo-1-methoxybenzene
- [✓ (D)] 3-Bromo-5-methoxy benzenecarbaldehyde

QUESTION 02

IUPAC name of  is:

- (A) N-Deutero-N-fomylbenzenamine
- (B) N-Phenylamino-N-deuteromethanal
- [✓ (C)] N-Deutero-N-phenylmethanamide
- (D) N-Deuterobenzene carboxamide

QUESTION 03

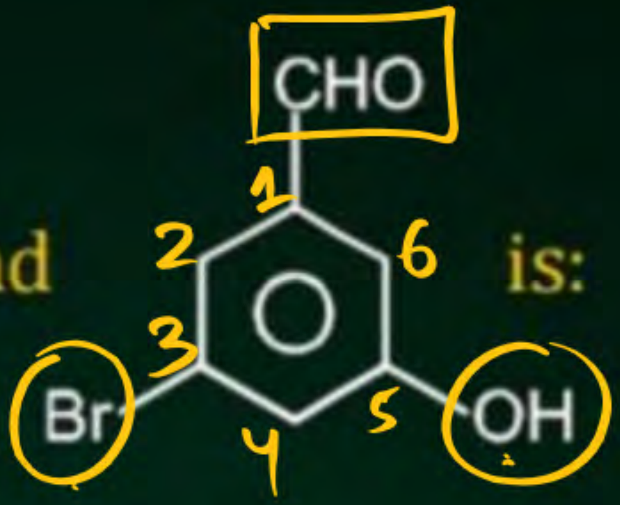
The IUPAC name of the compound 

is:

- (A) 2-Cyano-1-formyl benzene-4-carboxylic acid
- [✓ (B)] 3-Cyano-4-formyl benzene-1-carboxylic acid
- (C) 4-Carboxy-2-cyano benzene-1-carbaldehyde
- (D) 2-Formyl-5-carboxy benzene-1-carbonitrile

QUESTION 04

The IUPAC name of the following compound

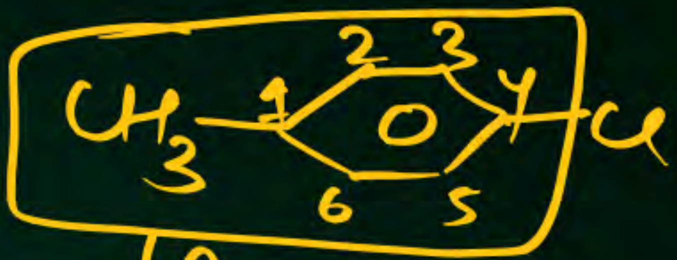


is:

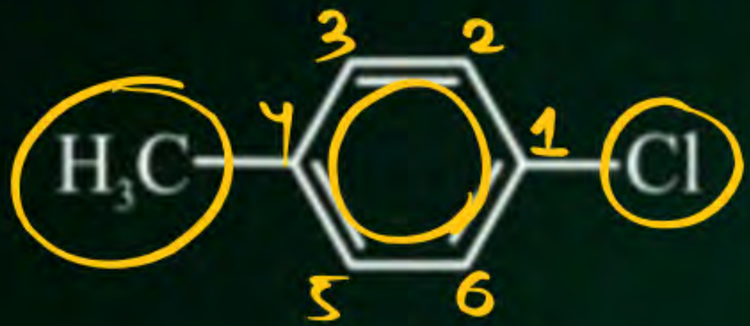
- **A** 5-Bromo-3-hydroxy benzene carbaldehyde
- **B** 3-Bromo-5-formyl phenol
- [✓ **C** 3-Bromo-5-hydroxy benzene carbaldehyde]
- **D** 1-Bromo-3-formyl-5-hydroxybenzene

QUESTION 05

The IUPAC name of the following compound is:



CH3
1
2
3
4
Cl
5
6



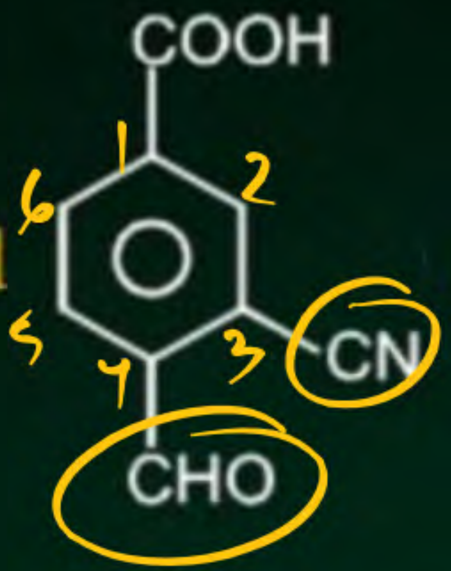
H3C
Cl
3
2
4
1
5
6

4-chloro toluene

- [✓ A] 1-Chloro-4-methylbenzene
- B 1-methyl-4-chlorobenzene
- C 4-methyl chlorobenzene
- D None of these

QUESTION 06

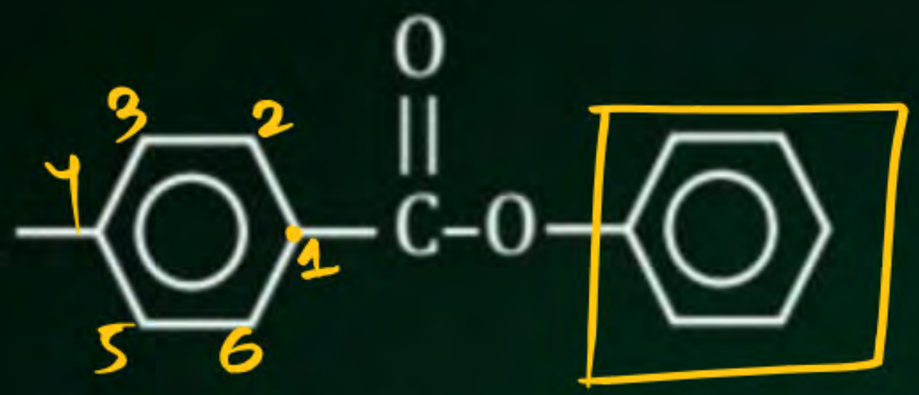
The IUPAC name of the compound is:



- **A** 3-Cyano-1-formyl benzene-4-carboxylic acid
- **B** 3-Cyano-4-formyl benzene-1-carboxylic acid ✓
- **C** 4-Carboxy-2-cyano benzene-1-carbaldehyde
- **D** 2-Formyl-5-carboxy benzene-1-carbonitrile

QUESTION 07

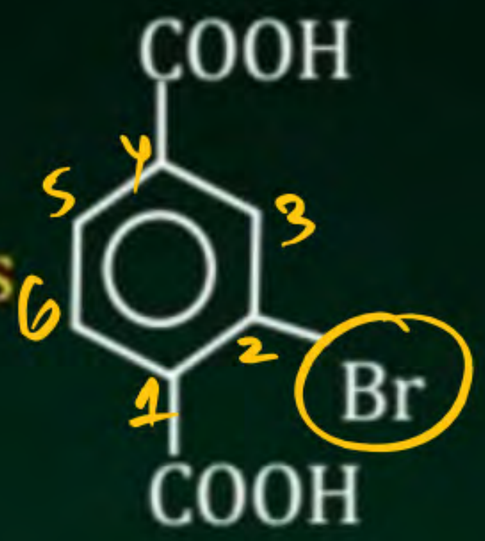
IUPAC name of



- (A) 4-Chlorophenyl benzoate
- [✓ (B)] Phenyl 4-chlorobenzenecarboxylate
- (C) Benzyl 4-chlorobenzenecarboxylate
- (D) 4-Chlorodiphenylcarboxylate

QUESTION 08

IUPAC name of the following molecule is



A 2-Bromobenzene-1, 4-dioic acid

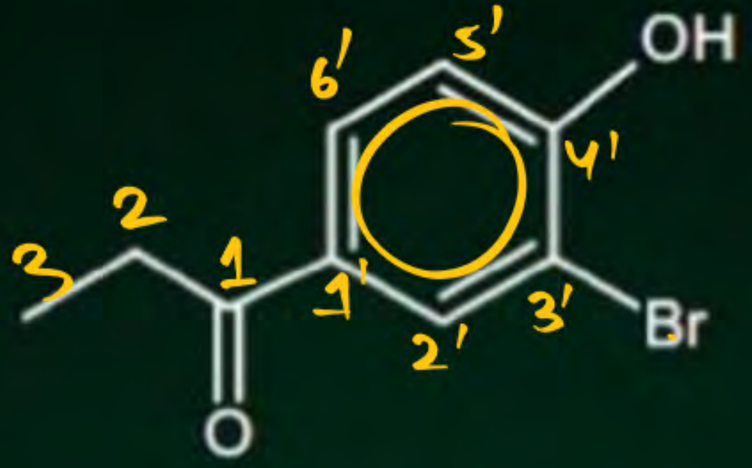
B 3-Bromobenzene-1, 4-dicarboxylic acid

[✓ **C** 2-Bromobenzene-1, 4-dicarboxylic acid]

D 3-Bromobenzene-1, 6-dicarboxylic acid

QUESTION 09

What is the IUPAC name for

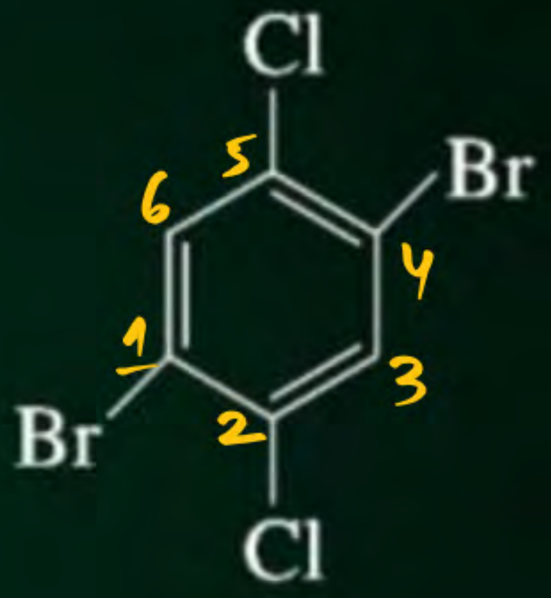


compound?

- **A** m-Bromo-p-hydroxy propiophenone
- **B** 2-Bromo-4-propanoyl phenol
- [✓ **C**] 3-Bromo-4-hydroxy phenyl propan-1-one
- **D** 2-Hydroxy-5-propanoyl bromo benzene

QUESTION 10

What is the correct IUPAC name of the following compound?



A 2, 5-dibromo-1-4-dichlorobenzene

B 1, 4-dibromo-3, 5-dichlorobenzene

C 3, 5-dibromo-1, 4-dichlorobenzene

[✓ **D** 1, 4-dibromo-2, 5-dichlorobenzne]

ANSWER KEY

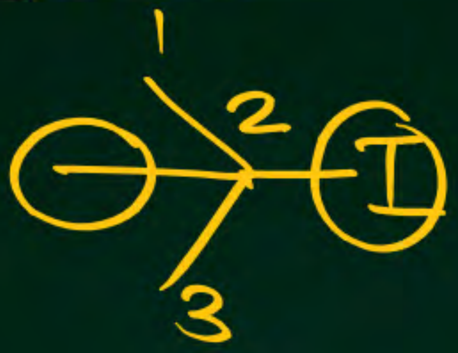
1. D
2. C
3. B
4. C
5. A
6. B
7. B
8. C
9. C
10. D

Home Work

Discussion of L-07

QUESTION ①

The IUPAC name of tertiary butyl iodide is:



- A 1-idodo-3-methyl propane
- [✓ B] 2-iodo-2-methyl propane
- C 4-iodobutane
- D 2-iodobutane

QUESTION 2

Which of the following is not correctly matched?

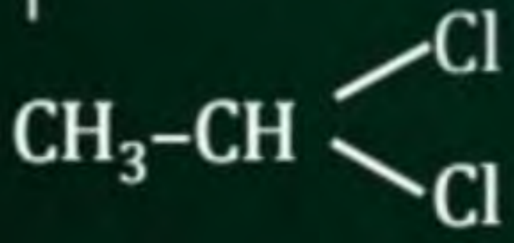
$CH_3-C\equiv N$

A Acetonitrile $CH_2=CHCN$

B Allyl chloride $CH_2=CH-CH_2Cl$

C s-Butyl group $CH_3-\underset{|}{CH}-C_2H_5$

D Ethylidene chloride



$CH_3-CH\begin{matrix}\diagup Cl\\ \diagdown Cl\end{matrix}$

QUESTION 03

Select correct common name of the compound.

$\underline{CH_3} - CO - COOH$

(A) Lactic acid $CH_3 - \overset{OH}{\overset{|}{CH}} - COOH$

[✓ (B) Pyruvic acid]

(C) Carbonic acid H_2CO_3

(D) Crotonic acid $CH_3 - CH = CH - COOH$

QUESTION 04

The IUPAC name of vinyl acetylene is:

$$\overset{1}{C}H_2=\overset{2}{C}H-\overset{3}{C}\equiv\overset{4}{C}H$$

- **A** Pent-1-en-4-yne
- **B** Pent-4-yn-1-ene
- **C** [✓ But-1-en-3-yne]
- **D** But-1-yn-3-ene

QUESTION ⑤

The structure of allyl vinyl thioether is:

$CH_2 = CH - S - CH_2 - CH = CH_2$

A $CH_2 = CH - CH_2 - S - CH_2 - CH = CH_2$

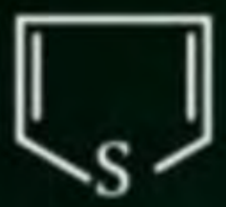
[✓ B] $CH_2 = CH - S - CH_2 - CH = CH_2$

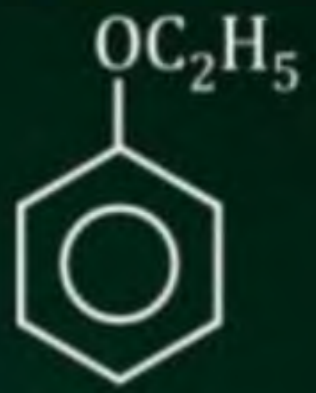
C $CH_2 = CH - S - CH = CH_2$

D None

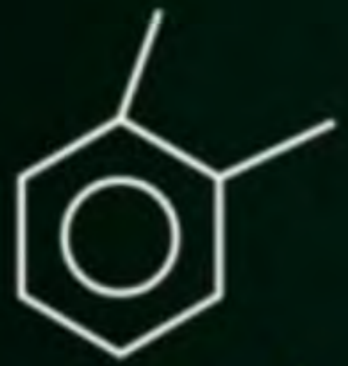
QUESTION 06

Which of the following common name is incorrect?

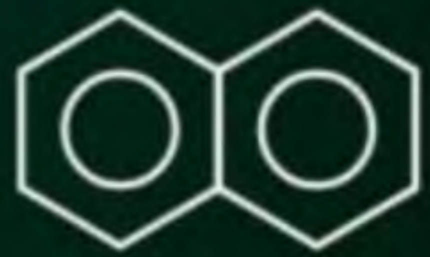
A 
Thiophene

B 

⇒ Phenetol

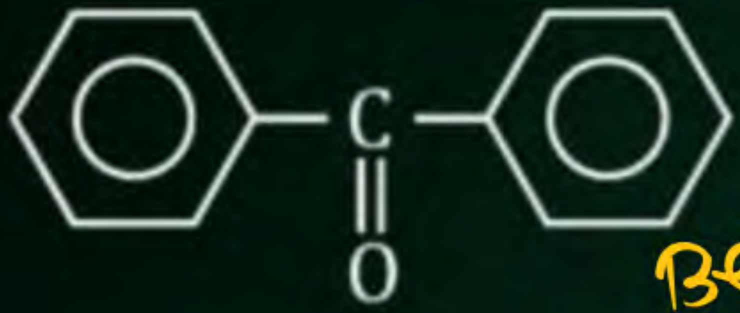
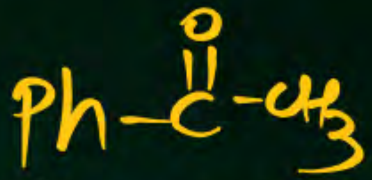
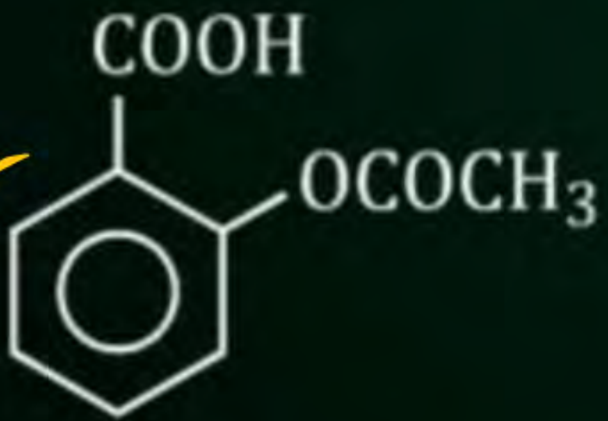
[✓ **C**] 
⇒ M-xylene

o-xylene

D 
⇒ Naphthalene

QUESTION 07

Which of the following are correct common name?

A	 Benzophenone	 $Ph-\overset{O}{\overset{\|}{C}}-CH_3$ Acetophenone
B	CH_3COCH_3 acetone	Anisole $PhOCH_3$
C	$PhCOCH_3$ acetophenone	Benzophenone $PhCOPh$
[✓ **D**]		Aspirin (Acetyl salicylic acid)

QUESTION 08

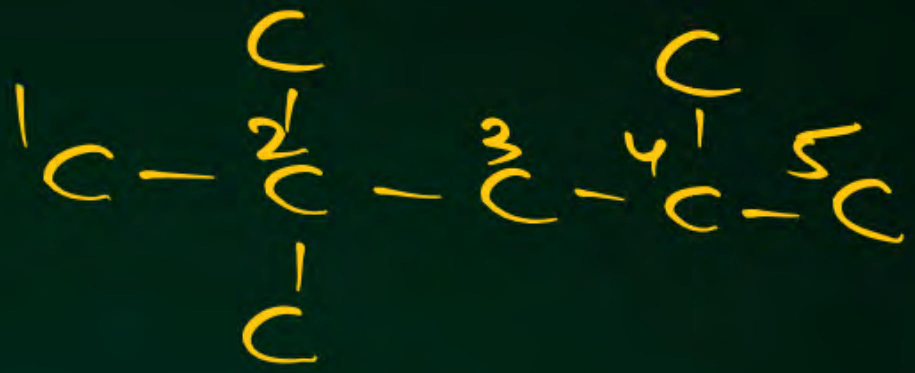
The IUPAC name of acrolein is:

$\overset{3}{C}H_2=\overset{2}{C}H-\overset{1}{C}HO$

- **A** But-2-enal
- **B** [✓ Prop-2-enal]
- **C** But-3-enal
- **D** 2-Methyl prop-2-enal

QUESTION ⑨

The IUPAC name of iso-octane is:



A 2, 2-dimethylpentane

B 2, 3-dimethylpentane

C 2, 3, 3-trimethylpentane

D [✓ 2, 2, 4-trimethylpentane]

QUESTION 10

Which of the following common names are correct?

[✓ A] CH_3CHCl_2 ⇒ Ethylidene chloride

B $CH_2=CH-Cl$ ⇒ Allyl chloride

vinyl chloride

C $CH\equiv C-CH_2-OH$ ⇒ Allyl alcohol

propargyl

D $CH_2=CH-CH_2-OH$ ⇒ Propargyl alcohol

Allyl

ANSWER KEY

1. B
2. A
3. B
4. C
5. B
6. C
7. D
8. B
9. D
10. A

Thank you!

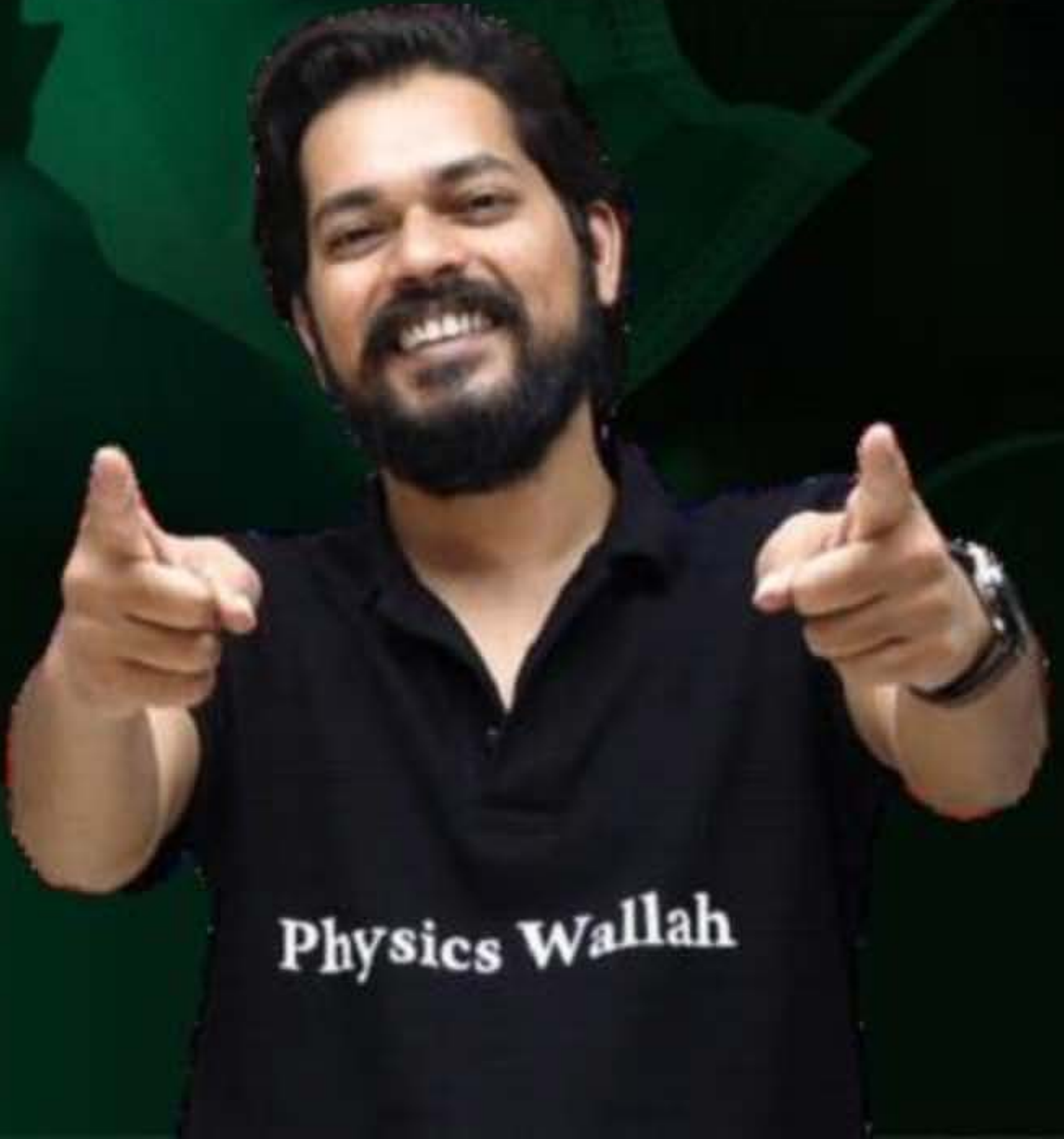
YAKEEN 2.0

FOR NEET 2025

Lecture- 02 | **Organic Chemistry**

Some Basic Principles and Techniques (ISOMERISM)

By- Pankaj Sir(POPU MAMA)


Physics Wallah

Topics *to be covered*

1. Structural Isomerism Part 02
2. Practice

metamerism

func^{n}

Ring chain

Tauto

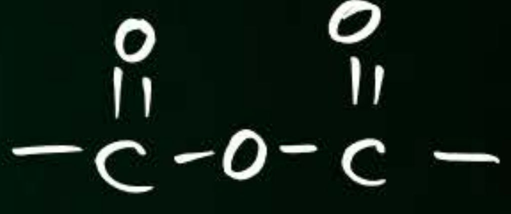
3. Metamerism

Definition: Compounds which have same molecular formula but have different arrangement of atoms or groups from either side of bridging function group.

Koi bhi ek side

A * ✓ —O— Ether ✓

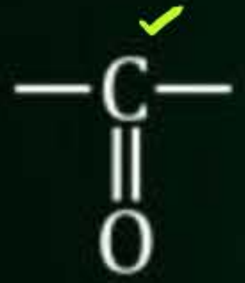
B —S— thioether



(I) $-\overset{\overset{O}{\|}}{C}-O-\overset{\overset{O}{\|}}{C}-$

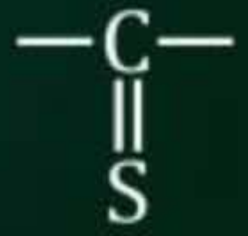
Anhydride

C *



$-\underset{\underset{O}{\|}}{C}-$ ✓ Ketone ✓

D

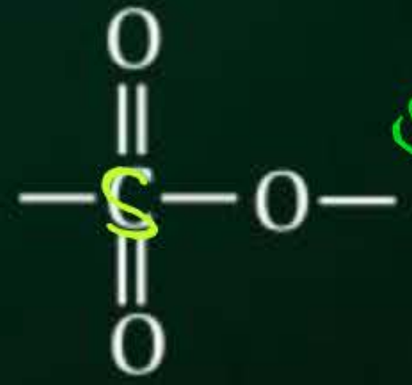


$-\underset{\underset{S}{\|}}{C}-$ thio ketone

E * ✓ —NH— 2° amine &

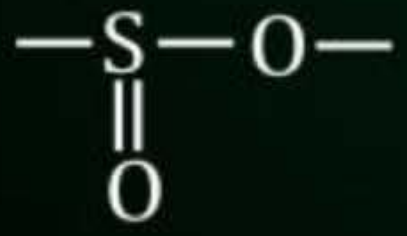
$-\underset{|}{N}-$ 3° amine

F



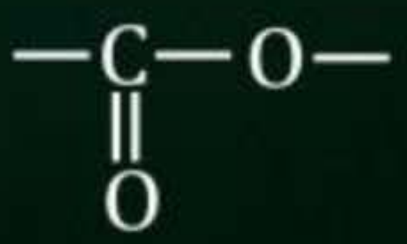
$-\overset{\overset{O}{\|}}{\underset{\underset{O}{\|}}{S}}-O-$ sulphonic ester

G



$-\underset{\underset{O}{\|}}{S}-O-$ suphonous ester

H



$-\underset{\underset{O}{\|}}{C}-O-$ Ester

$\boxed{C_4H_{10}O}$

Ⓐ

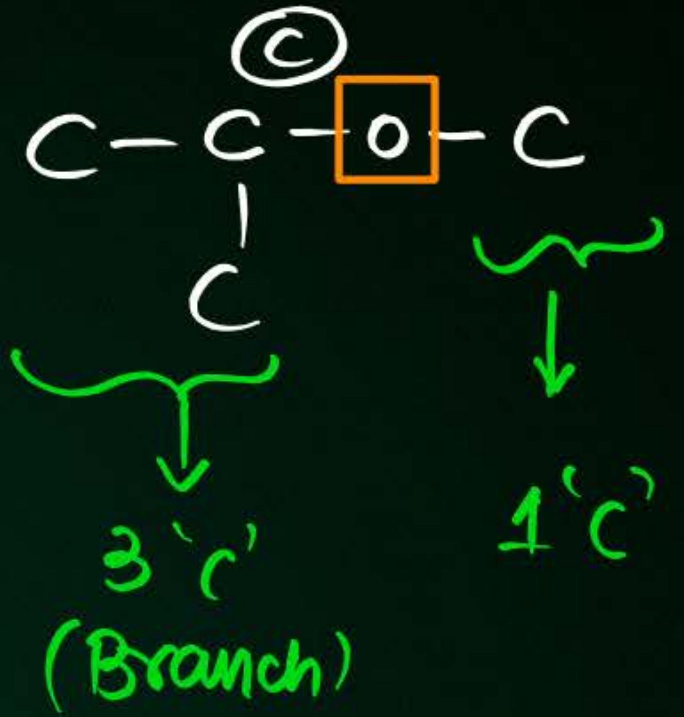
$$\underbrace{H_3C-H_2C-CH_2}_{3\text{'C' (straight chain)}}-\boxed{O}-\underbrace{CH_3}_{1\text{'C'}}$$

Ⓑ

$$\underbrace{C-C}_{2\text{'C'}}-\boxed{O}-\underbrace{C-C}_{2\text{'C'}}$$

$\boxed{C_4H_{10}O}$

Ⓒ

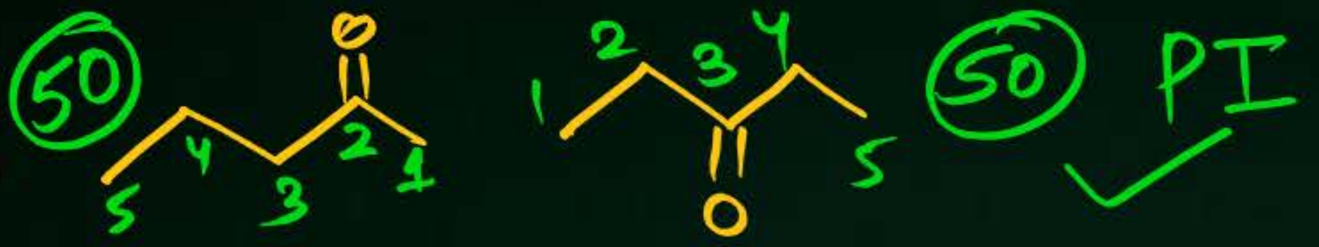


Ⓐ & Ⓑ are Metamer

Ⓐ & Ⓒ are Metamer

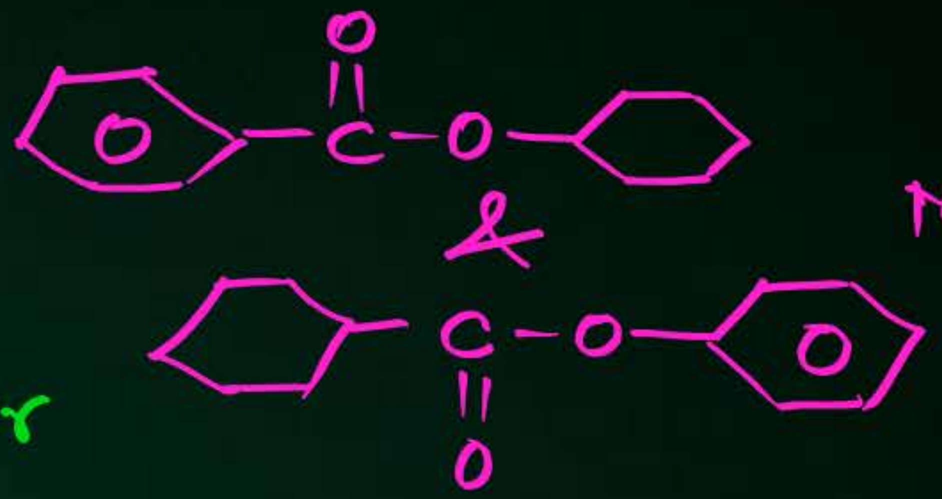
Ⓑ & Ⓒ are Metamer

QUESTION



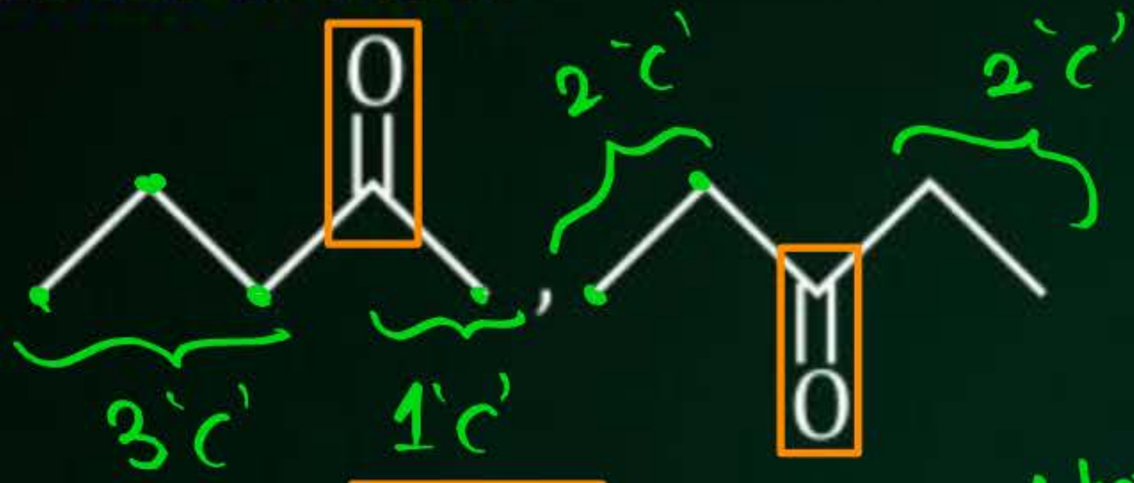
(50)
O
1
2
3
4
5
1
2
3
4
5
O
(50)
PI

Metamers or NOT?



metamer

A

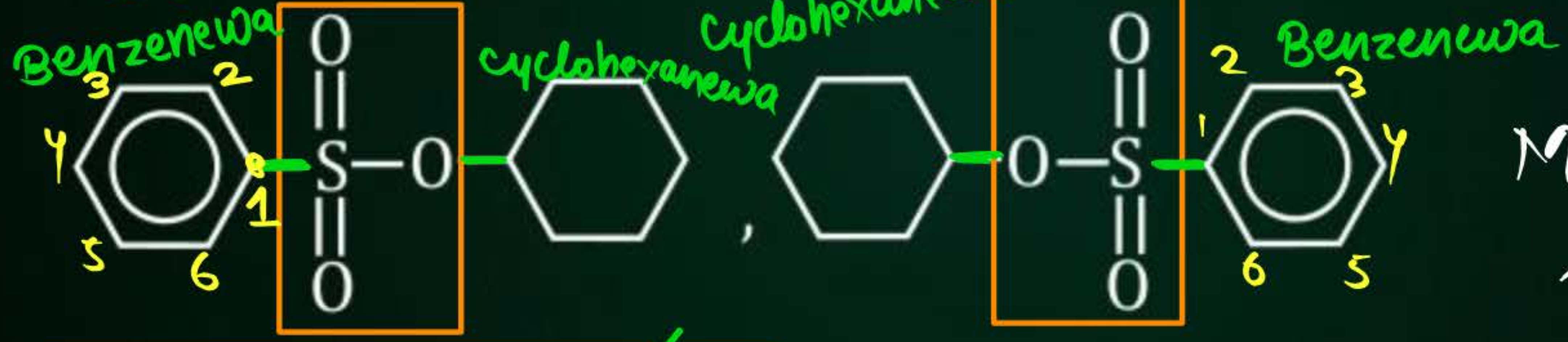


O
O
2 'C'
2 'C'
3 'C'
1 'C'

Metamer

Identicalwa

B



Benzenewa
cyclohexanewa
cyclohexanewa
Benzenewa
1
2
3
4
5
6
O
S
O
O
O
S
O
O
1
2
3
4
5
6

~~Metamer~~

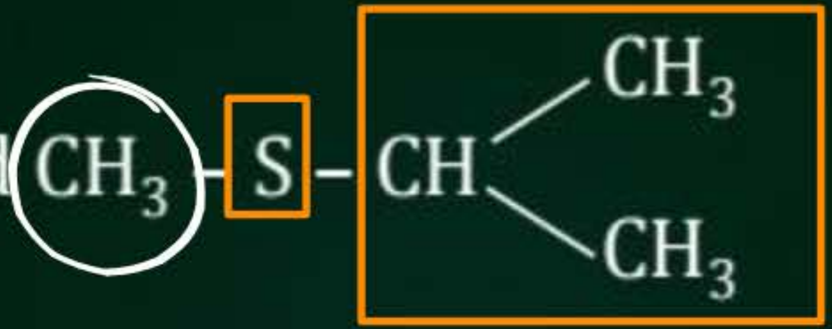
Priority : M > C > P ✓

For M.I, F.G must be same

QUESTION (NCERT Exemplar)

Compounds with same molecular formula but differing in their structures are said to be structural isomers. What type of structural isomerism is shown by

$CH_3-S-CH_2-CH_2-CH_3$ and



$$CH_3-S-CH\begin{matrix}CH_3\\CH_3\end{matrix}$$

3 'c'
straight

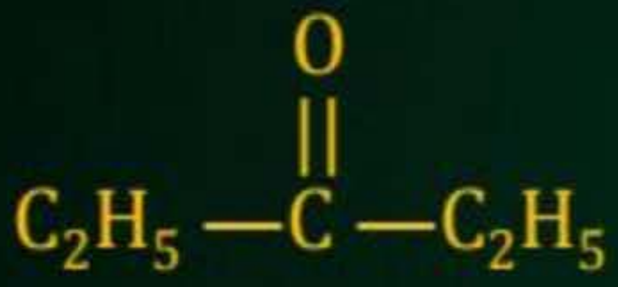
3 'c'
branch

MetaMER

Example of Metamers

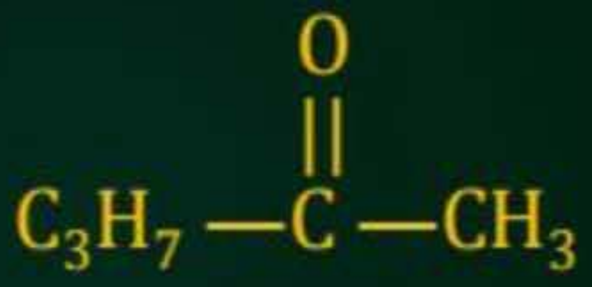
$C_4H_{10}O$ $C_2H_5—O—C_2H_5$; $C_3H_7—O—CH_3$

$C_5H_{10}O$



$C_2H_5—\overset{\overset{\displaystyle O}{||}}{C}—C_2H_5$

;



$C_3H_7—\overset{\overset{\displaystyle O}{||}}{C}—CH_3$

4. Functional Isomerism

Definition: Compounds which have same molecular formula but have different functional groups.

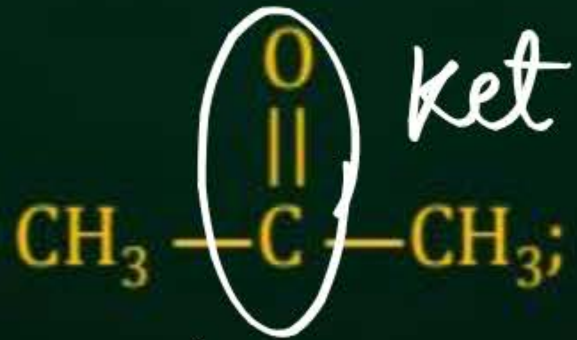
Example.

Alcohol Ether

C_2H_6O CH_3CH_2OH ; $H_3C-O-CH_3$

sp^3

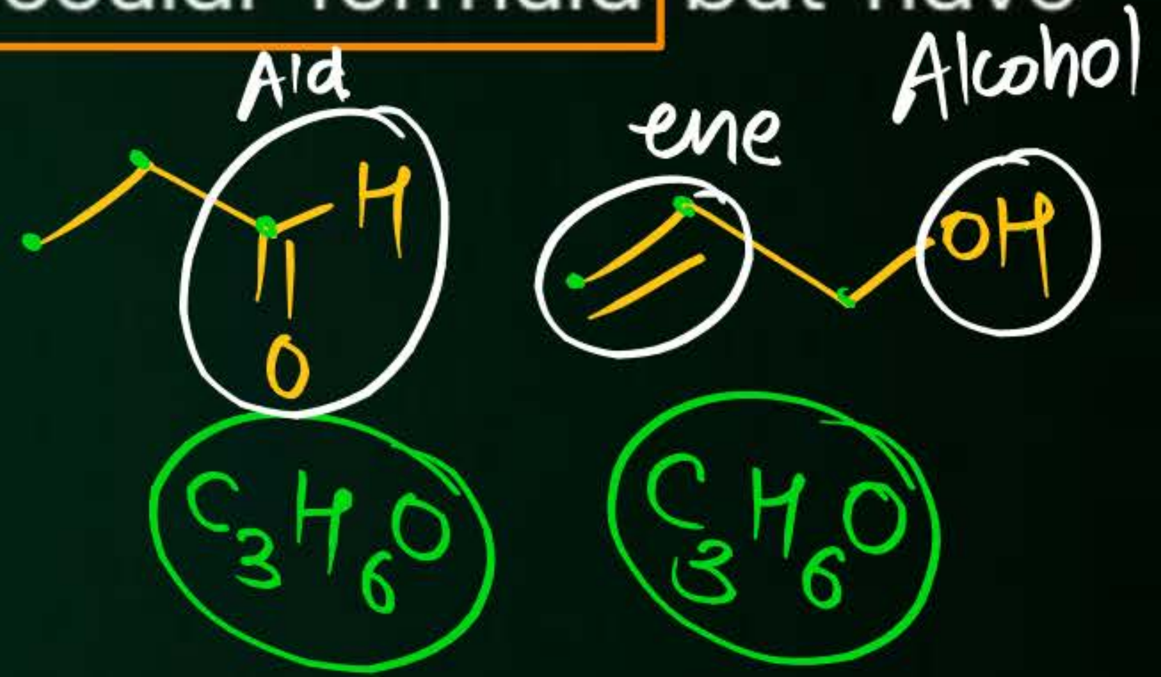
Ald Ket



C_3H_6O CH_3CH_2CHO ; $CH_3-\overset{O}{\overset{\|}{C}}-CH_3$;

Acid Ester

$C_2H_4O_2$ CH_3COOH ; $HCOOCH_3$

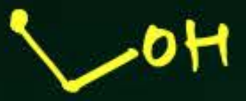

Ald
H
O
ene
Alcohol
OH
C_3H_6O
C_3H_6O

F.I ✓

Some Important Functional Isomers:

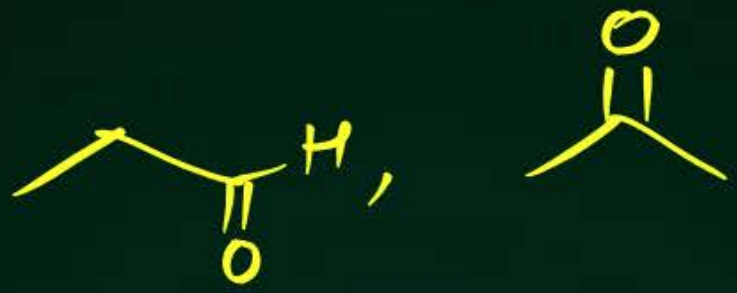
Polarity
(F>M>C>P)

A Alcohols and ethers



CH_3-O-CH_3

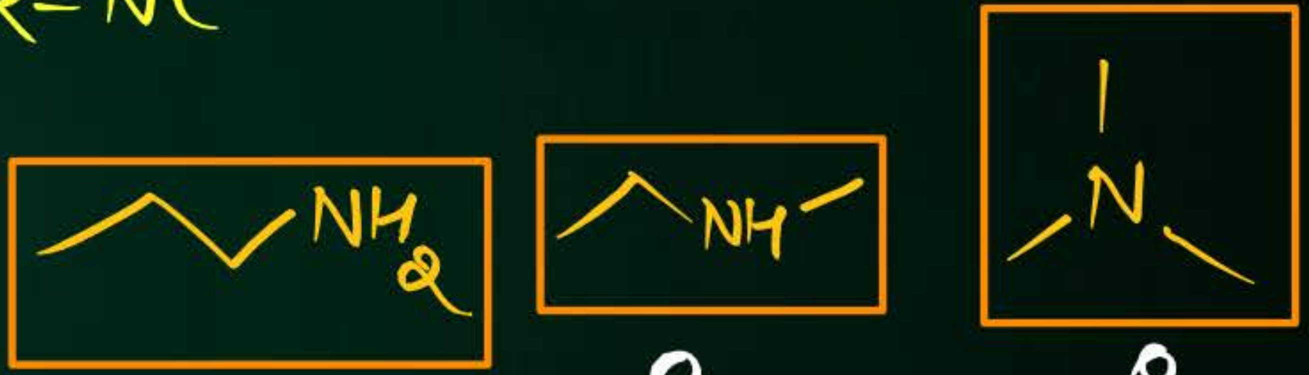
B Aldehydes and ketones



C Cyanides and isocyanides

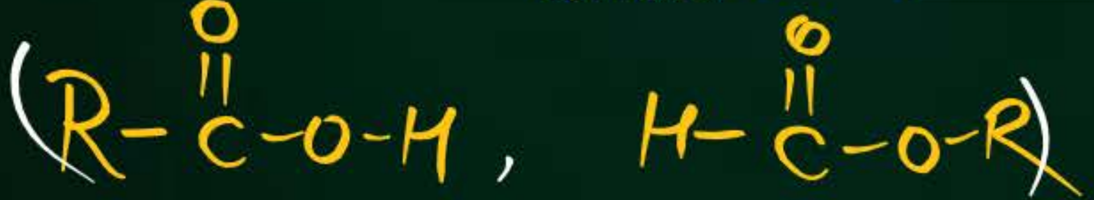
R-CN , R-NC

D Primary, secondary and tertiary amines

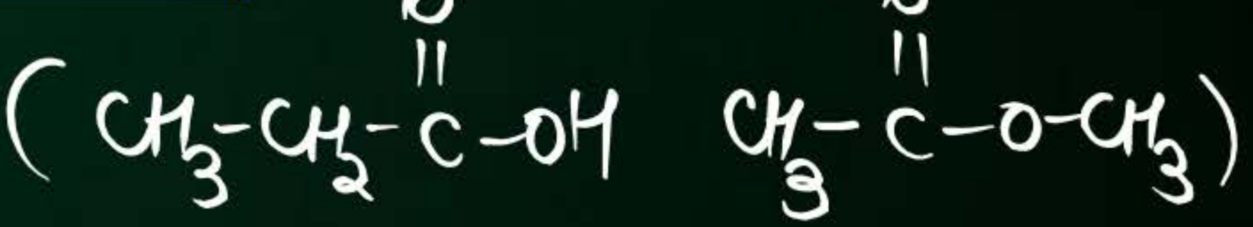


amides

E Acids and esters

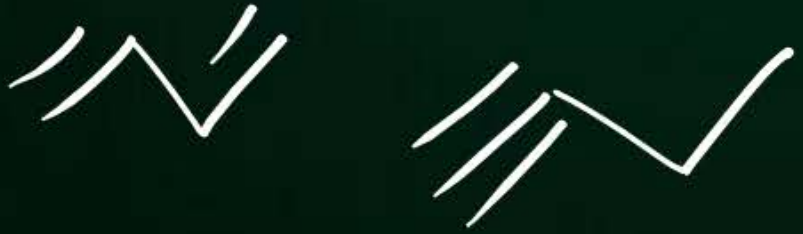


$$\left(\cancel{R}-\overset{O}{\overset{\|}{C}}-O-H,\quad H-\overset{O}{\overset{\|}{C}}-O-\cancel{R} \right)$$



$$\left(CH_3-CH_2-\overset{O}{\overset{\|}{C}}-OH \qquad CH_3-\overset{O}{\overset{\|}{C}}-O-CH_3 \right)$$

F Diene and yne



QUESTION (NCERT Exemplar)

In which of the following, functional group isomerism is not possible?

A Alcohols

B Aldehydes

[✓ C Alkyl halides]

D Cyanides

QUESTION

(CI, PI, MI, FI)

What isomerism is exhibited by the following pairs of compounds?

A CH_3CH_2CHO and CH_3COCH_3 F.I

B $C_2H_5\overset{B.F.G}{\boxed{O}}C_2H_5$ and $CH_3\boxed{O}C_3H_7$ M.I

C $CH_3\overset{BFG}{\boxed{NH}}C_3H_7$ and $C_2H_5\overset{BFG}{\boxed{NH}}C_2H_5$ M.I

D $\overset{4}{C}H_3\overset{3}{C}H_2\overset{2}{C}H=\overset{1}{C}H_2$ and $\overset{1}{C}H_3\overset{2}{C}H=\overset{3}{C}H\overset{4}{C}H_3$ P.I

$\boxed{40}$ $\boxed{40}$

5. Ring-Chain Isomerism

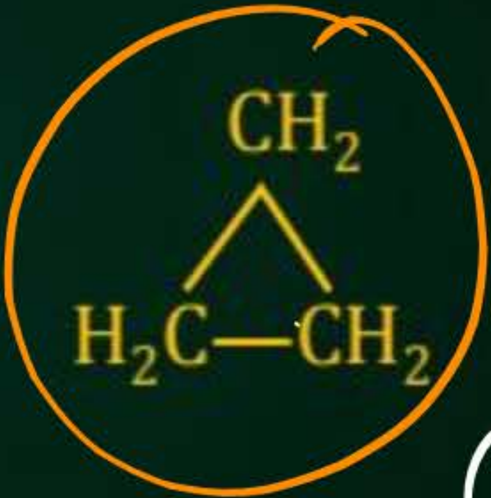
R.C.I are considered as F.I

Priority
(R > F > M > C > P)

Definition: Compounds which have same molecular formula but one compound is chain & other is cyclic.

Example.

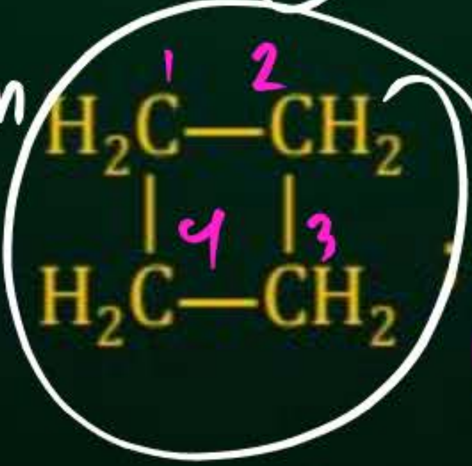
C_3H_6 $CH_3—CH = CH_2$; Chain



Ring

C_4H_8 $CH_3CH_2CH=CH_2$; (A) Chain

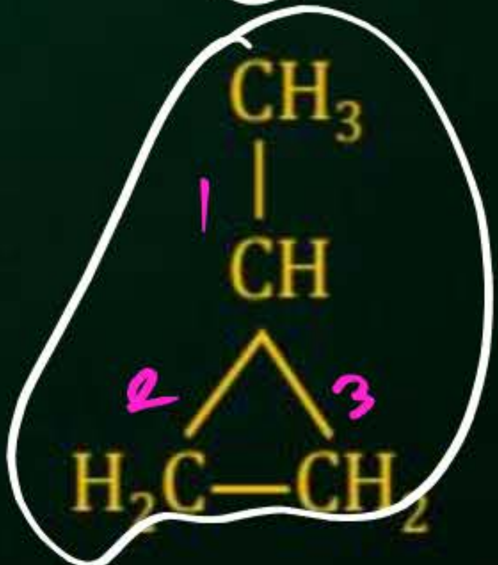
(B)


1
2
H₂C—CH₂
4
3
H₂C—CH₂

Ring

(40)

(C)


CH₃
1
CH
2
3
H₂C—CH₂

(31)

A&B RCI
A&C RCI
B&C C.I

6. Tautomerism

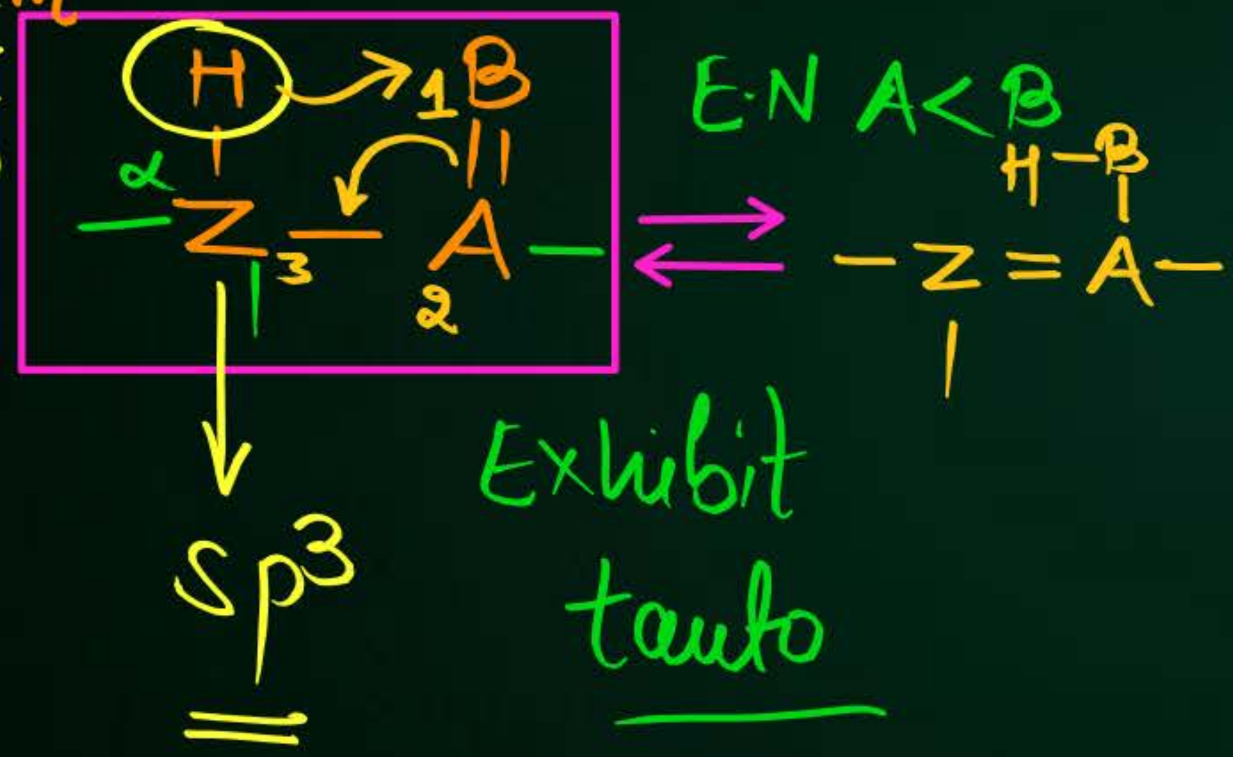
Keto-enol

1,3-system

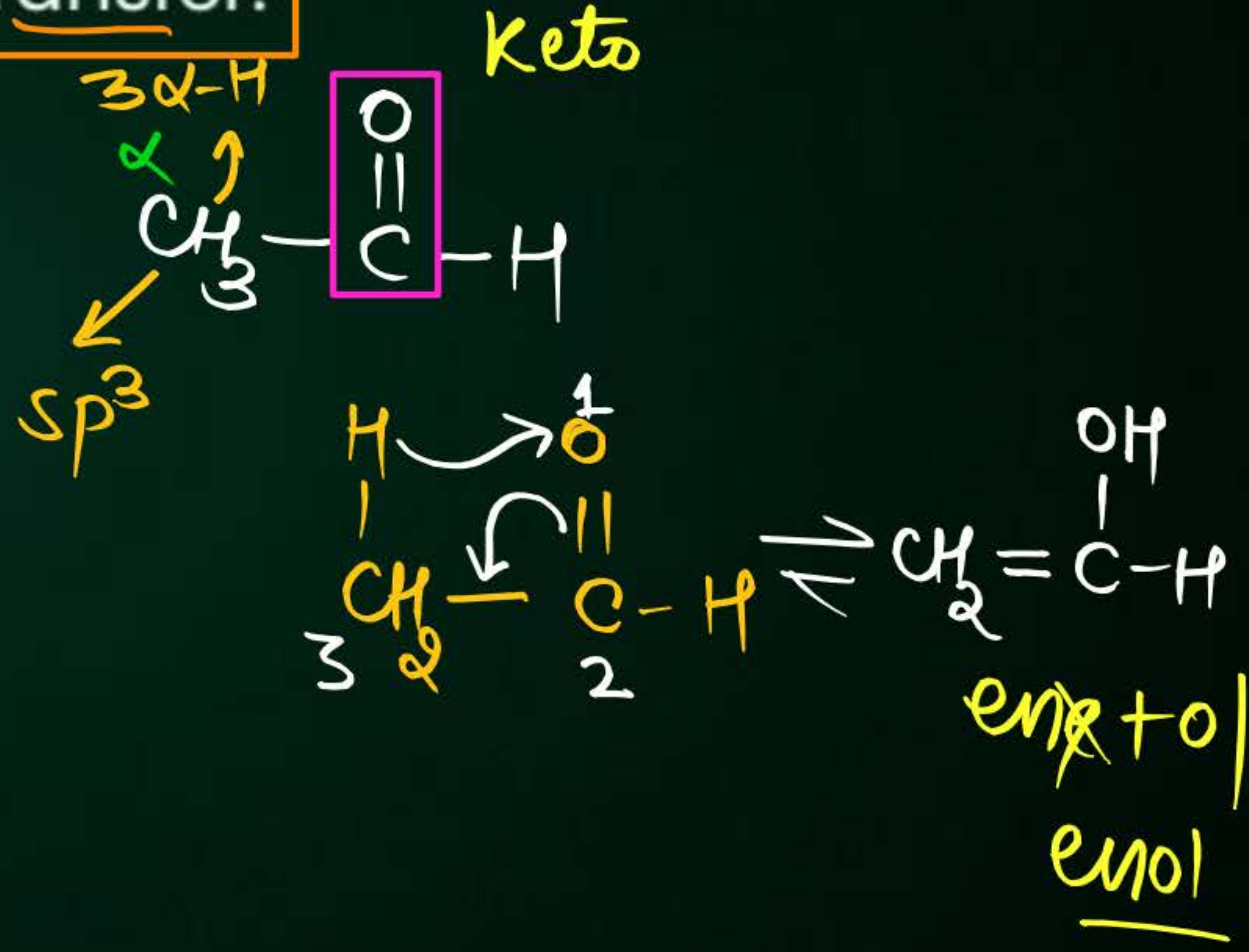
Cond^n for Exhibition
1) α-C → sp^3
2) atleast 1 α-H

Definition: Intramolecular proton (H^+) transfer.

1,3-sytem
atleast 1'H'

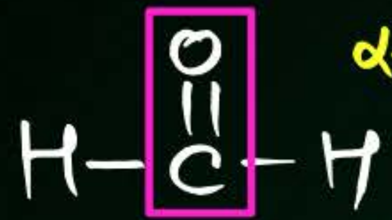


H → 1B
α
Z 3
A 2
E.N A<B
H−B
−Z=A−
sp^3
Exhibit tauto



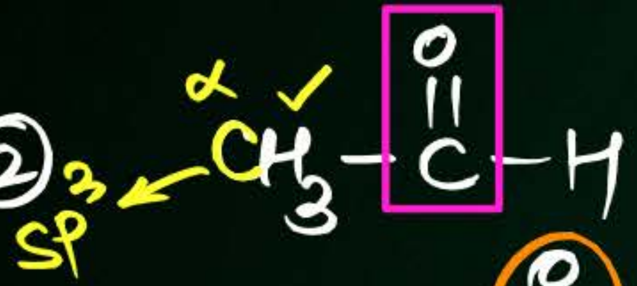
Keto
3α-H
α
CH$_3$−C(=O)−H
sp^3
H → O 1
CH$_2$ 3
C 2
CH$_2$=C(OH)−H
en+ol
enol

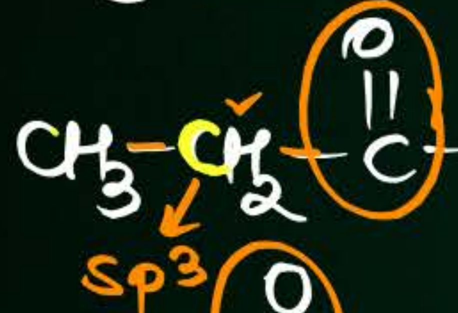
Q Tautomerism Exhibits or not?

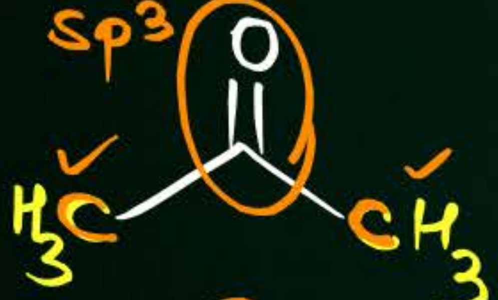
①


α-C ✗

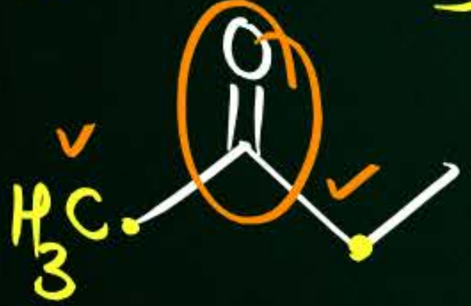
NO

②

α ✓
CH_3
C
O
H
sp^3
yes

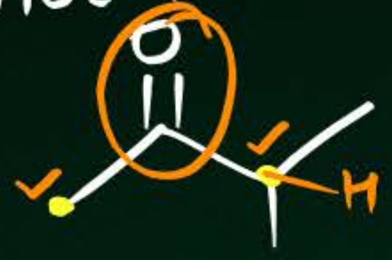
③

CH_3
CH_2
C
O
H
sp^3
yes

④


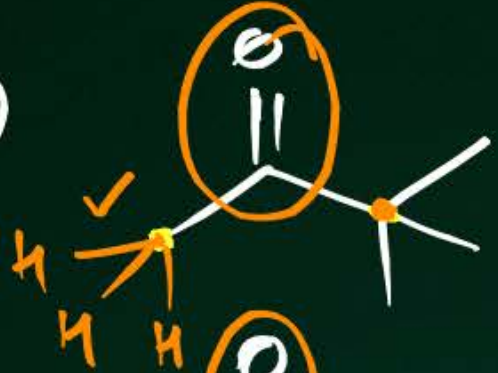
yes

⑤


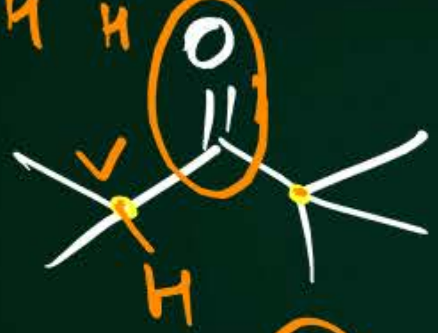
yes

⑥


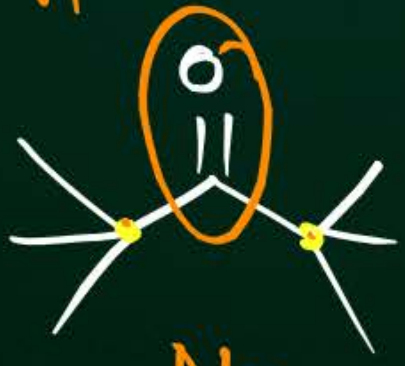
Yes

⑦


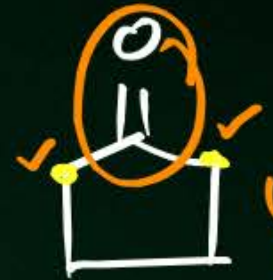
yes

⑧


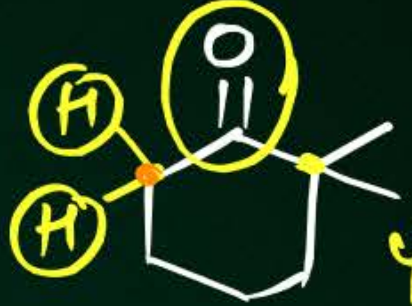
Yes

⑨


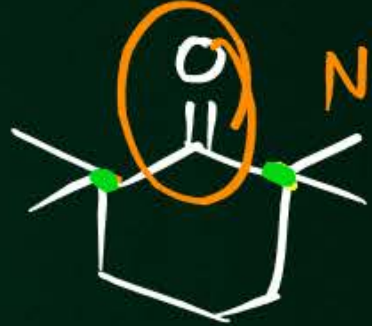
NO

⑩


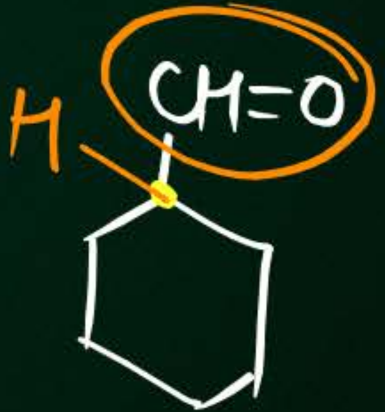
yes

⑪


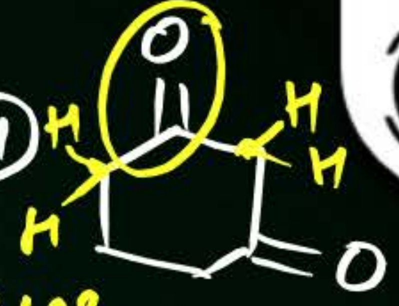
yes

⑫


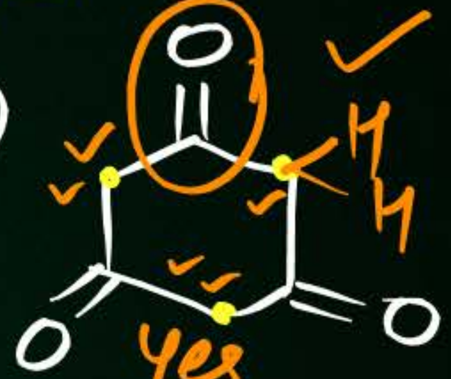
NO

⑬


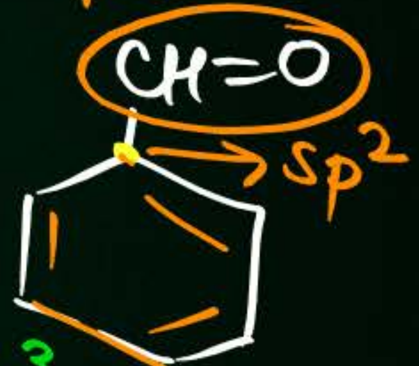
Yes

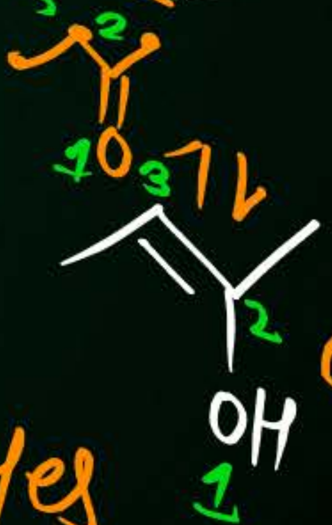
⑭


yes

⑮


yes

⑯


⑰


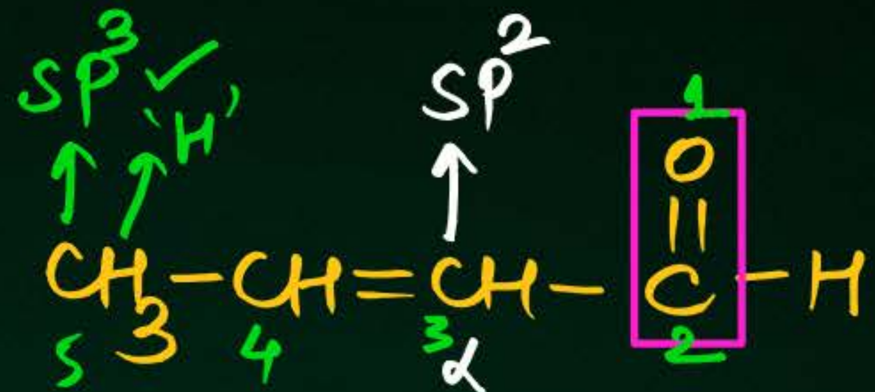
enol

Yes

1,5-system

Q. kab lagana hai??

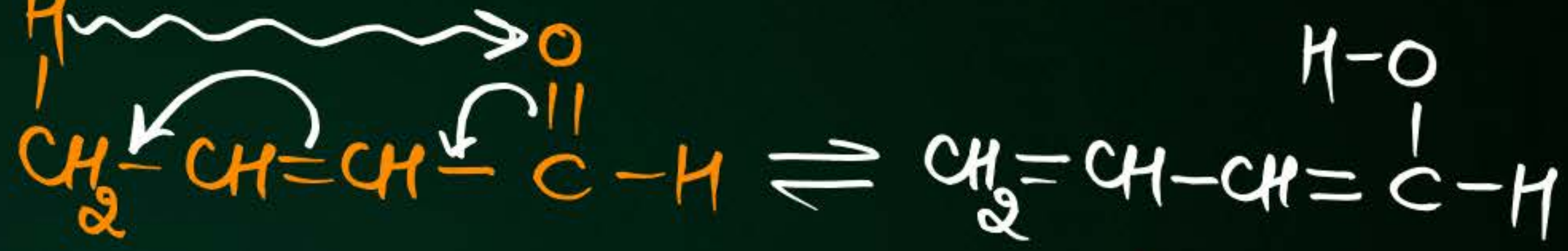
A. Jab 1,3 fail ho Jaye.



$CH_3-CH=CH-\overset{O}{\overset{\|}{C}}-H$

sp3 ✓
'H'
sp2
1
2
5
3
4
3
α

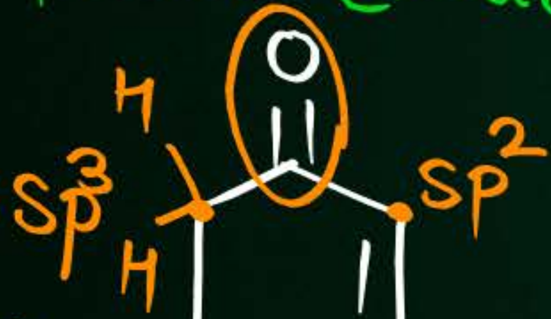
yes



$\overset{H}{\overset{|}{CH_2}}-CH=CH-\overset{O}{\overset{\|}{C}}-H \rightleftharpoons CH_2=CH-CH=\overset{H-O}{\overset{|}{C}}-H$

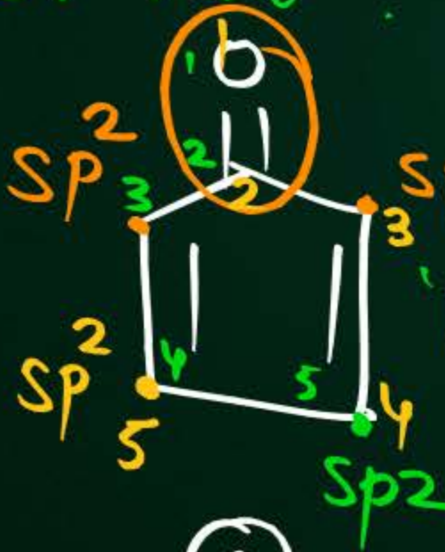
Q Tauto exhibits or not?

①



yes

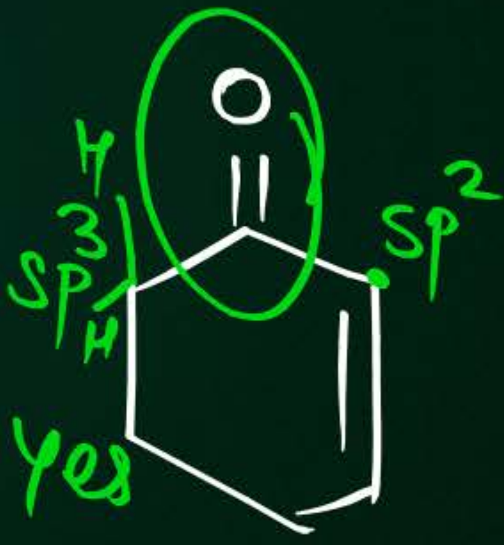
②



1
sp2
2
3
sp2
3
sp2
4
5
5
4
sp2

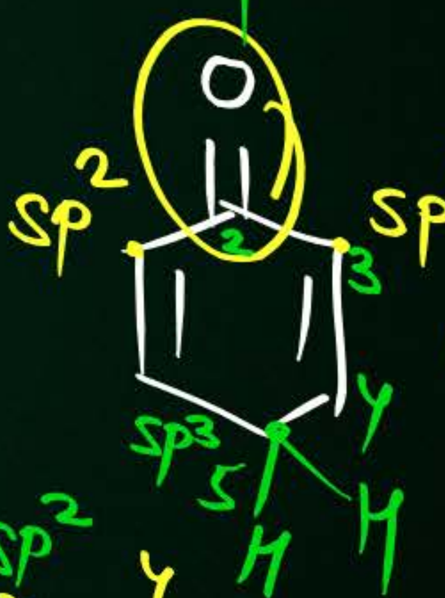
'NO'

③



Yes

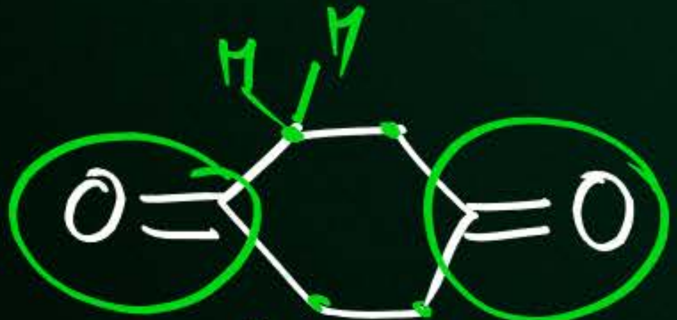
④



sp2
2
3
sp2
3
4
sp3
5
H
H

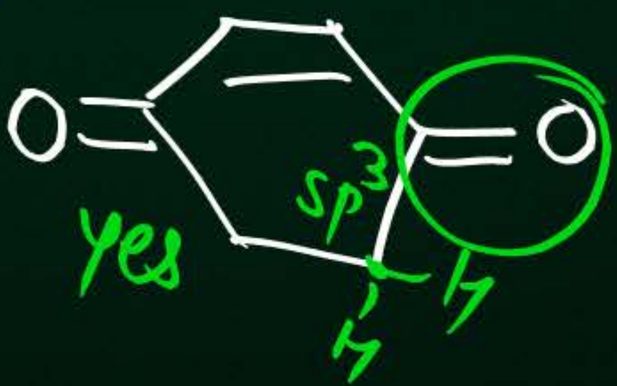
yes

⑤



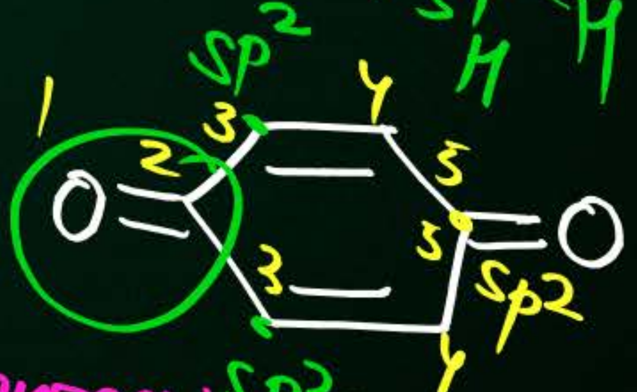
yes

⑥



yes

⑦

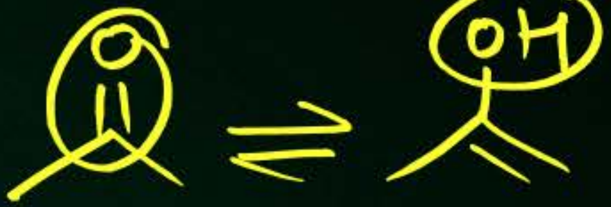


1
sp2
2
3
4
5
3
5
sp2
4
sp2

NO

p-benzoquinone

op point ÷ ① Tautomers are also considered as F.I



FI ✓

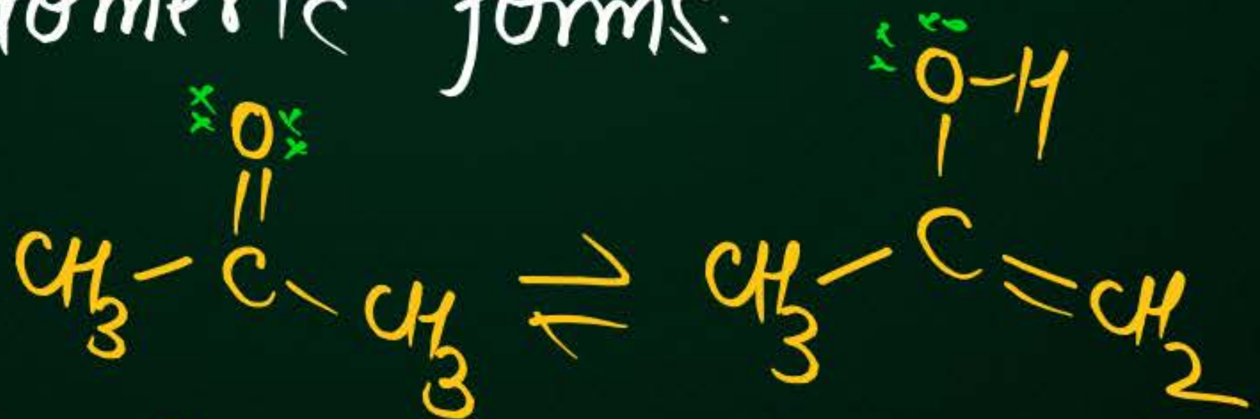
Tautomers ✓

priority

② R > T > F > M > C > P

RaaT F m chain position

③ Total no. of σ bonds, π bond and L.P are same in all tautomeric forms.



$$CH_3-\overset{\overset{\large O}{\|}}{C}-CH_3 \rightleftharpoons CH_3-\overset{\overset{\large O-H}{|}}{C}=CH_2$$

9σ, 1π, 2LP   9σ, 1π, 2LP

Other names of Tautomerism

Desmotropism

or

Allelotropism

or

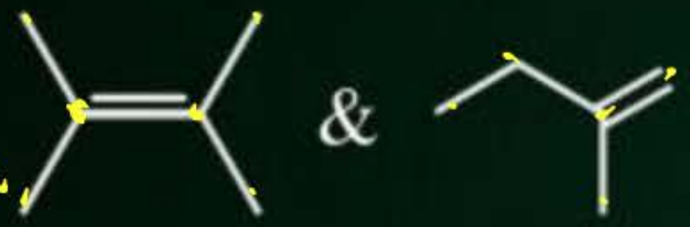
Prototropy

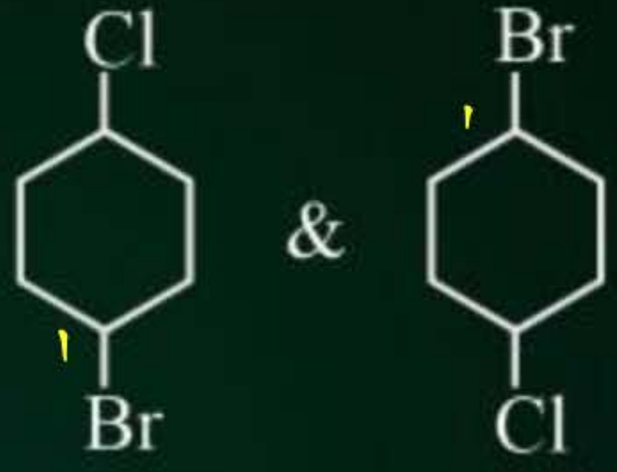
or

Kryptotropism

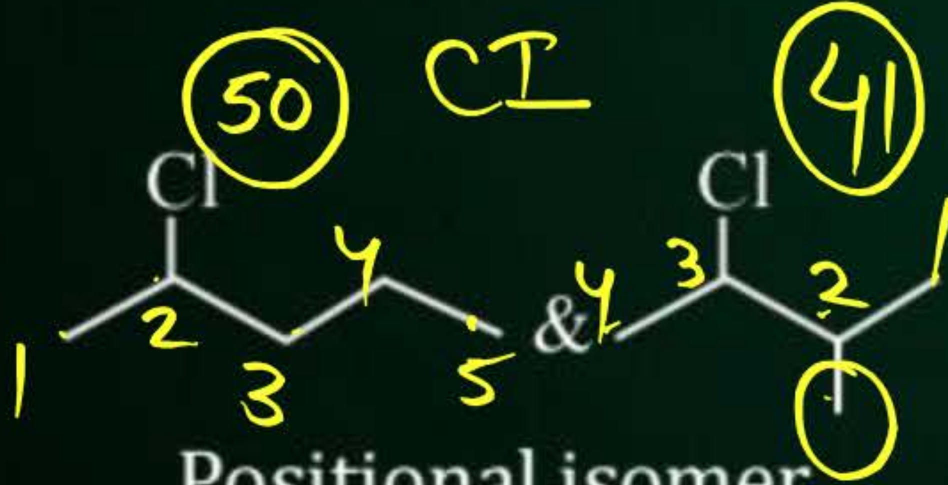
QUESTION

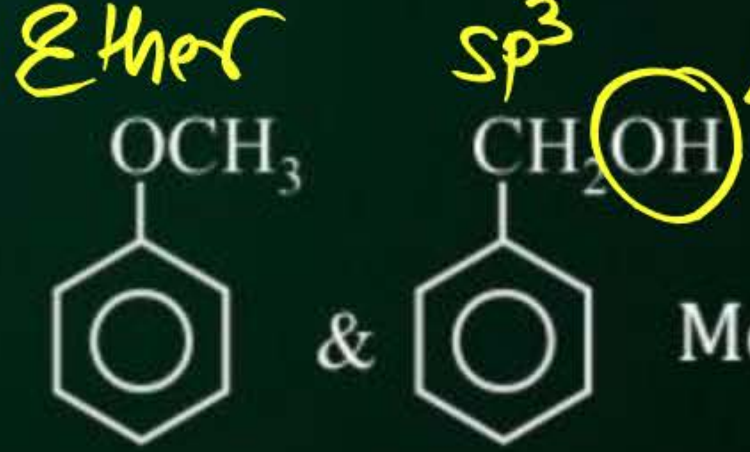
Which of the following is correctly matched?

(A) 
Chain isomer

(B) 

identical

(C) 
50
CI
41
Cl
Cl
1
2
3
4
5
4
3
2
1
Positional isomer

(D) 
Ether
sp3
OCH_3
CH_2OH
Alcohol FI

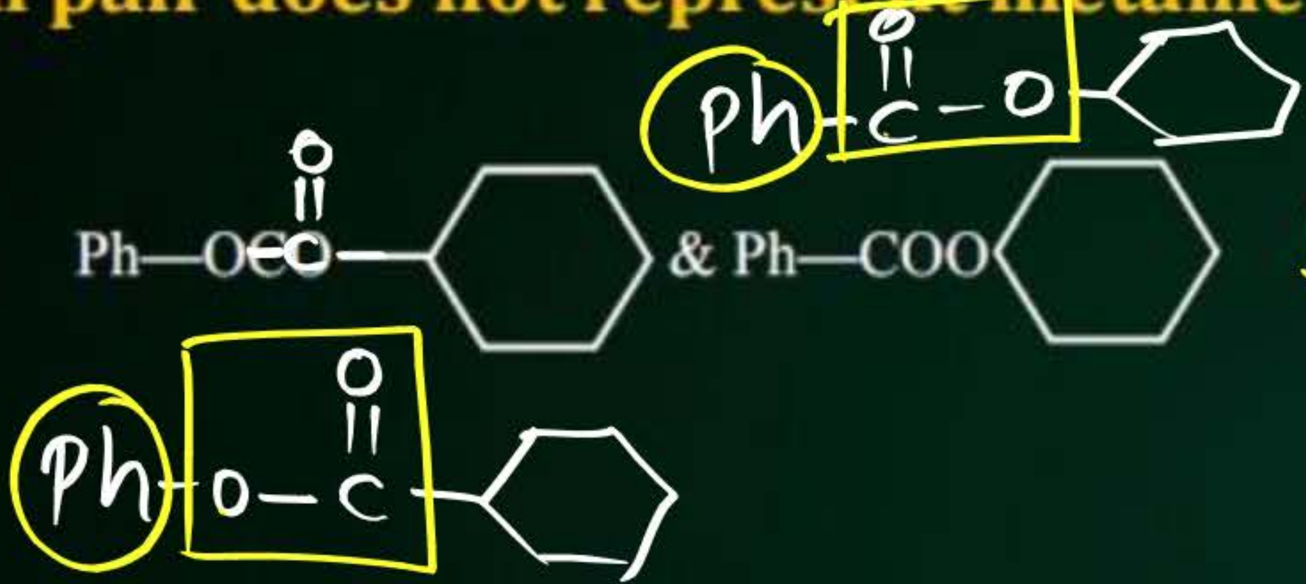
Metamer

QUESTION*

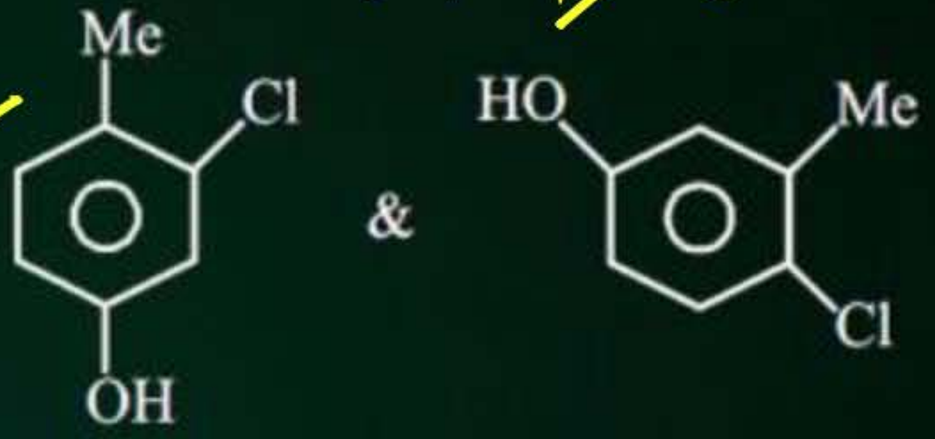
Which pair does not represent metamerism?

BFG ✗

A


Ph
C
O
Ph—OCO
& Ph—COO
Ph
O
C

B ✓

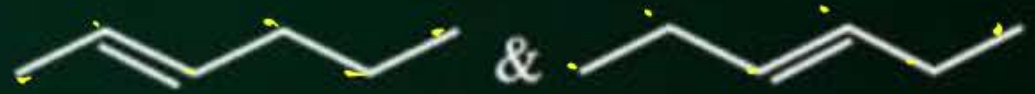

Me
Cl
OH
&
HO
Me
Cl

C ✓ $CH_3CH_2NH_2$ & CH_3NHCH_3

1° amine 2° amine

FI

D ✓

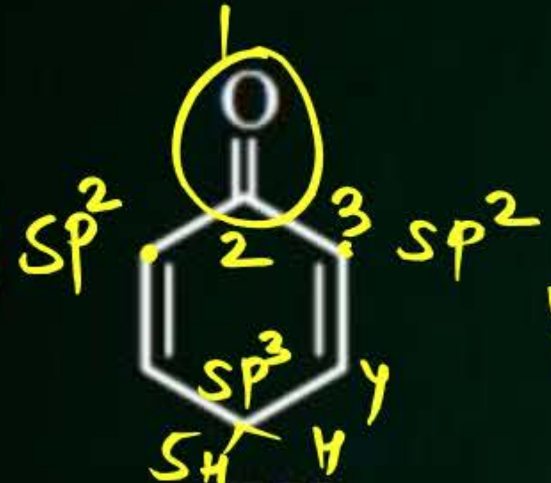


PI

QUESTION*

Which can show Tautomerism?

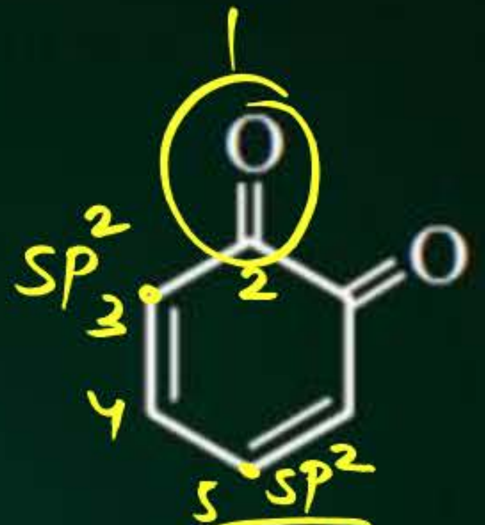
A



1
O
Sp2
2
3
sp2
sp3
4
5H
H

yes

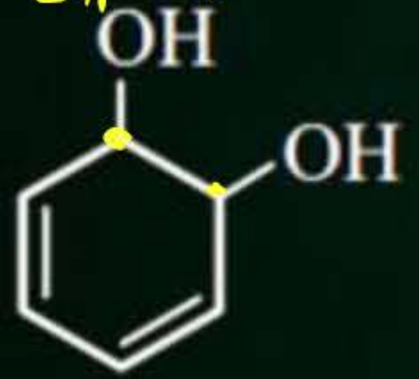
B



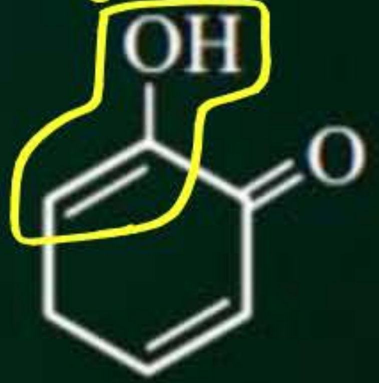
1
O
Sp2
2
3
4
O
5
sp2

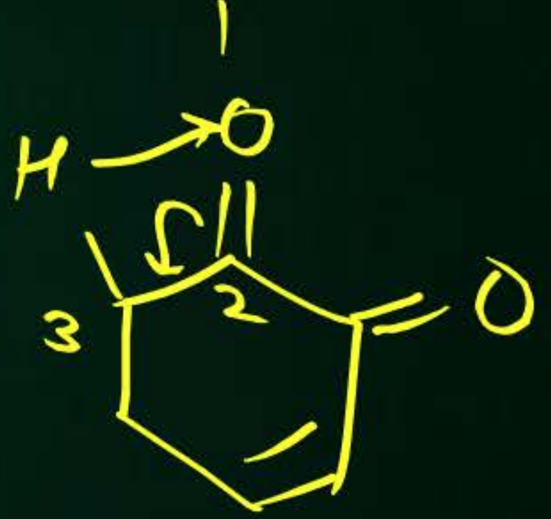
NO

C X



✓ **D**





Home Work

QUESTION 01

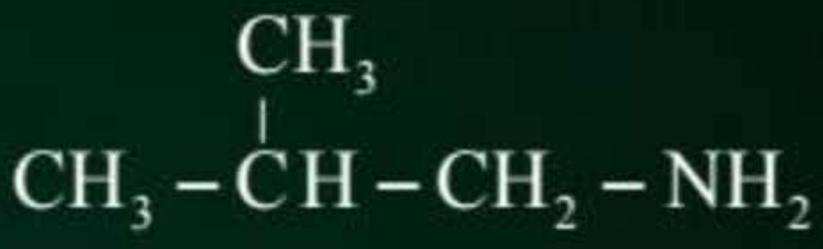
CH_3CH_2OH and $CH_3—O—CH_3$ are the examples of:

- (A) Functional isomerism
- (B) Chain isomerism
- (C) Metamerism
- (D) Position isomerism

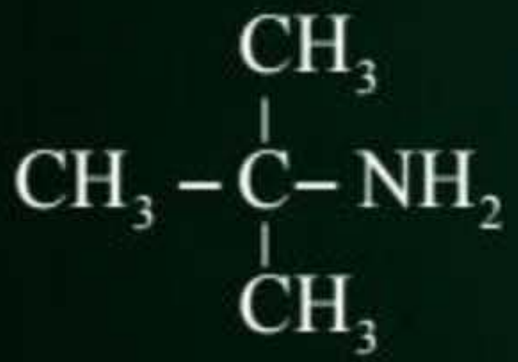
QUESTION 02

Which one of the following is a functional isomer of $CH_3–CH_2–CH_2–CH_2–NH_2$?

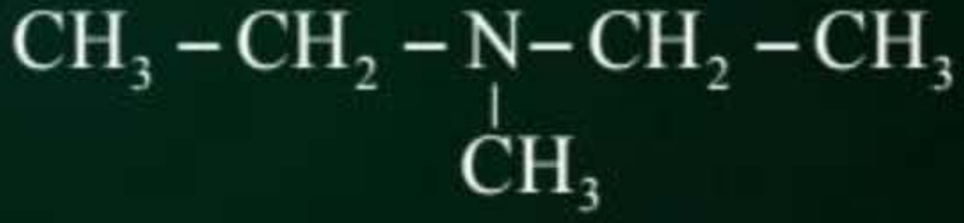
(A) $CH_3–CH_2–NH–CH_2–CH_3$

(B) 

$CH_3-\overset{\overset{\large CH_3}{|}}{C}H-CH_2-NH_2$

(C) 

$CH_3-\underset{\underset{\large CH_3}{|}}{\overset{\overset{\large CH_3}{|}}{C}}-NH_2$

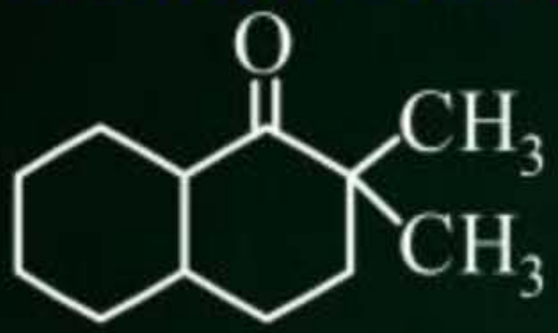
(D) 

$CH_3-CH_2-\underset{\underset{\large CH_3}{|}}{N}-CH_2-CH_3$

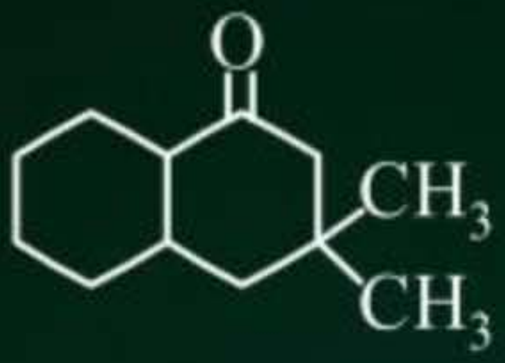
QUESTION 03

Identify which can exhibit tautomerism?

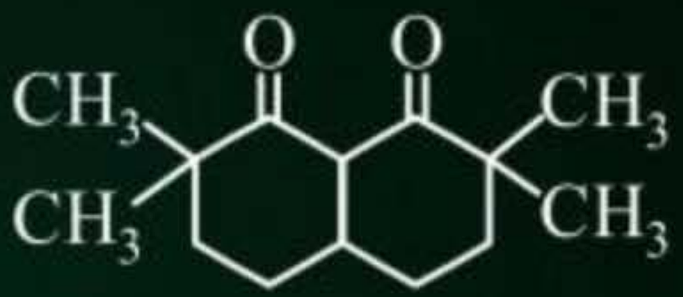
(I)



(II)



(III)


O
O
CH3
CH3
CH3
CH3

- **A** (i) only
- **B** (ii) only
- **C** (iii) only
- **D** All of these

QUESTION 04

Metamers of ethyl propionate are:

Ⓐ C_4H_9COOH and $HCOOC_4H_9$

Ⓑ C_4H_9COOH and $CH_3COOC_3H_7$

Ⓒ CH_3COOCH_3 and $CH_3COOC_3H_7$

Ⓓ $CH_3COOC_3H_7$ and $C_3H_7COOCH_3$

QUESTION 05

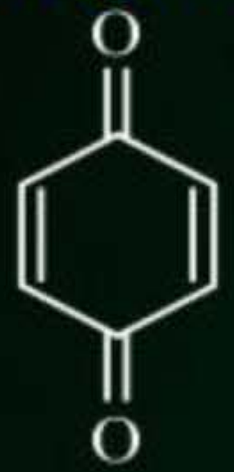
n-propyl alcohol and isopropyl alcohol are:

- (A) Position isomers
- (B) Chain isomers
- (C) Tautomers
- (D) Geometrical isomers

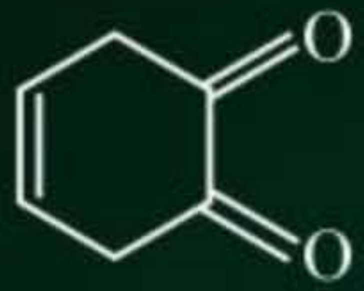
QUESTION 06

Among the given structure which can exhibit tautomerism?

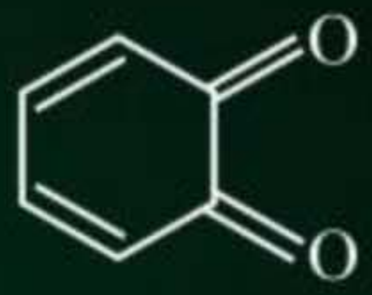
(I)



(II)



(III)



A Only (i)

B Only (ii)

C Only (iii)

D None of these

QUESTION 07

Which of the following are examples of metamerism?

Ⓐ Ethoxyethane and 1-methoxypropane

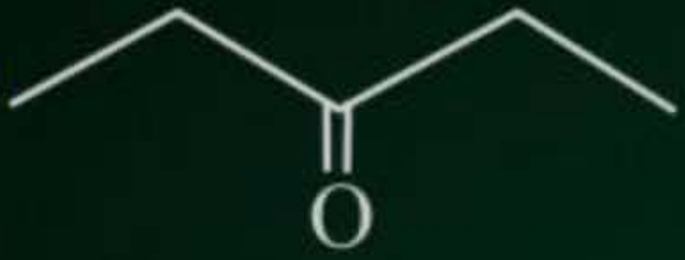
Ⓑ Pentan-2-one and pentan-3-one

Ⓒ N-Methylpropan-1-amine and N-ethylethanamine

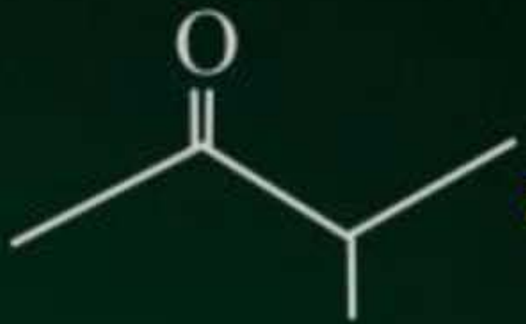
Ⓓ All of the above

QUESTION 08

The compounds



and

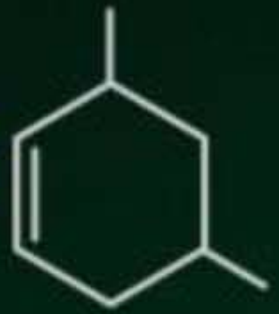


are:

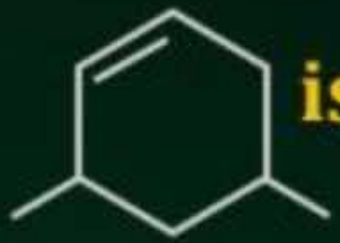
- (A) Chain isomers
- (B) Metamers
- (C) Position isomers
- (D) Both (A) & (B)

QUESTION 09

Relation between compounds



&

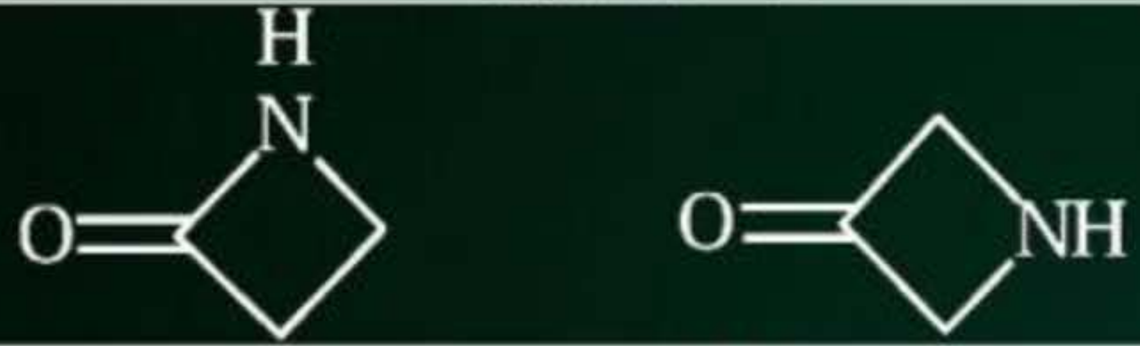
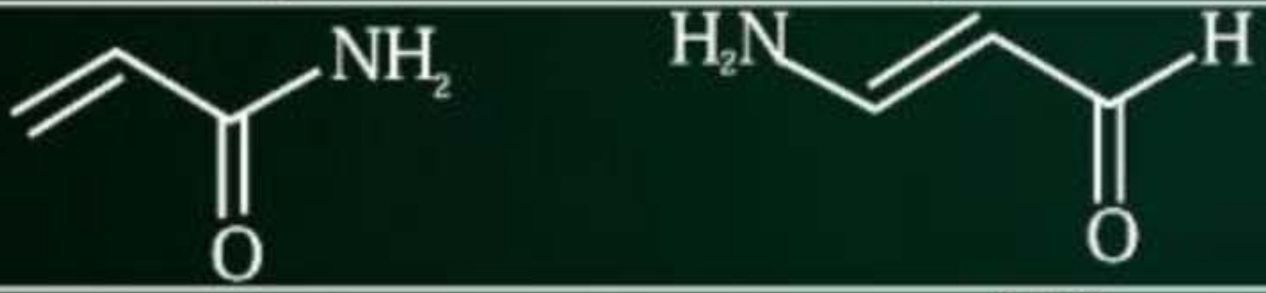
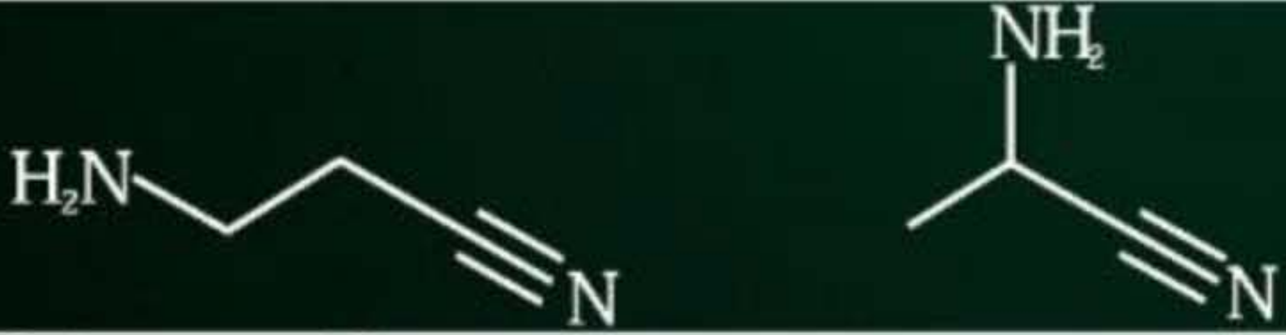
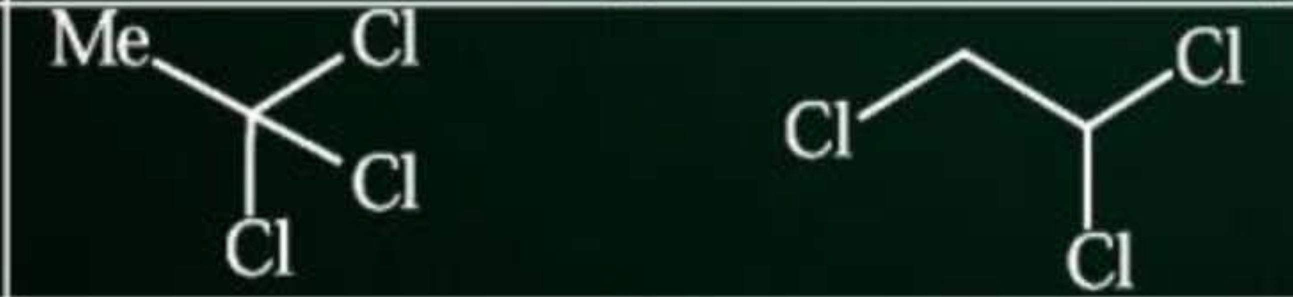


is:

- (A) Position isomers
- (B) Chain isomers
- (C) Identical
- (D) Functional isomers

QUESTION 10

Match the columns.

Column – I		Column – II	
(A)		(P)	Functional isomers
(B)		(Q)	Chain isomers
(C)		(R)	Position isomers
(D)		(S)	Metamers

Ⓐ A-P; B-P; C-R; D-R

Ⓑ A-P; B-Q; C-R; D-S

Ⓒ A-S; B-R; C-Q; D-P

Ⓓ A-R; B-P; C-Q; D-S

ANSWER KEY

1. A
2. A
3. D
4. D
5. A
6. B
7. D
8. D
9. C
10. A

Home Work From PW Module (Yakeen NEET)

Prarambh: Q 60, 61, 78, 79, 80

Prabal: Q 11, 12

Parikshit: Q 07, 08, 10

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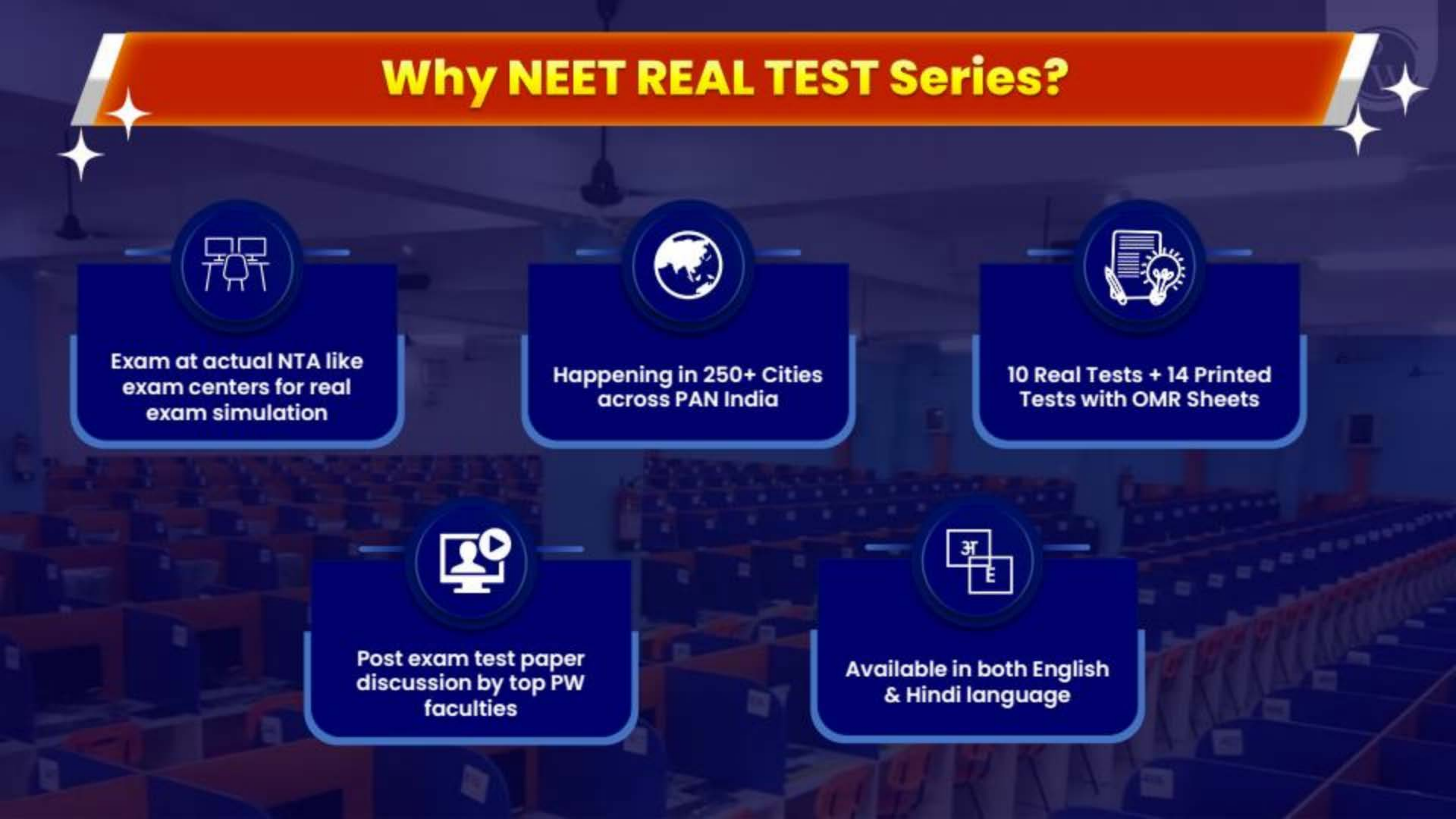

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NEET	Dropper	Test 01	Vedika Naithani	700	720	2	KARNAL
NEET	Dropper	Test 01	Utkarsh Mishra	700	720	3	AURAIYA
NEET	Dropper	Test 01	Anand Chauhan	695	720	4	SIDDHARTHNAGAR
NEET	Dropper	Test 01	Muskan Kumari	691	720	5	KATIHAR
NEET	Dropper	Test 01	Ankit Yadav	690	720	6	WEST DELHI
NEET	Dropper	Test 01	Akshat Upadhyay	690	720	7	BANDA
NEET	Dropper	Test 01	Aditya Raj	690	720	8	NALANDA
NEET	Dropper	Test 01	Garima	687	720	9	HANUMANGARH
NEET	Dropper	Test 01	Monami Bera	687	720	10	EAST MIDNAPORE

DROPPER NEET REAL TEST 02 SYLLABUS

Overview

Exam Date	Mode	Pattern	Test No.	Physics	Chemistry	Botany	Zoology
Sunday, November 10, 2024	Offline	NEET	Test 2	Circular Motion Work, energy and power Centre of mass and System of Particles Rotational Motion Gravitation Mechanical Properties of Solids	Chemical Kinetics Structure of Atom Classification of Elements and Periodicity in Properties Chemical Bonding and Molecular Structure	Anatomy of Flowering Plants Respiration in Plants	Locomotion & Movement Neural Control & Coordination

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Exam Date - 13 Oct 2024 (online)

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NEET REAL TEST 01 SYLLABUS

11th NEET REAL TEST SERIES SYLLABUS

Cohort	Class	Name of the Test	Exam Date	Mode	Physics	Chemistry	Botany	Zoology
NEET	11	Test 1	13-Oct-2024	Online	Basic Maths & Calculus (Mathematical Tools) Vectors Units and Measurements Motion in a straight line	Structure of Atom Some Basic Concepts of Chemistry Classification of Elements and Periodicity in Properties	Cell - The Unit of Life Cell Cycle and Cell Division	Structural Organization in Animals Breathing and Exchange of Gases

12th NEET REAL TEST SERIES SYLLABUS

Cohort	Class	Name of the Test	Exam Date	Mode	Physics	Chemistry	Botany	Zoology
NEET	12	Test 1	13-Oct-2024	Online	Electric Charges and Fields Electrostatic Potential and Capacitance	Solution Electrochemistry	Sexual Reproduction in Flowering Plant	Human Reproduction

DROPPER NEET REAL TEST SERIES SYLLABUS

Cohort	Class	Name of the Test	Exam Date	Mode	Physics	Chemistry	Botany	Zoology
NEET	Dropper	Test 1	13-Oct-2024	Online	Basic Maths & Calculus (Mathematical Tools) Vectors Units and Measurements Motion in a straight line Motion in a plane Circular motion Laws of motion	Some Basic Concept of Chemistry Redox Reaction Solutions Thermodynamics Equilibrium Electrochemistry	Cell - The Unit of Life Cell Cycle and Cell Division The Living World Biological Classification Plant Kingdom Morphology of Flowering Plants	Structural Organization in Animals Breathing and Exchange of Gases Body Fluids and Circulation Excretory Products & their Elimination

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- **Exam Duration:** 60 Minutes

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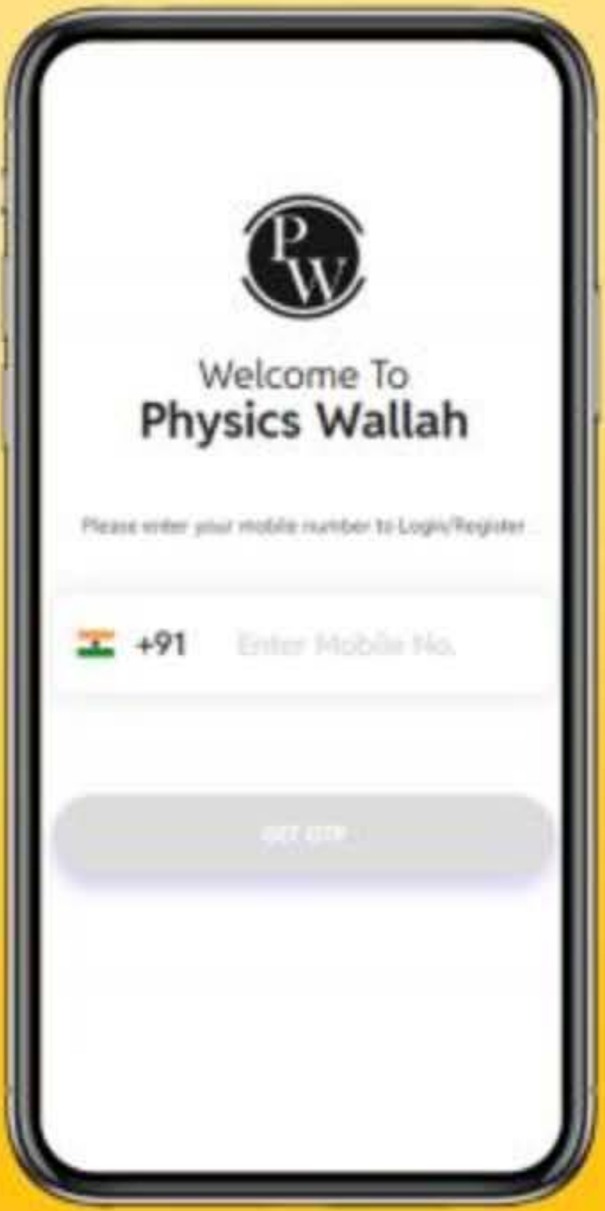
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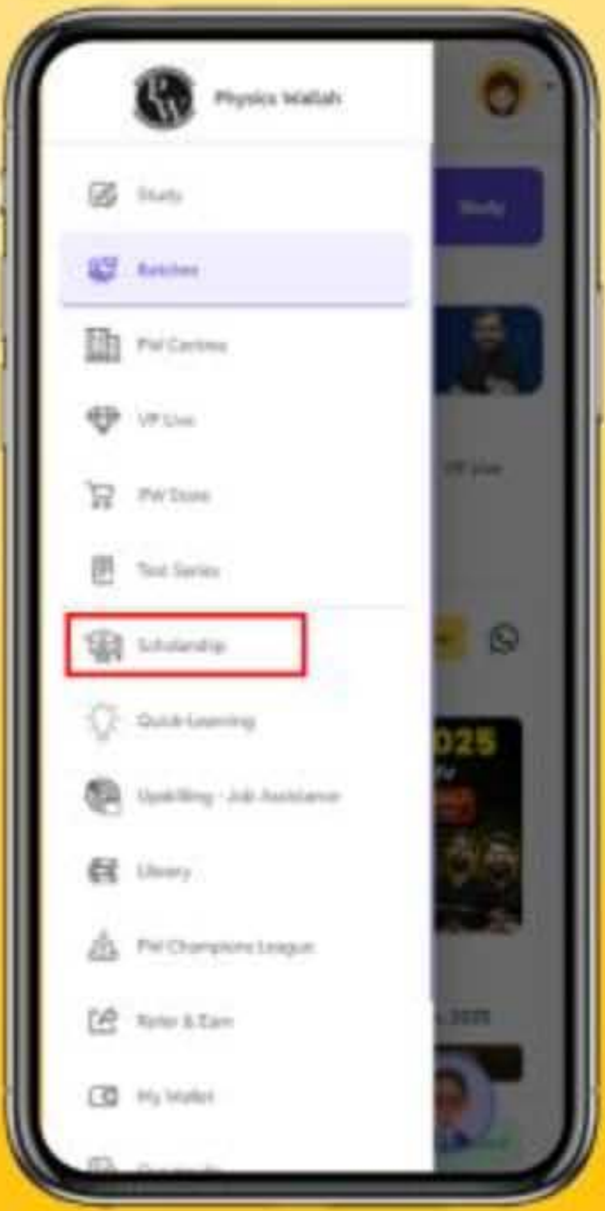
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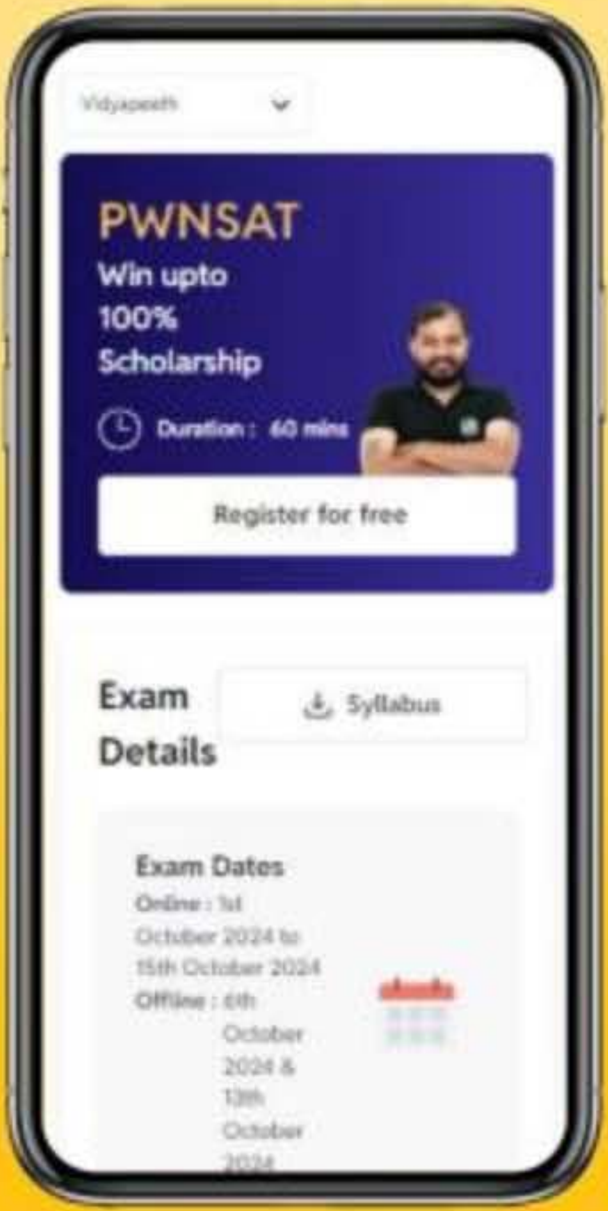
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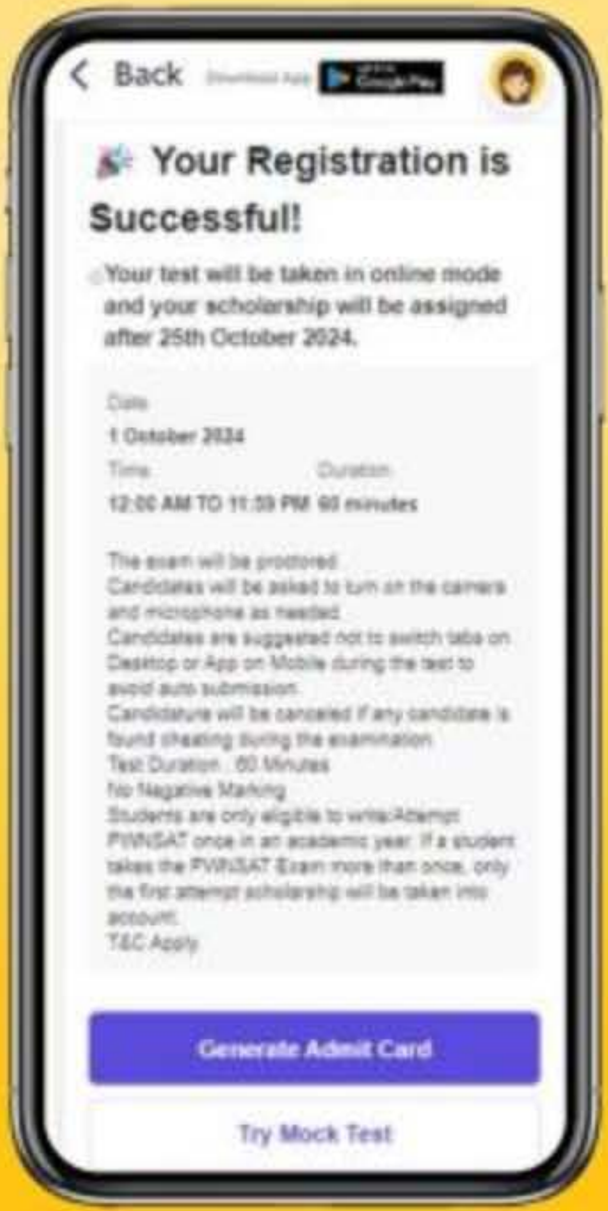
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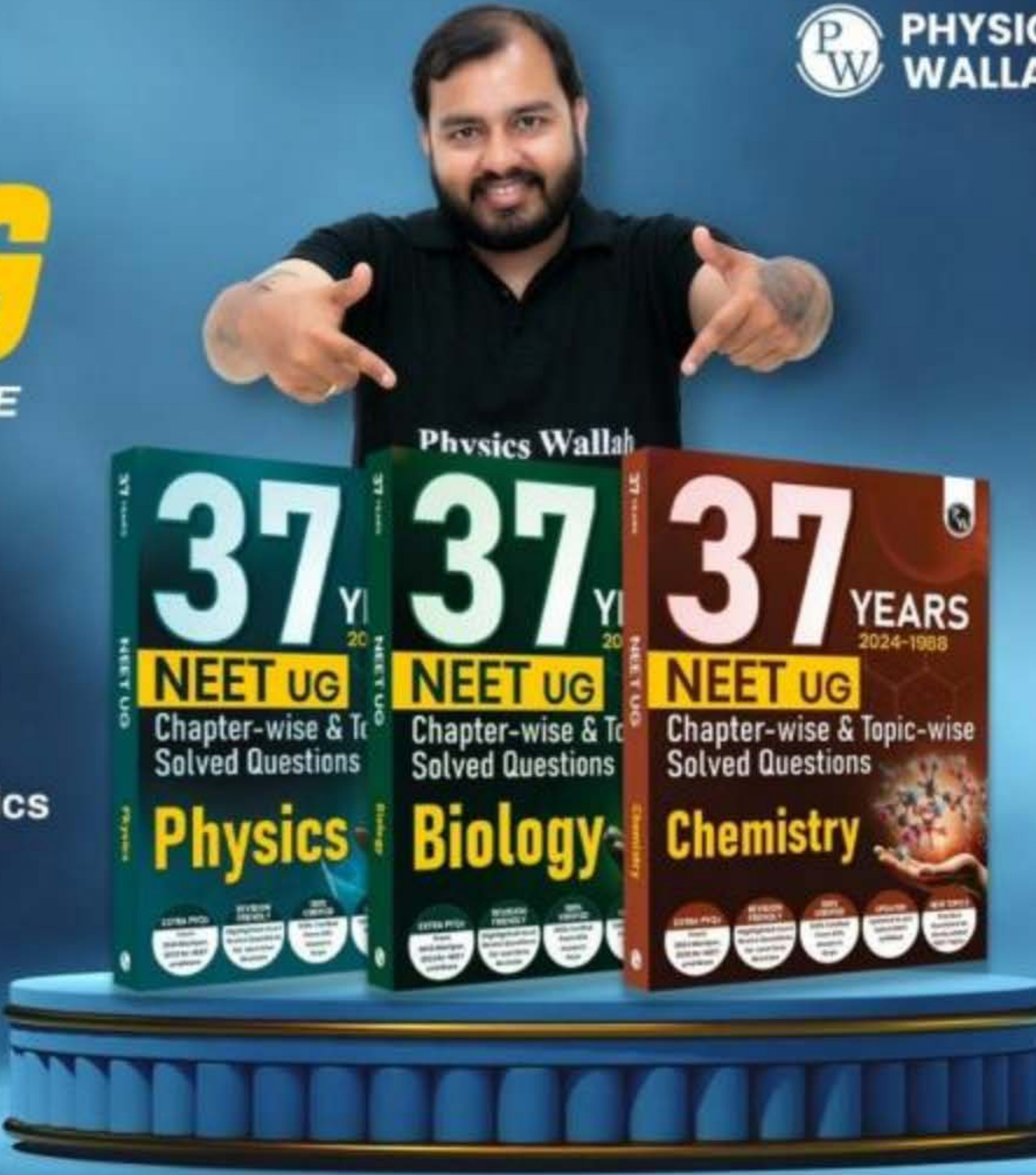
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Thankyou!!

Calculation no. of structural isomers.

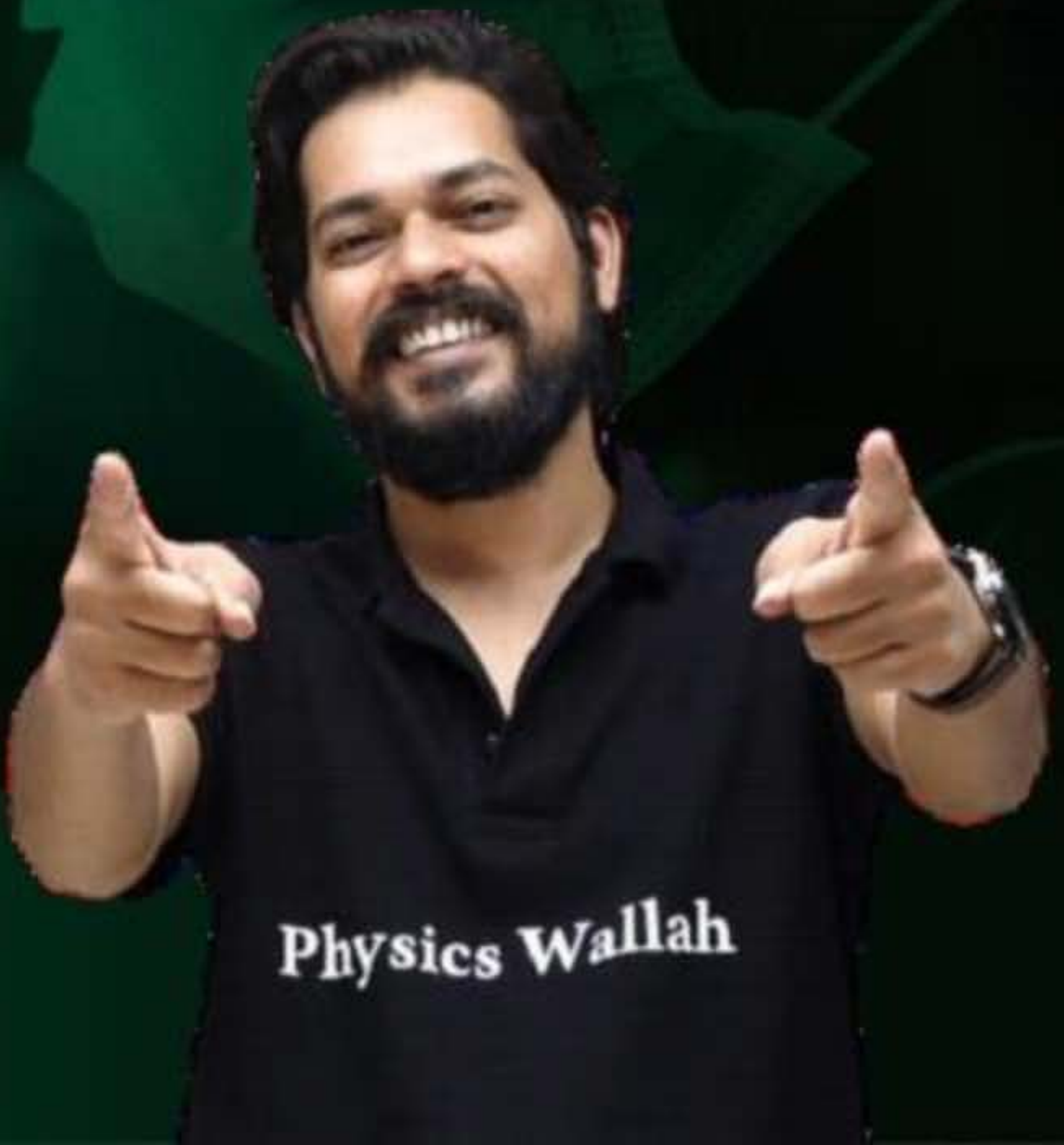
YAKEEN 2.0

FOR NEET 2025

Lecture- 03 | **Organic Chemistry**

Some Basic Principles and Techniques (ISOMERISM)

By- Pankaj Sir(POPU MAMA)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Topics *to be covered*

1. No. of Structural Isomers ✓
2. Practice

Calculation of no. of Structural Isomers

Q. M.F given ✓

$$D.U = (C+1) - \left(\frac{H+X-N}{2}\right)$$

✓ DU = 0 Saare single (No π, No Ring)

✓ DU = 1 1π or 1 Ring

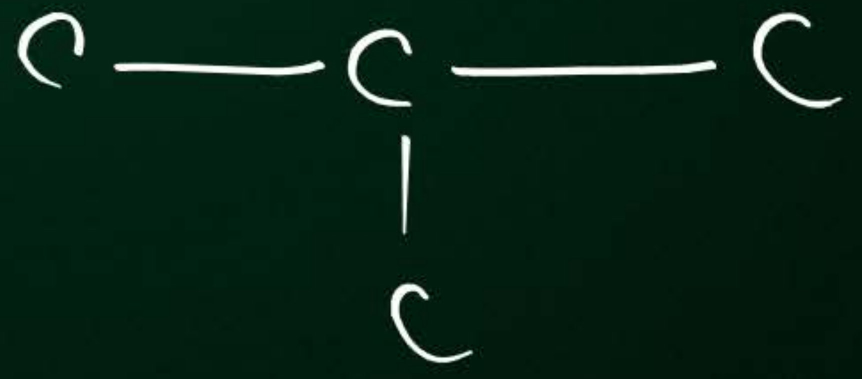
DU = 2 2π or 2 Ring or 1π + 1 Ring

① CH_4 ①

② C_2H_6 $DU = (2+1) - \left(\frac{6+0-0}{2}\right)$
$= 3-3 \neq 0$
$H_3C - CH_3$ ①

③ C_3H_8 $DU = (3+1) - \left(\frac{8+0-0}{2}\right)$
$= 4-4 = 0$
$H_3C - CH_2 - CH_3$ ①

④ C_4H_{10} $DU = (4+1) - \left(\frac{10+0-0}{2}\right)$
$= 5-5 = 0$
$C-C-C-C$ ②

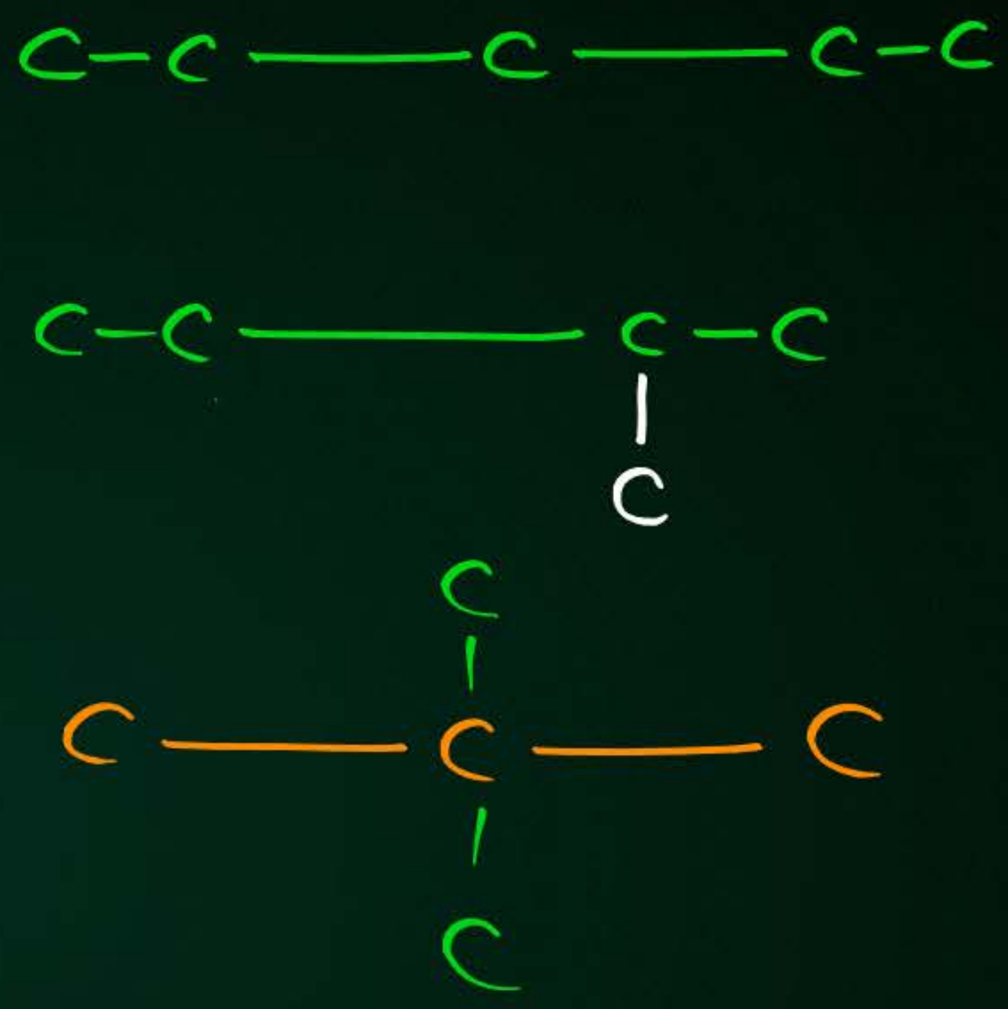


⑤ C_5H_{12} $DU = (5+1) - \left(\frac{12+0-0}{2}\right)$

$= 6-6 = 0$

$$C \longrightarrow -CH_3$$

$$\begin{tikzcd} & -CH_2CH_3 \\ C, C \arrow[ur] \arrow[dr] & \\ & -CH_3, -CH_3 \end{tikzcd}$$



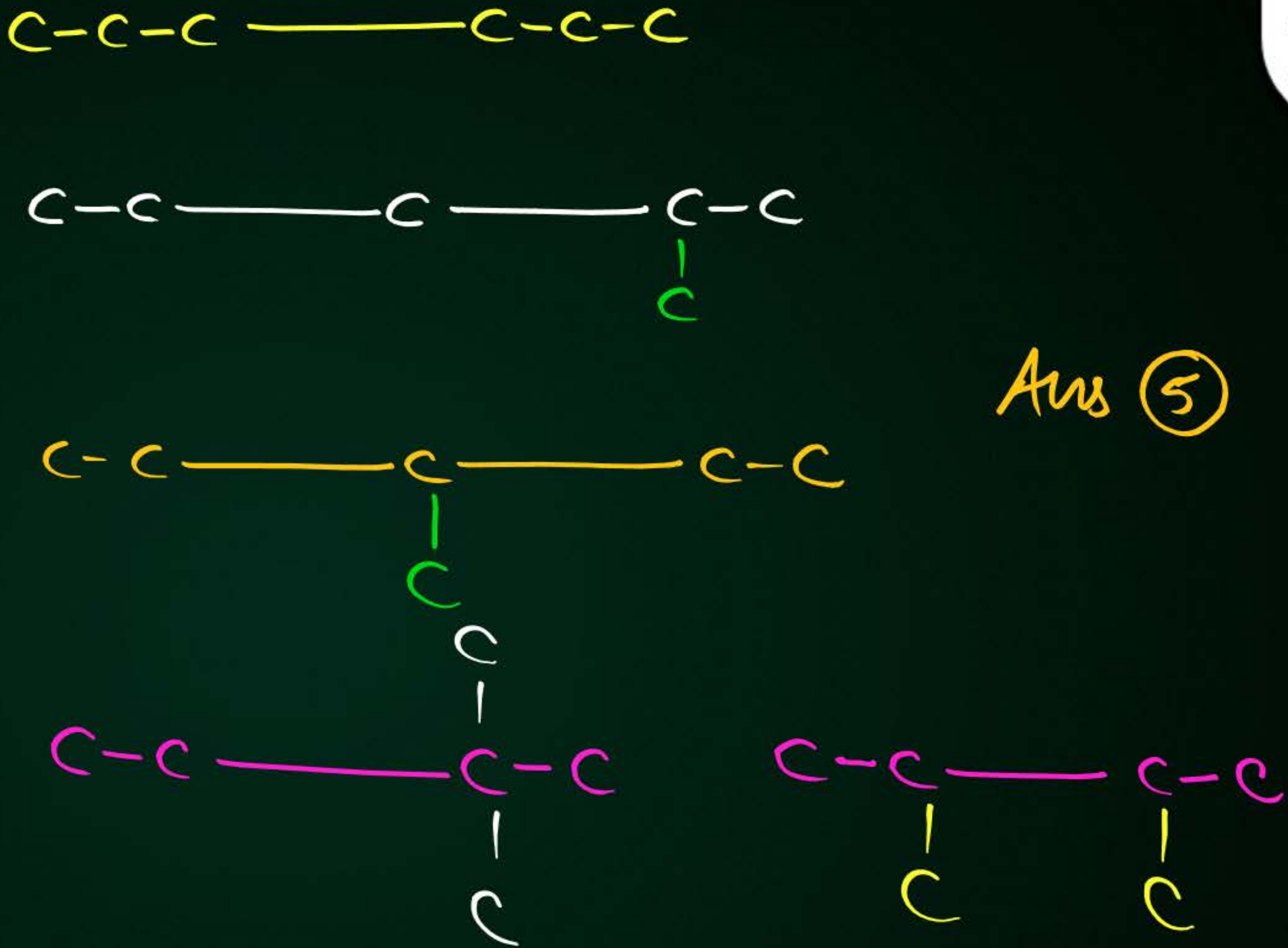
③

⑥ $\boxed{C_6H_{14}}$

$$DU = (6+1) - \left(\frac{14+0-0}{2}\right)$$

$$= 7-7$$

$$= 0$$



Ans ⑤

Total number of open chain structural alkanes

Alkane (C_nH_{2n+2})	isomers
C_1	1
C_2	1
C_3	1
C_4	2*
C_5	3*
C_6	5*
C_7	9*
C_8	18
C_9	35
C_{10}	75

⑦ C_2H_4

$DU = (2+1) - \left(\frac{4+0-0}{2}\right)$

$= 3 - 2 = 1$

↙

1π or 1 Ring ✗

Ring
2 'C' mein
nahi
hogi

$C=C$ ①

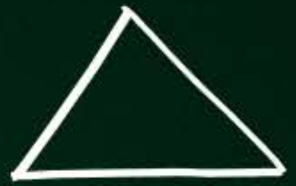
⑧ C_3H_6

$DU = (3+1) - \left(\frac{6+0-0}{2}\right)$

$= 4 - 3$

$= 1$

$C-C=C$



Ans ②

⑨ C_4H_8

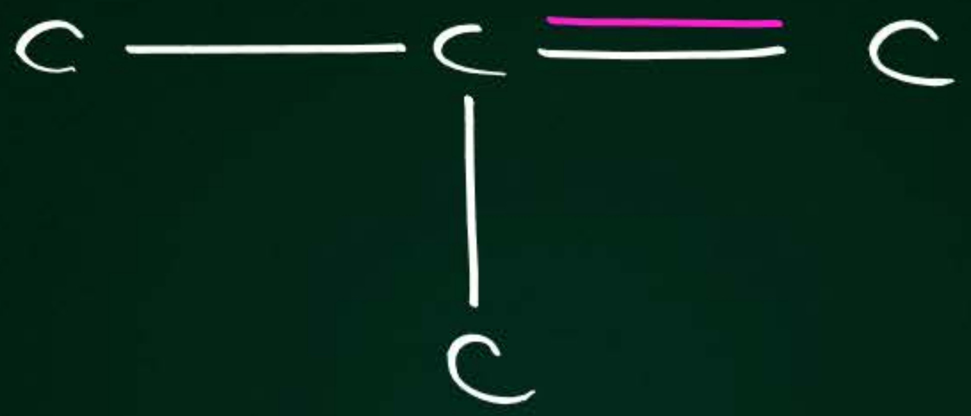
$DU = (4+1) - \left(\frac{8+0-0}{2}\right)$

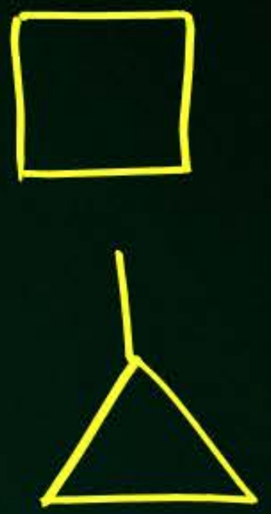
$= 5-4$

$= 1$

C–C——C=C

C–C══C–C





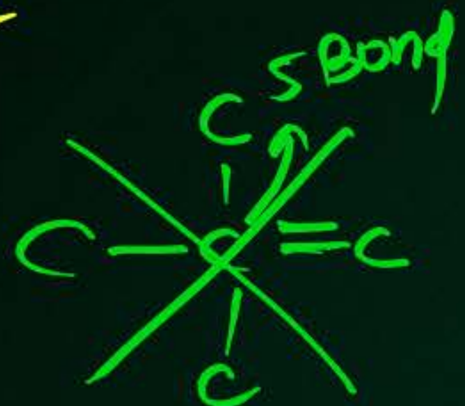
Ans ⑤

⑩ C_5H_{10}

$DU = (5+1) - \left(\frac{10+0-0}{2}\right)$

$= 6-5$

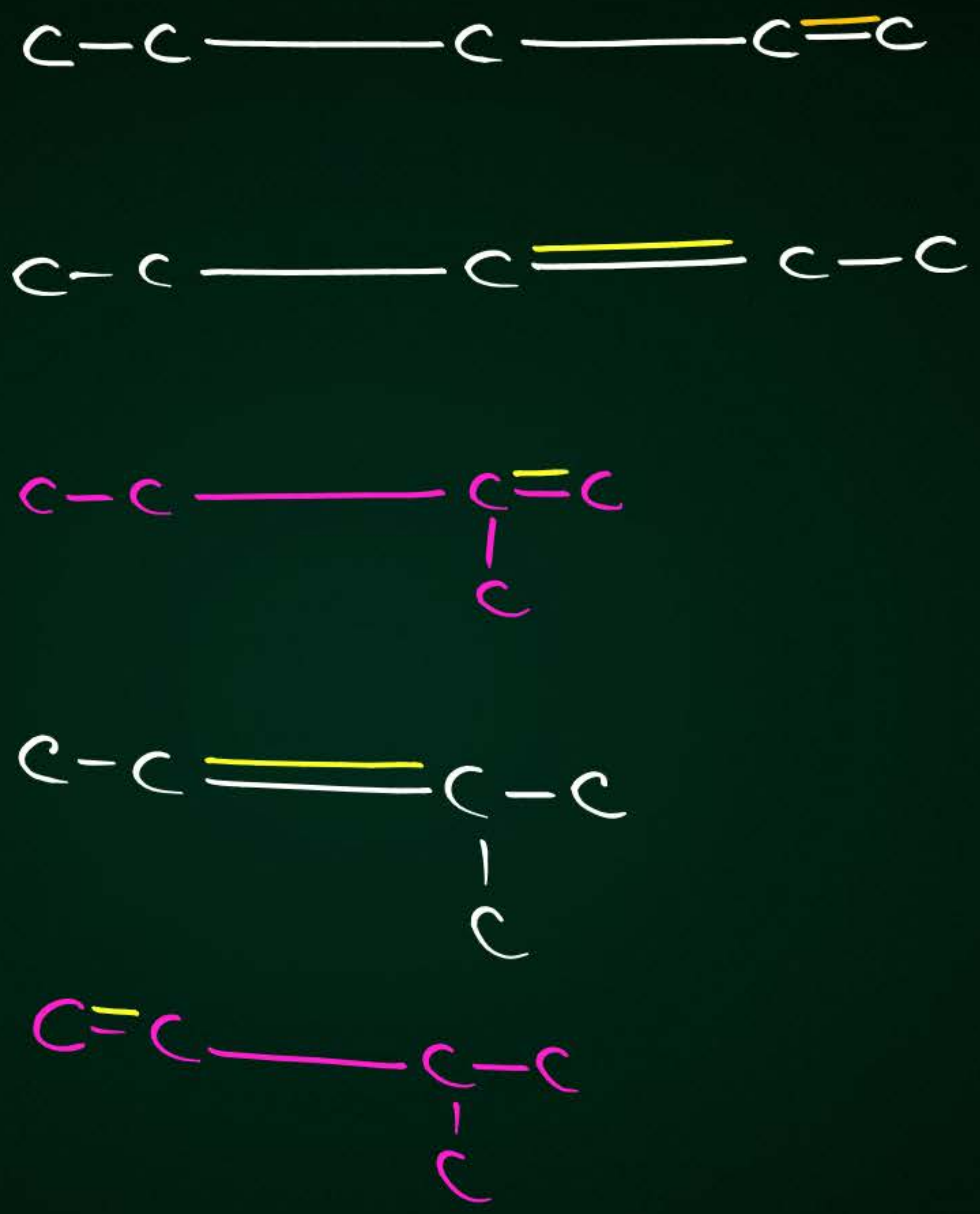
$= 1$

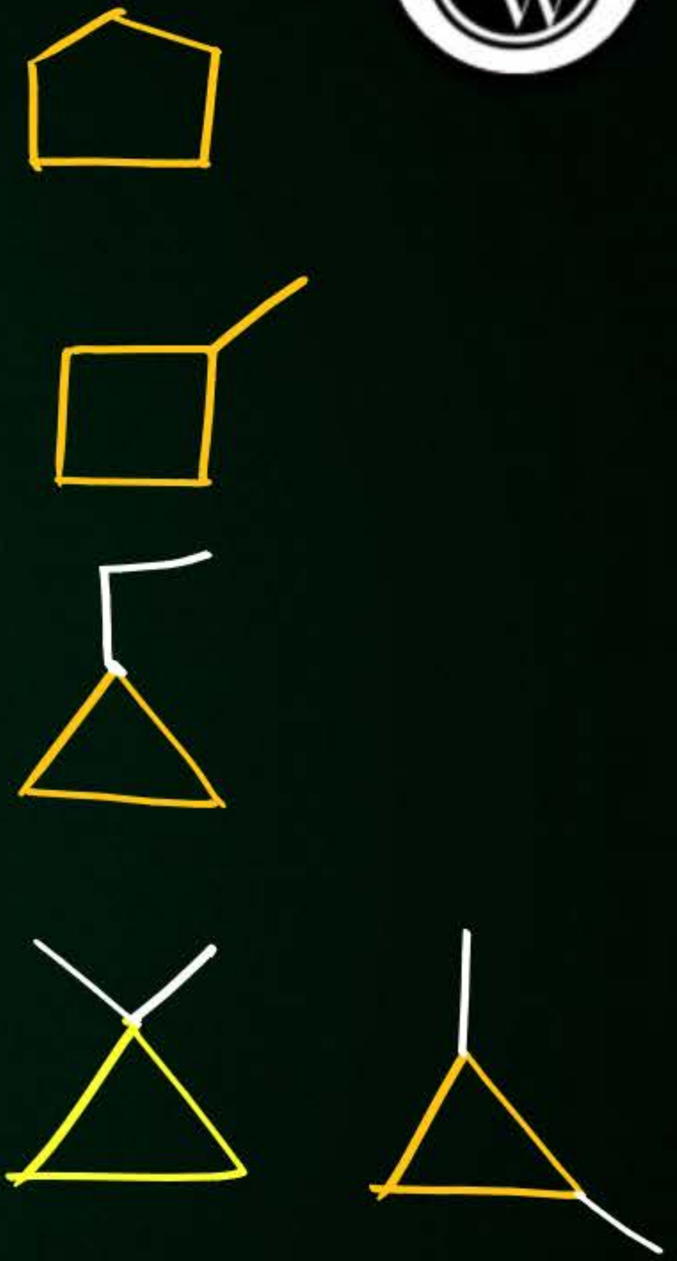


$2C \rightarrow 1Et$

$2C \rightarrow 2Me$

Ans: ⑩





C_nH_{2n} (Alkene cycloalkane)	Total struc isomer
C_2H_4	1
C_3H_6	2 *
C_4H_8	5 * ✓
C_5H_{10}	10 * ✓

Q. Total structural alkynes possible for

① C_3H_4

$C-C\equiv C$

Ans ①

$DU = (3+1) - \left(\frac{4+0-0}{2}\right)$

$= 4-2$

$= 2$

② C_4H_6

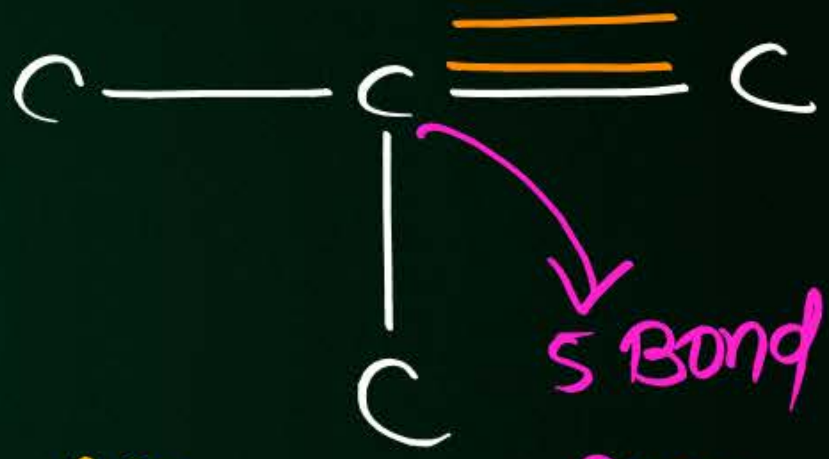
$DU = (4+1) - \left(\frac{6+0-0}{2}\right)$

$= 5-3$

$= 2$

$C-C-C\equiv C$

$C-C\equiv C-C$



क्रिमीभोजनम

PHK

DKHK

③ C_5H_8

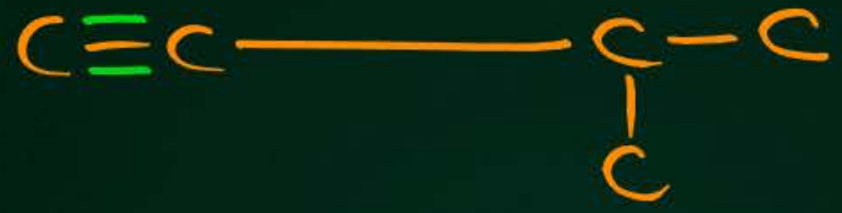
$DU = (5+1) - \left(\frac{8+0-0}{2}\right)$

$= 6-4$

$= 2$

$C-C-C-C\equiv C$

$C-C-C\equiv C-C$

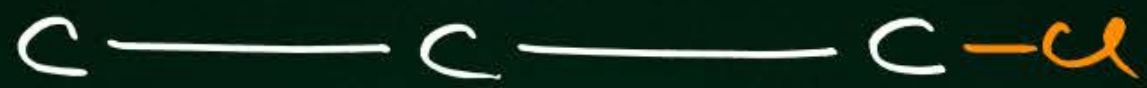


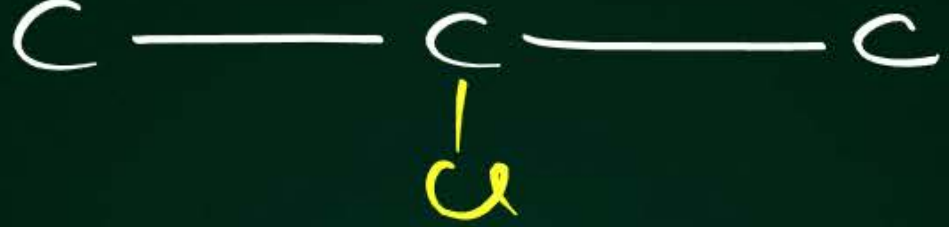
$C\equiv C-\underset{\displaystyle C}{\underset{|}{C}}-C$

Ans ③

Q Total no. of structural isomers of

① C_3H_7Cl





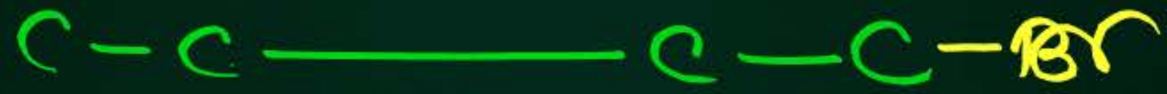
$DU = (3+1) - \left(\frac{7+1-0}{2}\right)$

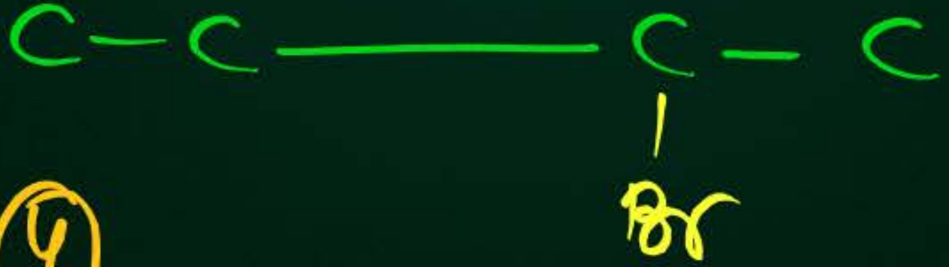
$= 4-4$

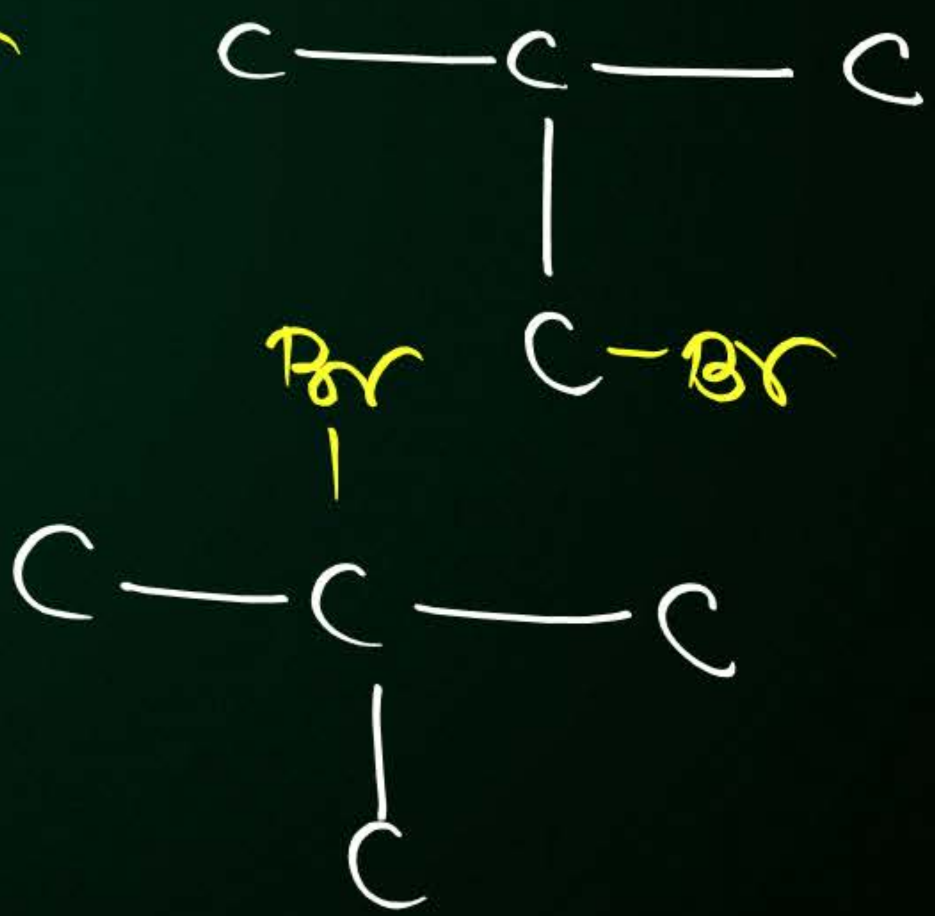
$= 0$

② C_4H_9Br

$DU = 0$







Ans ④

③ $C_3H_6Cl_2$

$DU = (3+1) - \left(\frac{6+2-0}{2}\right)$

$= 4-4$

$= 0$

$\overset{1}{C} - \overset{2}{C} - \overset{3}{C}$

✓(1,1)
✓(1,2)
✓(1,3)
✓(2,2)

~~(2,3 = 1,2~~
~~3,3 = 1,1)~~

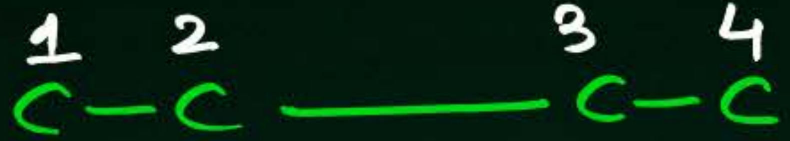
Ans ④

(4) $C_4H_8Br_2$

$DU = (4+1) - \left(\frac{8+2-0}{2}\right)$

$= 5-5$

$= 0$



(1,1) ✓

(1,2) ✓

(1,3) ✓

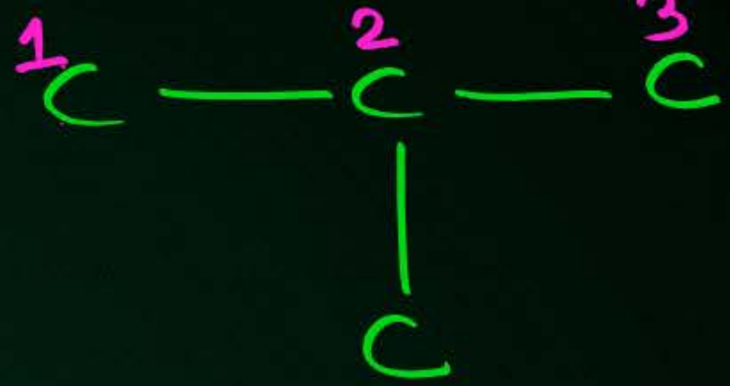
(1,4) ✓

(2,2) ✓

(2,3) ✓

1 = 4

2 = 3



✓ 1,1

✓ 1,2

✓ 1,3

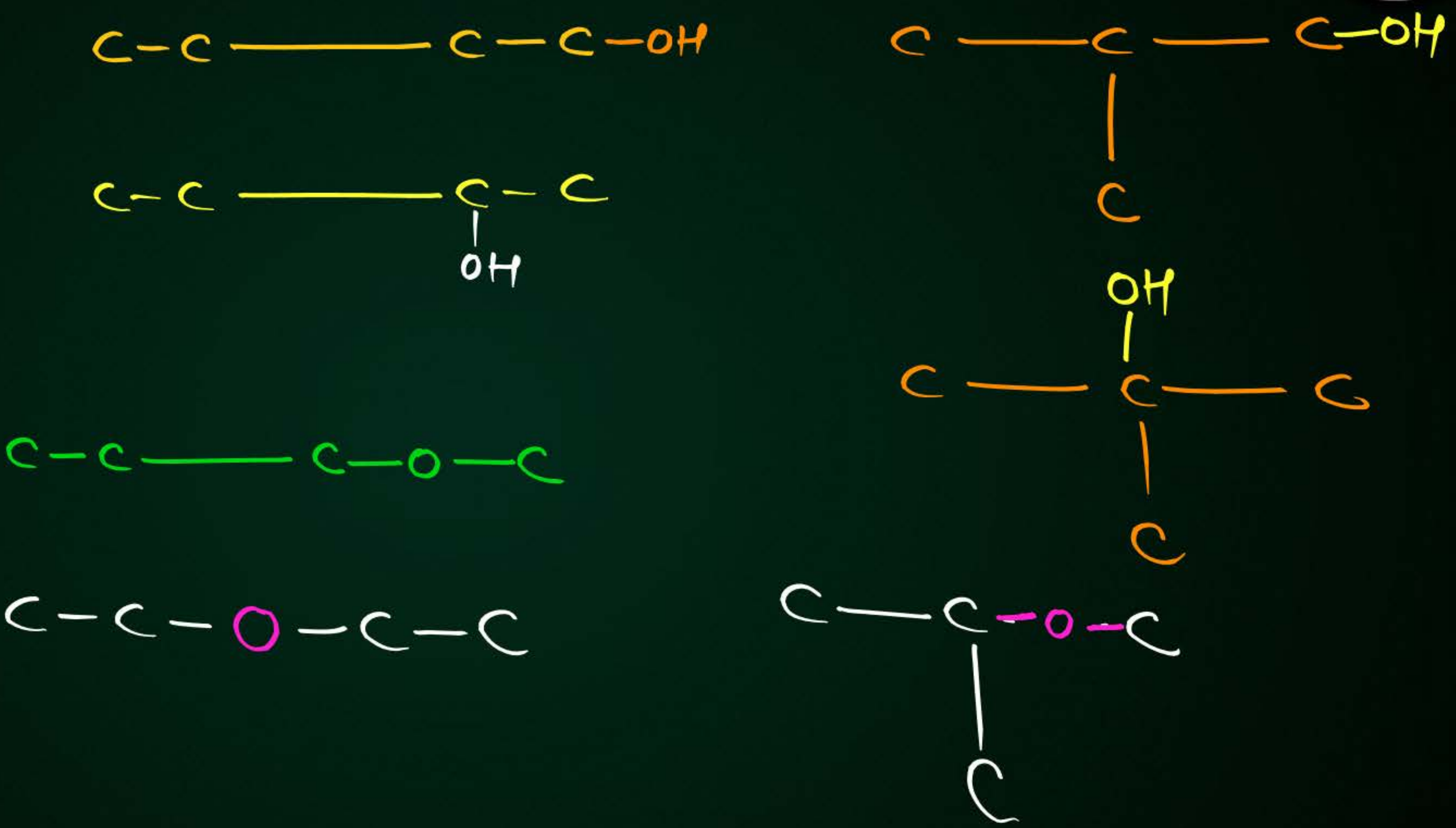
Ans: ⑨

Q. Total number of structural isomers

1) $C_4H_{10}O$

$$DU = (4+1) - \left(\frac{10+0-0}{2}\right)$$
$$= 5-5$$
$$= 0$$

Ans ⑦



C−C——C−C−OH
C——C——C−OH
C
C−C——C−C
OH
OH
C——C——C
C
C−C——C−O−C
C−C−O−C−C
C——C−O−C
C

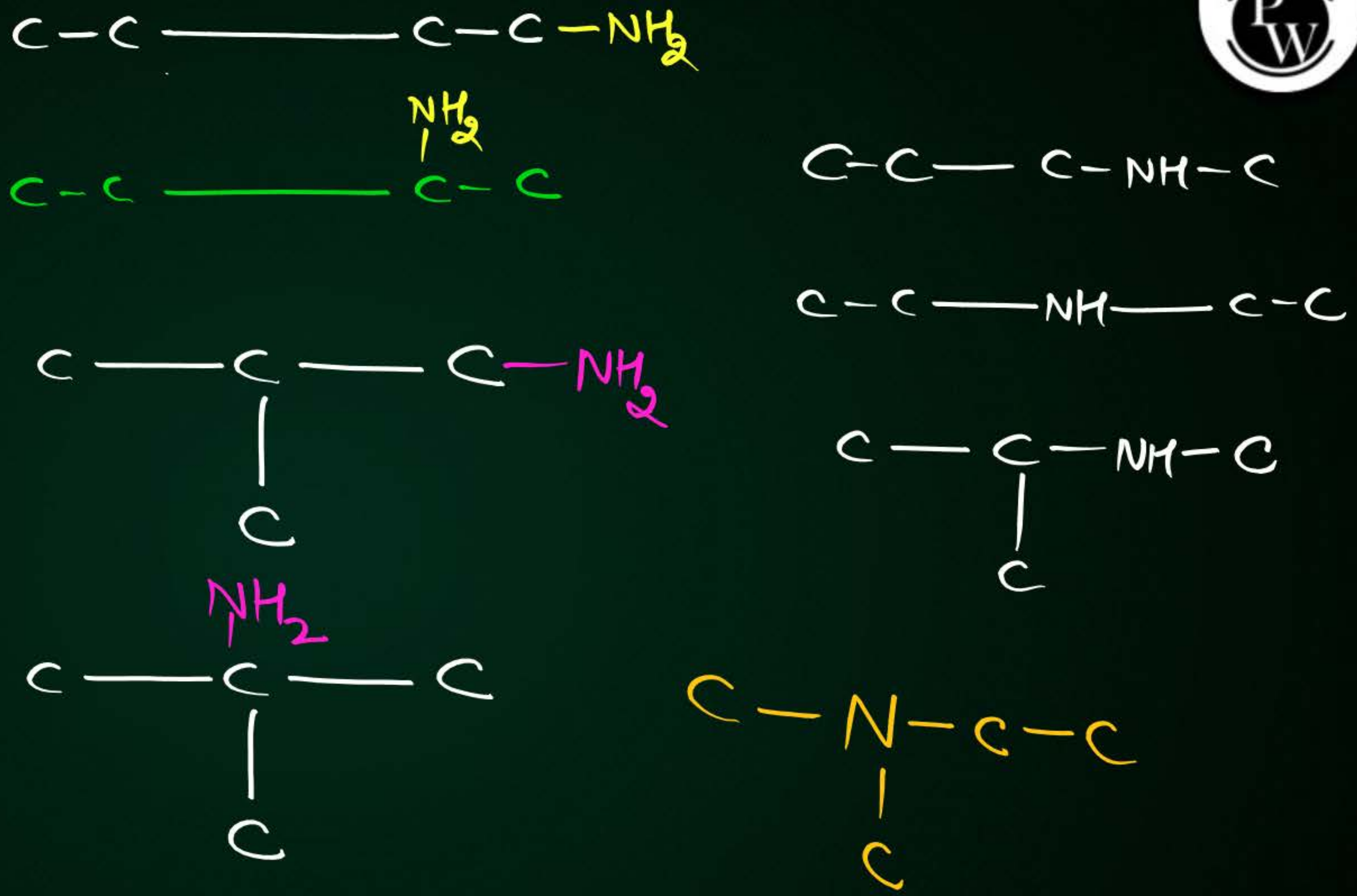
② $C_4H_{11}N$

$$DU = (4+1) - \left(\frac{11+0-1}{2}\right)$$

$$= 5 - 5$$

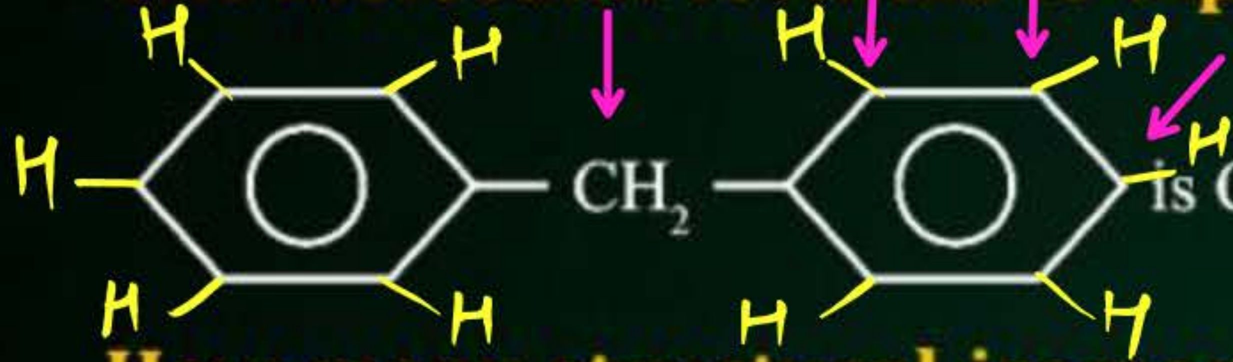
$$= 0$$

Ans :- 8



QUESTION (AIIMS 2014)

The molecular formula fo diphenylmethane, is $C_{13}H_{12}$



How many structural isomers are possible when one of the hydrogen is replaced by a chlorine atom?

A 6

[✓ B 4]

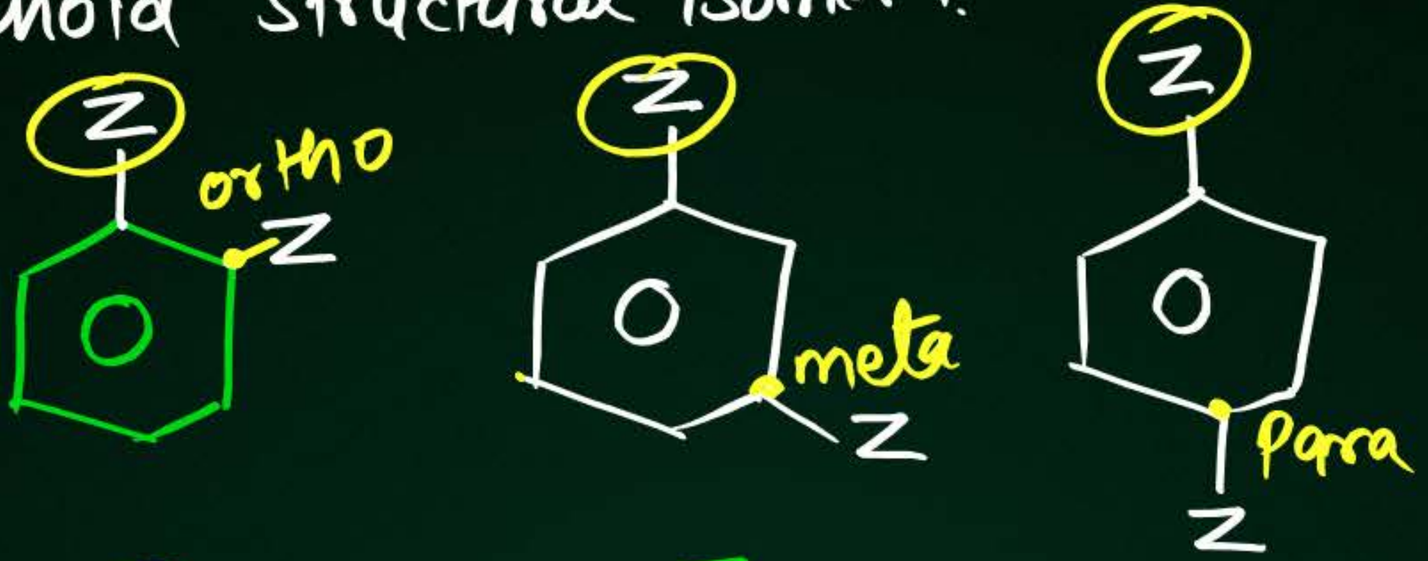
C 8

D 7

Q Total no. of Benzenoid structural isomer?

① $C_6H_4Z_2$

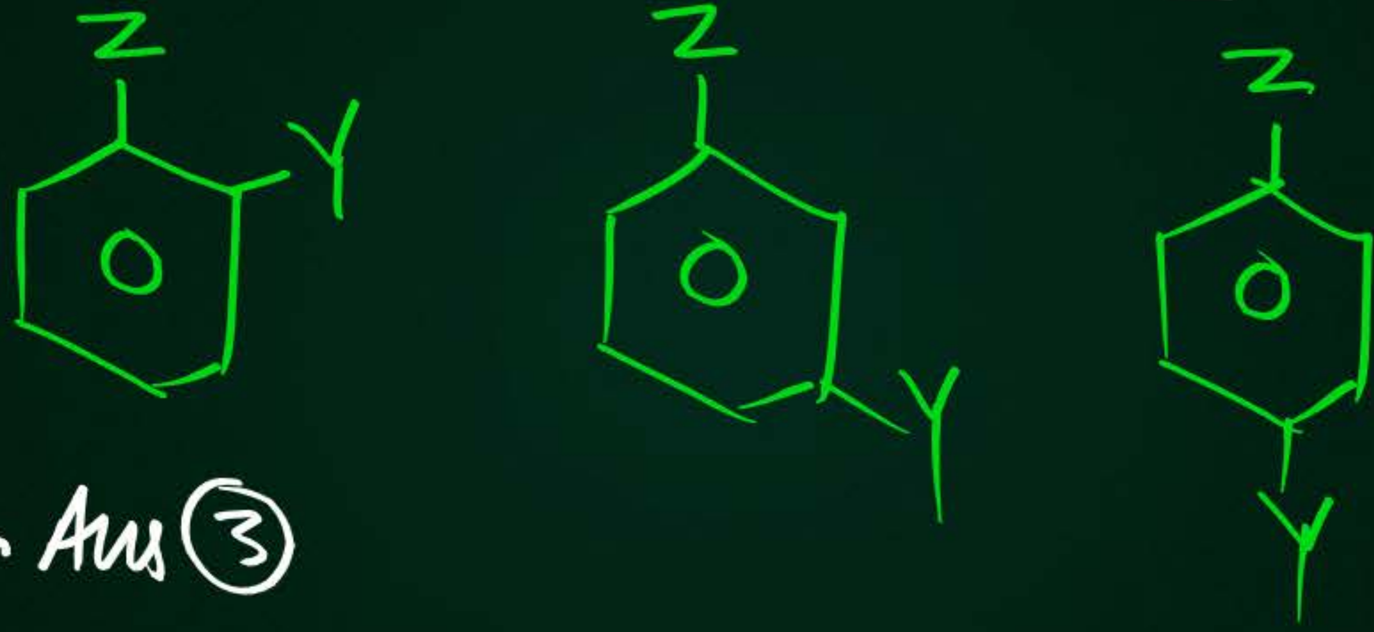
DU = ④



Z
ortho
Z
Z
meta
Z
Z
para
Z

Ans ③

② C_6H_4YZ

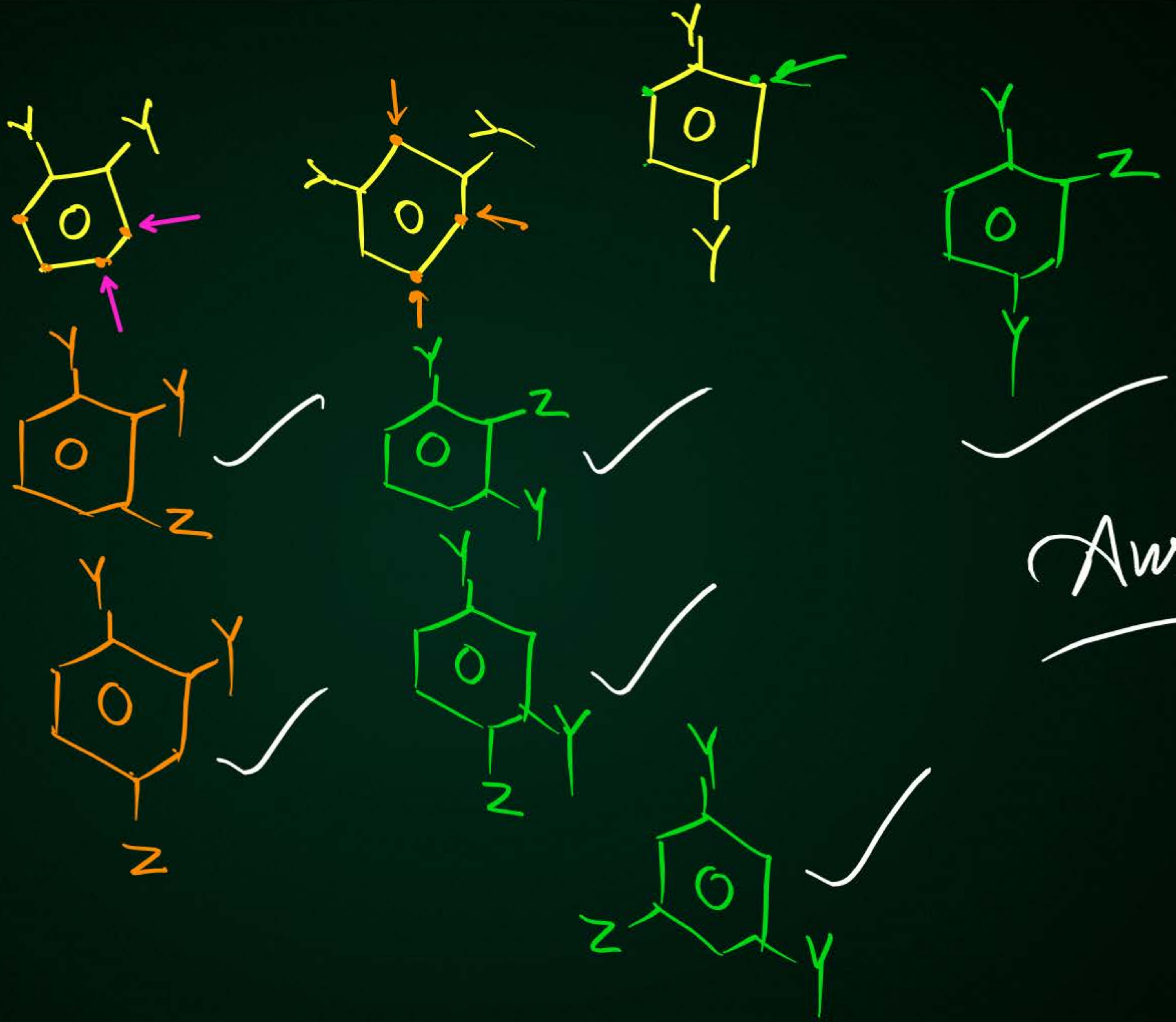


Ans ③

Exp:- $C_6H_4BrCl \longrightarrow$ Ans ③

$C_6H_4(COOH)_2 \longrightarrow$ Ans ③

③ $C_6H_3Y_2Z$



Ans ⑥

Total number of benzenoid isomers

Ans

① $C_6H_4X_2 \longrightarrow 3$

② $C_6H_4XY \longrightarrow 3$

③ $C_6H_3X_3 \longrightarrow 3$

④ $C_6H_3X_2Y \longrightarrow 6$

⑤ $C_6H_3XYZ \longrightarrow 10$

QUESTION

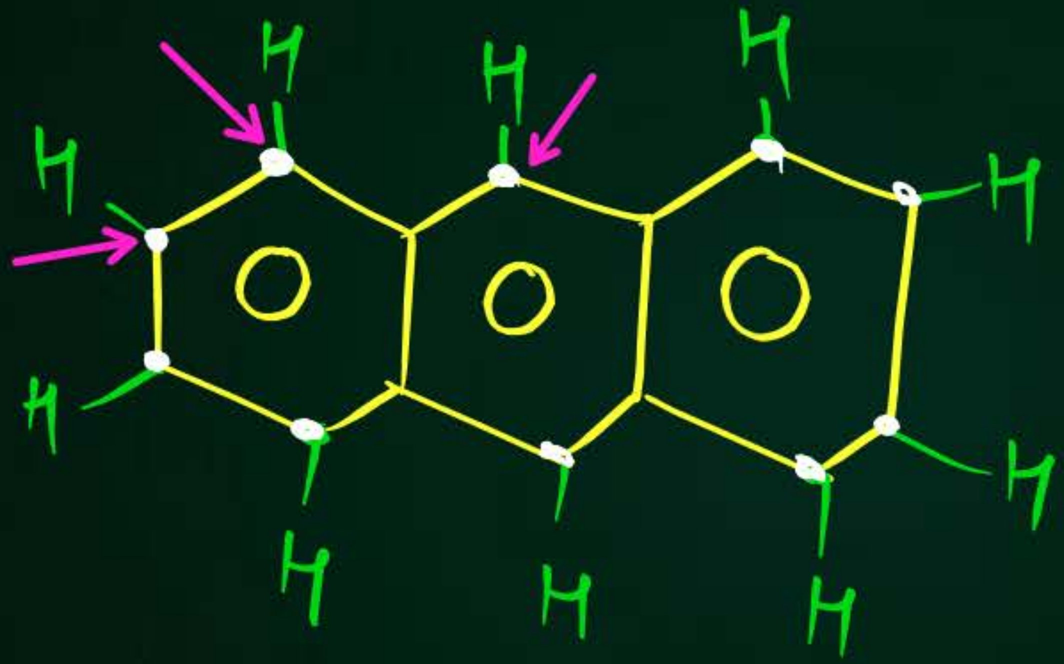
How many structural isomers are possible when one of the hydrogen is replaced by a chlorine atom in anthracene?

[✓ A] 3

B 7

C 4

D 6



Home Work

QUESTION 01

How many acids and esters are possible for the compound with molecular formula $C_4H_8O_2$?

- A Two acids + Two esters
- B Two acids + Four esters
- C Four acids + Two esters
- D Three acids + Three esters

QUESTION 02

Match the Column : [X = Cl, Y = Br, Z = F]

Column-I Molecular Formula		Column-II No. of Benzenoid isomers	
(A)	$C_6H_2X_4$	(p)	3
(B)	C_6H_4XY	(q)	6
(C)	C_6H_3XYZ	(r)	10
(D)	$C_6H_3X_2Y$	(s)	12

QUESTION 03

Total number of benzene derivatives with the molecular formula $C_6H_3Cl_3$.

- (A) 2
- (B) 3
- (C) 4
- (D) 5

QUESTION 04

The total number of structural non-cyclic isomers formed by C_5H_{10} is______.

- Ⓐ 2
- Ⓑ 3
- Ⓒ 4
- Ⓓ 5

QUESTION 05

The total number of structural isomers of a disubstituted benzene compound ______.

Ⓐ 2

Ⓑ 3

Ⓒ 4

Ⓓ 5

QUESTION 06

How many total structural isomers can be formed from $C_4H_8Br_2$?

Ⓐ 7

Ⓑ 8

Ⓒ 9

Ⓓ 10

QUESTION 07

How many aldehydes are structural isomers with the formula $C_6H_{12}O$?

- A 6
- B 7
- C 8
- D 9

QUESTION 08

The number of alkynes possible with molecular formula C_5H_8 is:

- (A) 2
- (B) 3
- (C) 4
- (D) 5

QUESTION 09

Total number of 2° amine isomers of $C_4H_{11}N$ would be (only structural)

A 1

B 2

C 3

D 4

QUESTION 10

How many structural isomers of all the tertiary alcohols with molecular formula $C_6H_{14}O$?

(A) 2

(B) 3

(C) 4

(D) 5

ANSWER KEY

1. B
2. A-p; B-p; C-r, D-q
3. B
4. D
5. B
6. C
7. C
8. B
9. C
10. B

Home Work From PW Module (Yakeen NEET)

Prarambh: Q 74, 76, 82, 84, 85, 87, 92, 93, 94

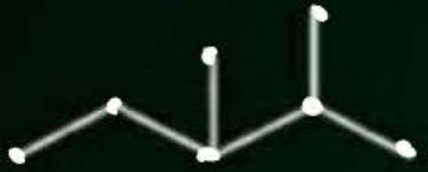
Home work

Discussion of L-01

QUESTION

Select the pair of chain isomers among the following:

(i)



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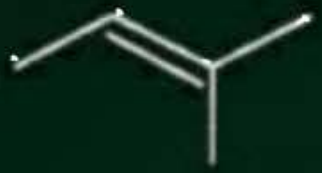

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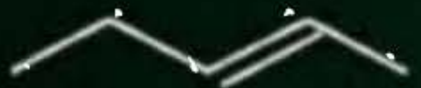

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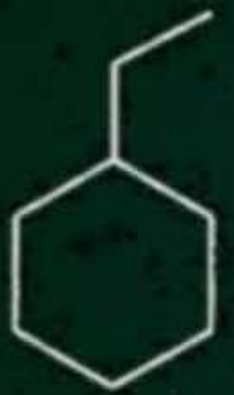

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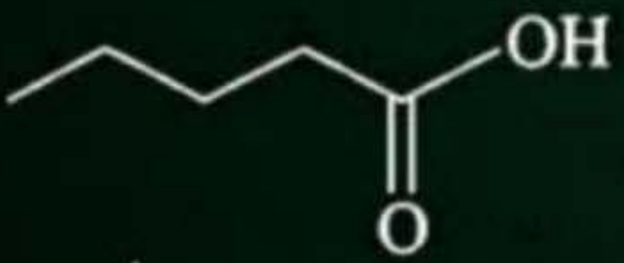

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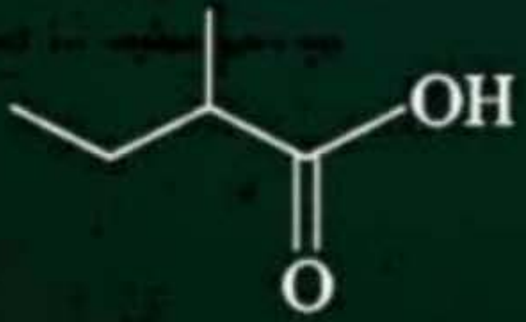
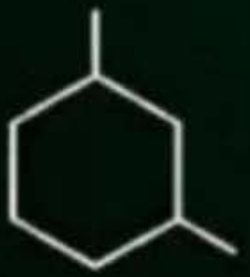
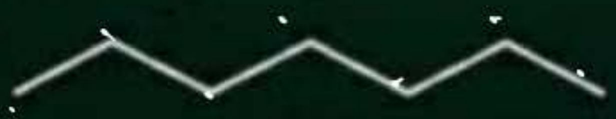


(vii)

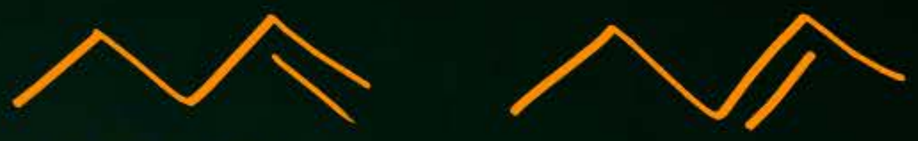


(viii)



(i, viii)
(ii, iii)
(iv, vii)
(v, vi)

QUESTION (NCERT Exemplar)



Assertion (A): Pent-1-ene and pent-2-ene are position isomers. ✓

Reason (R): Position isomers differ in the position of functional group or a substituent.

[✓ A] Both A and R are correct and R is the correct explanation of A.

B Both A and R are correct but R is not the correct explanation of A.

C Both A and R are not correct.

D A is not correct but R is correct.

QUESTION

Compounds having same number and kind of atoms but different arrangement of atoms in their molecules are called:

Ⓐ allotropes

Ⓑ isotopes

Ⓒ [✓ isomers]

Ⓓ polymers

QUESTION

Isomers have essentially identical:

Ⓐ structural formula

Ⓑ chemical properties

[✓ Ⓒ molecular formula]

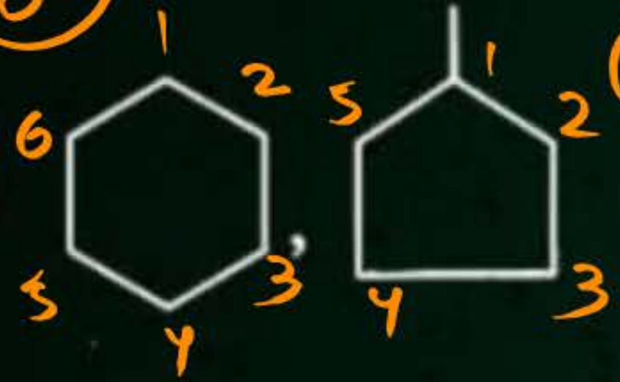
Ⓓ physical properties

QUESTION

What is the relation between following compounds?

(60)

A

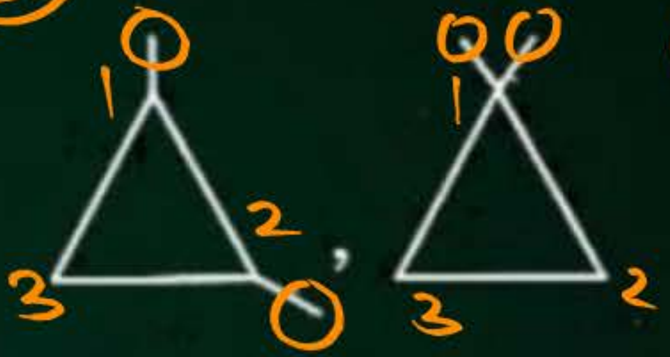

1
2
3
4
5
6
1
2
3
4
5

(51)

C.I

㉜

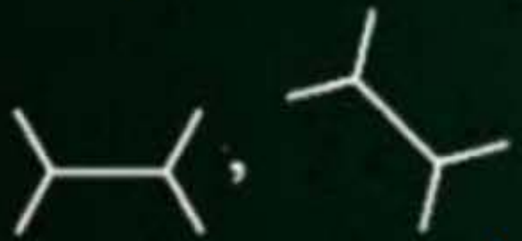
B



㉜

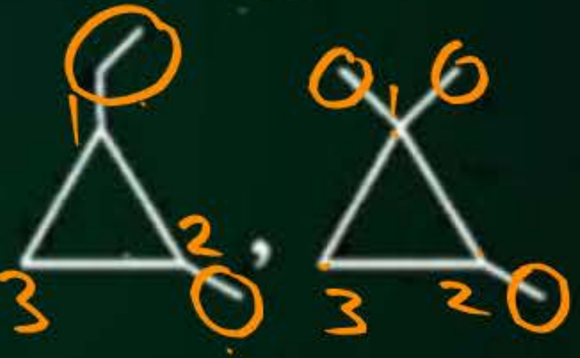
P.I

C



identical

D



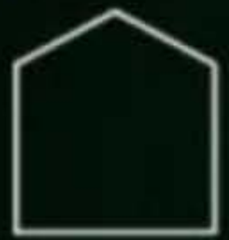
C.I

㉜ ㉝

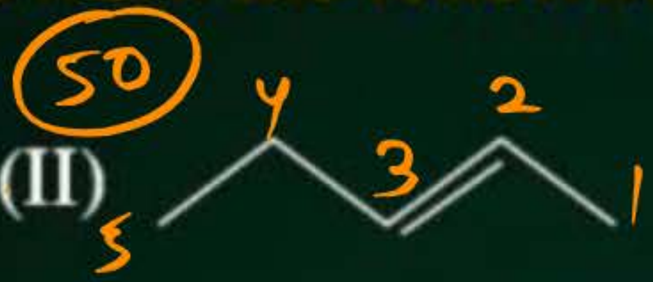
QUESTION

Select pair of chain isomers from the following

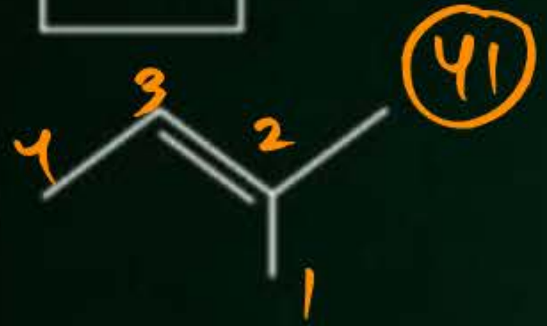
(I)



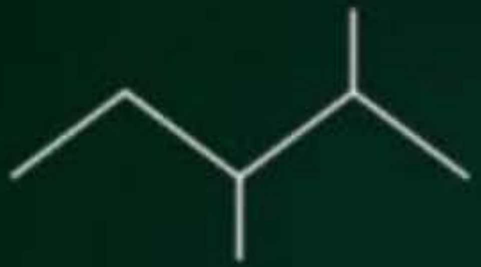
(II)



(III)



(IV)

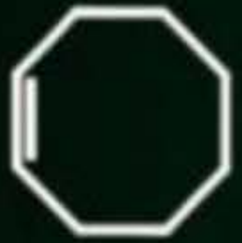


- A I and II
- B II and IV
- C I and IV
- [✓ D] II and III

QUESTION

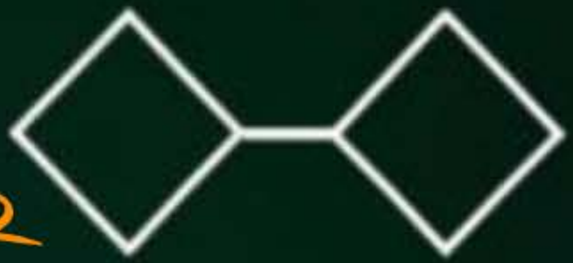
Which one of the following compound is not isomer of others?

A



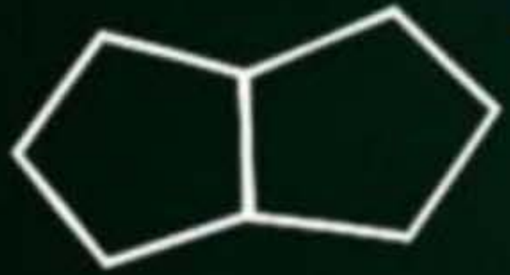
DU=2

B



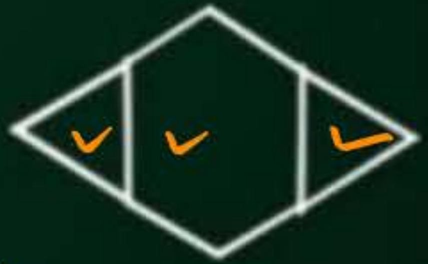
DU=2

C



DU=2

✓ **D**

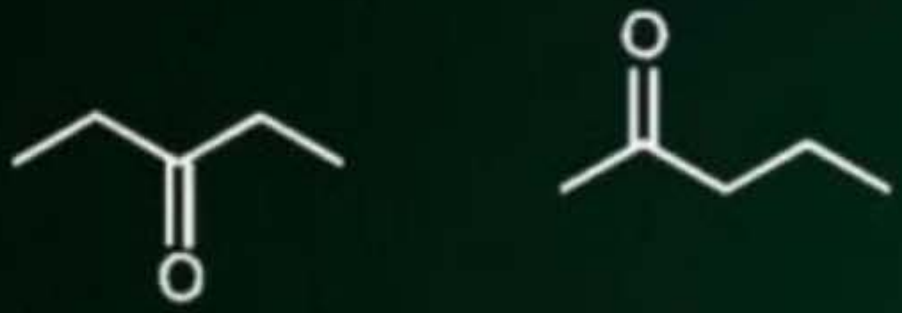


DU=3

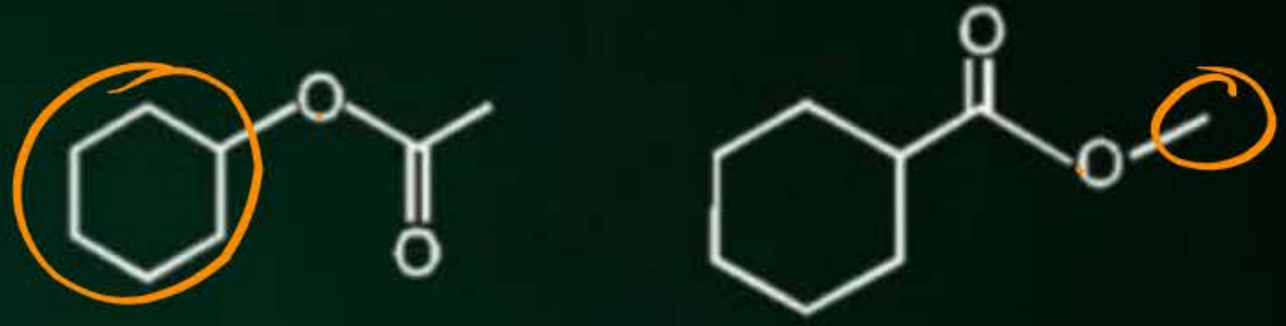
QUESTION

Which of the following pair is identical?

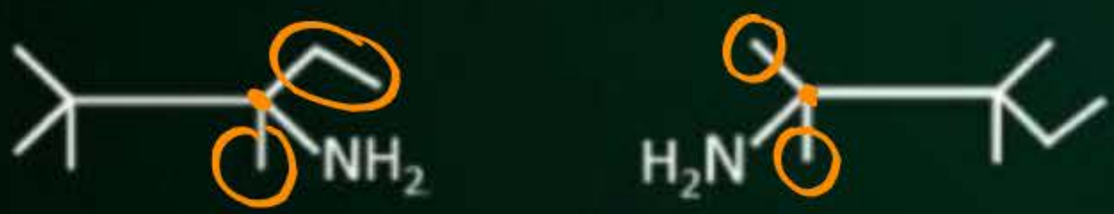
A ✗



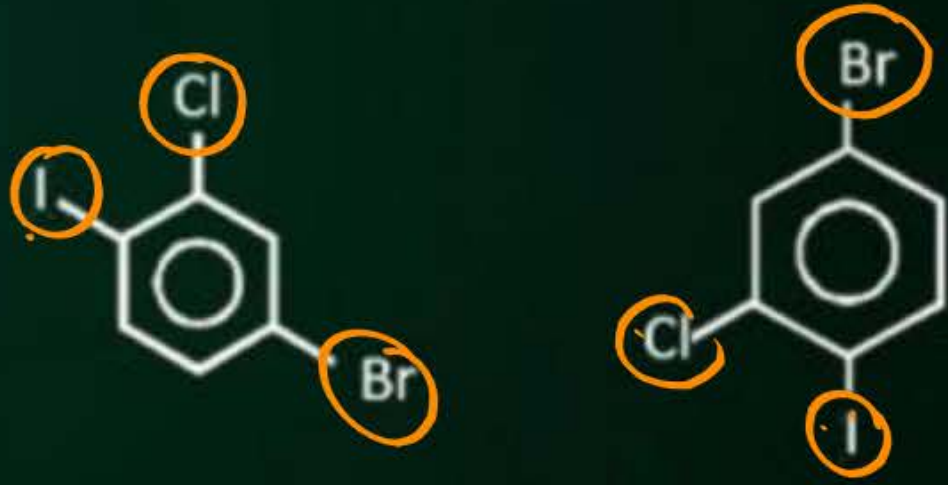
B ✗



C ✗



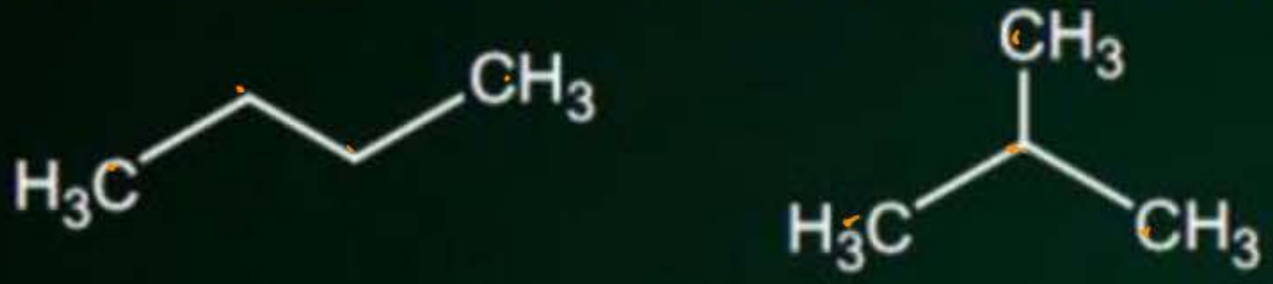
[✓ **D**]


Cl
I
Br
Br
Cl
I

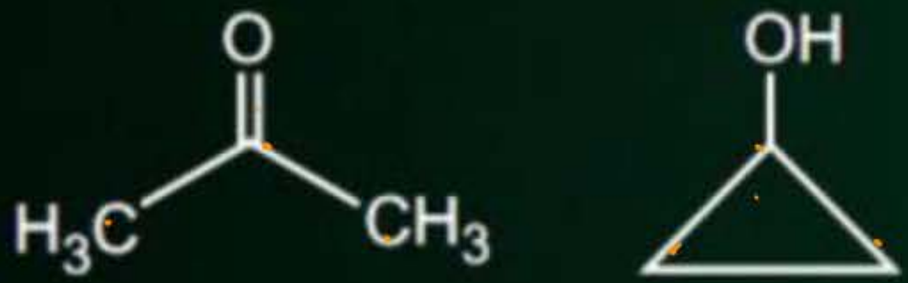
QUESTION

Which of the following pairs of molecules are NOT structural isomers ?

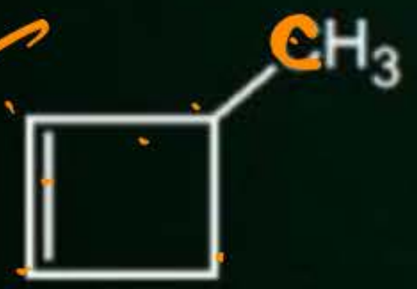
A



B

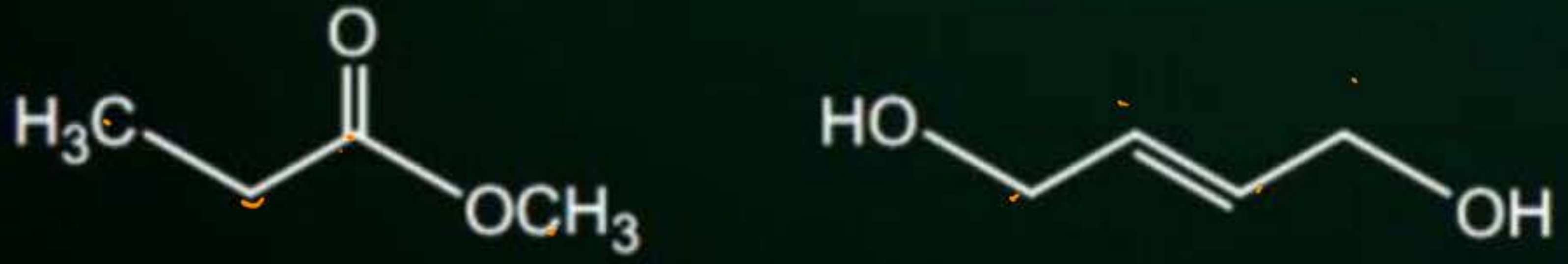


C



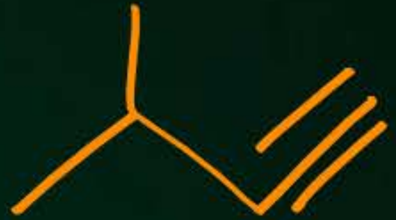
$H_3C-C\equiv C-CH_3$

D

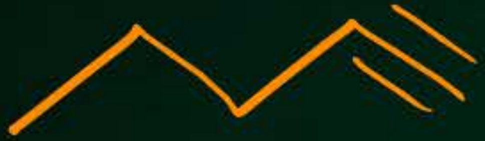


QUESTION [illegible]

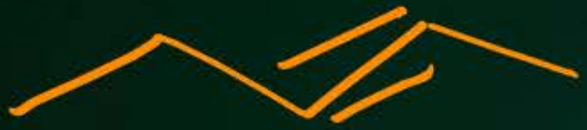
Which one of the following is not an isomer of 3-methyl but-1-yne?



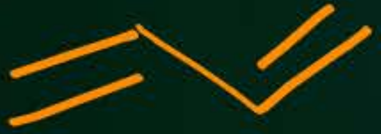
A Pent-1-yne



B Pent-2-yne



[✓ C] Buta-1,3-diene

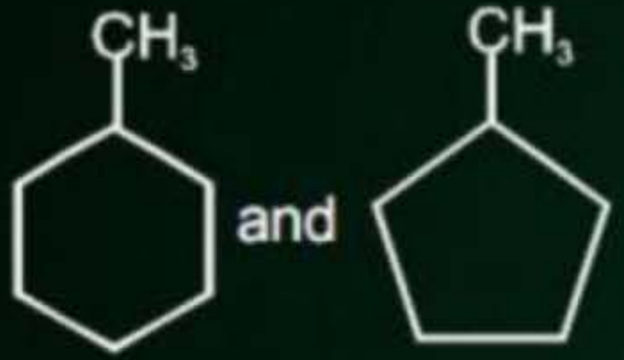


D Penta-1, 3-diene

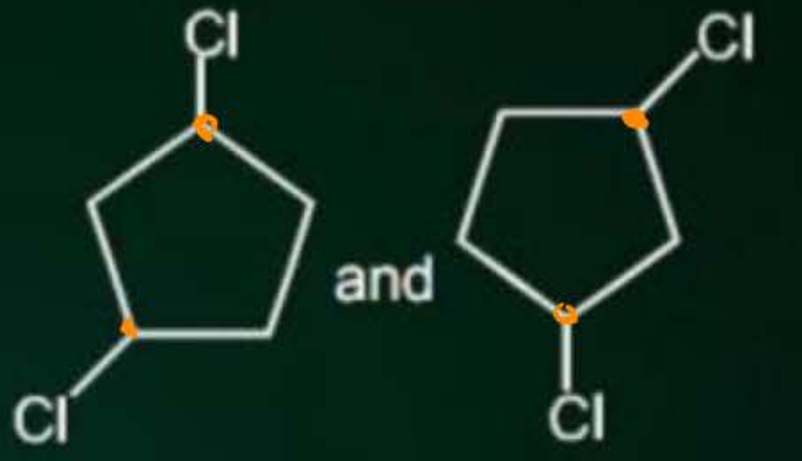
QUESTION [redacted]

Which of the following is a pair of structural isomers?

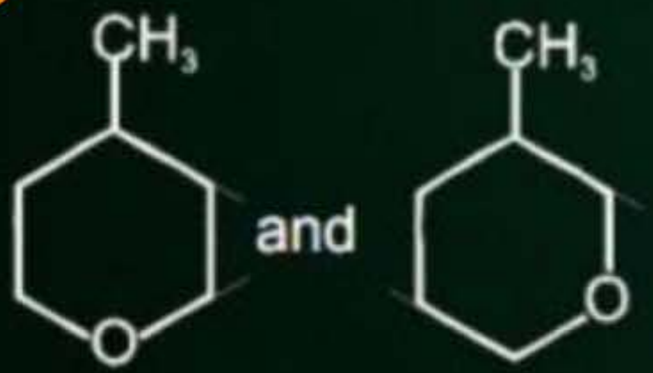
(A)



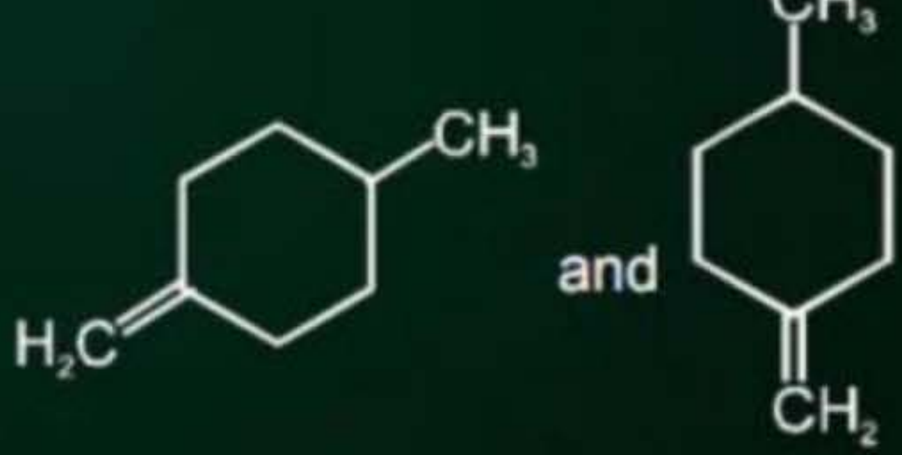
(B)


Cl
Cl
and
Cl
Cl

[✓ (C)]


CH_3
O
and
CH_3
O

(D)


CH_3
H_2C
and
CH_3
CH_2

Home Work

discussion-L-02

QUESTION 01

$\underline{CH_3CH_2OH}$ and $\underline{CH_3—O—}CH_3$ are the examples of:

[✓ A] Functional isomerism

B Chain isomerism

C Metamerism

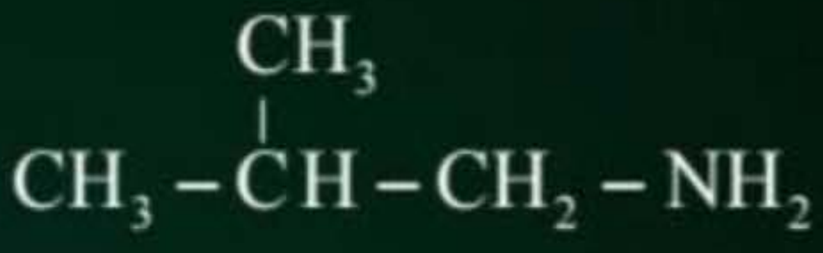
D Position isomerism

QUESTION 02

Which one of the following is a functional isomer of $CH_3-CH_2-\overset{1^\circ}{CH_2}-CH_2-NH_2$?

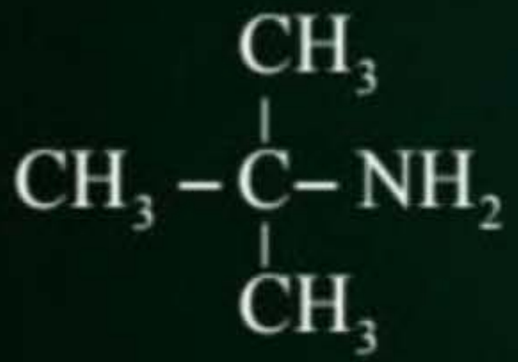
[✓ A] $CH_3-CH_2-\overset{2^\circ}{NH}-CH_2-CH_3$

B ✗



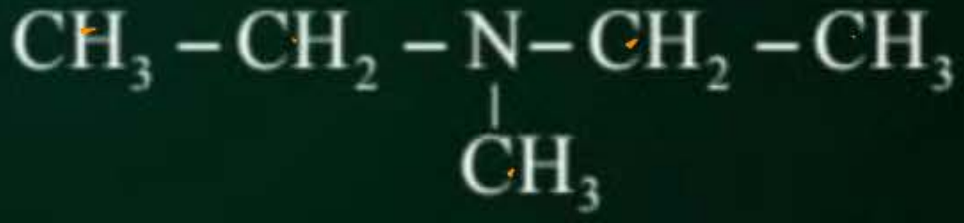
$CH_3-\overset{\overset{CH_3}{|}}{C}H-CH_2-NH_2$

C ✗



$CH_3-\underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}}-NH_2$

D

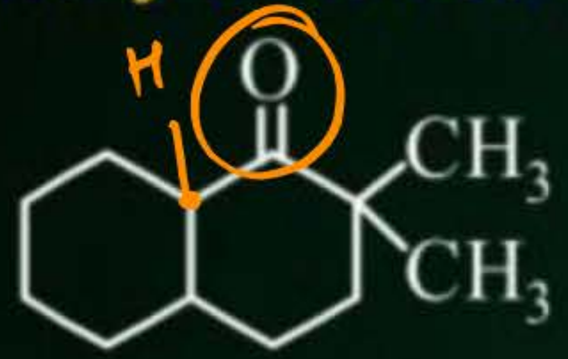


$CH_3-CH_2-\underset{\underset{CH_3}{|}}{N}-CH_2-CH_3$

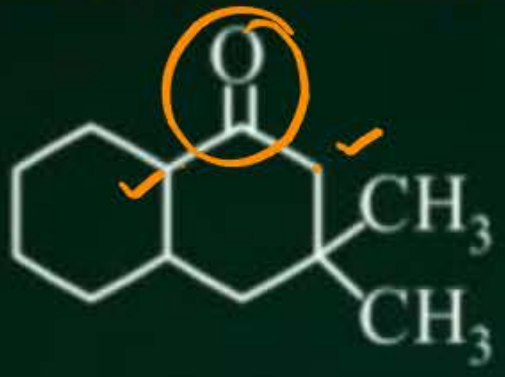
QUESTION 03

Identify which can exhibit tautomerism?

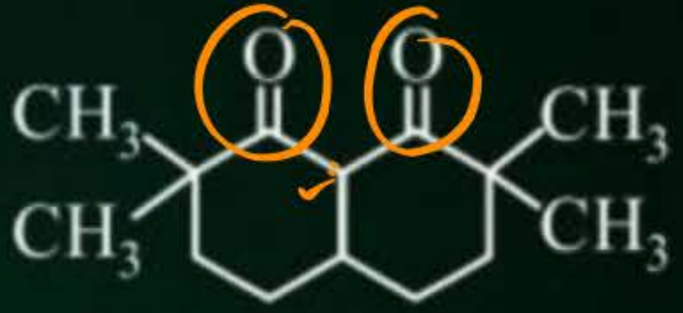
(I)



(II)



(III)


O
O
CH3
CH3
CH3
CH3

A (i) only

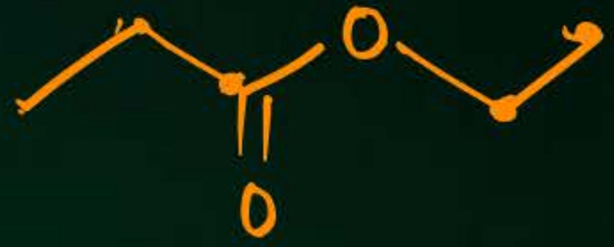
B (ii) only

C (iii) only

D [✓ All of these]

QUESTION 04

Metamers of ethyl propionate are:



A ✗ $C_4H_9\underline{COOH}$ and $HCOOC_4H_9$

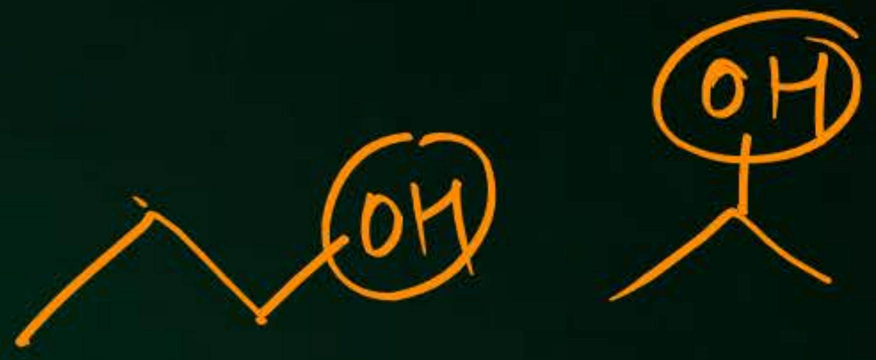
B ✗ $C_4H_9\underline{COOH}$ and $CH_3COOC_3H_7$

C ✗ $\underline{C}H_3\underline{C}OO\underline{C}H_3$ and $CH_3COOC_3H_7$

[✓ D] $CH_3COOC_3H_7$ and $C_3H_7COOCH_3$

QUESTION 05

n-propyl alcohol and isopropyl alcohol are:



(A) [✓ Position isomers]

(B) Chain isomers

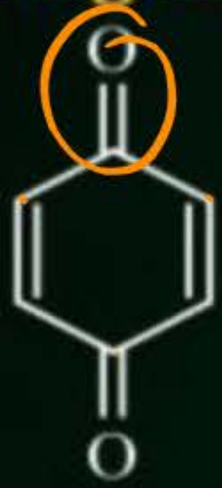
(C) Tautomers

(D) Geometrical isomers

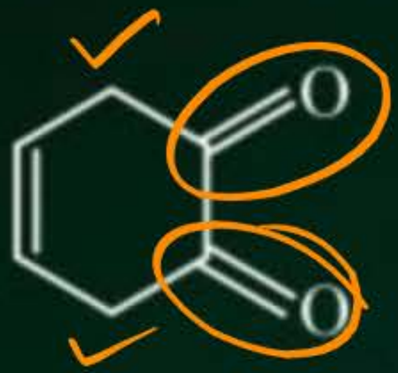
QUESTION 06

Among the given structure which can exhibit tautomerism?

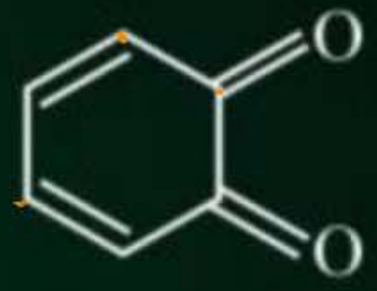
✗ (I)



✓ (II)



✗ (III)



A Only (i)

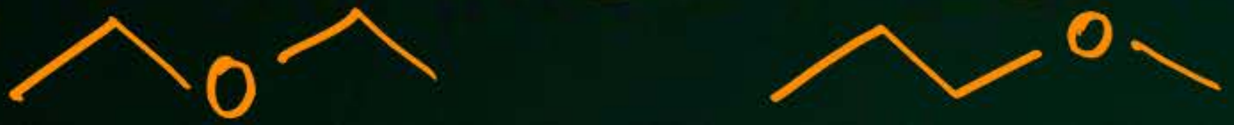
B [✓ Only (ii)]

C Only (iii)

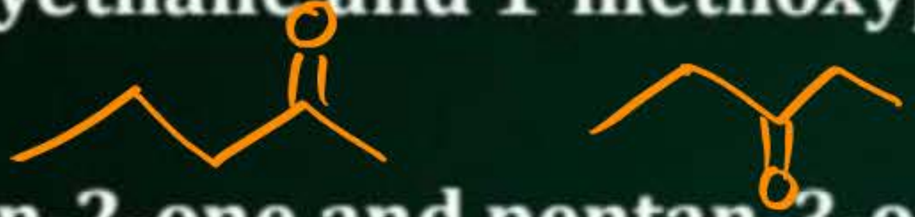
D None of these

QUESTION 07

Which of the following are examples of metamerism?

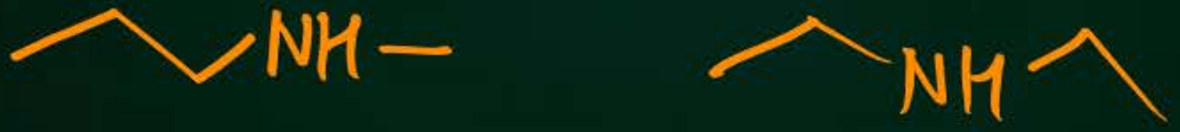


(A) Ethoxyethane and 1-methoxypropane



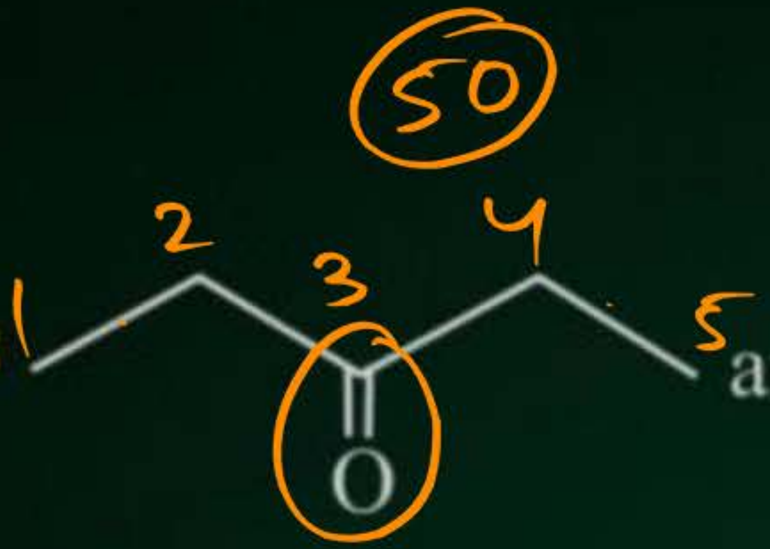
(B) Pentan-2-one and pentan-3-one

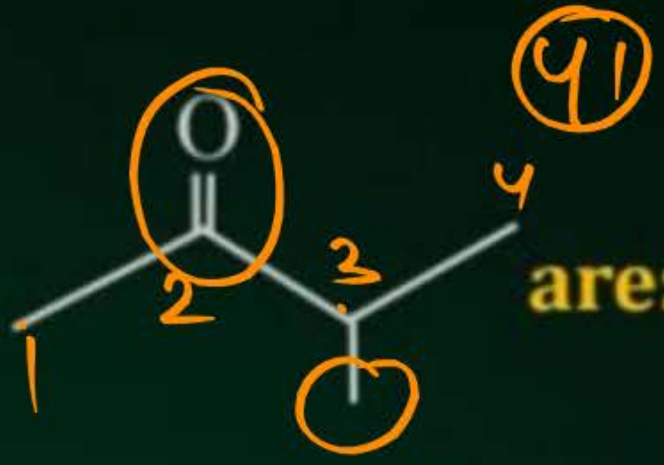
(C) N-Methylpropan-1-amine and N-ethylethanamine



[✓ D] All of the above

QUESTION 08

The compounds 

and 

are:

[✓ (A)] Chain isomers

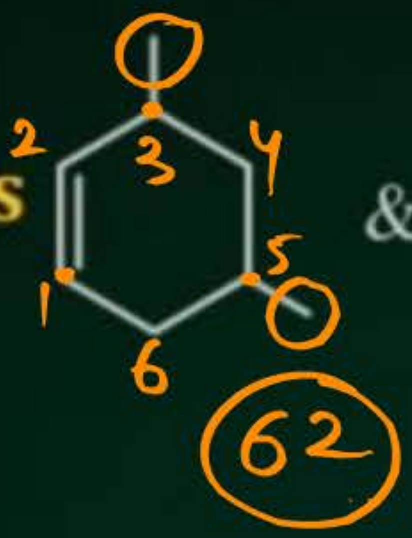
[✓ (B)] Metamers

(C) Position isomers

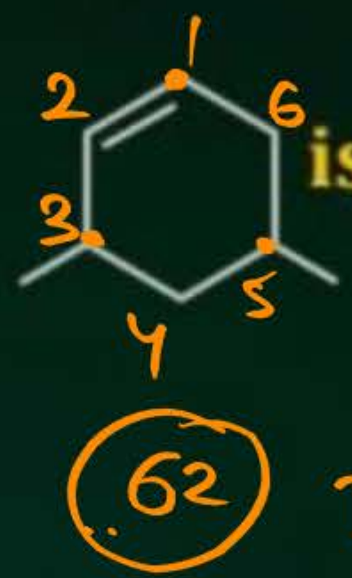
[✓ (D)] Both (A) & (B)

QUESTION 09

Relation between compounds



&



is:

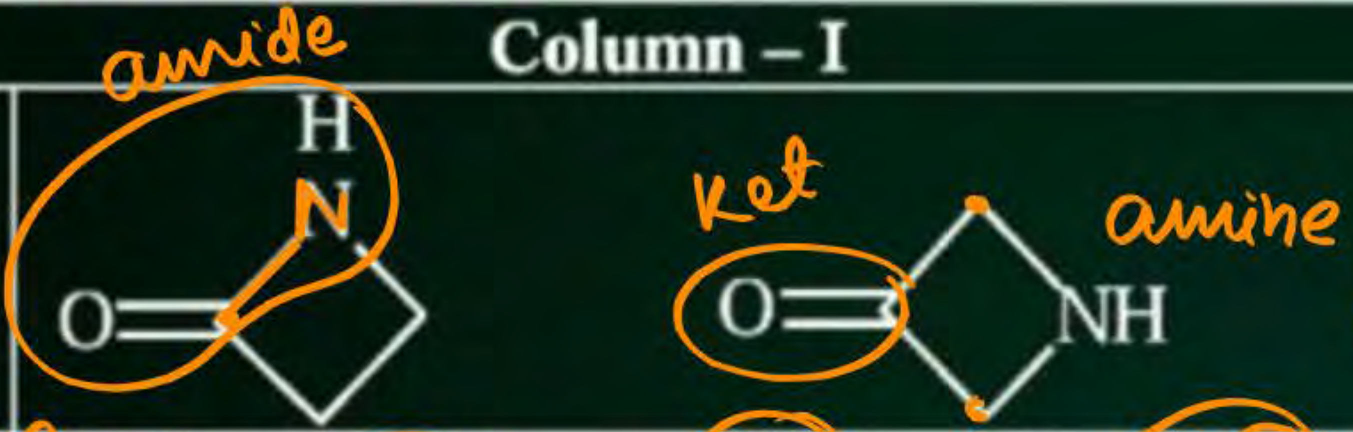
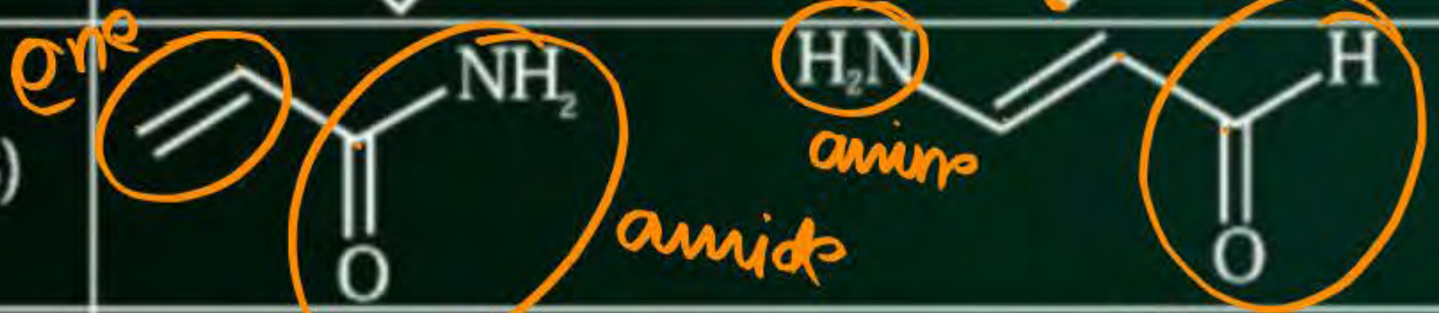
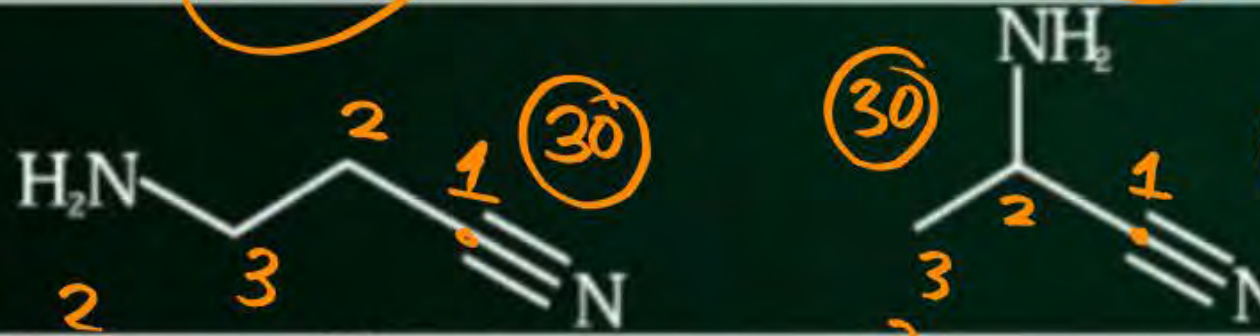
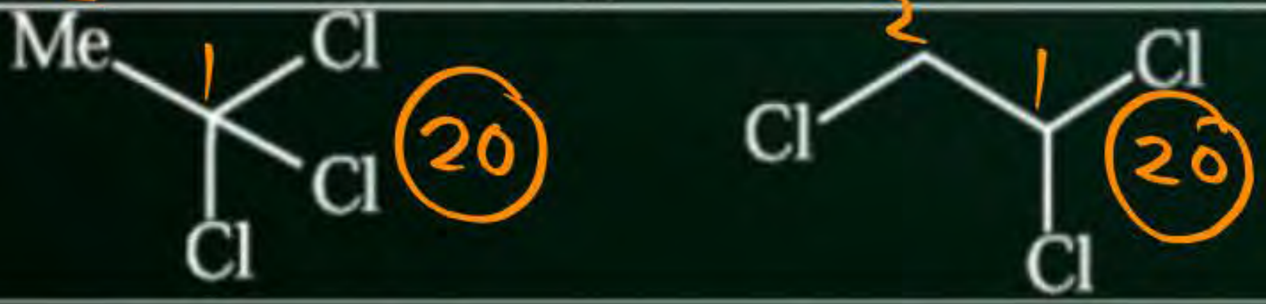
Identical

Ident

- **A** Position isomers
- **B** Chain isomers
- [✓ **C**] Identical
- **D** Functional isomers

QUESTION 10

Match the columns.

	Column – I			Column – II
(A)	 amide Ket amine	P	(P)	Functional isomers
(B)	 ene amide amine Ald	P	(Q)	Chain isomers
(C)		R	(R)	Position isomers
(D)		R	(S)	Metamers

[✓ A] A-P; B-P; C-R; D-R

B A-P; B-Q; C-R; D-S

C A-S; B-R; C-Q; D-P

D A-R; B-P; C-Q; D-S

ANSWER KEY

1.A
2.A
3.D
4.D
5.A
6.B
7.D
8.D
9.C
10.A

Thankyou!!

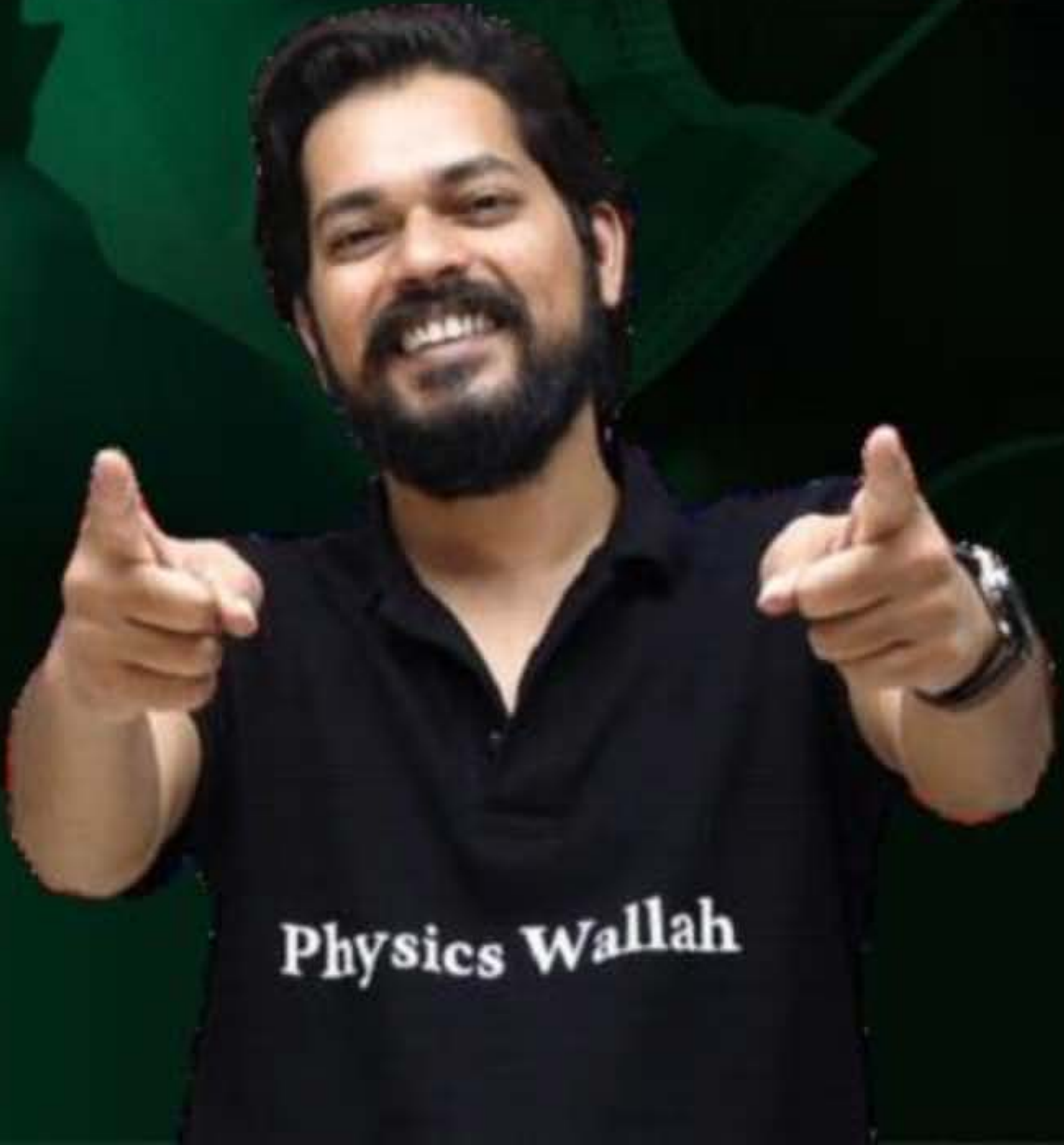
YAKEEN 2.0

FOR NEET 2025

Lecture- 04 | **Organic Chemistry**

Some Basic Principles and Techniques
(ISOMERISM)

By- Pankaj Sir(POPU MAMA)


Physics Wallah

Topics *to be covered*

1. No. of Structural Isomers ki aur practice ✓
2. Homologous Series ✓
3. Geometrical Isomerism ✓
4. Practice

Homologous Series

C_nH_{2n+2}

$CH_4 \xrightarrow{+CH_2} C_2H_6 \xrightarrow{+CH_2} C_3H_8 \xrightarrow{+CH_2} C_4H_{10} \ldots$

$n=1$

C_nH_{2n} $C_2H_4 \xrightarrow{+CH_2} C_3H_6 \ldots$

Definition: A group or a series of organic compounds each containing a characteristics functional group forms a homologous series and the members of the series are called homologues.

- Same Functional group. ✓ (Same general formula, family Same)
- Different Molecular formula. ✓
- Different Molecular mass. ✓
- Differ in CH_2 group. ✓ MW diff 14, 28 ......

1, 2, 3, 4

QUESTION

Homologous compound have same

[✓ (A) General formula]

(B) Empirical formula

(C) Structural formula

(D) Molecular formula

QUESTION

The homologue of ethyne is:

$CH\equiv CH$

$\boxed{C_2H_2} \xrightarrow{+CH_2} C_3H_4$

- (A) C_2H_4
- (B) C_2H_6
- (C) C_3H_2
- [✓ (D)] C_3H_4

QUESTION

A group of closely related compounds which can be expressed by a general formula & in which two consecutive members differ by 14 in their molecular masses is called

- **A** A heterogeneous series
- [✓ **B** A homologous series]
- **C** A homogeneous series
- **D** An electrochemical series

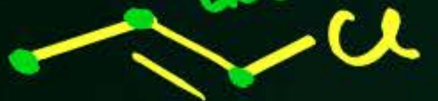
QUESTION

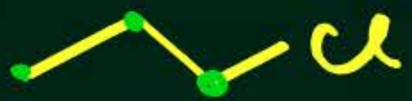
Which of the following compounds belong to the same homologous series?

(1) 1-chloropropene (2) 1-chloropropane (3) 2-chlorobutane

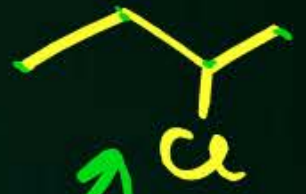
double

C_3H_5Cl





← same →
single



C_3H_7Cl $+CH_2$ C_4H_9

A (1) and (2) only

B (1) and (3) only

[✓ C] (2) and (3) only

D (1), (2) and (3)

QUESTION

Which of the following statements is/are correct?

✓ (1) Two organic compounds with the same general formula must belong to the same homologous series.

✗ (2) Two organic compounds with same main functional groups must belong to the same homologous series.

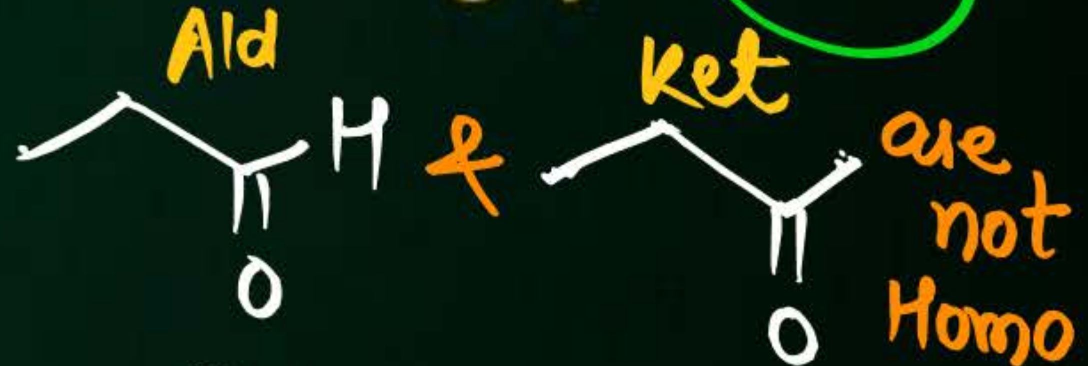
✗ (3) Two organic compounds with the molecular mass differing by 14 must belong to the same homologous series.

[✓ A] (1) only

B (2) only

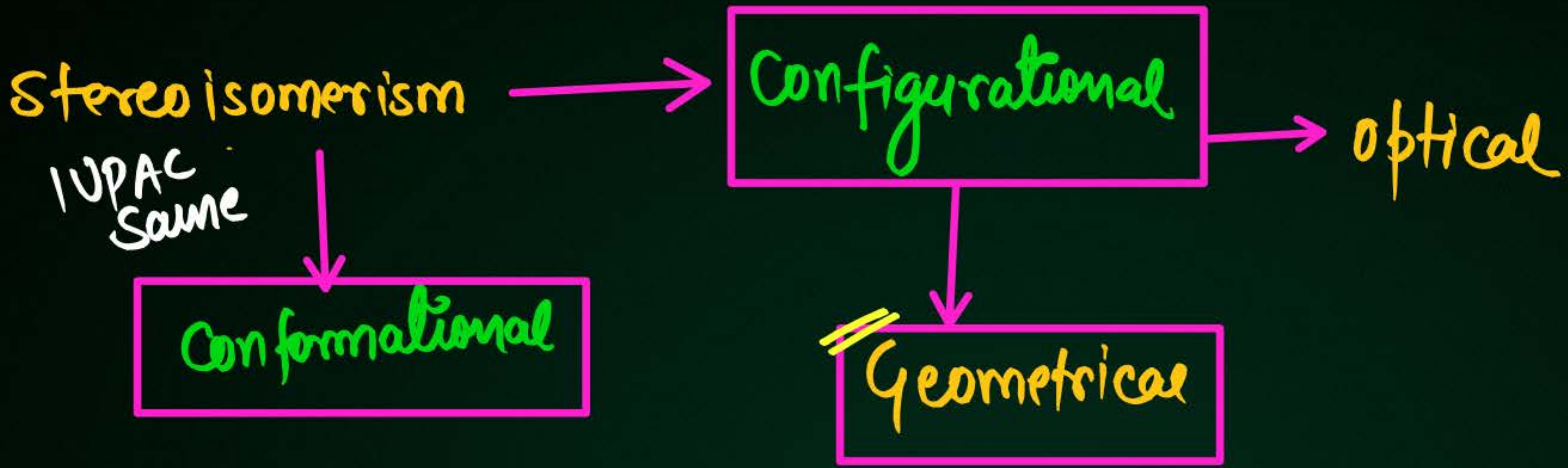
C (1) and (3) only

D (2) and (3) only



C_3H_6O C_4H_8O

$+CH_2$



Stereoisomerism

IUPAC same

Conformational

Configurational

optical

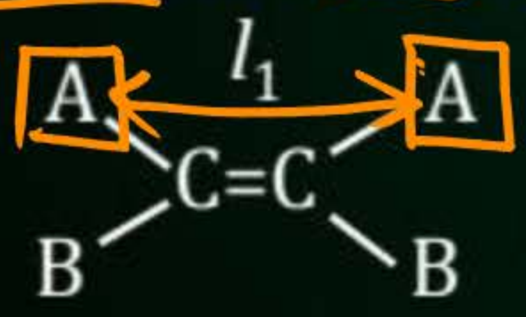
Geometrical

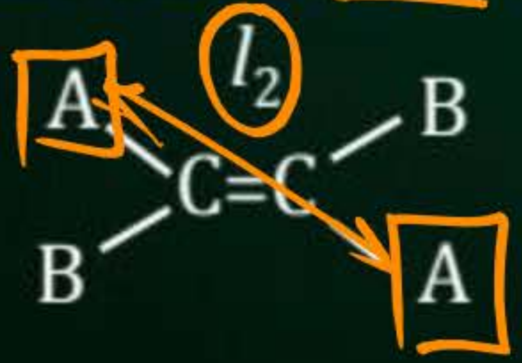
IUPAC same ✓

but have diff geometry ✓

Geometrical Isomerism

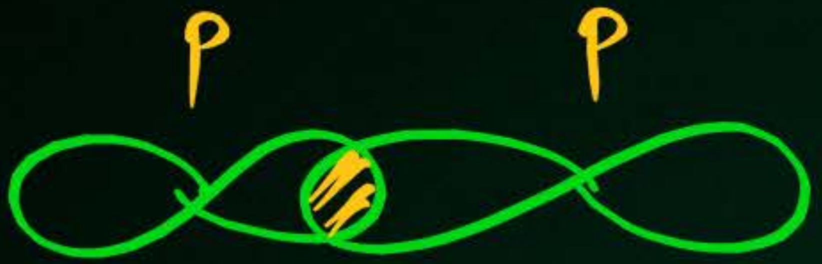
1. Arises due to Restricted rotation around
   $C=C$, $C=N$, $C=O^+H$, $N=N$, Cycloalkanes etc.
   σ-Bond
   G.I. are not interconvertible at room temperature because of π-bond dissociation energy (62 Kcal).
2. G.I are also known as diastereomers (Not mirror image).
3. Areal Distance must be different ($l_1 \neq l_2$).





$\boxed{l_1 < l_2}$

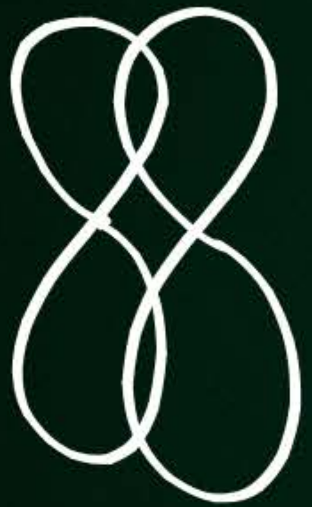
4. Can be separated.



σ Bond

Free Rotation

Head on overlap



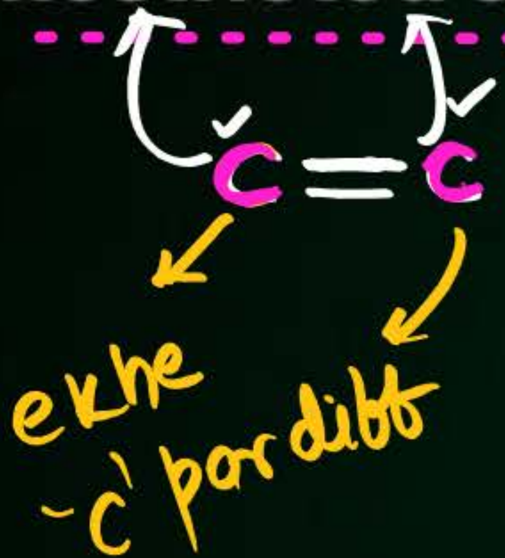
π Bond

Restricted Rotation ✓

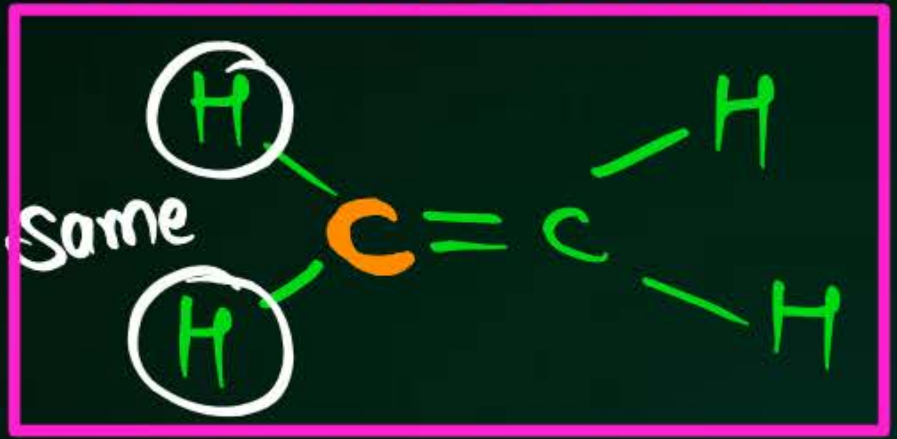
Side wise overlap
or
Lateral overlap

Condition for exhibition of Geometrical Isomerism

Restricted site must have different groups.

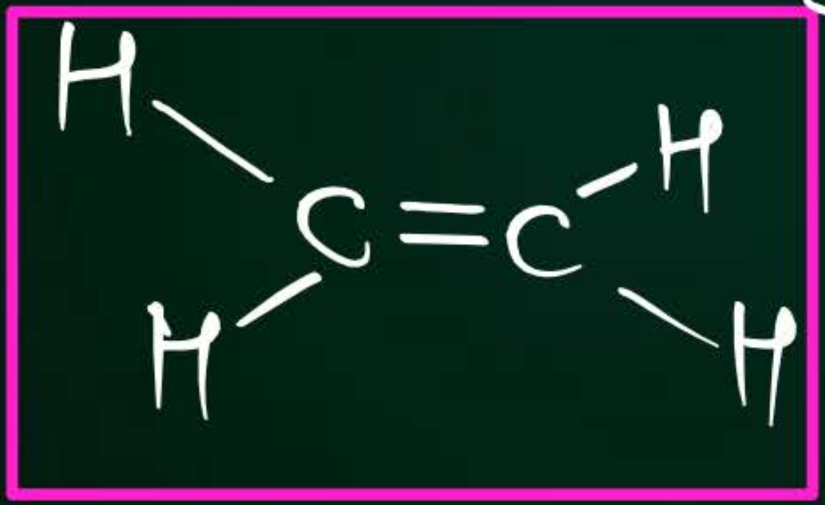

C=C
ekhe
'c' par diff

①

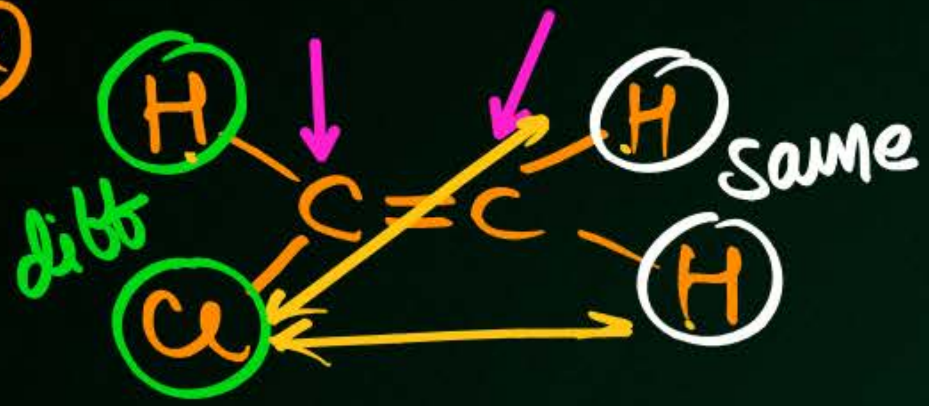

H
H
same
C=C
H
H

does not Exhibit GI

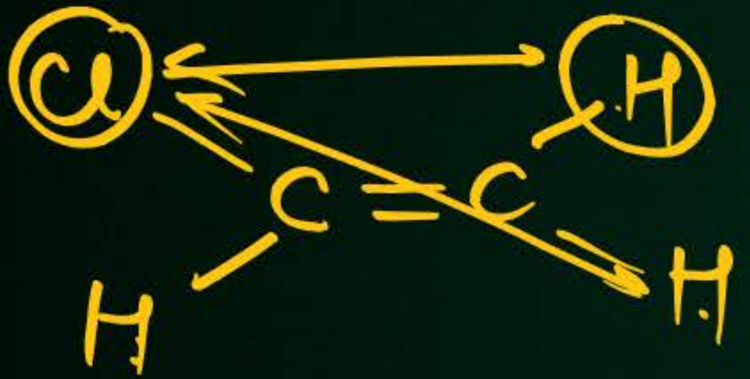
Same geo



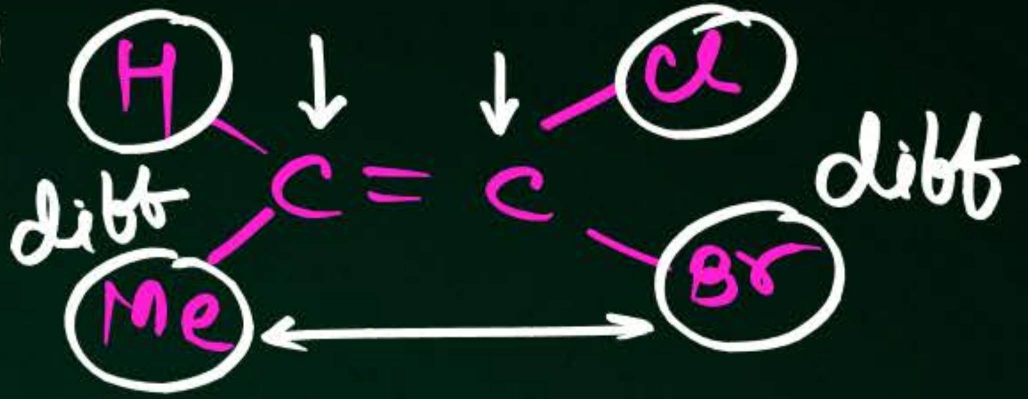
②


H
Cl
H
H
diff
same
C=C

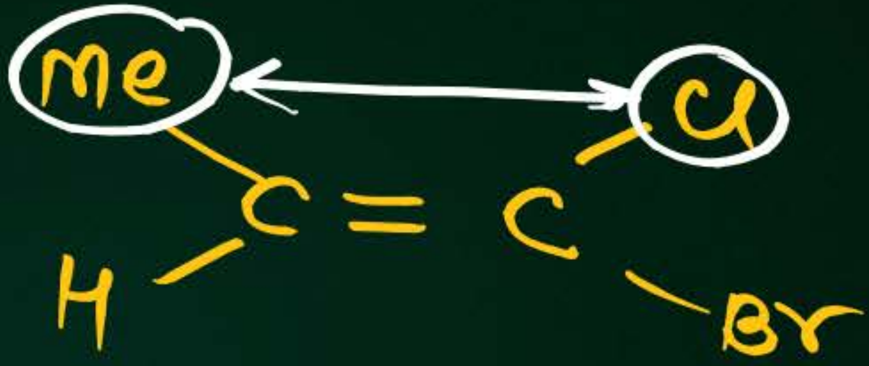
G I ×



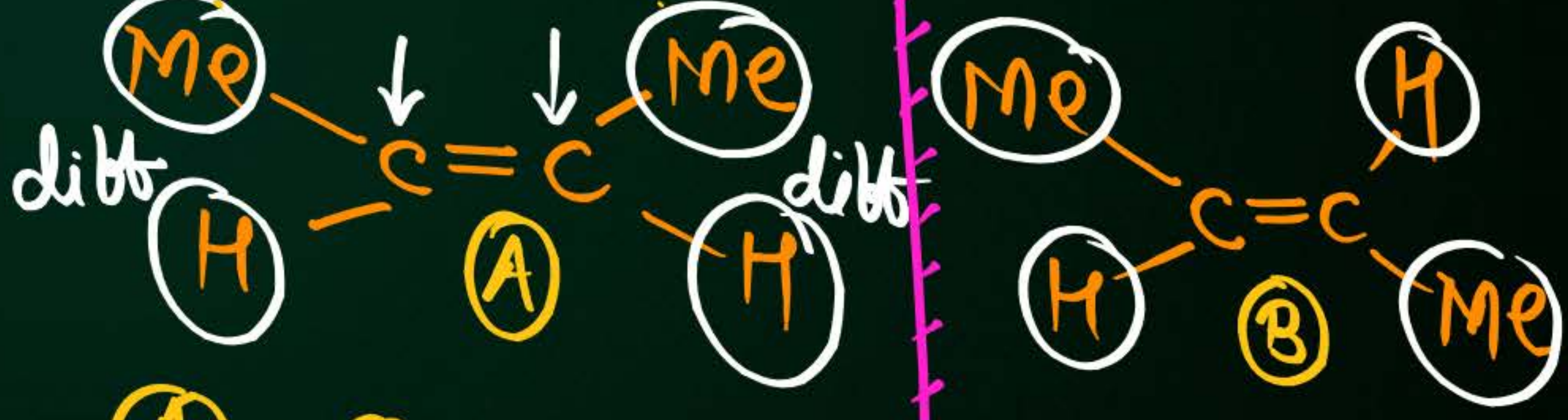
③


H
Me
Cl
Br
diff
diff
C=C

G.I ✓



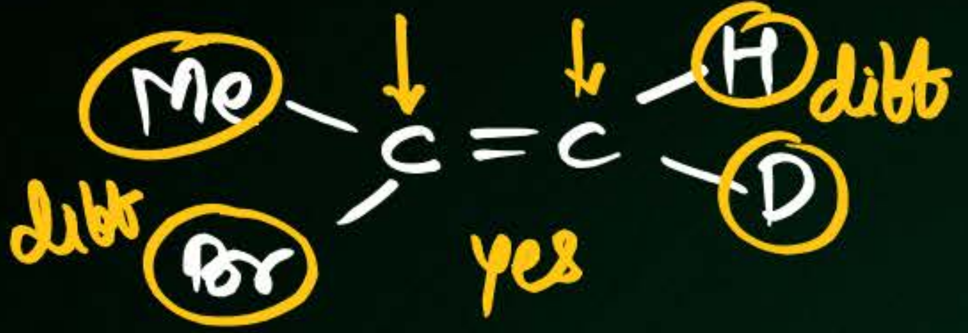
④


Me
H
Me
H
diff
diff
C=C
Ⓐ
Me
H
H
Me
C=C
Ⓑ

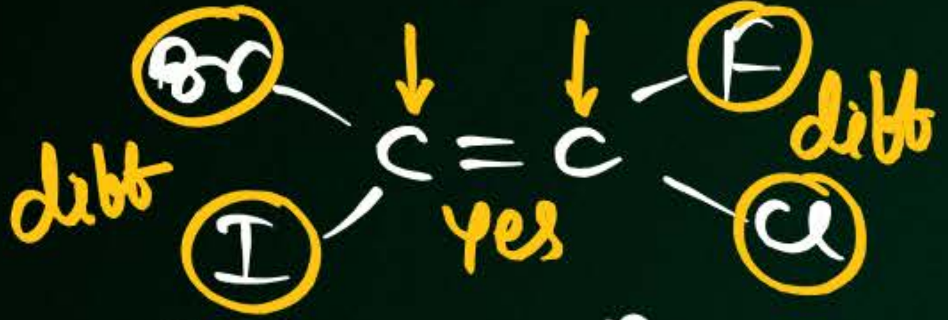
Ⓐ & Ⓑ are G.I

Ⓐ & Ⓑ are not Mirror image (Diastereo)

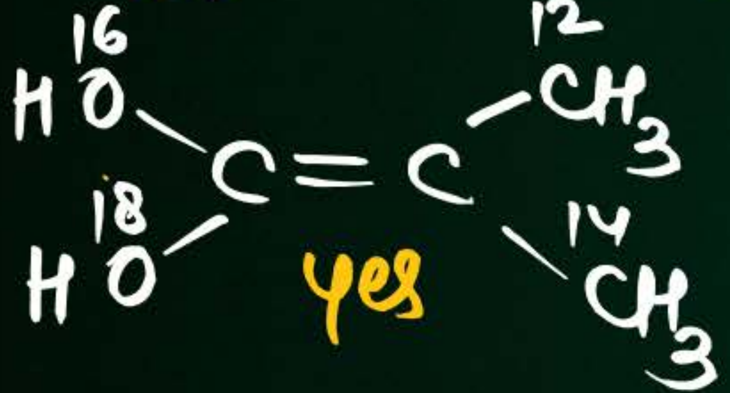
⑤


Me
C=C
H
diff
D
diff
Br
yes

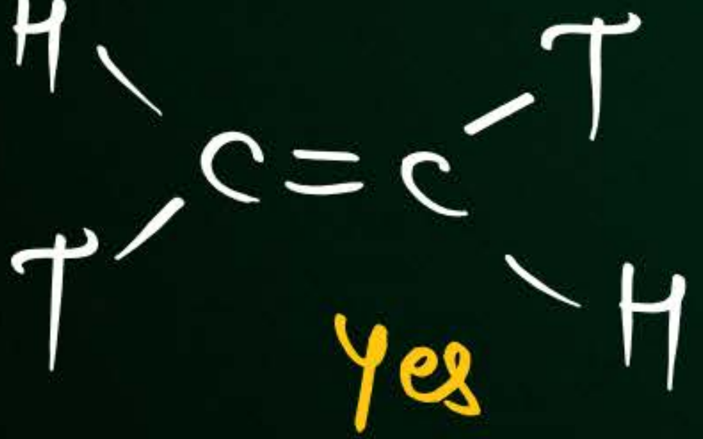
⑥


Br
C=C
F
diff
diff
I
yes
Cl

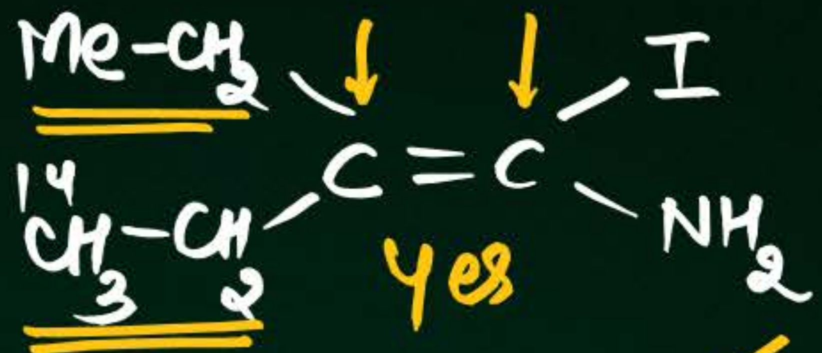
⑦


16
HO
12
CH3
C=C
18
HO
yes
14
CH3

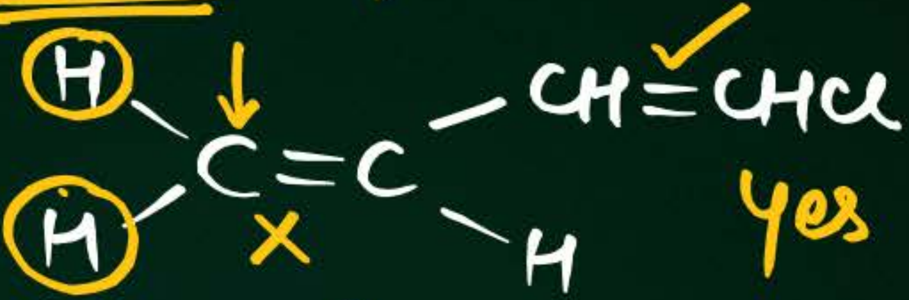
⑧



⑨


Me–CH2
I
C=C
14
CH3–CH2
Yes
NH2

⑩


H
CH=CHCl
C=C
H
×
H
Yes

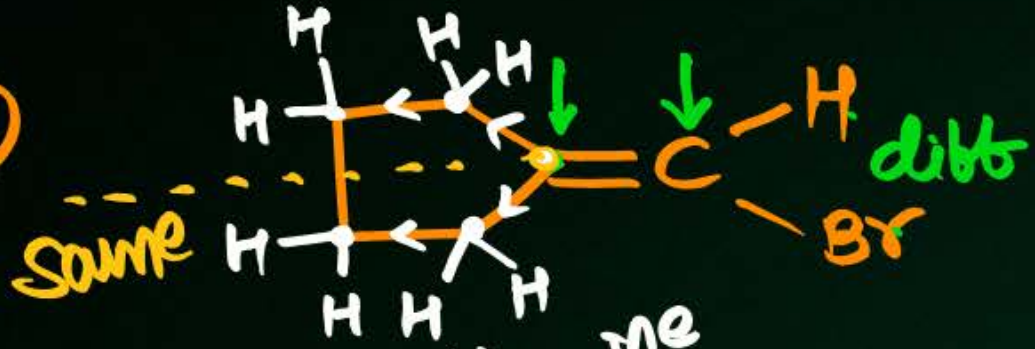
⑪ $\underbrace{CH_2=CH}_{\times}-\underline{CH}=\underline{CH}-\underbrace{CH=CH_2}_{\times}$

Yes

⑫ $\underbrace{BrCH_2}-CH=CH\underline{Br}$

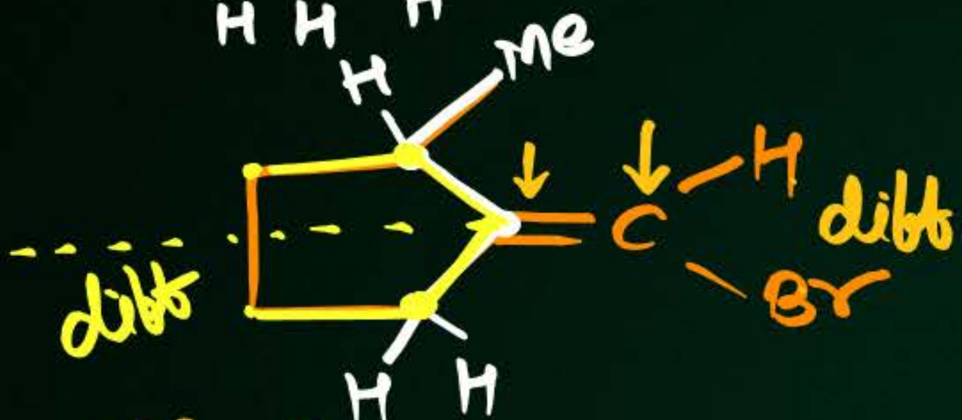
Yes

⑬


H
H
H
H
C
H
diff
Br
same
H
H
H
H
H

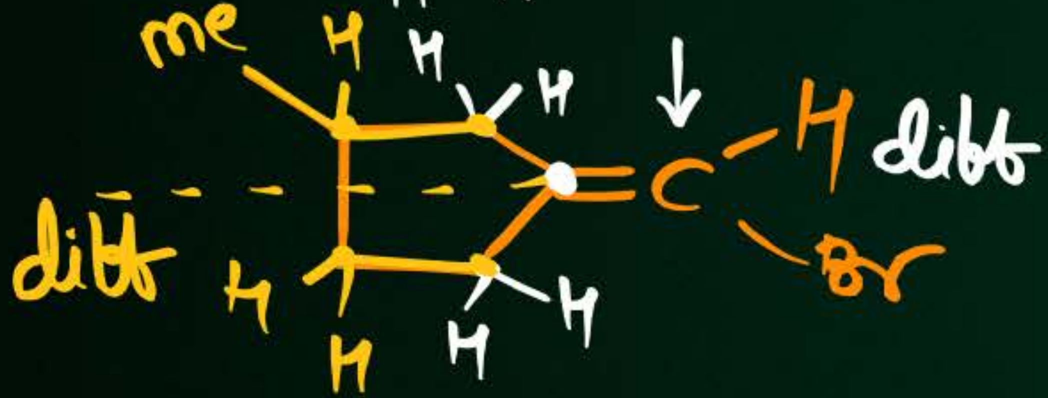
NO

⑭


H
Me
C
H
diff
Br
diff
H
H

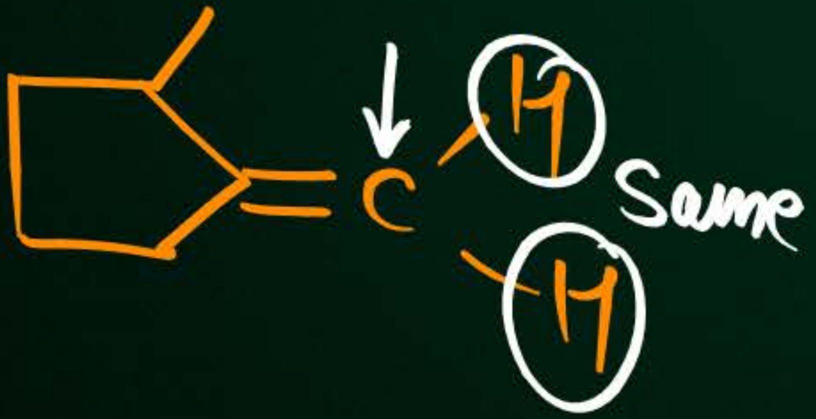
Yes

⑮


me
H
H
H
C
H
diff
Br
diff
H
H
H
H

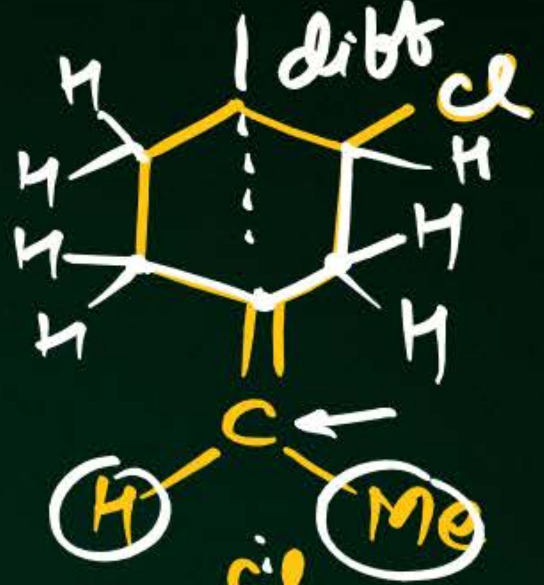
yes

⑯



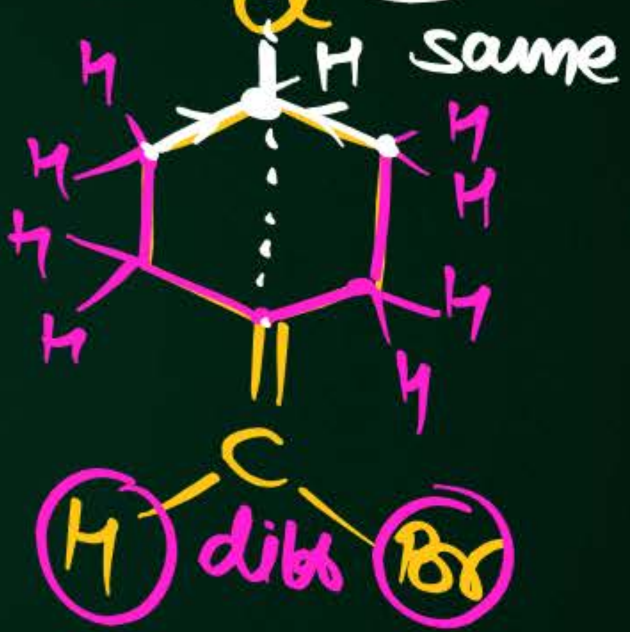
NO

⑰


diff
Cl
H
H
H
H
H
H
H
C
H
Me

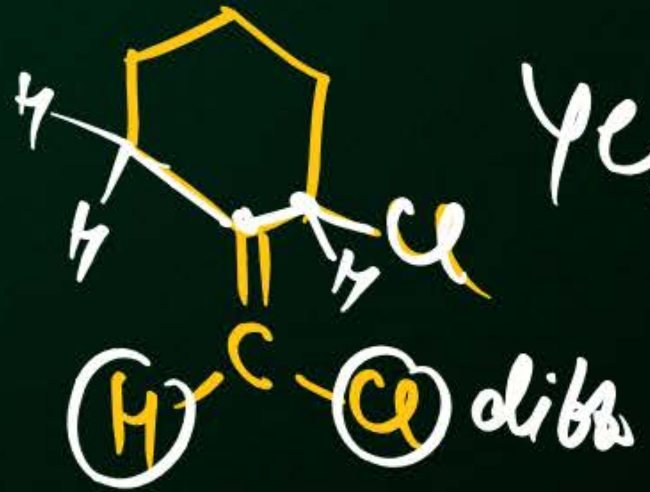
yes

⑱


Cl
H
same
H
H
H
H
H
H
H
H
C
H
diff
Br

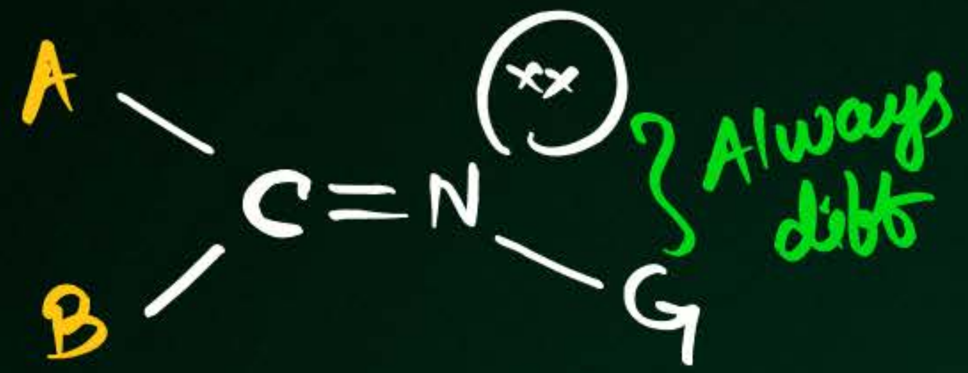
NO

⑲


H
H
H
Cl
C
H
Cl
diff

Yes

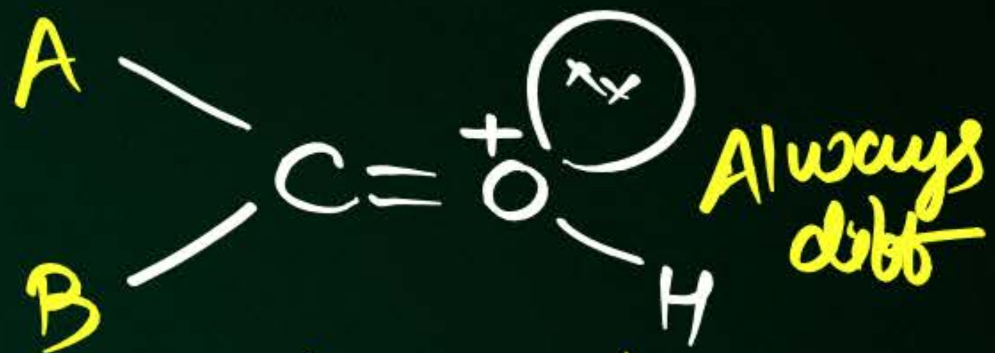
GI exhibition in $C=N$, $C=\overset{+}{O}H$, $N=N$


A
B
C=N
G
xx
Always diff

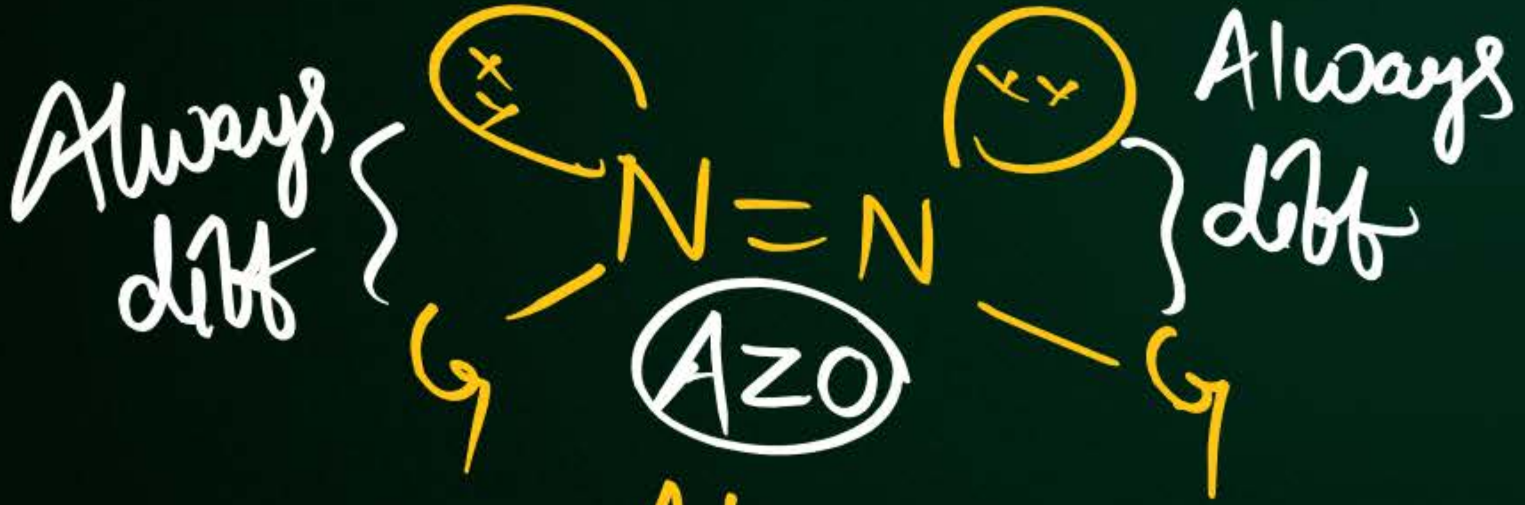
H, OH, NH₂, R etc

$A \neq B$

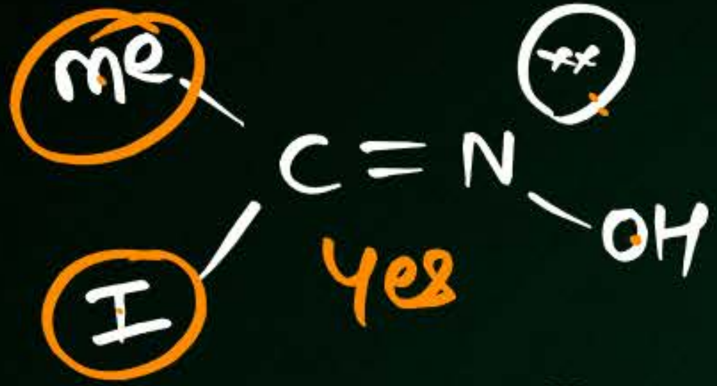
G.I ✓


A
B
$C=\overset{+}{O}$
H
xx
Always diff

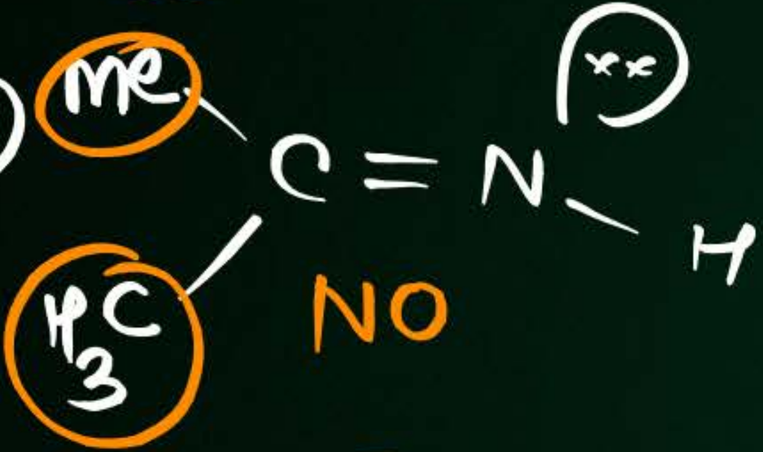
$A \neq B$ G.I ✓


Always diff
N=N
xx
xx
G
G
AZO
Always diff

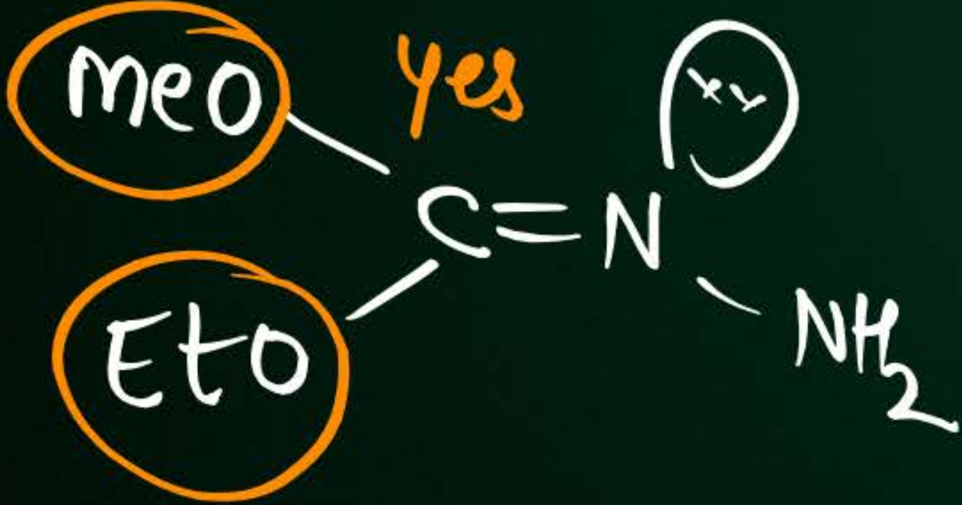
Always G.I exhibits

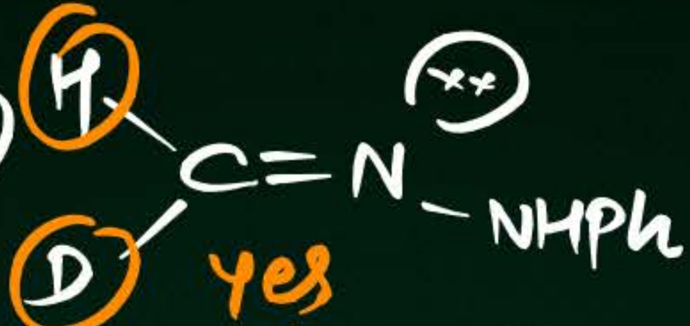
⑳


Yes

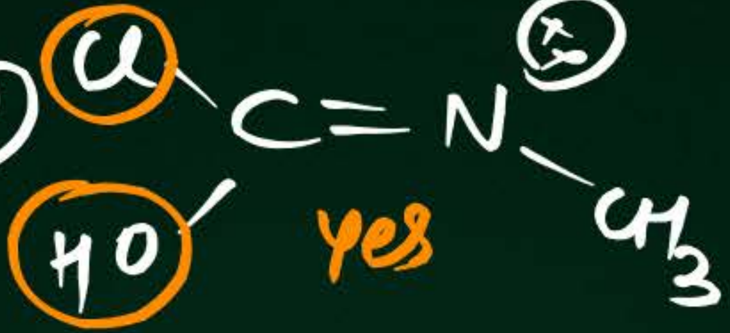
㉑


NO

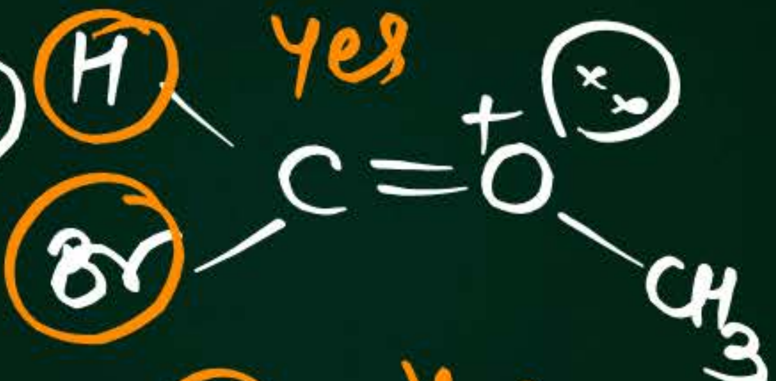
㉒

MeO
EtO
C=N
NH2
Yes

㉓


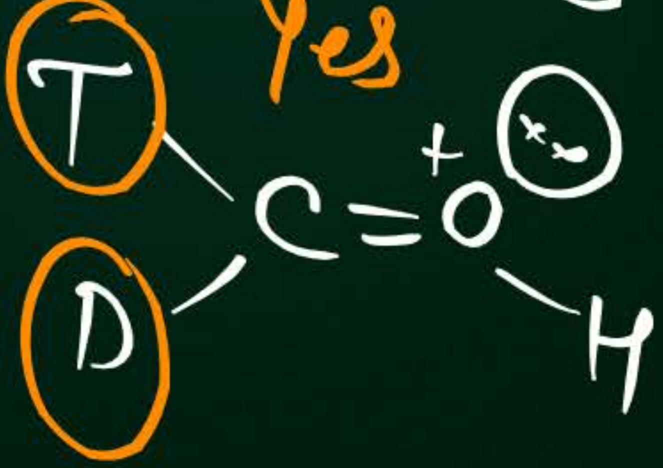
Yes

㉔


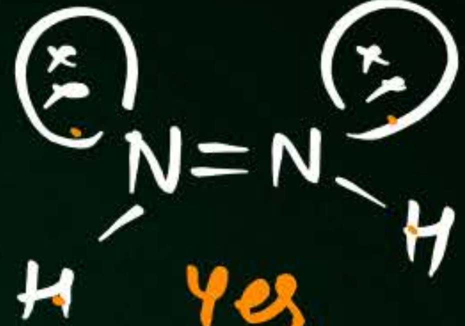
Yes

㉕


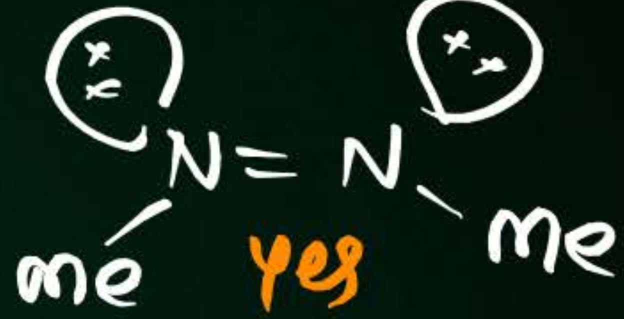
Yes

㉖


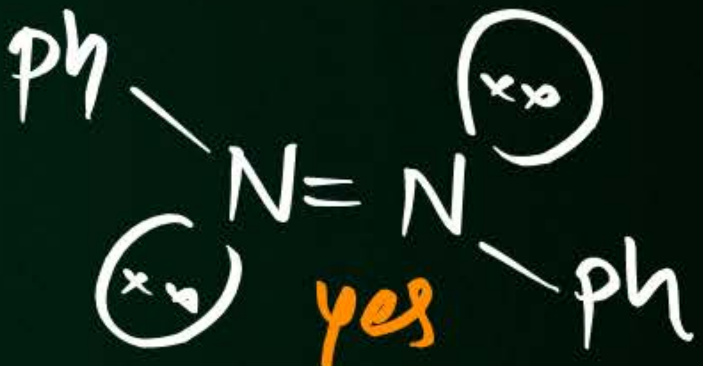
Yes

㉗


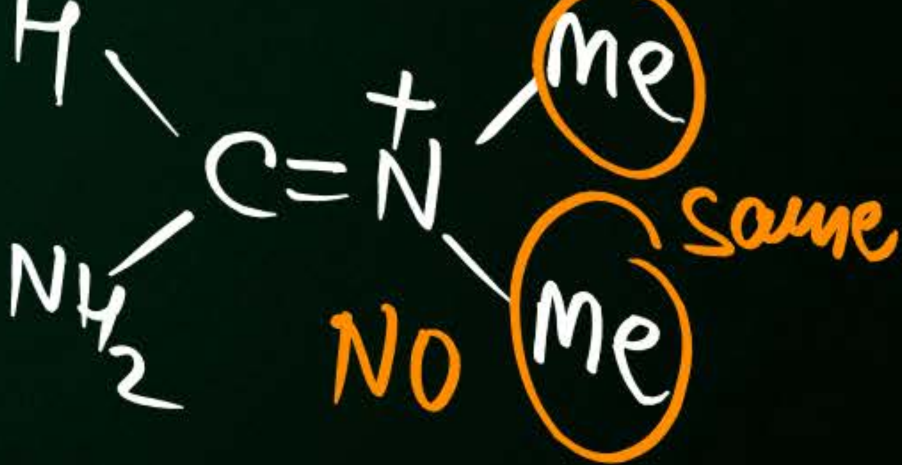
Yes

㉘


Yes

㉙


Yes

㉚

H
NH2
C=N+
Me
Me
same
NO

Home Work From PW Module (Yakeen NEET)

Prarambh: Q 62, 64, 68, 70

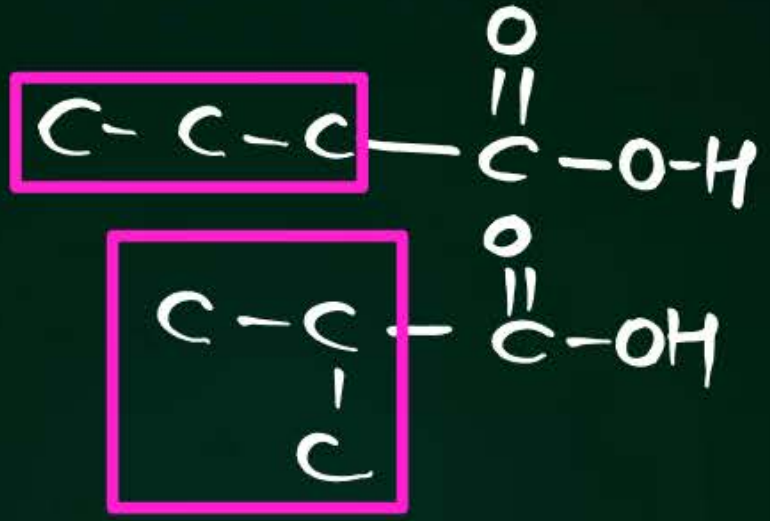
Home Work

Discussion of L-03

QUESTION 01

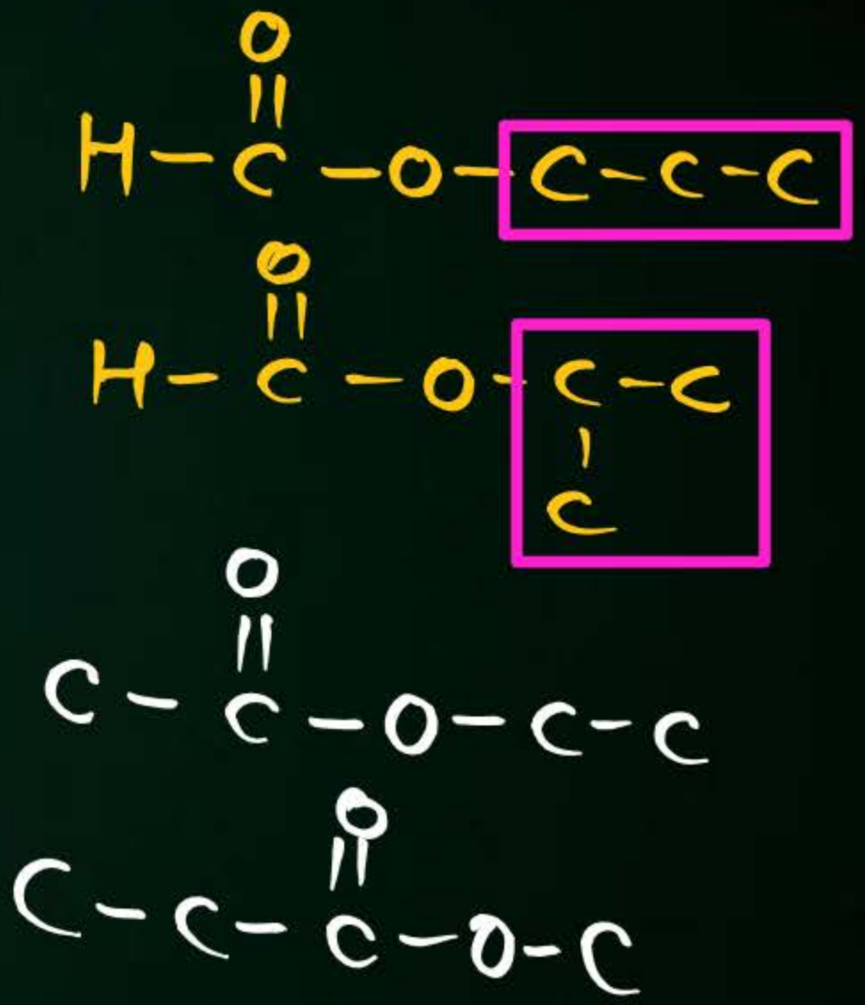
How many acids and esters are possible for the compound with molecular formula $C_4H_8O_2$?

- (A) Two acids + Two esters
- [✓ (B) Two acids + Four esters]
- (C) Four acids + Two esters
- (D) Three acids + Three esters



$\boxed{C-C-C}-\overset{\overset{O}{\|}}{C}-O-H$

$\boxed{C-\underset{\underset{C}{|}}{C}}-\overset{\overset{O}{\|}}{C}-OH$



$H-\overset{\overset{O}{\|}}{C}-O-\boxed{C-C-C}$

$H-\overset{\overset{O}{\|}}{C}-O-\boxed{\underset{\underset{C}{|}}{C}-C}$

$C-\overset{\overset{O}{\|}}{C}-O-C-C$

$C-C-\overset{\overset{O}{\|}}{C}-O-C$

QUESTION 02

Match the Column : [X = Cl, Y = Br, Z = F]

$C_6H_2X_4$
same
$C_6H_4X_2$

Column-I Molecular Formula		Column-II No. of Benzenoid isomers
(A) $C_6H_2X_4$	p	(p) 3
(B) C_6H_4XY	p	(q) 6
(C) C_6H_3XYZ	r	(r) 10
(D) $C_6H_3X_2Y$	q	(s) 12

QUESTION 03

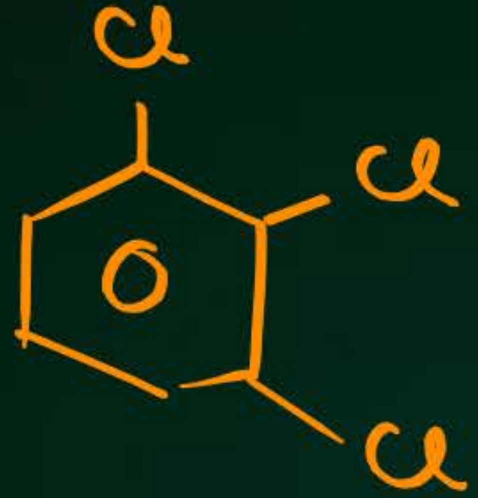
Total number of benzene derivatives with the molecular formula $C_6H_3Cl_3$.

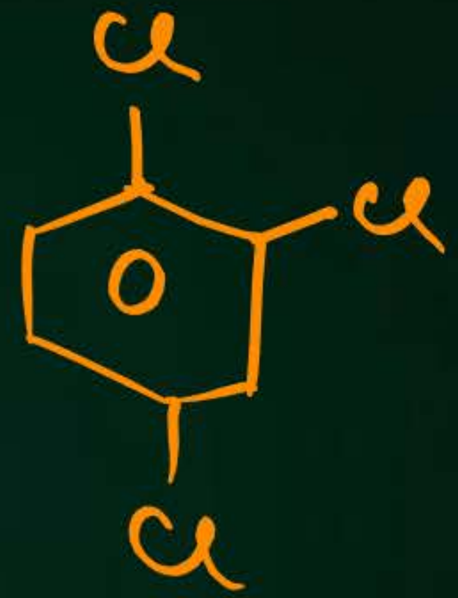
(A) 2

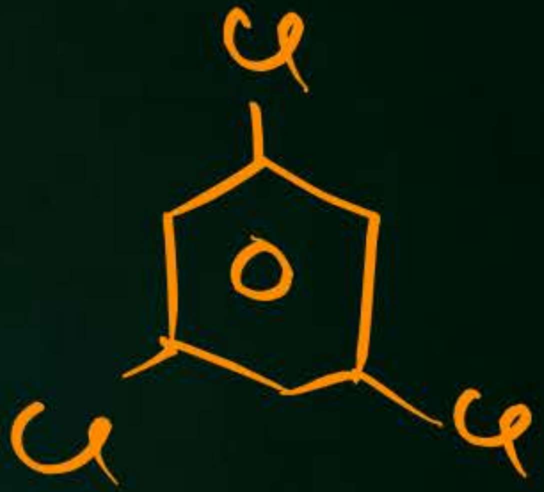
(B) [✓ 3]

(C) 4

(D) 5

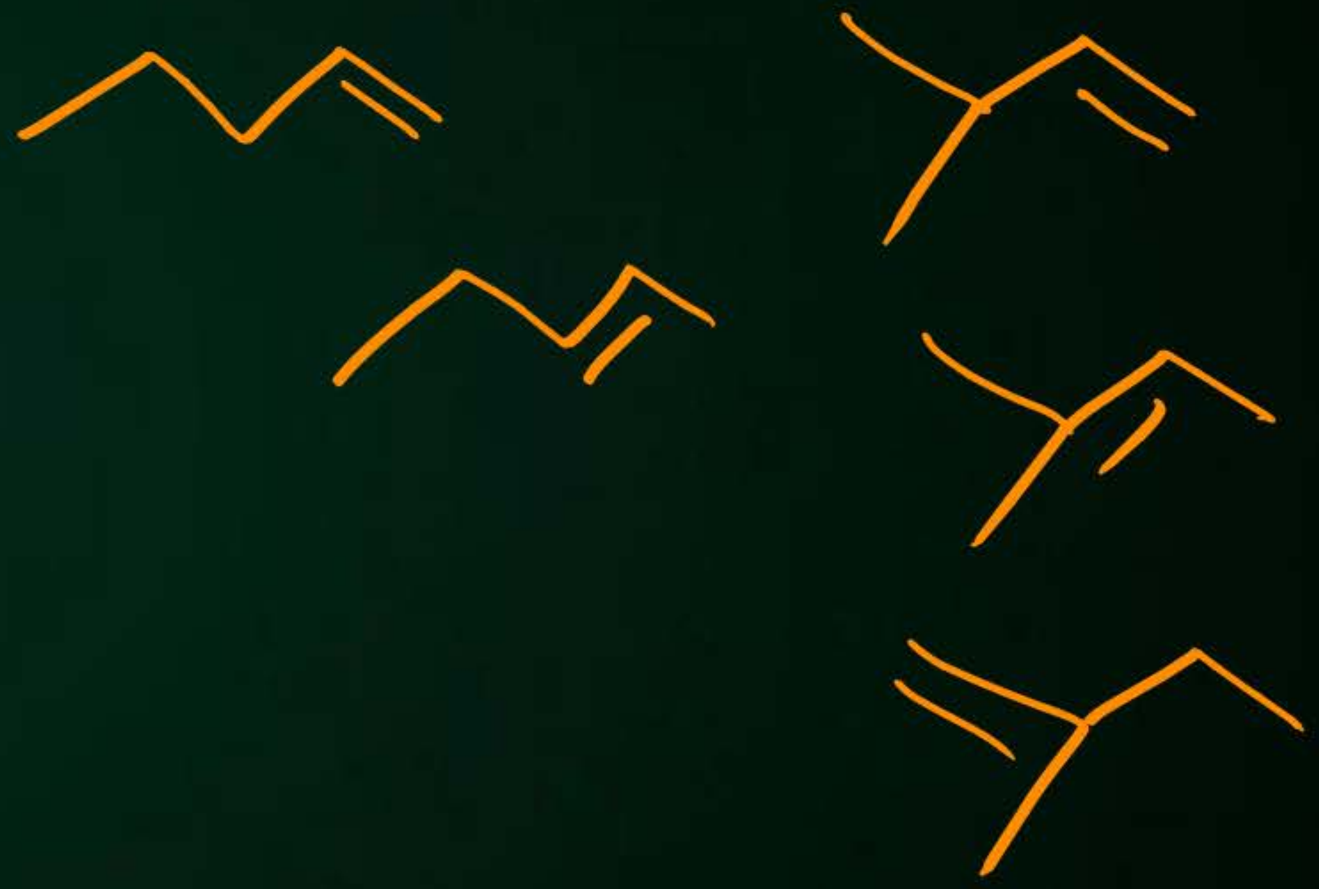






QUESTION 04

The total number of structural non-cyclic isomers formed by C_5H_{10} is______.



A 2

B 3

C 4

[✓ **D** 5]

QUESTION 05

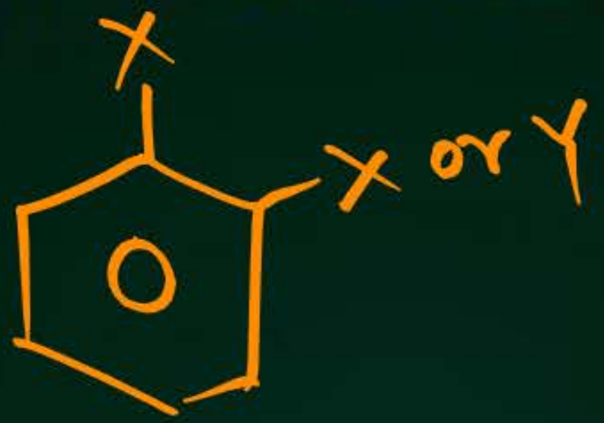
The total number of structural isomers of a disubstituted benzene compound ______.

A 2

[✓ **B** 3]

C 4

D 5



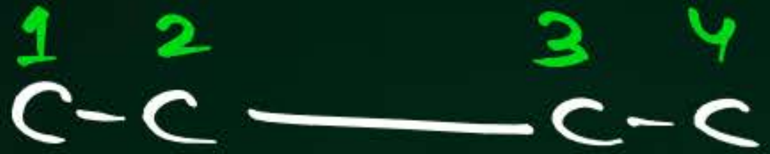
③

o,m,p

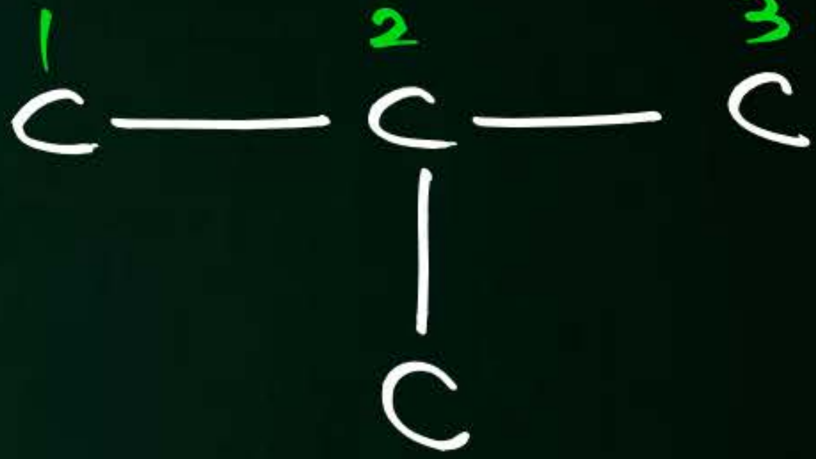
QUESTION 06

How many total structural isomers can be formed from $C_4H_8Br_2$?

- A 7
- B 8
- [✓ C 9]
- D 10



1,1
1,2
1,3
1,4
2,2
2,3



1,1
1,2
1,3

QUESTION 07

5 C

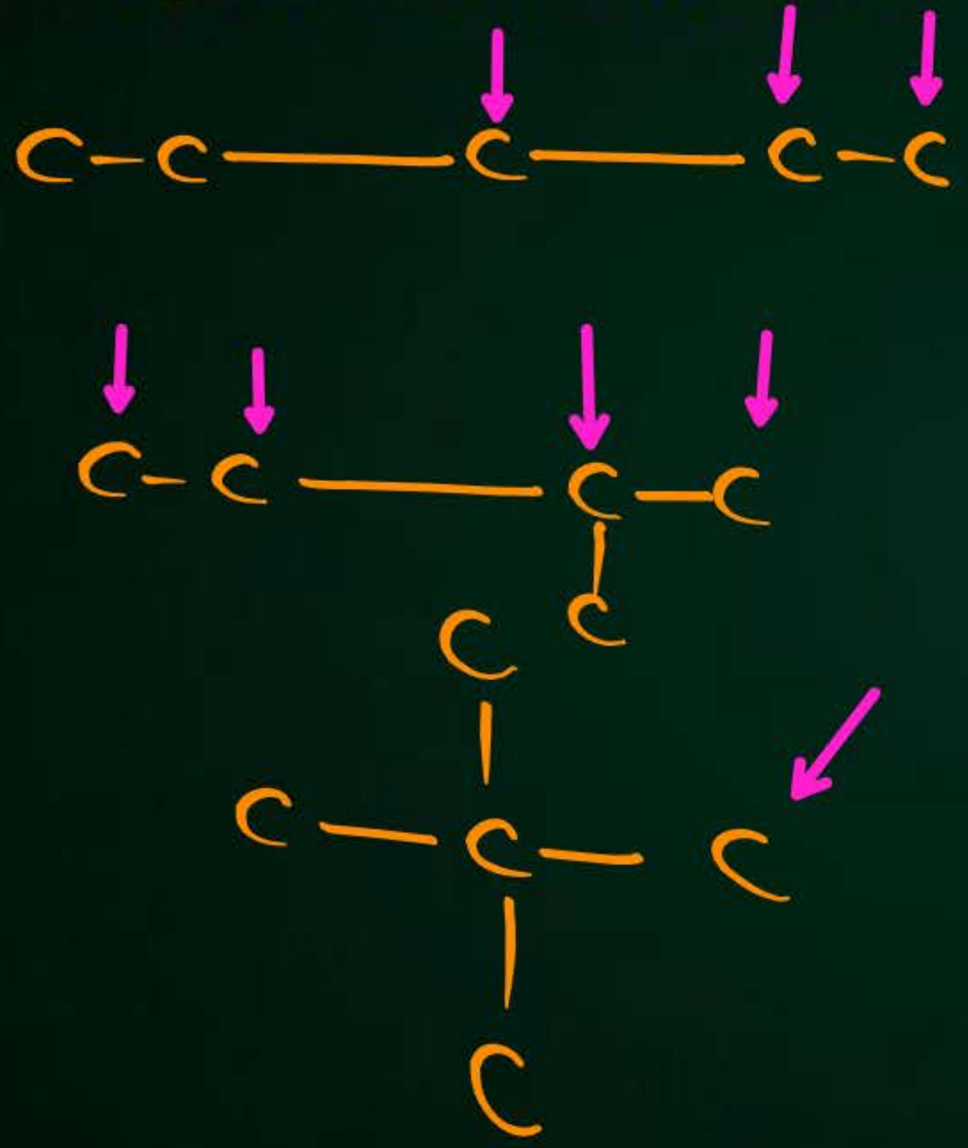
How many aldehydes are structural isomers with the formula $\underbrace{C_6H_{12}O}_{DU=1}$?

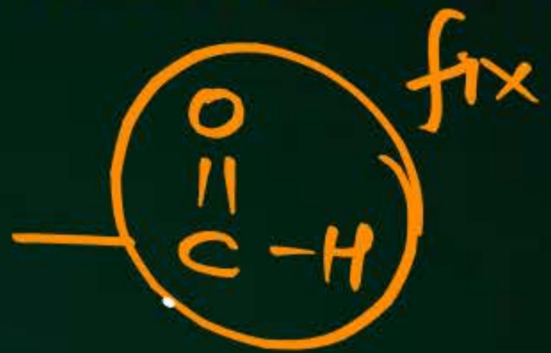
A 6

B 7

[✓ **C** 8]

D 9





QUESTION 08

The number of alkynes possible with molecular formula C_5H_8 is:

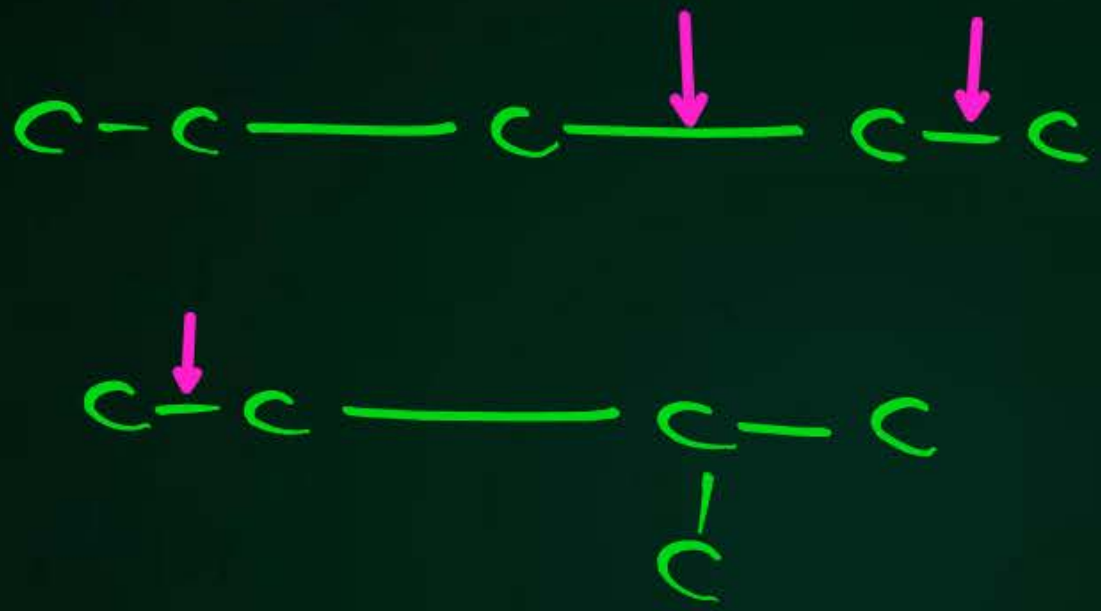
DU=2

A 2

[✓ B 3]

C 4

D 5


C-C—C—C-C
C-C—C-C
C

QUESTION 09

—NH—

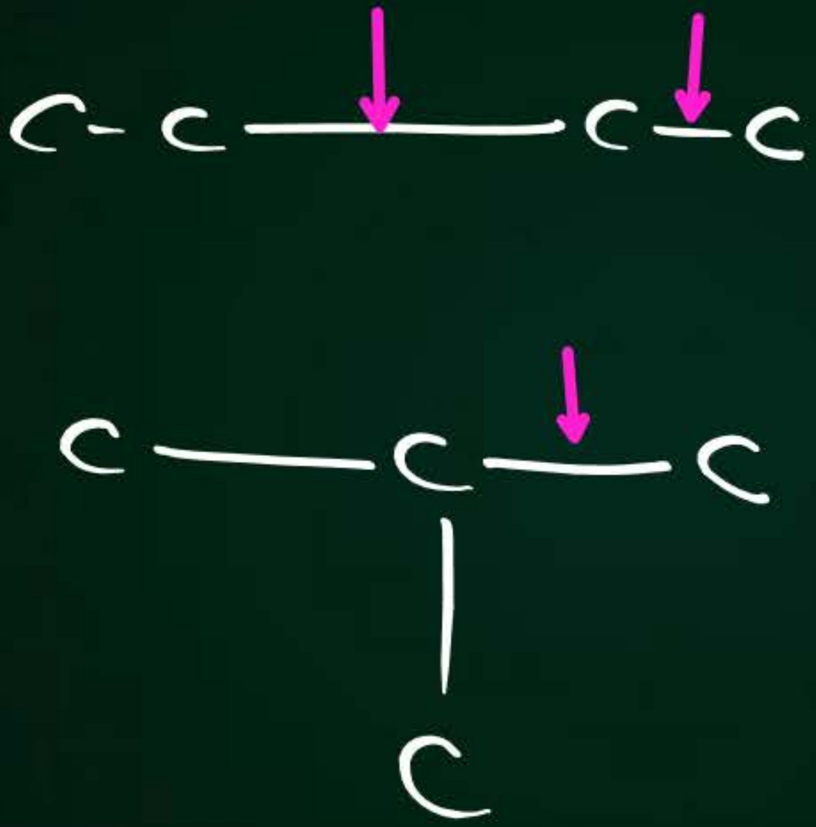
Total number of 2° amine isomers of $C_4H_{11}N$ would be (only structural)

A 1

B 2

[✓ **C** 3]

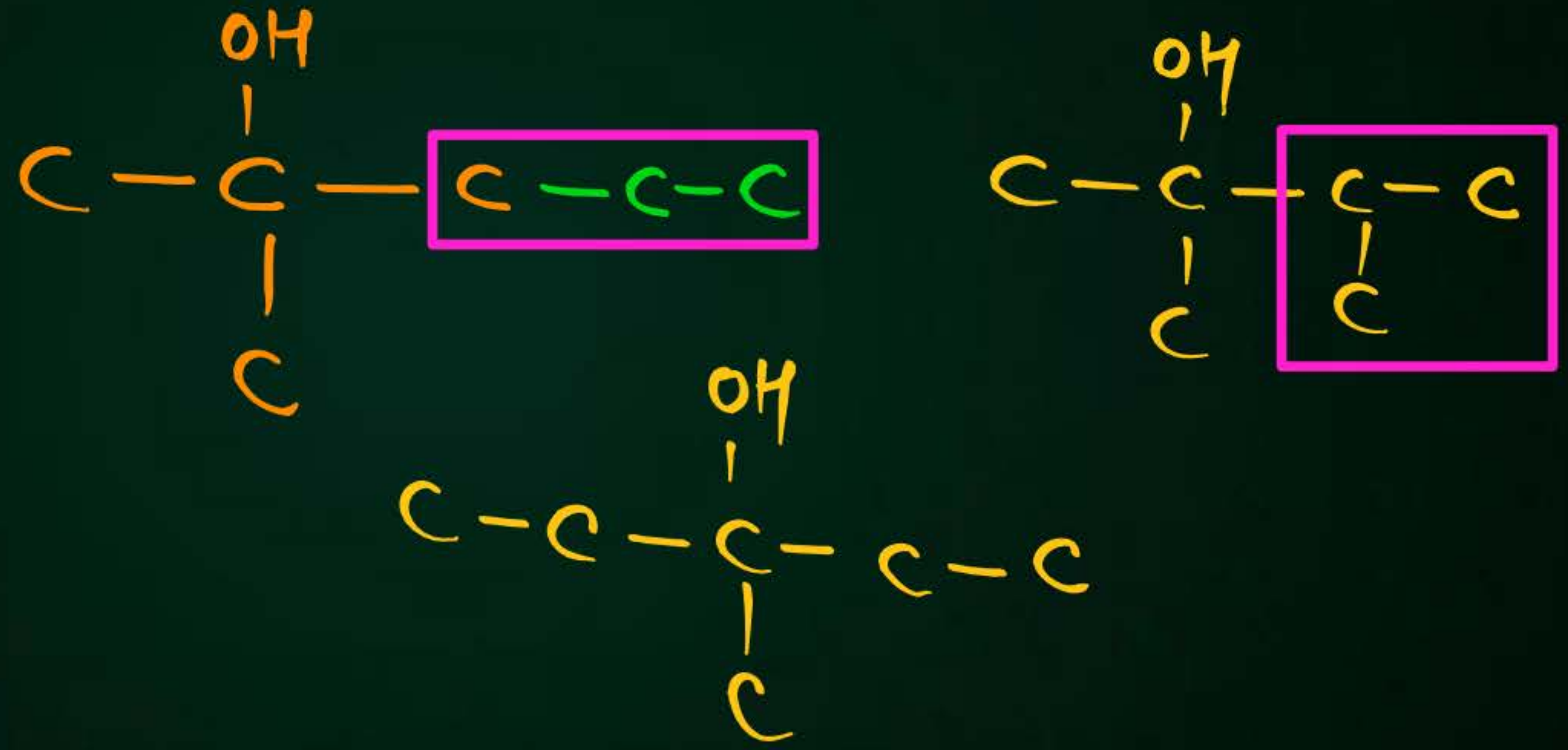
D 4



QUESTION 10

How many structural isomers of all the tertiary alcohols with molecular formula $C_6H_{14}O$?

- **A** 2
- [✓ **B** 3]
- **C** 4
- **D** 5



OH
C — C — C — C — C
C
OH
C — C — C — C
C C
OH
C — C — C — C — C
C

ANSWER KEY

1. B
2. A-p; B-p; C-r, D-q
3. B
4. D
5. B
6. C
7. C
8. B
9. C
10. B

Thankyou!!

IUPAC + Isomerism

Clean your Backlog or Revision.

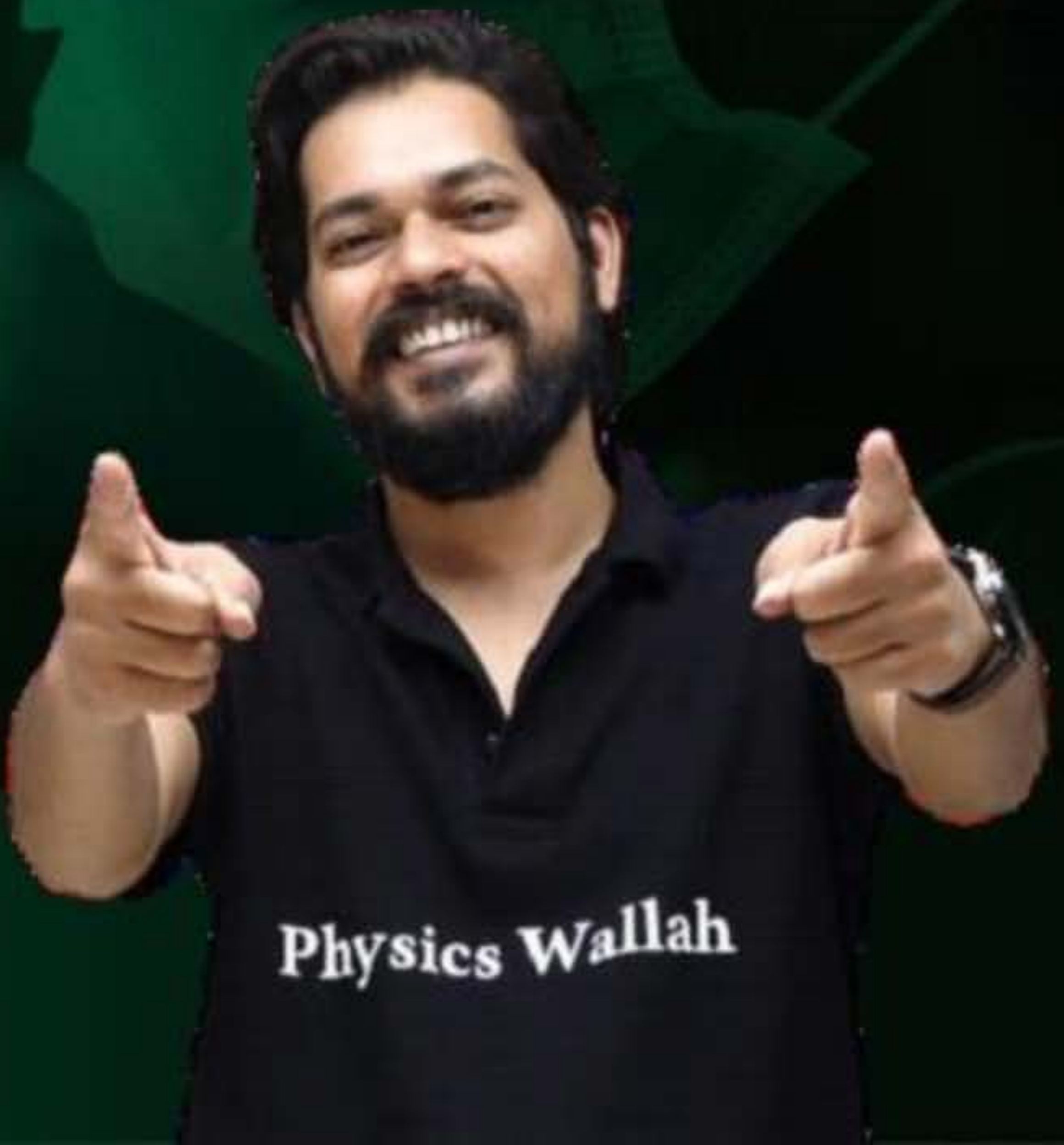
YAKEEN 2.0

FOR NEET 2025

Lecture- 05 **Organic Chemistry**

Some Basic Principles and Techniques
(ISOMERISM)

By- Pankaj Sir(POPU MAMA)


Physics Wallah

Topics *to be covered*

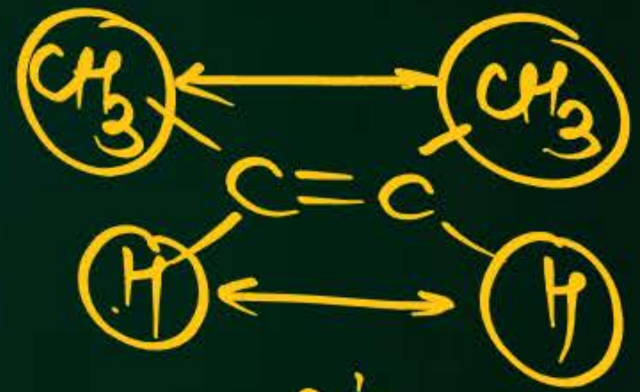
1. Properties of cis trans isomers ✓
2. Z/E nomenclature ✓

Properties of Cis-Trans

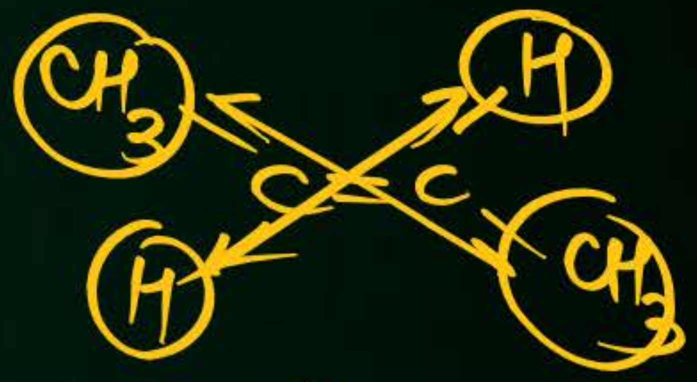
1. Dipole moment — nonpolar $\mu_{res} = 0$, polar $\mu_{res} \neq 0$
2. Boiling Point $\propto$ D·M
3. Crystal Lattice Energy $\propto$ stability
   amount of energy req to break 1mol crystal
4. Melting Point $\propto$ C·L·E
5. Stability ✓ $\propto \frac{1}{\text{Steric hind}}$
   ↳ repulsion b/w bulky groups.
6. Solubility $\propto \frac{1}{\text{stability}}$

Cis-Trans

Similar groups are on the same side then cis otherwise trans.

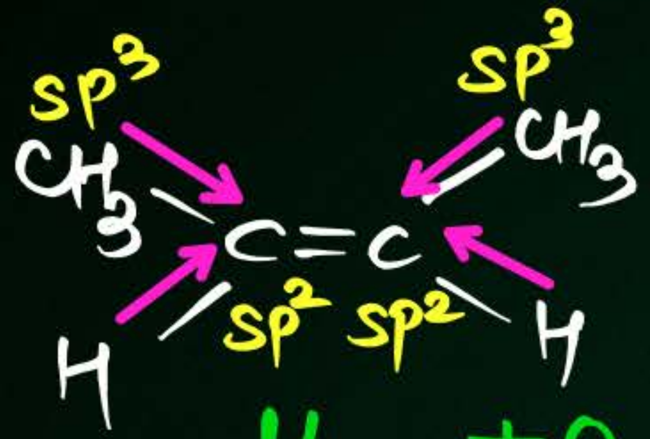


Cis

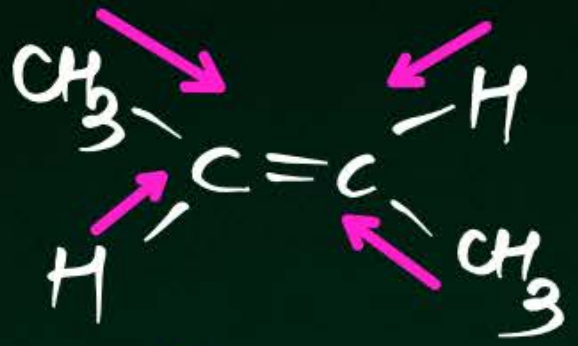


Trans

①


sp^3
CH_3
sp^3
CH_3
C=C
H
sp^2
sp^2
H

$\mu_{res} \neq 0$


CH_3
H
C=C
H
CH_3

$\mu_{res} = 0$

Low E.N → High E.N

$\overrightarrow{C - Cl}$

% s charac ↑ E.N ↑

1) D.M C > T

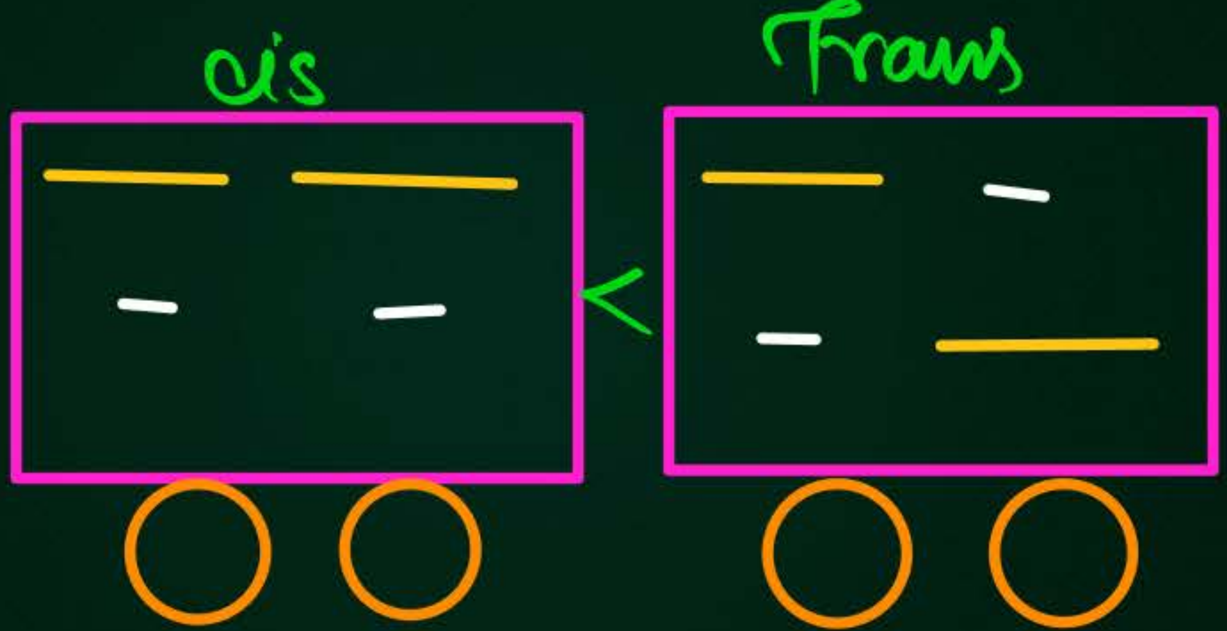
2) B.P C > T

3) Stability C < T

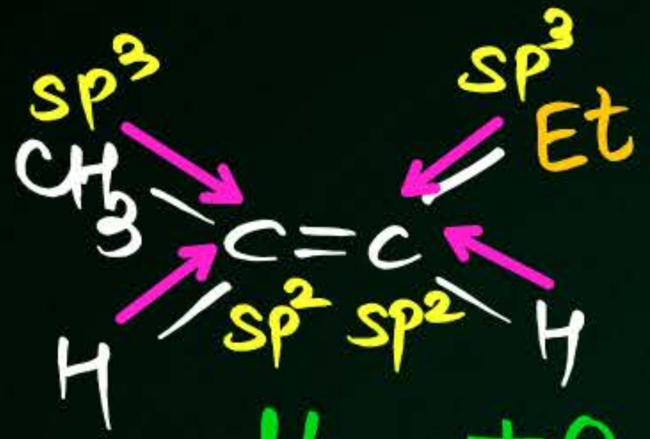
4) C.L.E C < T

5) Solubility C > T

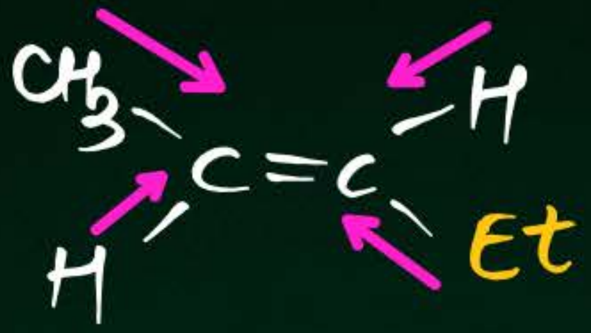
6) M.P C < T



②


sp3
sp3
CH_3
Et
C=C
H
H
sp2
sp2

$\mu_{res} \neq 0$



$\mu_{res} \neq 0$

Low E.N → High E.N

$\xrightarrow{\hspace{2em}}$
C — Cl

$\boxed{\% \text{ s charac} \uparrow \quad \text{E.N} \uparrow}$

1) D.M C > T

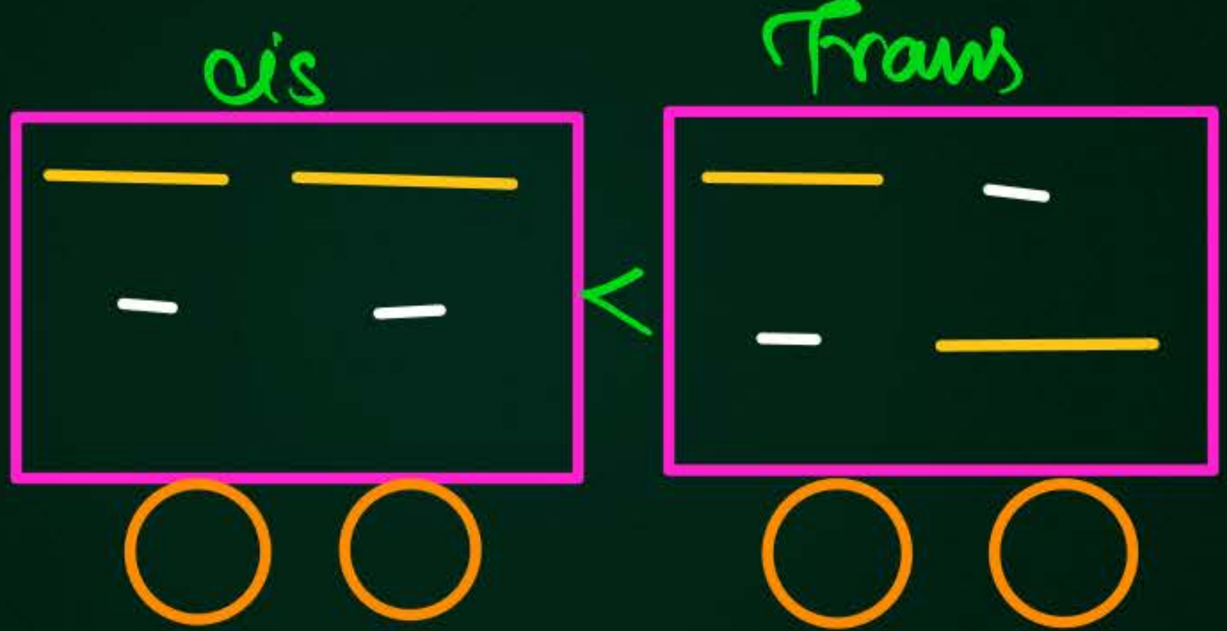
2) B.P C > T

3) Stability C < T

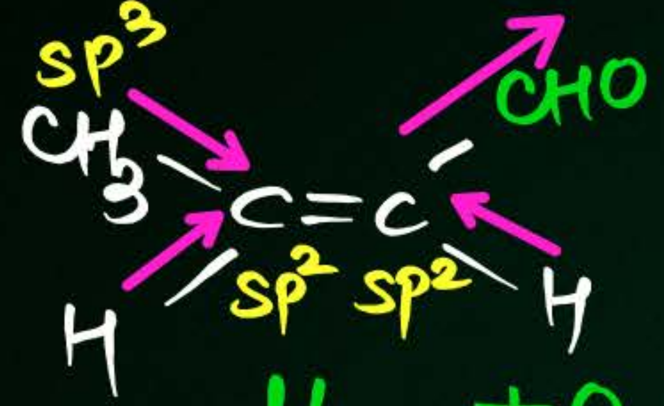
4) C.L.E C < T

5) Solubility C > T

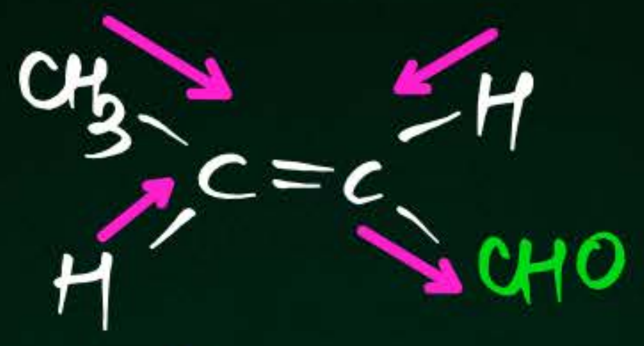
6) M.P C < T



③


sp3
CH3
C=C
CHO
H
sp2 sp2
H

$\mu_{res} \neq 0$


CH3
C=C
H
H
CHO

$\mu_{res} \neq 0$

Low E.N → High E.N

$\overrightarrow{C - Cl}$

% s charac ↑ E.N ↑

1) D.M C<T

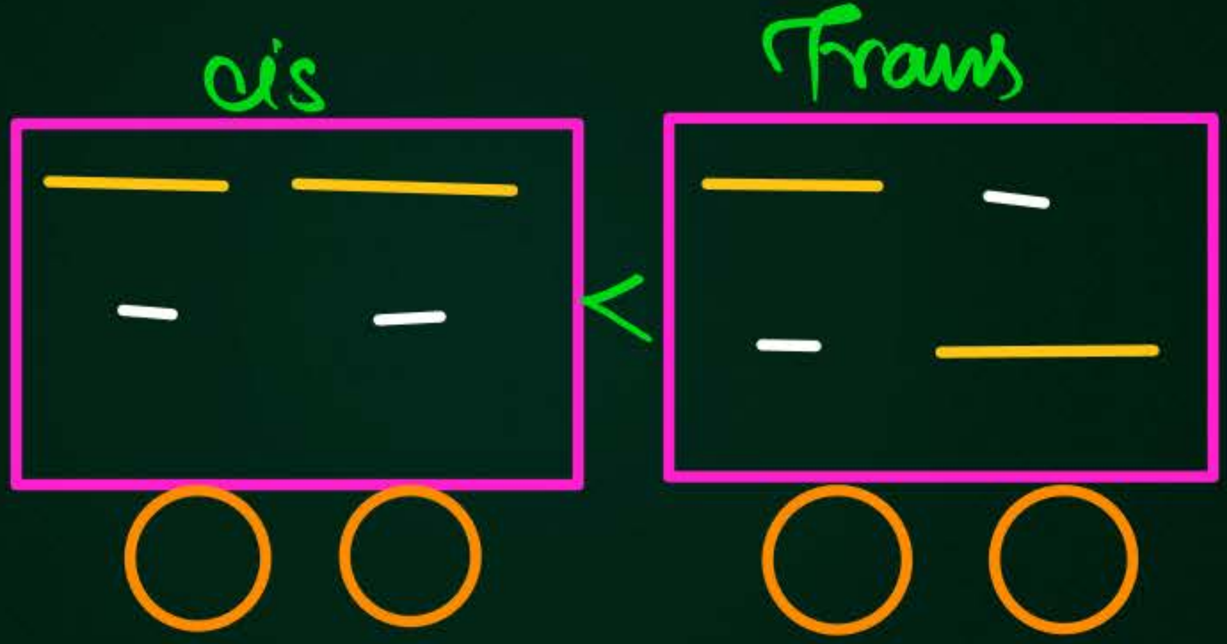
2) B.P C<T

3) Stability C<T

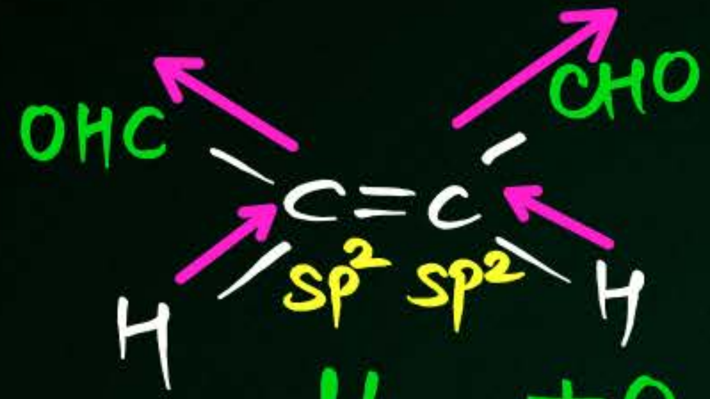
4) C.L.E C<T

5) Solubility C>T

6) M.P C<T

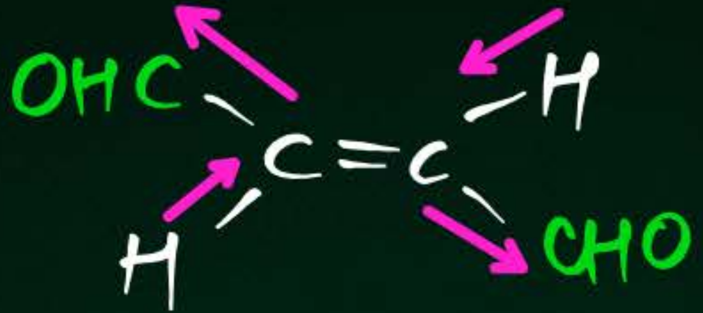


④



OHC
CHO
H
H
sp²
sp²

$\mu_{res} \neq 0$



$\mu_{res} = 0$

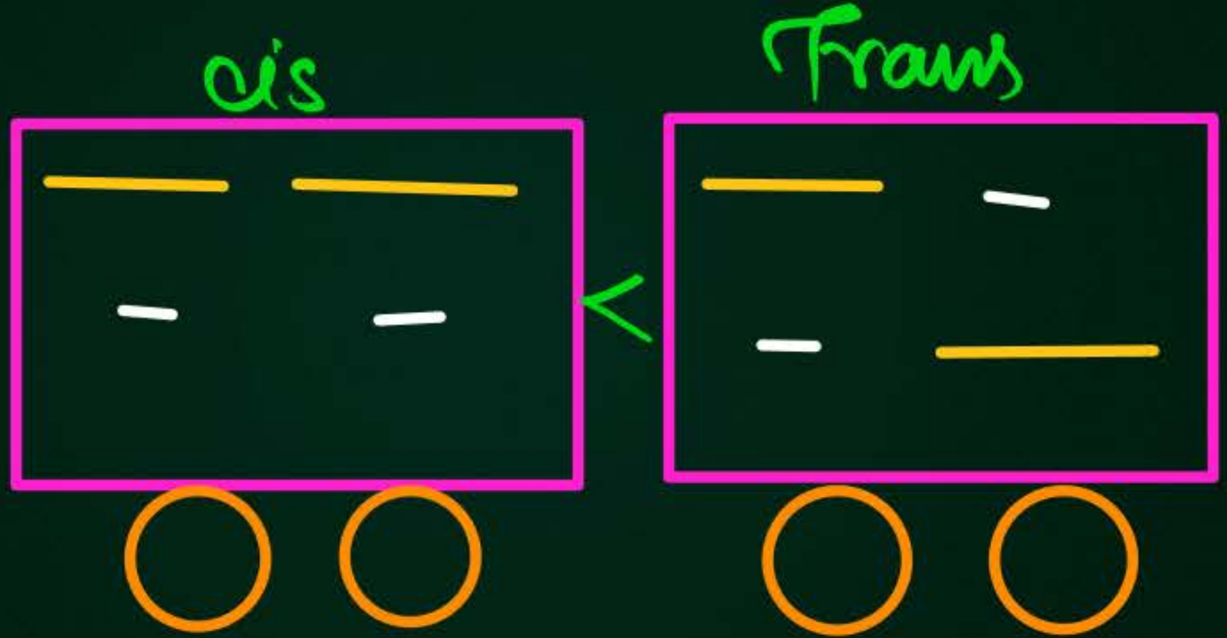
Low E.N ⟶ High E.N

$\overrightarrow{C - Cl}$

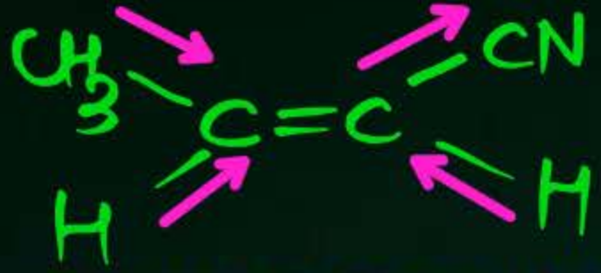
% s charac ↑ E.N ↑

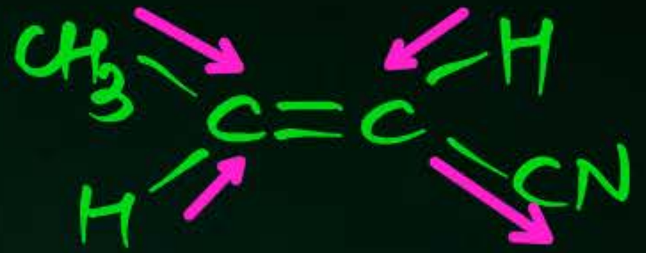
1) D.M C > T
2) B.P C > T

3) Stability C < T
4) C.L.E C < T
5) Solubility C > T
6) M.P C < T



QUESTION





Compare the physical properties (μ, B. P., M. P., & Stability) in the geometrical isomers of $CH_3-C=CH-CN$.
Which of the following option is correct?

	μ	B. P.	M. P.	Stability
A	cis > trans	cis > trans	trans > cis	trans > cis
B	cis > trans	trans > cis	trans > cis	trans > cis
C	cis > trans	cis > trans	trans > cis	cis > trans
[✓ D]	Trans > cis	trans > cis	trans > cis	trans > cis

QUESTION

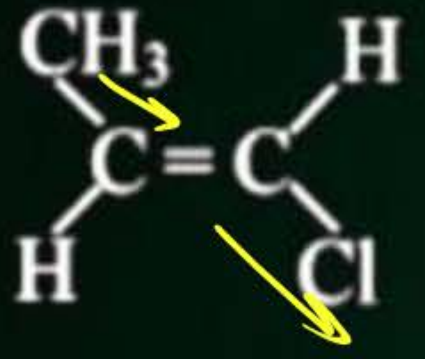
Match the following:

Column-I		Column-II	
I	$CH_3-CH=CH-CH_3$ P, S, R (C>T)	P	Dipole moment (cis > trans)
II	$CH_3-CH=CH-CN$ Q, R	Q	Dipole moment (trans > cis)
III	$CH_3-CH=CH-Cl$ Q, R	R	Melting point (trans > cis)
IV	$Cl-CH=CH-Cl$ P, R, S	S	Boiling point (cis > trans)

QUESTION

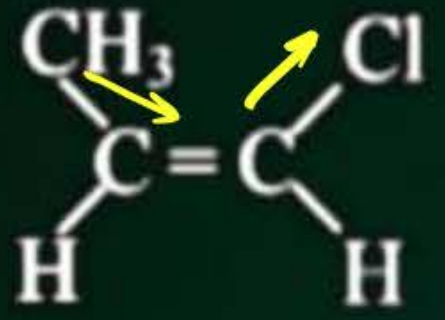
Which of the following is correct set of physical properties of geometrical isomers?

Trans I



&

cis II

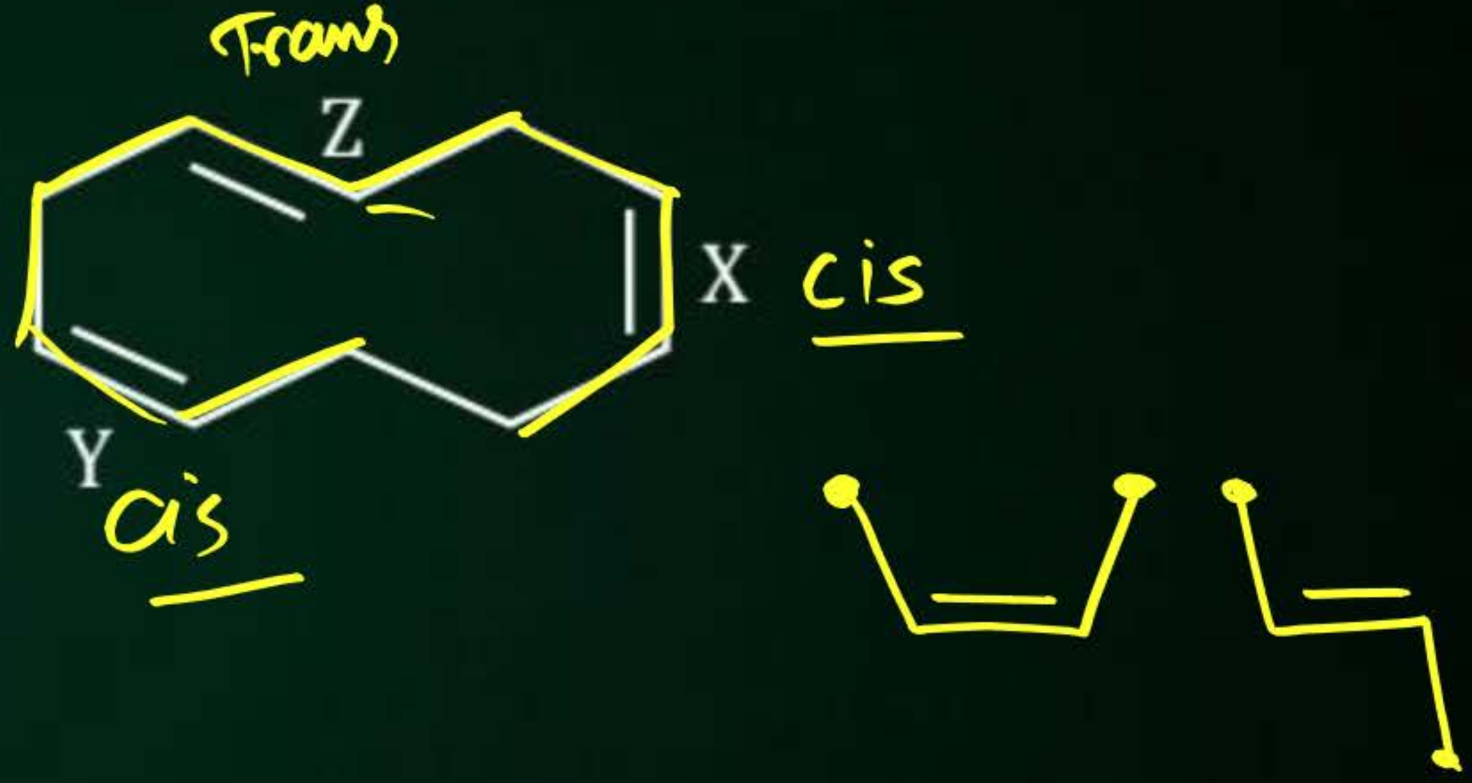


	Dipole moment	Boiling point	Melting point	Stability
(A)	I > II	I > II	II > I	I > II
(B)	✗ II > I	II > I	II > I	II > I
[✓ (C)]	I > II	I > II	I > II	I > II
(D)	✗ II > I	II > I	I > II	I > II

QUESTION

Types of geometrical isomerism shown at point X, Y and Z of the following compound respectively are:

	X	Y	Z
[✓ A]	cis	cis	trans
B	cis	trans	trans
C	trans	cis	cis
D	cis	trans	cis



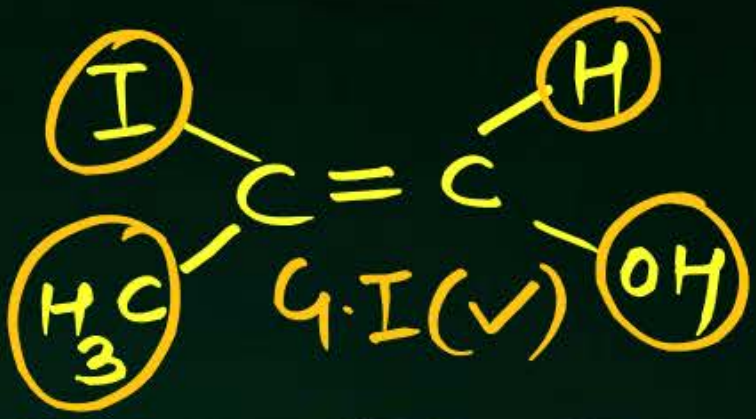
zusamenn (same side)

2.Z-E System

Entgegon (opposite side)

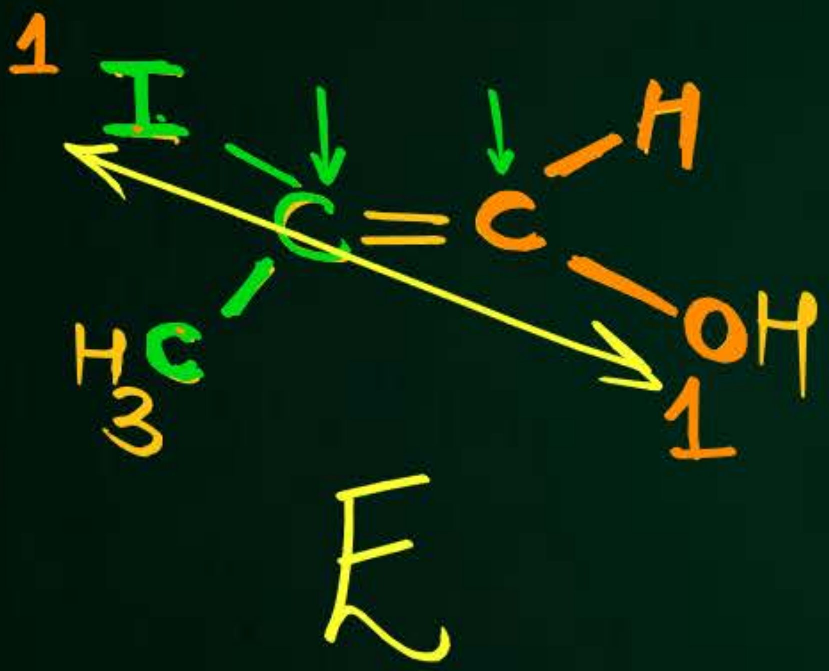
C.I.P. Rules

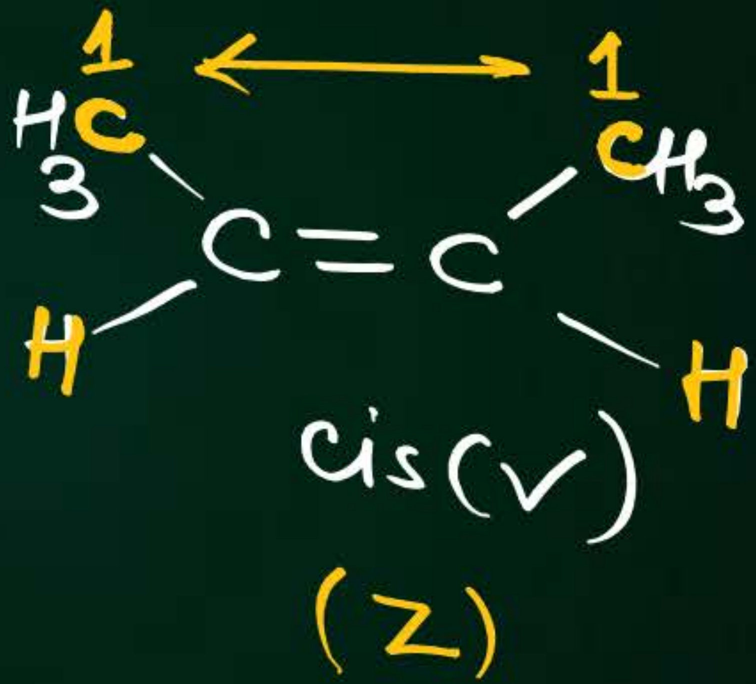
Cahn-Ingold-Prelog

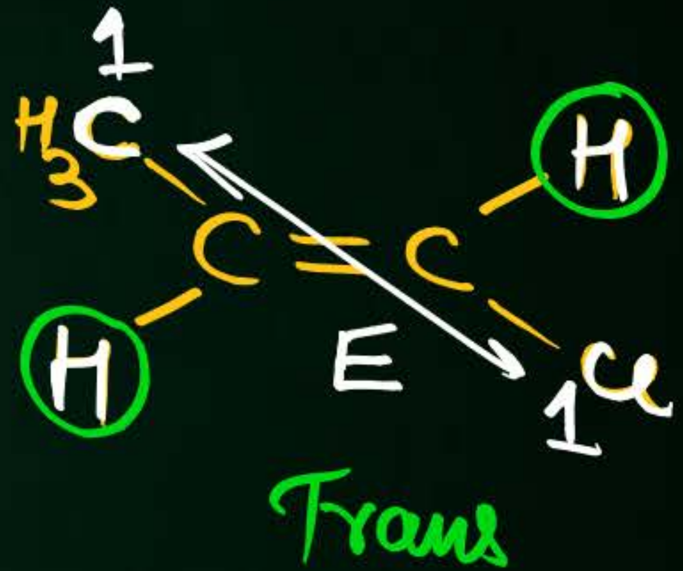

I
H
C=C
H_3C
OH
G.I(✓)

cis/Trans fail ho gya.

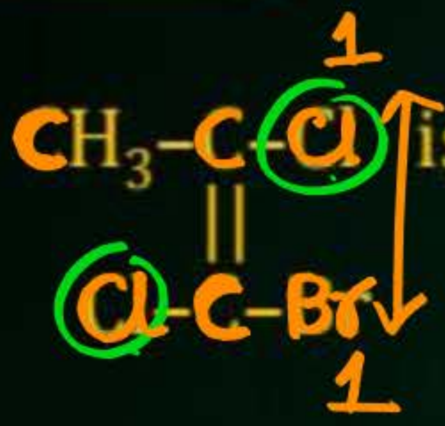
Rule 01. Greater the atomic number, higher will be the priority.


1
I
H
C=C
H_3C
OH
1
E


1
1
H_3C
CH_3
C=C
H
H
cis(✓)
(Z)


1
H_3C
H
C=C
H
E
1
Cl
Trans

QUESTION



$$\begin{matrix} CH_3-C-Cl \\ \| \\ Cl-C-Br \end{matrix}$$ is:

A Trans

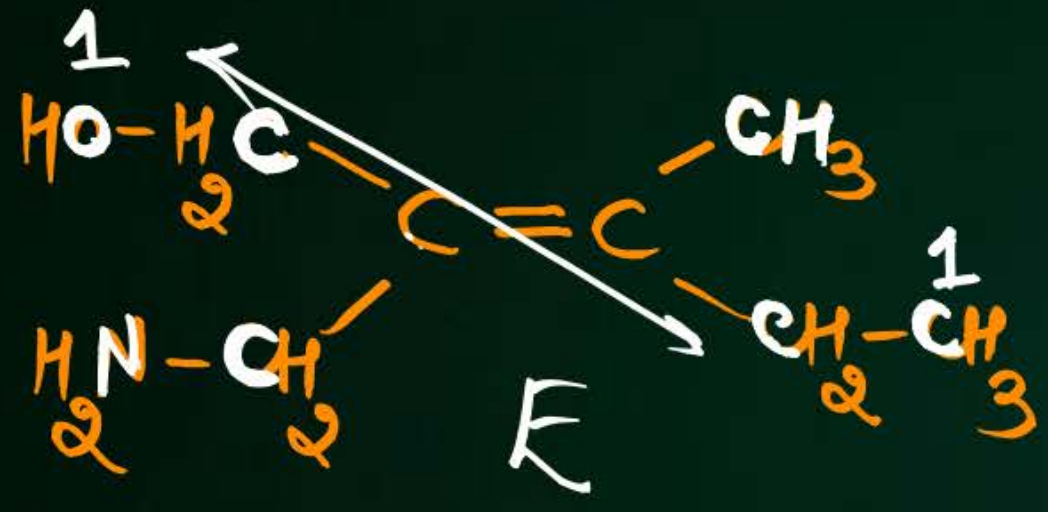
B Z

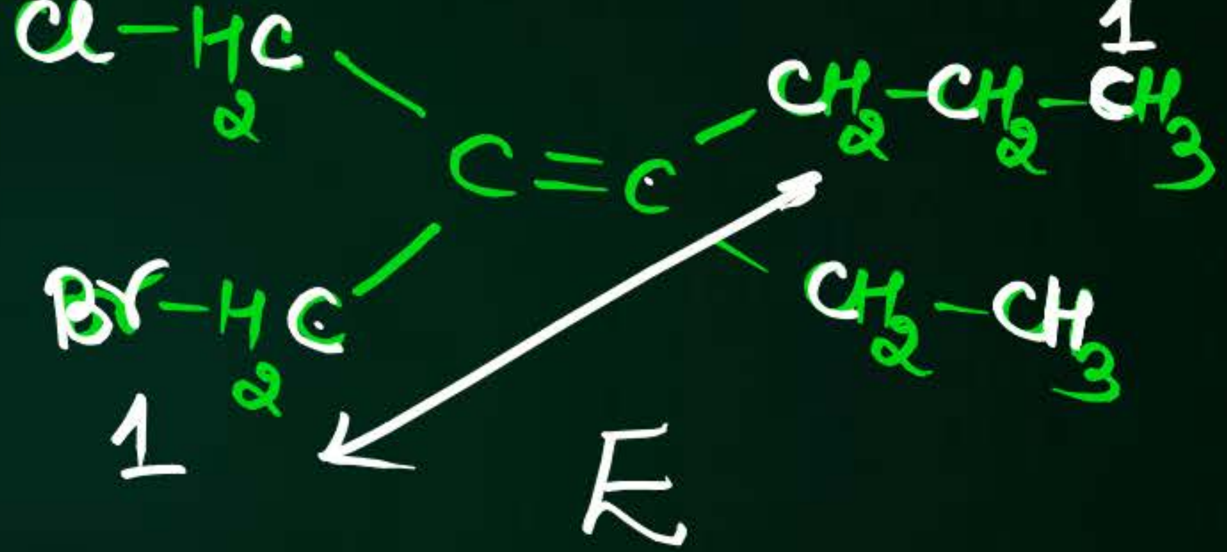
[✓ **C** Both (A) & (B) correct]

D None of these

C.I.P. Rules

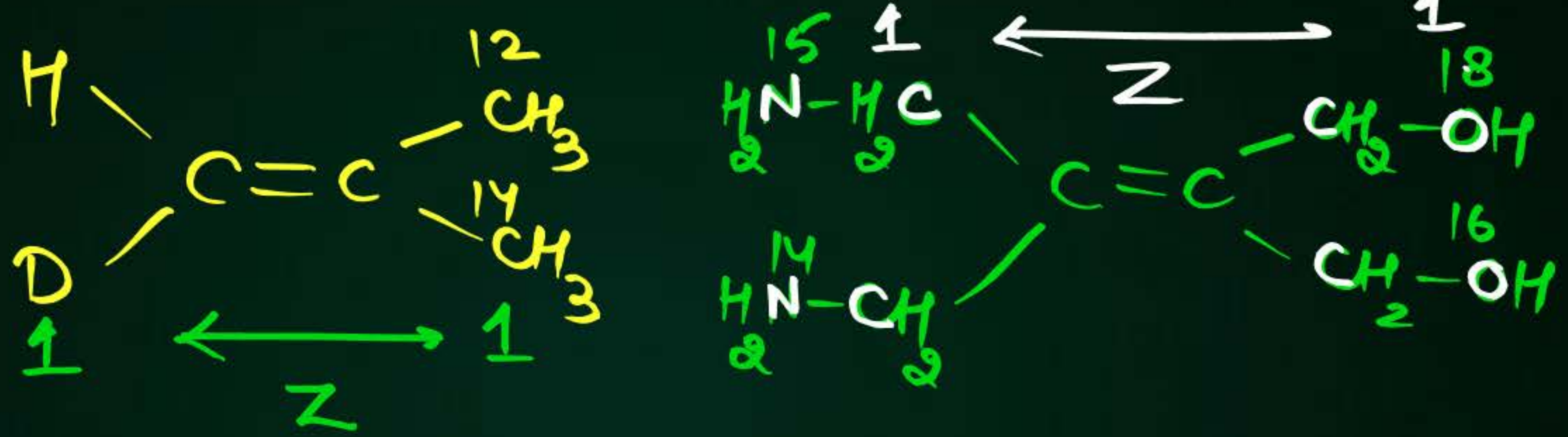
Rule 02. If the atomic number of first atom is same then go for the next atom and apply the rule number 01.


1
HO–H2C
CH3
C=C
H2N–CH2
1
CH2–CH3
E


Cl–H2C
1
CH2–CH2–CH3
C=C
Br–H2C
CH2–CH3
1
E

C.I.P. Rules

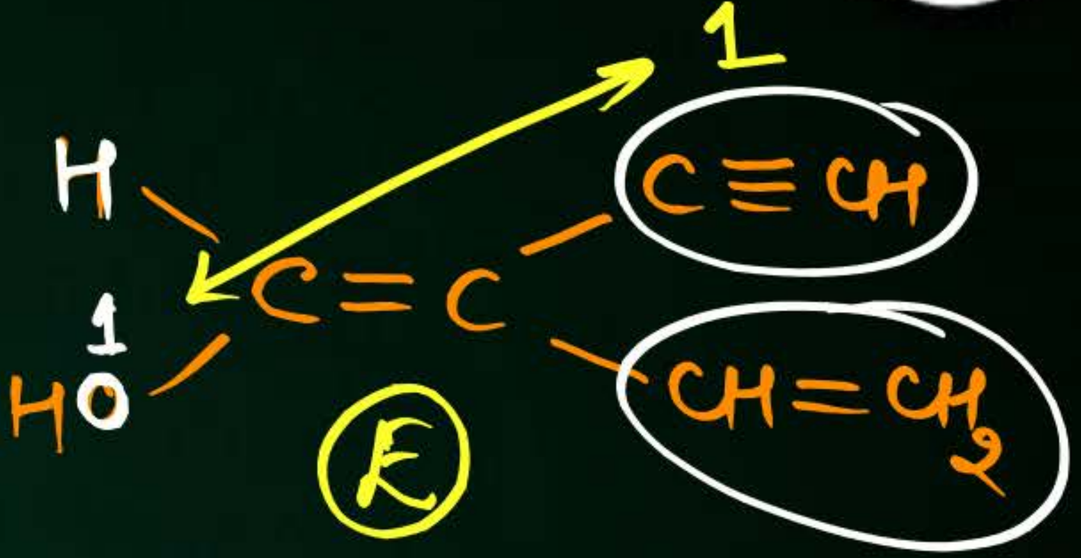
Rule 03. In the case of isotopes higher mass number will be the higher priority.



H
D
C=C
12
CH3
14
CH3
1
1
Z
15
H2N-H2C
14
H2N-CH2
C=C
18
CH2-OH
16
CH2-OH
1
1
Z

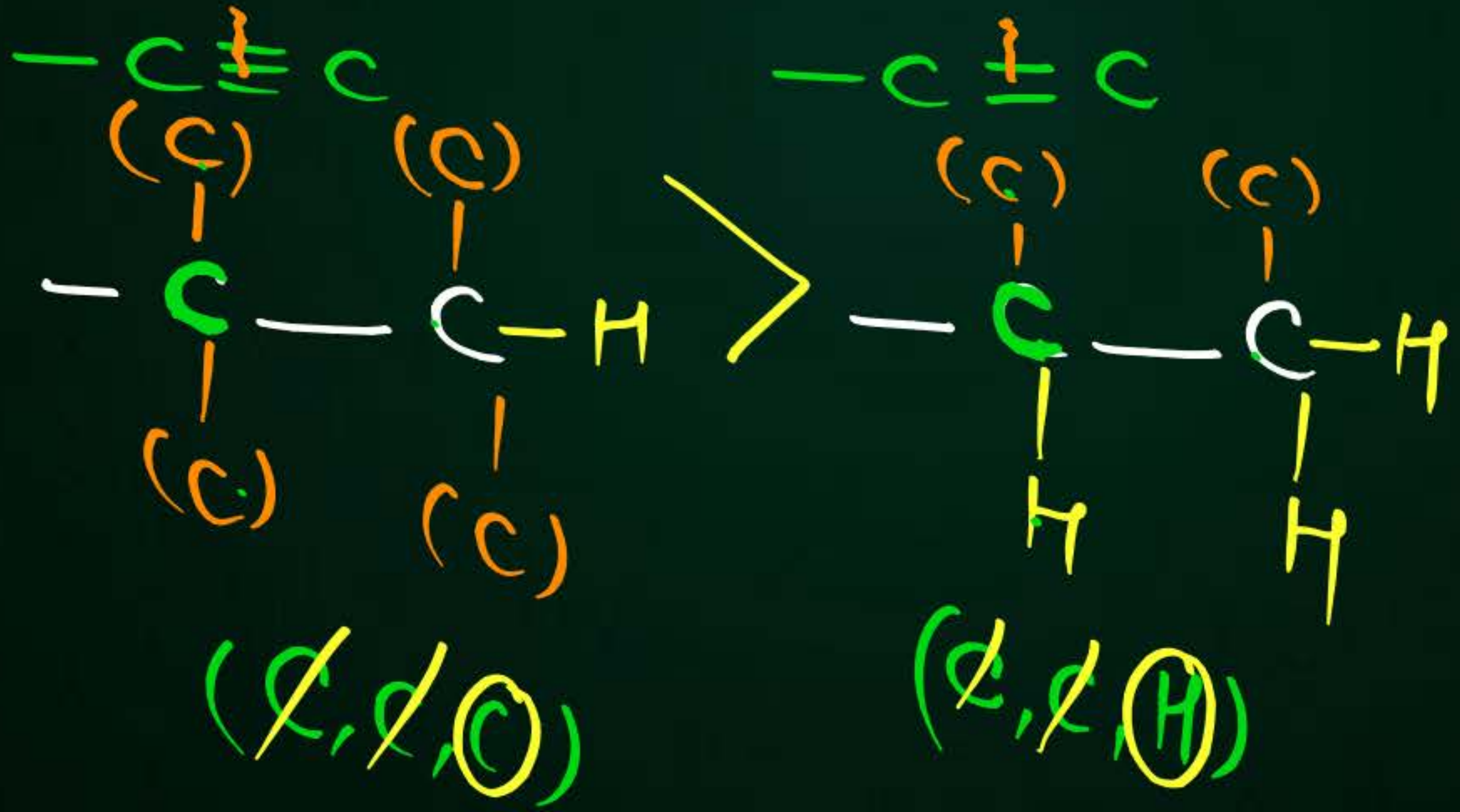
C.I.P. Rules

Rule 04. In the case of multiple bonds ~~and~~ ~~Rings~~.

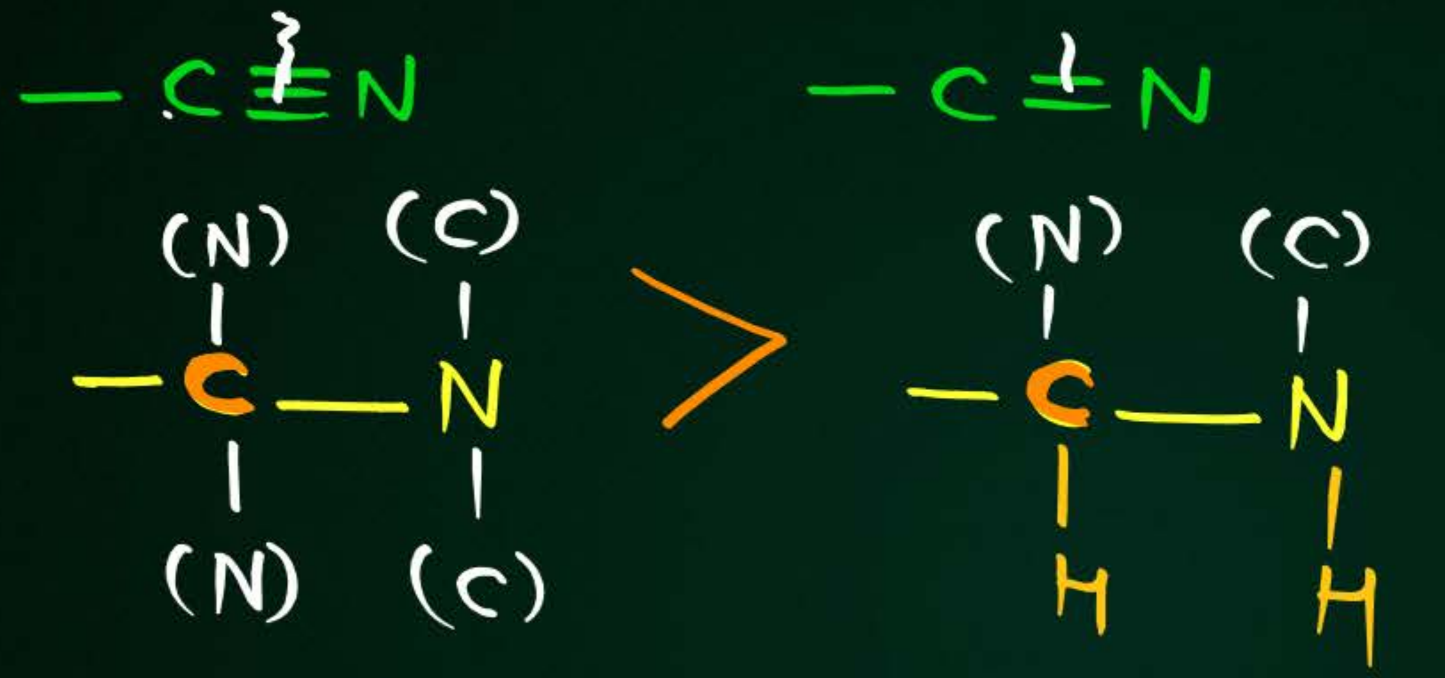

1
H
HO
C=C
C≡CH
CH=CH₂
E

Hypothetical atom consider karenge.

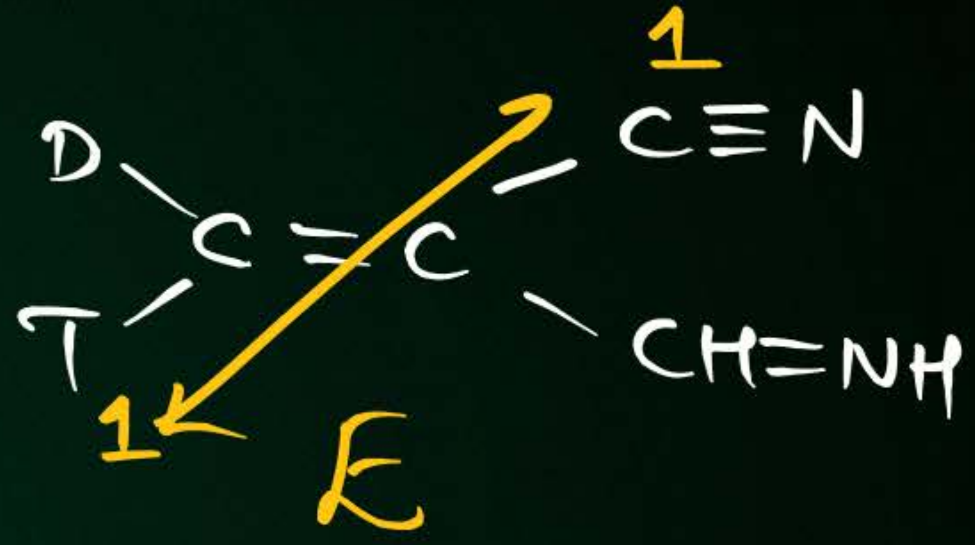
① $-C\equiv CH > -CH=CH_2$


−C≡C
(C)
(C)
−C—C−H
(C)
(C)
>
−C=C
(C)
(C)
−C—C−H
H
H
(C, C, C)
(C, C, H)

② $-C\equiv N > -CH=NH$


−C≡N
−C=N
(N)
(C)
−C—N
(N)
(C)
>
(N)
(C)
−C—N
H
H

$(\cancel{N},\cancel{N},\textcircled{N})$ $(\cancel{N},\cancel{N},\textcircled{H})$


1
C≡N
D
C=C
T
CH=NH
1
E

Op point
P.S. Rule

$A \equiv B > A = B > A - B$ (Jab same atoms ke beech ka bond ho)

$A \equiv A > A = A > A - A$

1) $-C \equiv CH > -CH = CH_2 > -CH_2 - CH_3$

2) $-C \equiv N > -CH = NH > -CH_2 - NH_2$

3) $-CH = O > -CH_2 - OH$

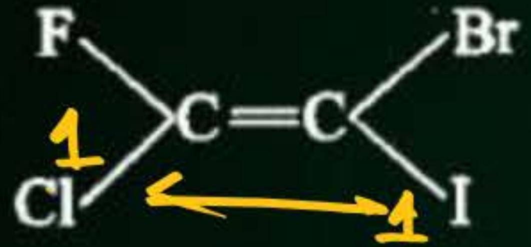
4) $-C \equiv CH < -CH = O$

5) $-C \equiv CH < -CH = NH$

QUESTION

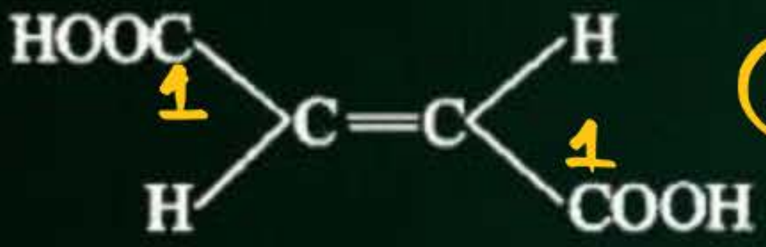
Give the E-Z designation of each of the following:

(i)


F
Br
C=C
1
Cl
1
I

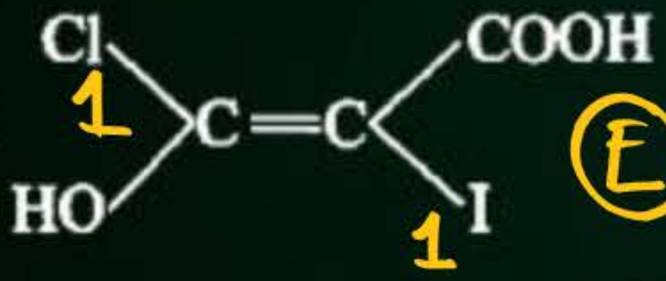
Ⓩ

(ii)


HOOC
H
1
C=C
1
H
COOH

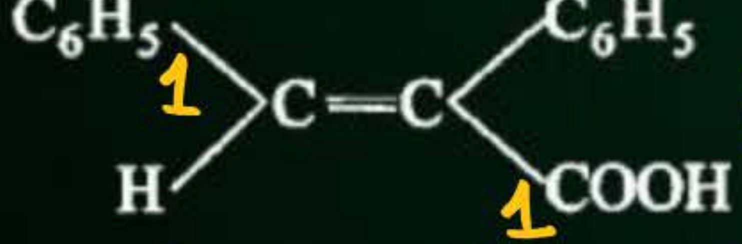
Ⓔ

(iii)


Cl
COOH
1
C=C
HO
1
I

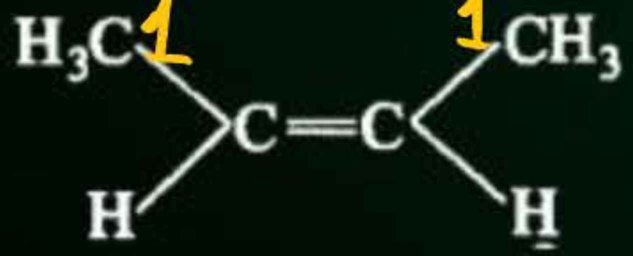
Ⓔ

(iv)


C_6H_5
C_6H_5
1
C=C
H
1
COOH

Ⓔ

(v)

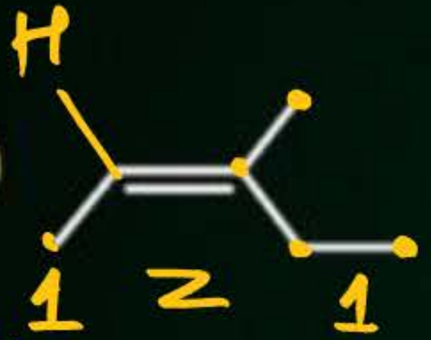

H_3C
1
1
CH_3
C=C
H
H

Ⓩ

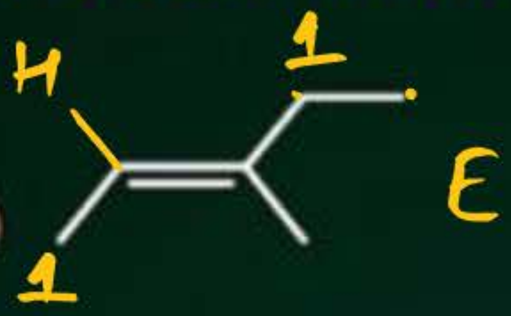
QUESTION

Write (E) and (Z) configuration of the following:

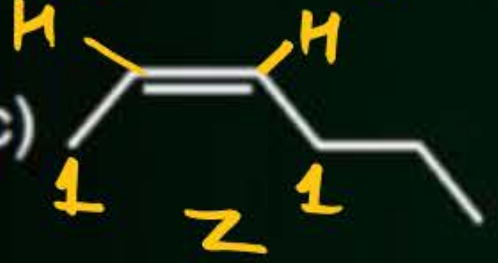
(a)



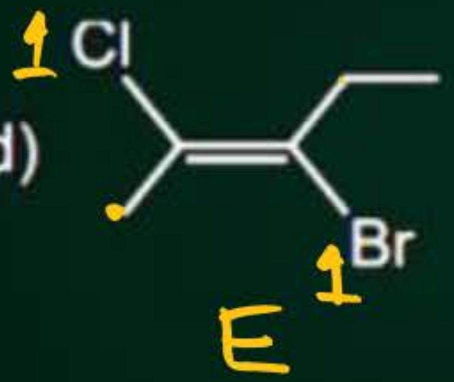
(b)



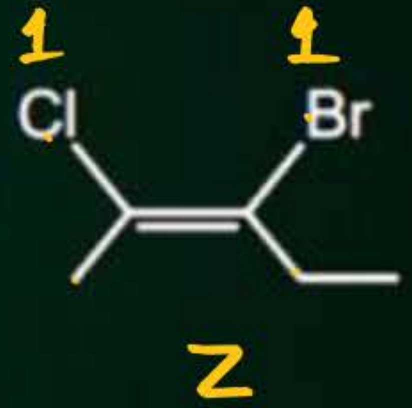
(c)



(d)



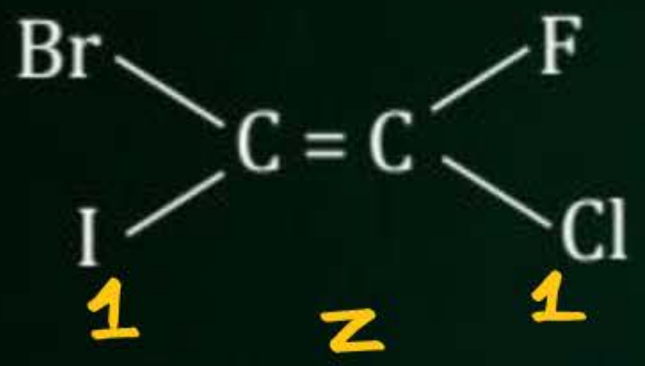
(e)



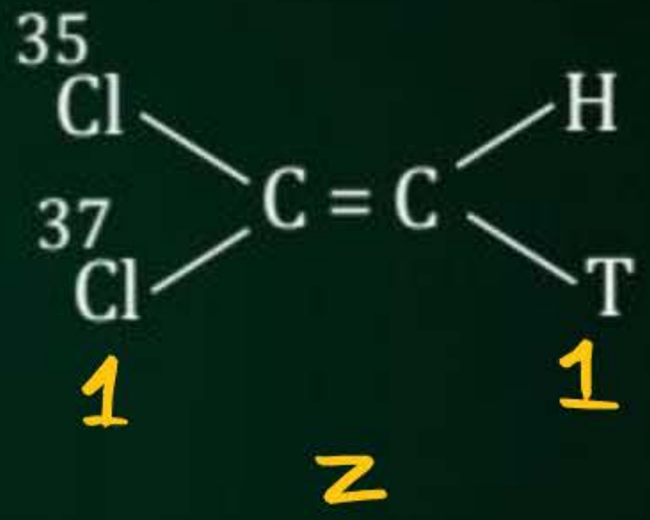
QUESTION

Find Z/E.

Ⓐ


Br
F
C = C
I
Cl
1
Z
1

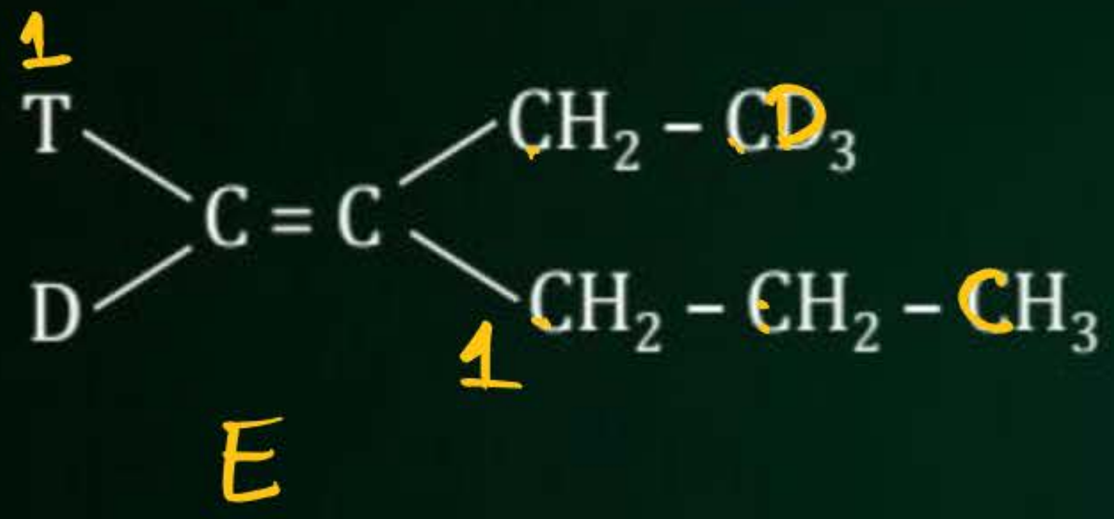
Ⓑ


35
Cl
H
C = C
37
Cl
T
1
1
Z

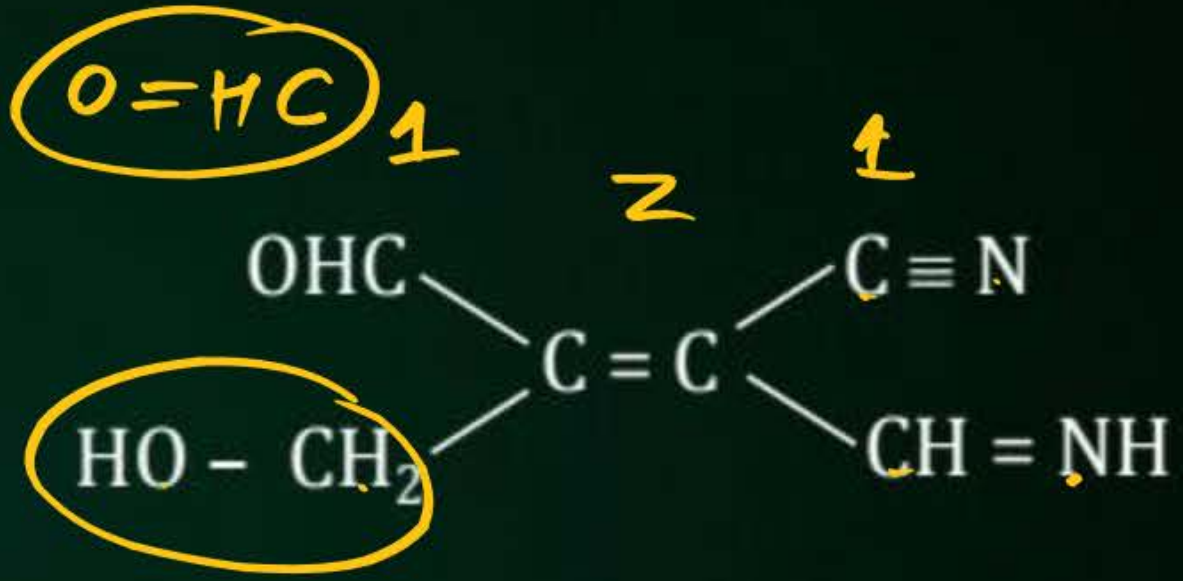
QUESTION

Find Z/E.

Ⓐ


1
T
D
C = C
CH₂ – CD₃
CH₂ – CH₂ – CH₃
1
E

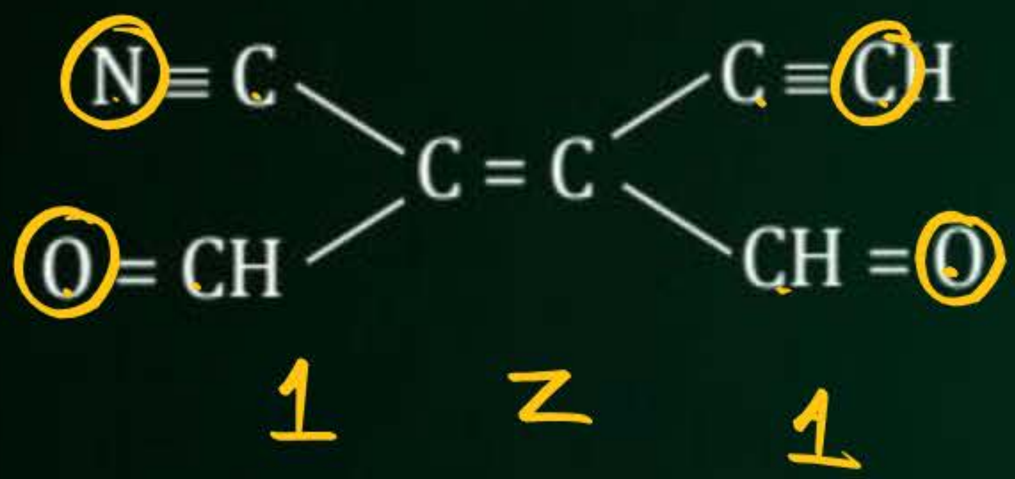
Ⓑ


O=HC
1
Z
1
OHC
HO – CH₂
C = C
C ≡ N
CH = NH

QUESTION

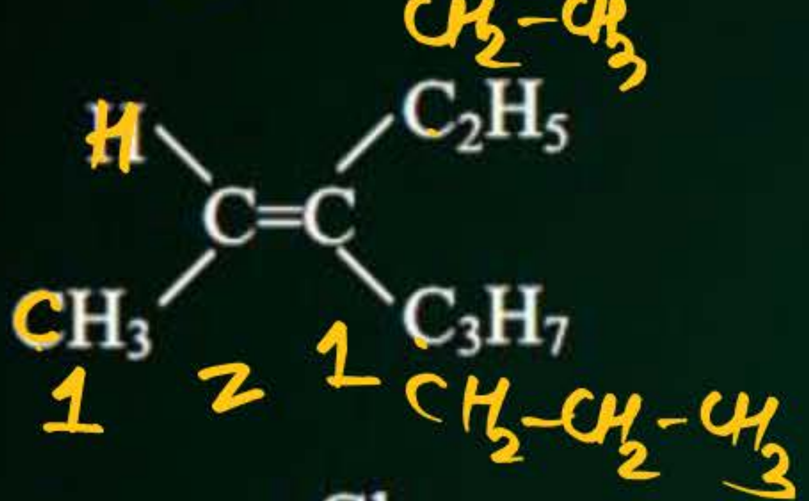
Find Z/E.

A

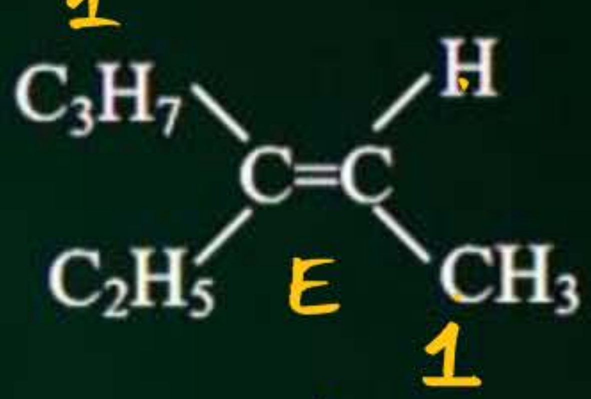

N≡C
C≡CH
C=C
O=CH
CH=O
1
z
1

QUESTION

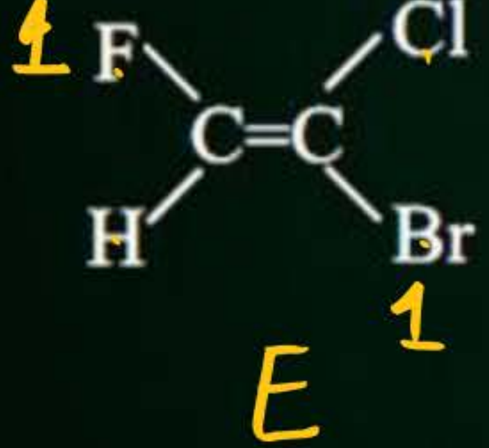
The Z–configuration in the following is:

A


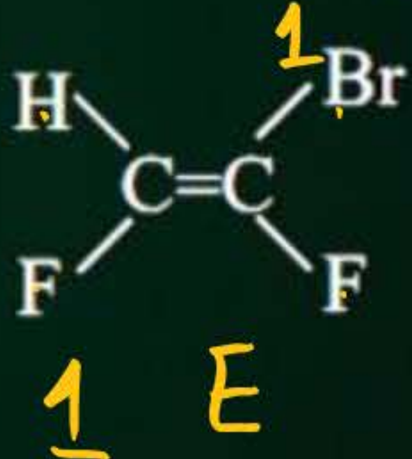
CH_2-CH_3
H
C_2H_5
C=C
CH_3
C_3H_7
1
Z
1
$CH_2-CH_2-CH_3$

B


1
C_3H_7
H
C=C
C_2H_5
E
CH_3
1

C


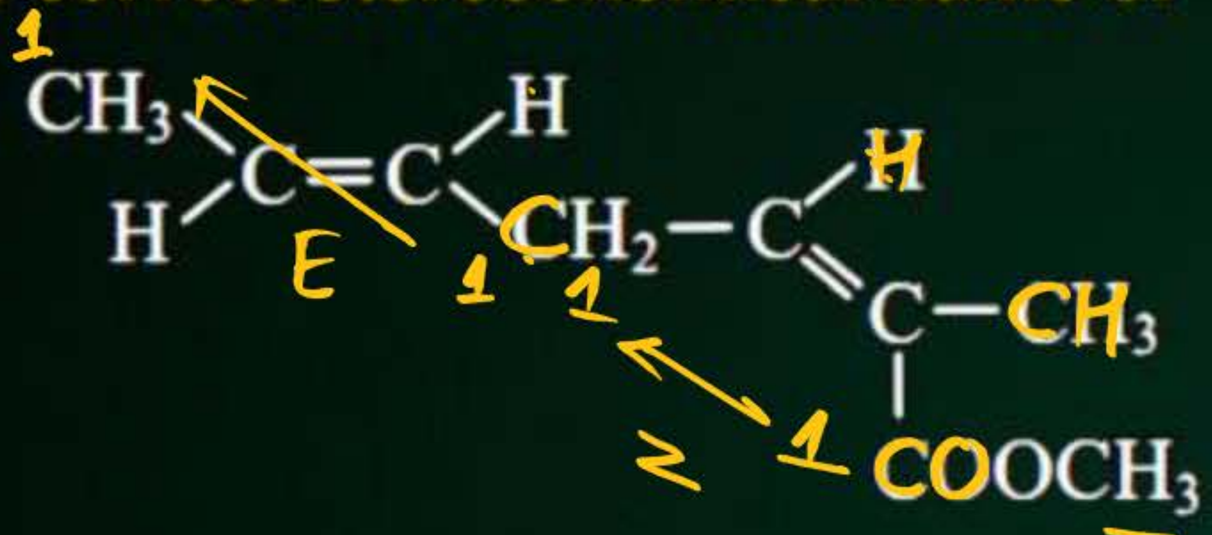
1
F
Cl
C=C
H
Br
1
E

D


H
1
Br
C=C
F
F
1
E

QUESTION

The correct stereochemical name of


1
CH3
H
C=C
H
CH2–C
H
C–CH3
COOCH3
E
1
1
Z
1

(A) Methyl 2-methylhepta (~~2~~E, 5E) dienoate

(B) Methyl 2-methylhepta (2Z, 5Z) dienoate

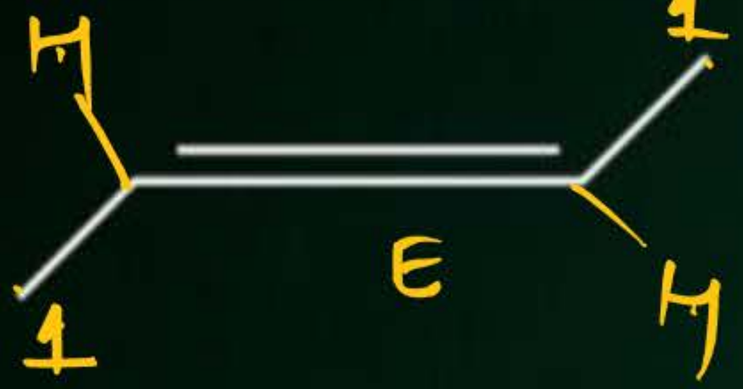
(C) Methyl 2-methylhepta (~~2~~E, 5Z) dienoate

[✓ (D)] Methyl 2-methylhepta (2Z, 5E) dienoate

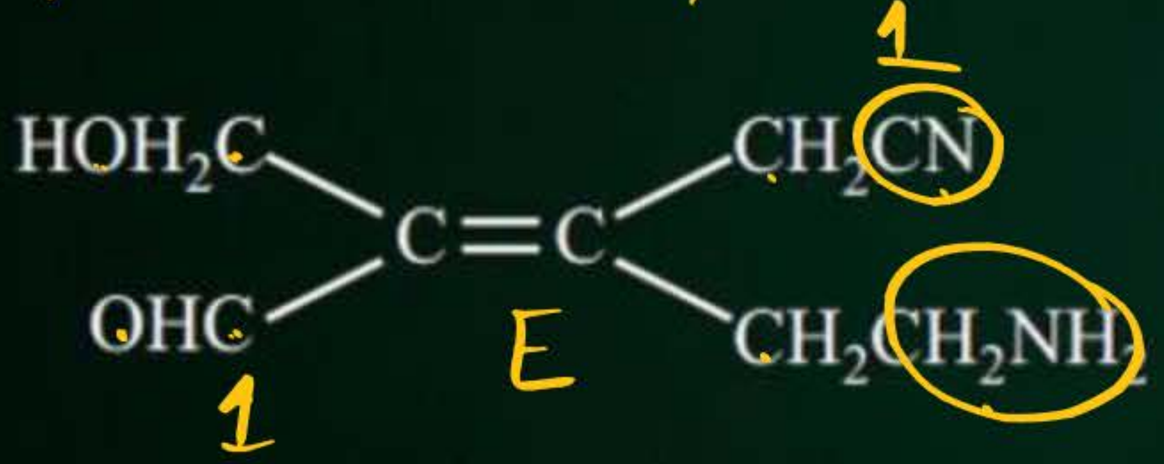
QUESTION

Assign the names E & Z to the following.

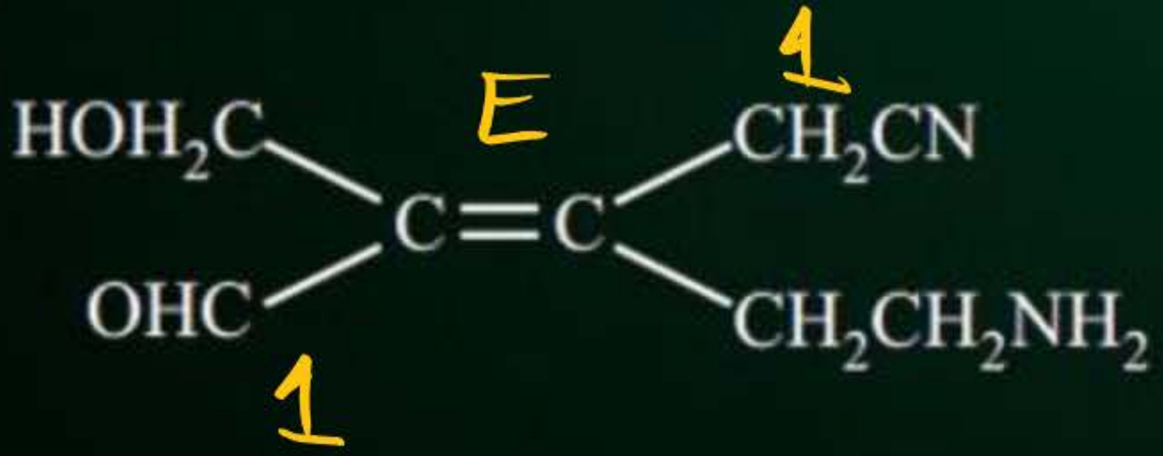
A



B


1
HOH₂C
CH₂CN
C=C
OHC
E
CH₂CH₂NH₂
1

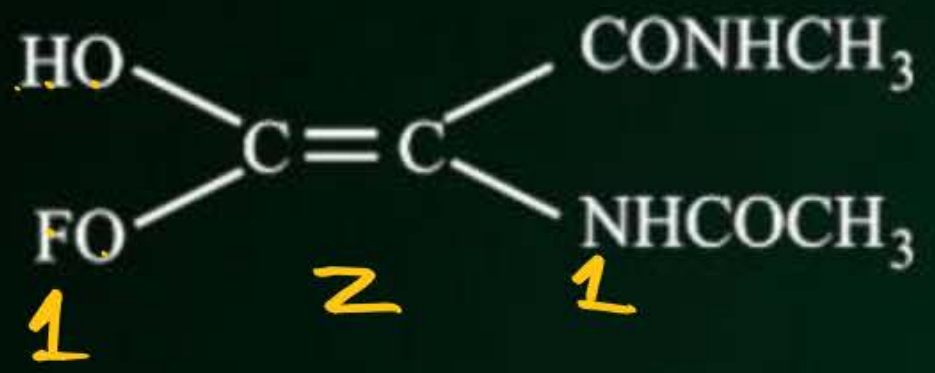
C


E
1
HOH₂C
CH₂CN
C=C
OHC
CH₂CH₂NH₂
1

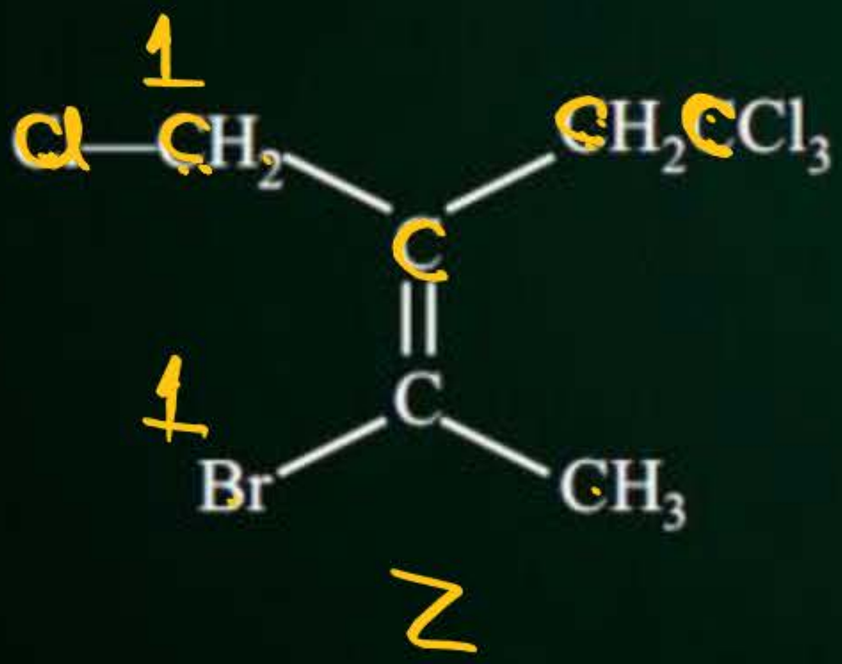
QUESTION

Assign the names E & Z to the following.

A


HO
FO
C=C
CONHCH$_3$
NHCOCH$_3$
1
Z
1

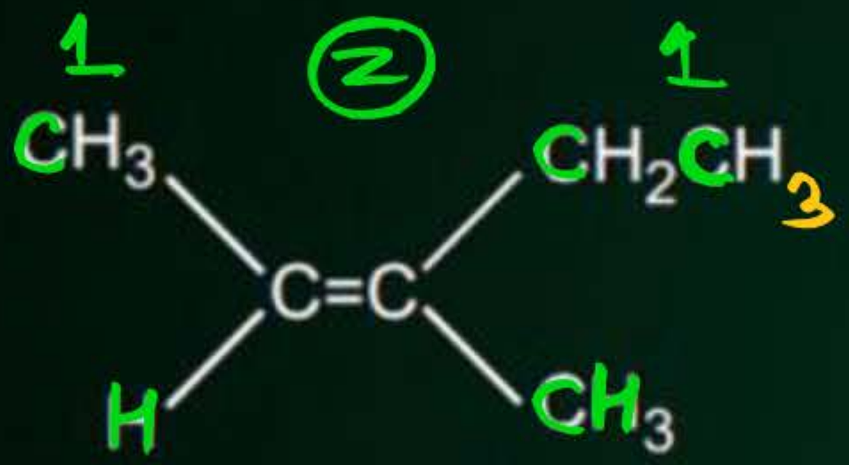
B


1
Cl—CH$_2$
CH$_2$CCl$_3$
C
C
1
Br
CH$_3$
Z

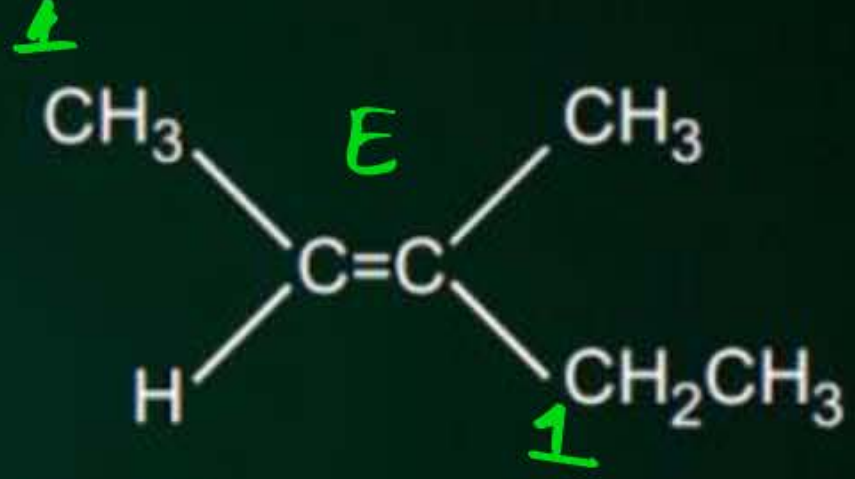
QUESTION

The Z-isomer among the following is:

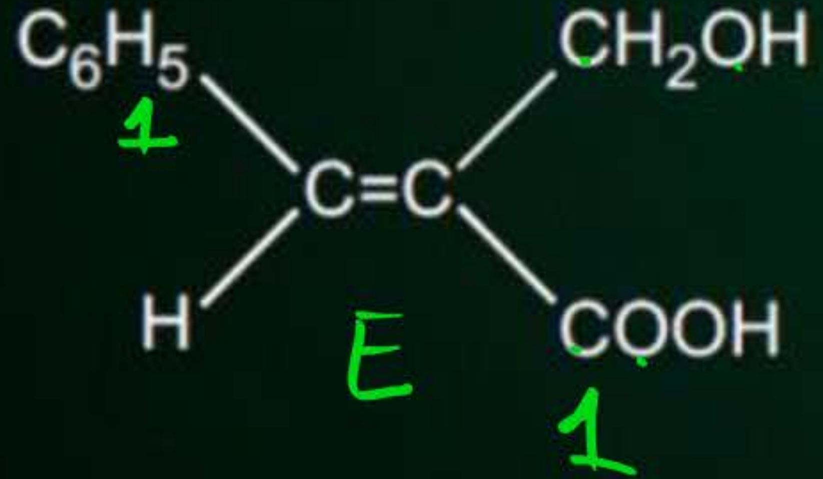
A ✓


1
②
1
CH_3
CH_2CH_3
3
H
CH_3

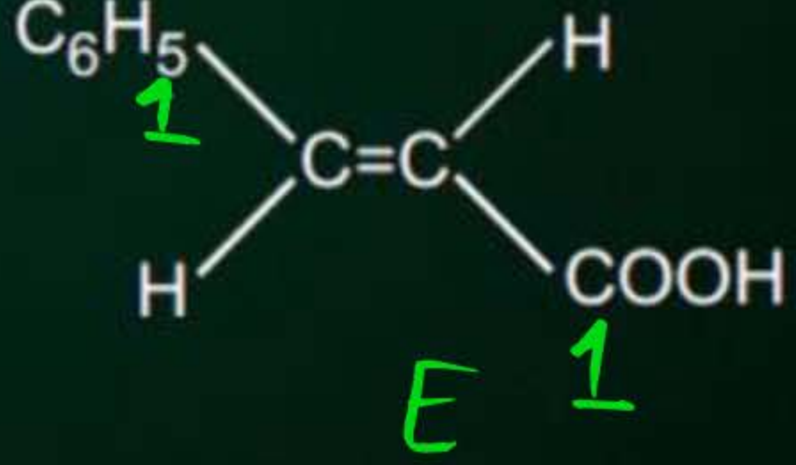
B


1
CH_3
E
CH_3
H
CH_2CH_3
1

C


C_6H_5
1
CH_2OH
H
E
COOH
1

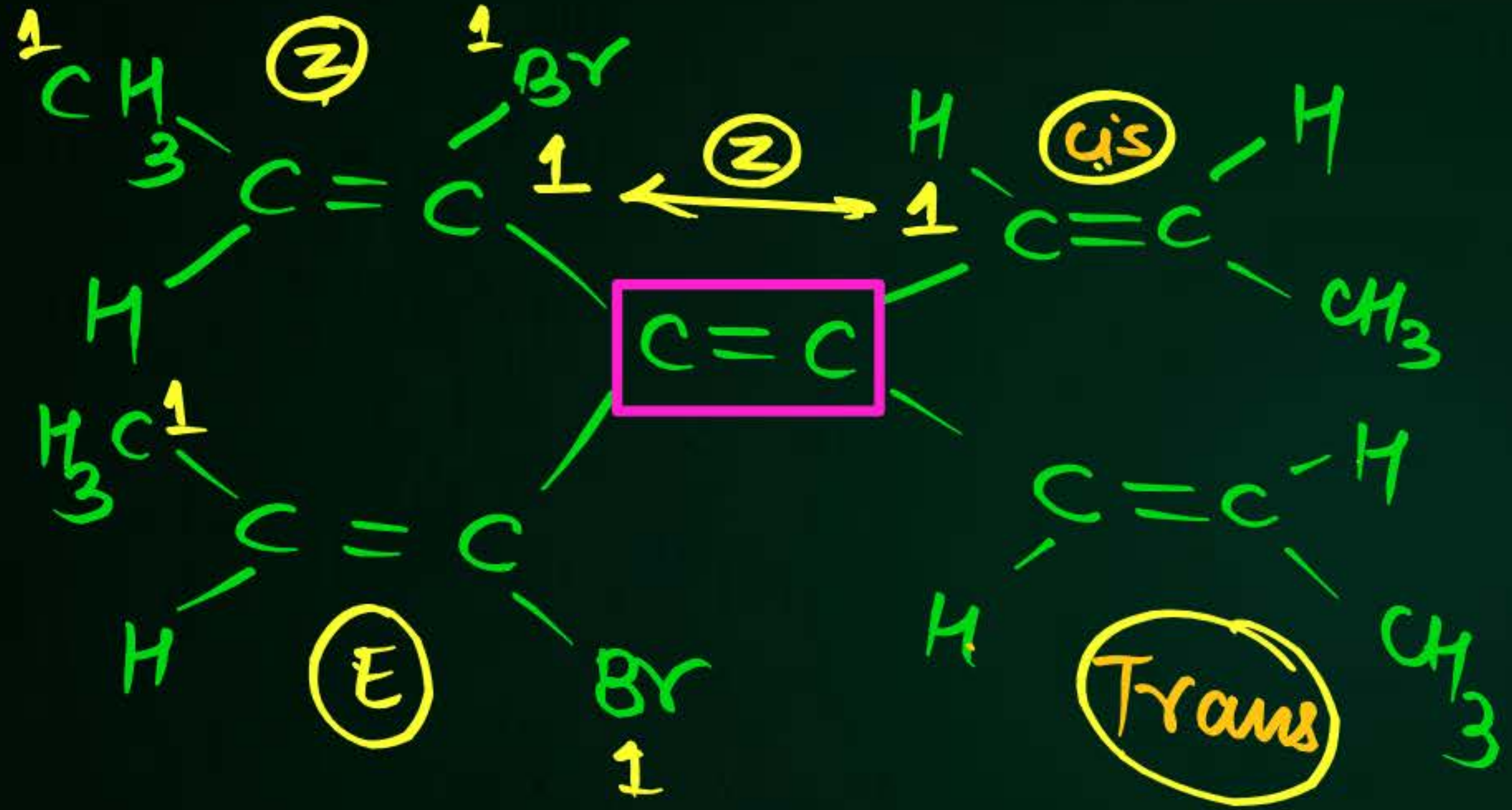
D


C_6H_5
1
H
H
COOH
E
1

C.I.P. Rules

(Least imp)

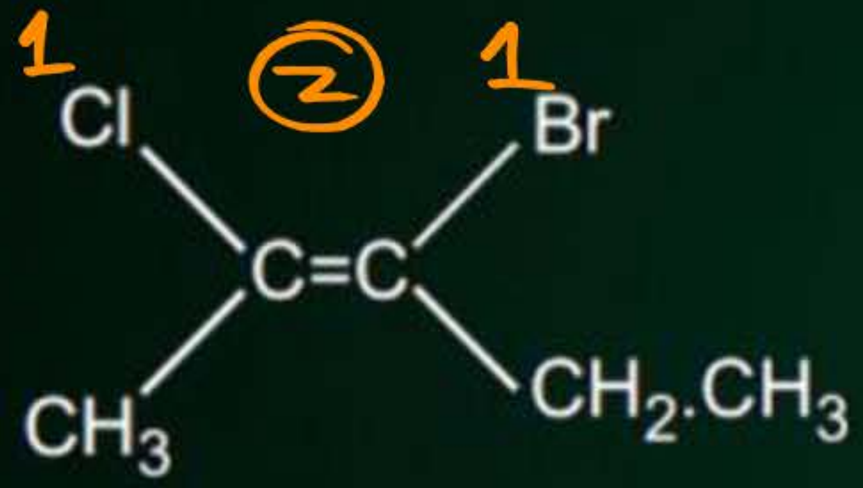
Rule 05. Priority [cis>Trans , Z>E],syn>anti


1 CH3
Z
1 Br
1
Z
H
cis
H
1
H
CH3
H3C 1
C=C
C=C
H
E
Br
1
H
Trans
CH3

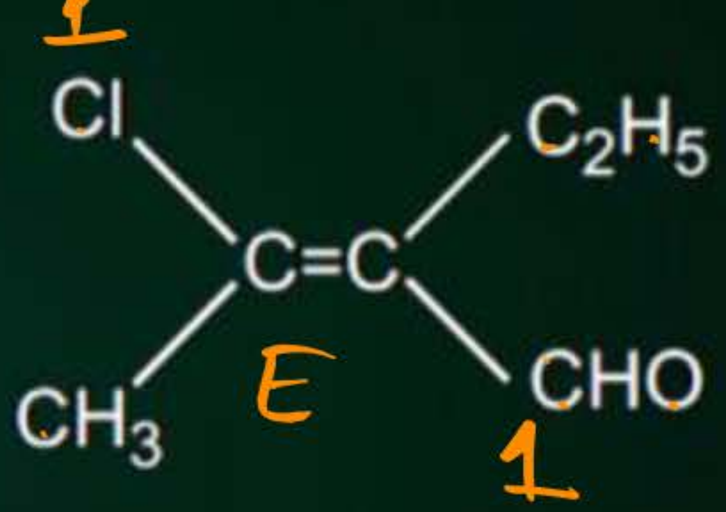
QUESTION

Which of the following is an 'E' isomer?

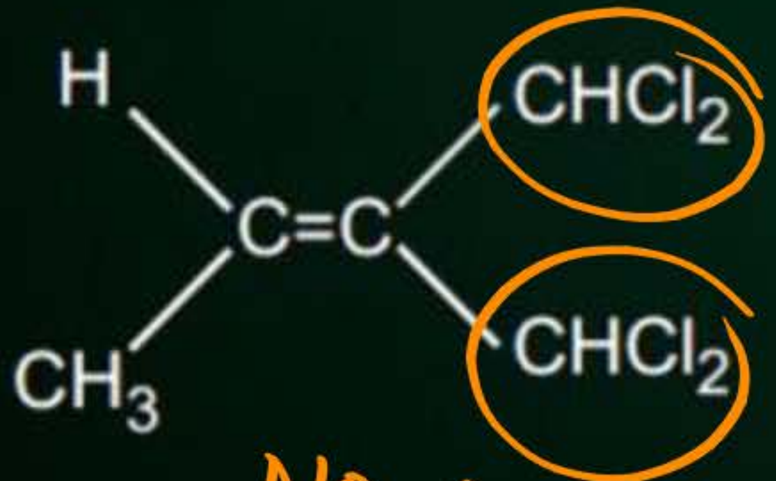
A


1
Cl
Z
1
Br
C=C
CH3
CH2.CH3

B

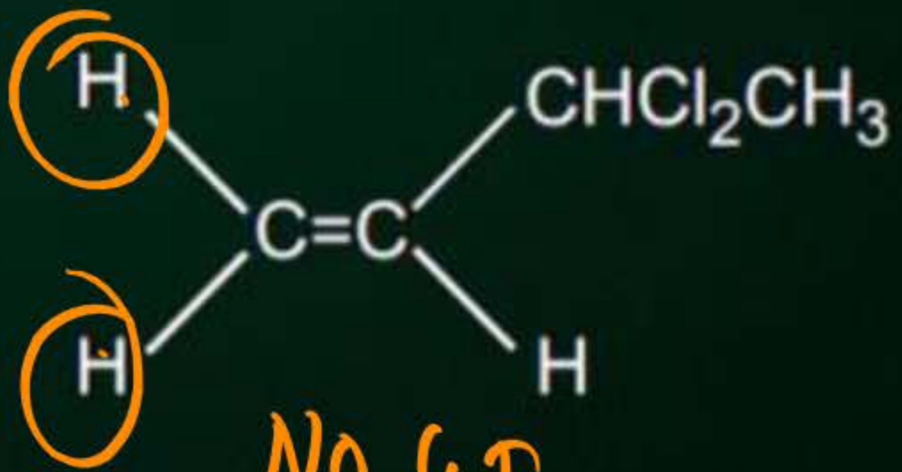

1
Cl
C2H5
C=C
CH3
E
CHO
1

C


H
CHCl2
C=C
CH3
CHCl2

NO. GI

D

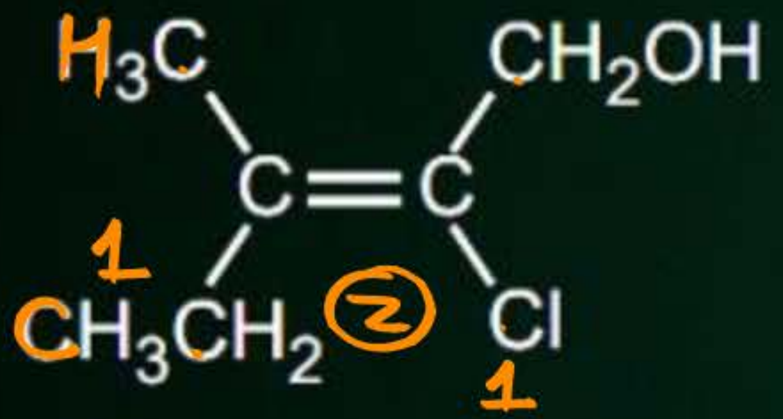

H
CHCl2CH3
C=C
H
H

NO GI

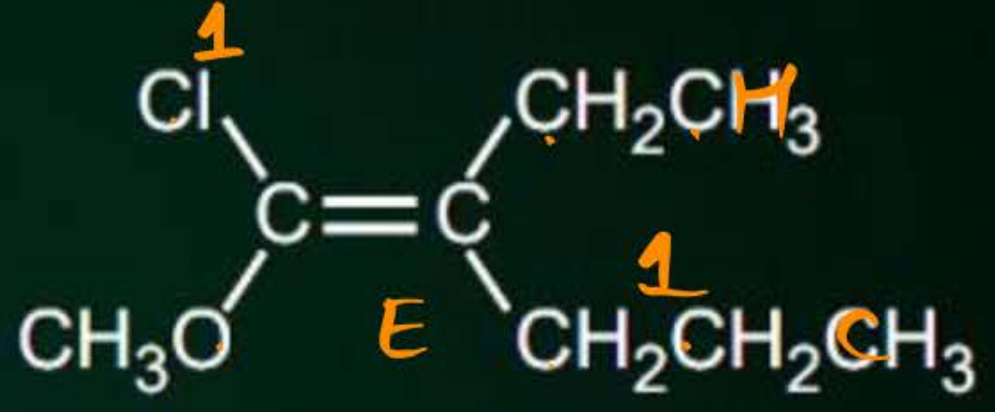
QUESTION

Assign E or Z configuration to the following alkenes:

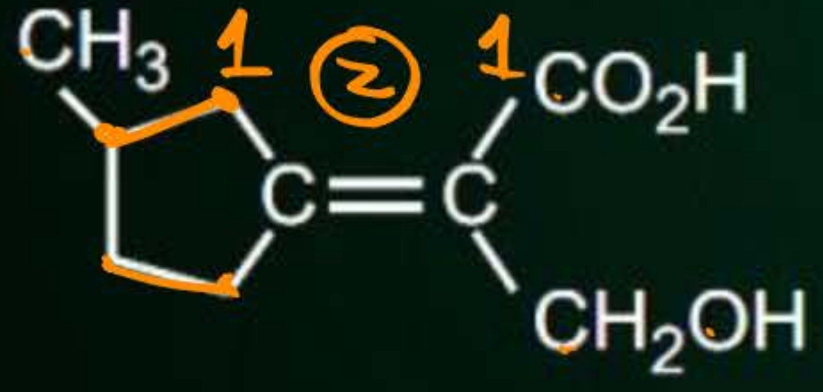
A


H3C
CH2OH
C=C
1
CH3CH2
Z
Cl
1

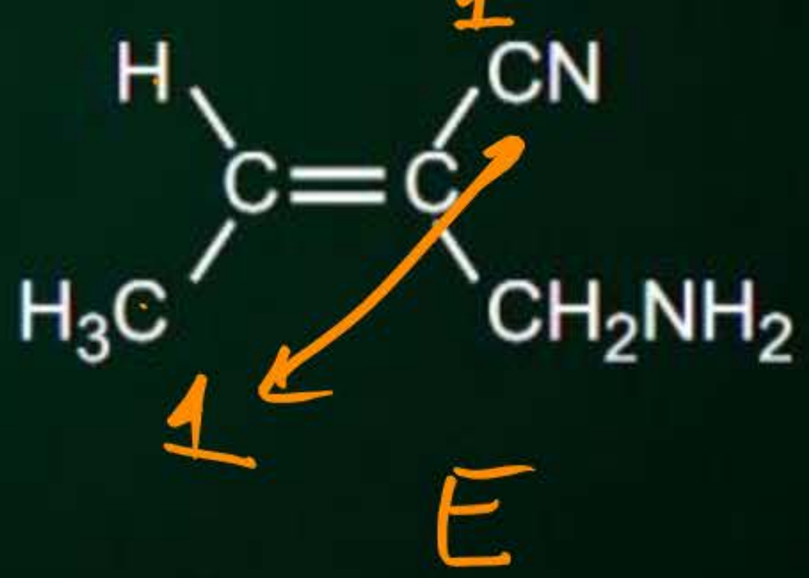
B


1
Cl
CH2CH3
C=C
1
CH3O
E
CH2CH2CH3

C


CH3
1
Z
1
CO2H
C=C
CH2OH

D


1
H
CN
C=C
H3C
CH2NH2
1
E

Thank you!!

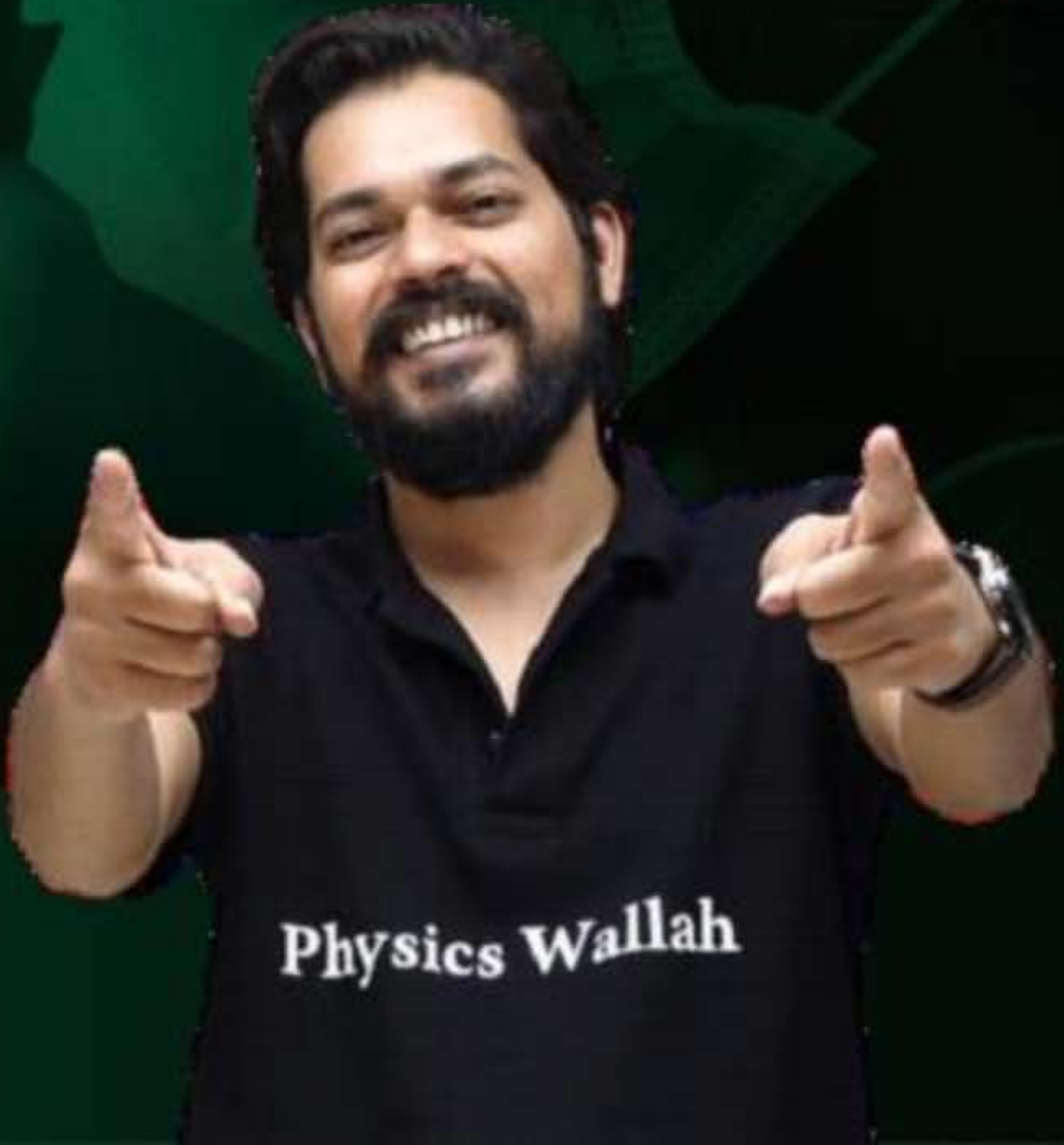
YAKEEN 2.0

FOR NEET 2025

Lecture- 06 | **Organic Chemistry**

Some Basic Principles and Techniques (ISOMERISM)

By- Pankaj Sir(POPU MAMA)


Physics Wallah

Topics *to be covered*

1. Syn-anti Nomenclature ✓
2. GI in Cycloalkanes ✓
3. Special Cases of GI ✓
4. Practice ✓

$C=C$ → ✓ cis-Trans

→ C.I.P rule, PS rule

Z|E

$C=N$

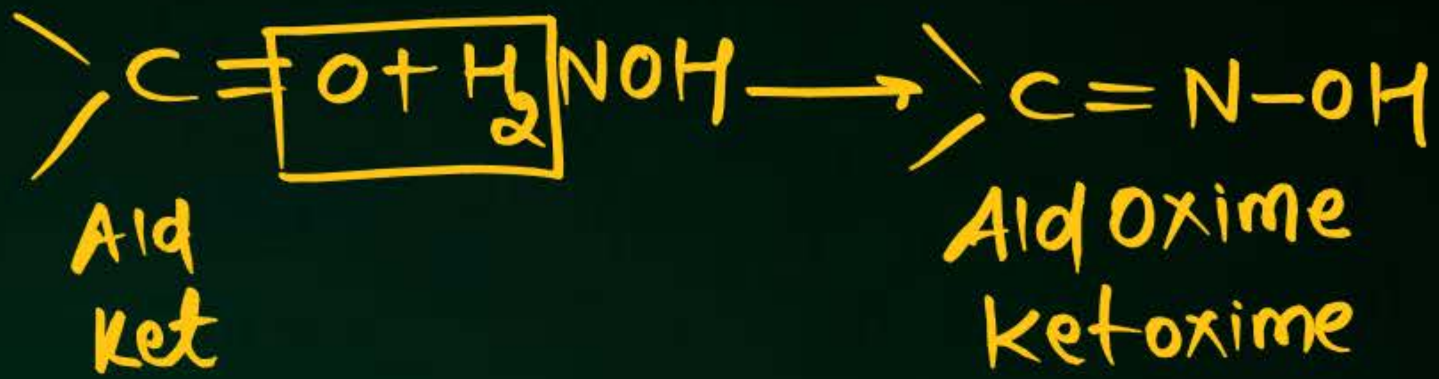
$N=N$ → syn anti

Cycloalkane → cis|Trans

Case-3 Syn anti System

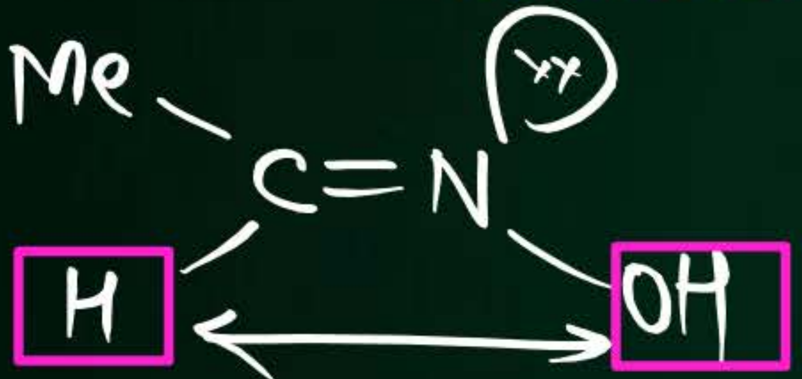
C=N

Case 01. Aldoxime

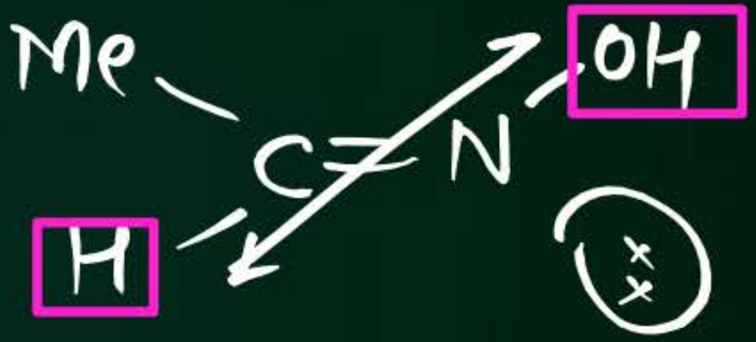

Ald
Ket
Ald Oxime
Ketoxime

$$>C=O + H_2NOH \longrightarrow >C=N-OH$$

If OH and H are on the same side then syn otherwise anti.

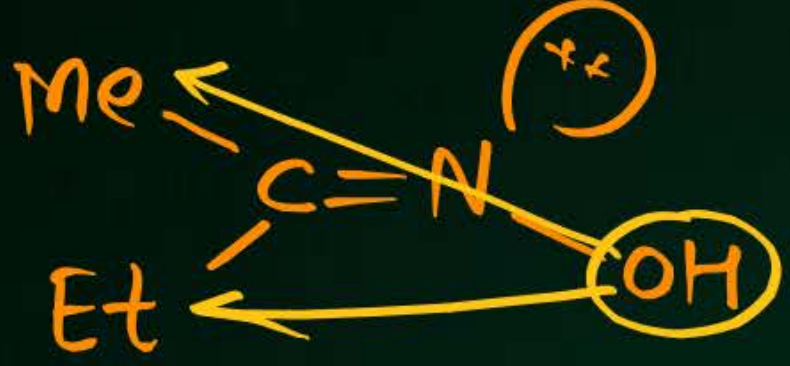


Syn



Anti

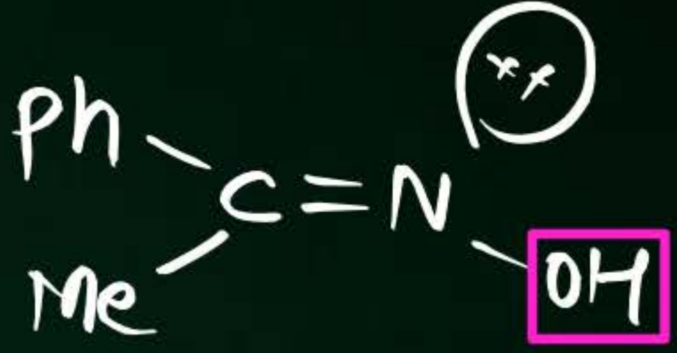
Case 02. Ketoxime (2 name exists)



Syn Ethyl methyl oxime

or

Antimethyl Ethyl oxime



Syn methyl phenyl oxime

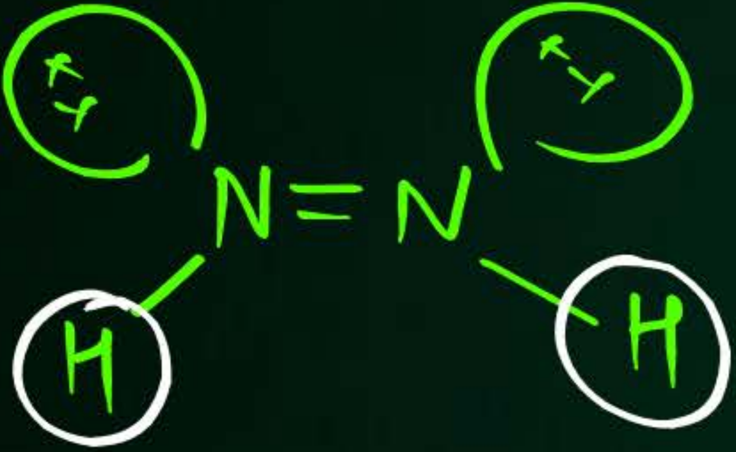
or

Antiphenyl methyl oxime

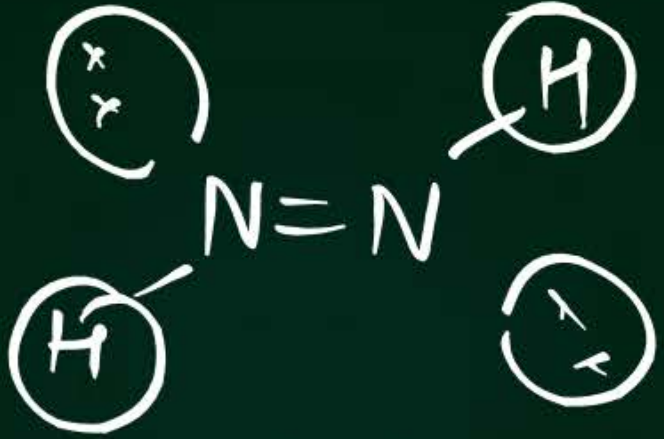
Case-3 N=N

1. Syn anti

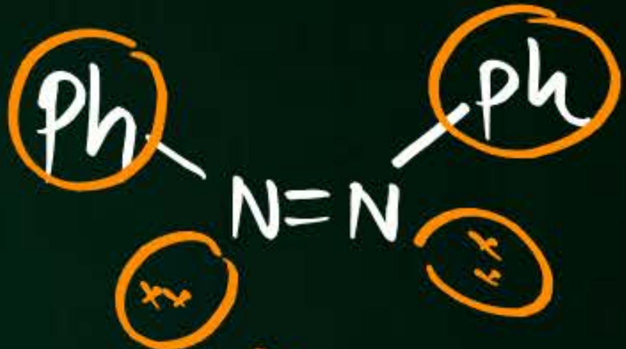
If group are on the same side then syn otherwise anti.



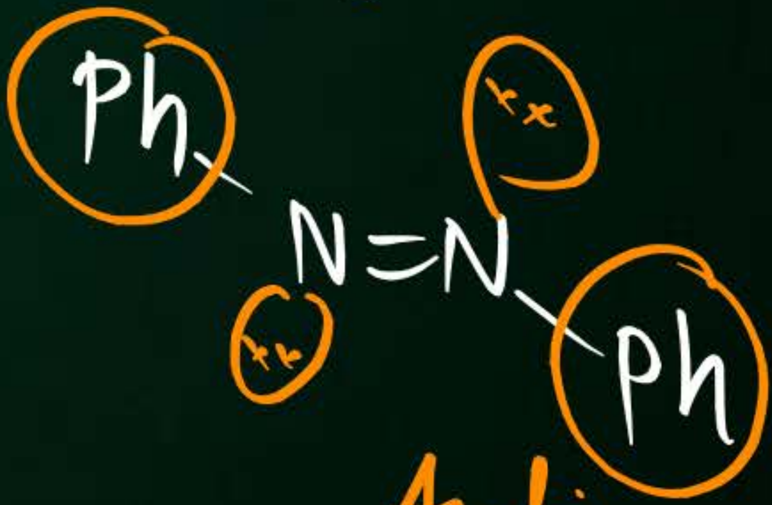
syn



Anti



syn

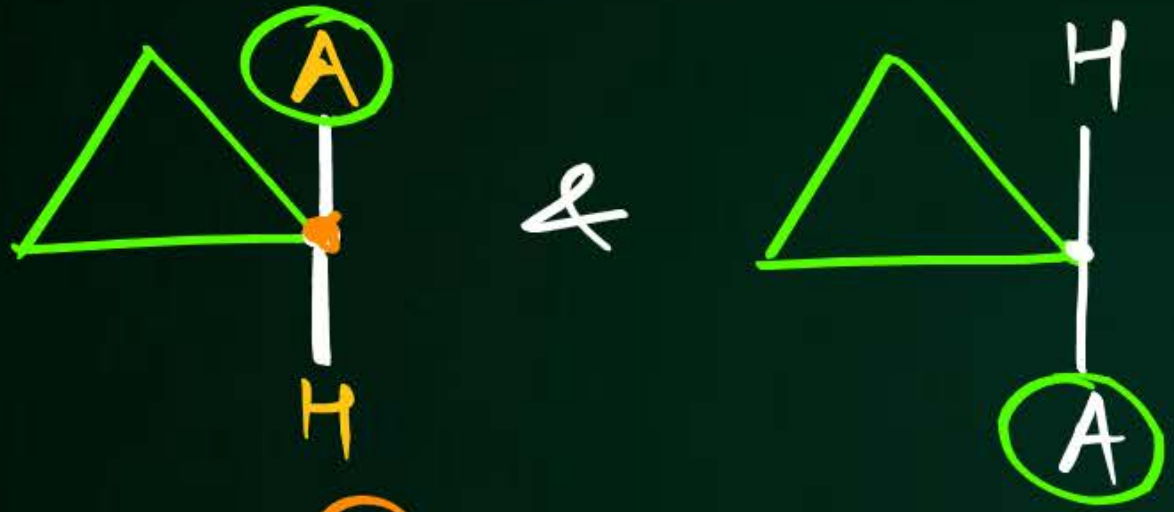


Anti

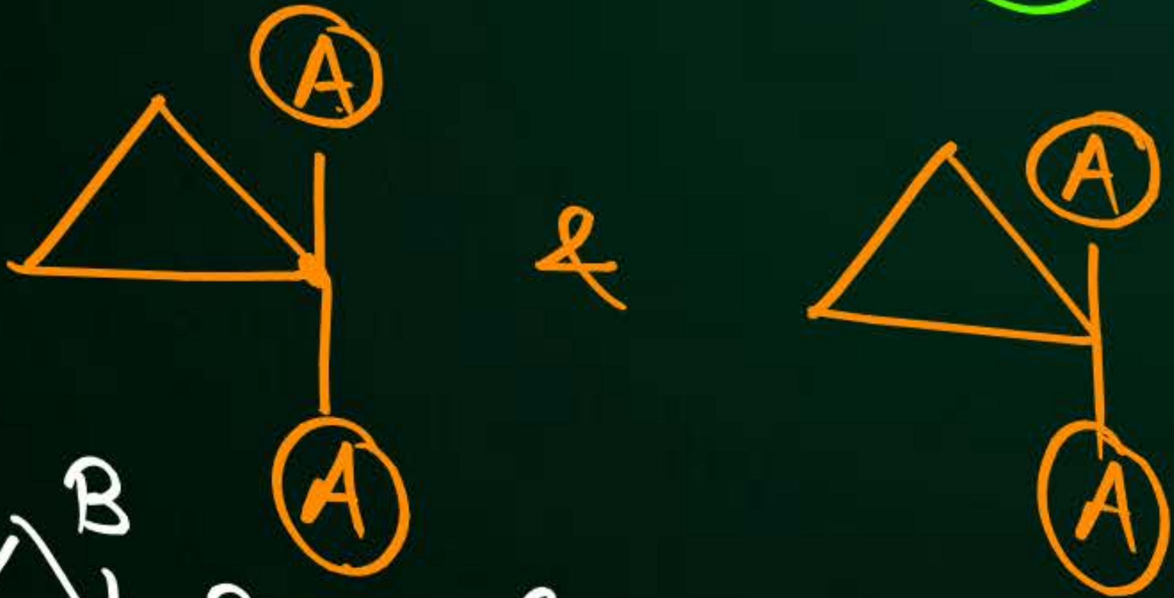
Case-4 Cycloalkanes

Restricted rotation ✓

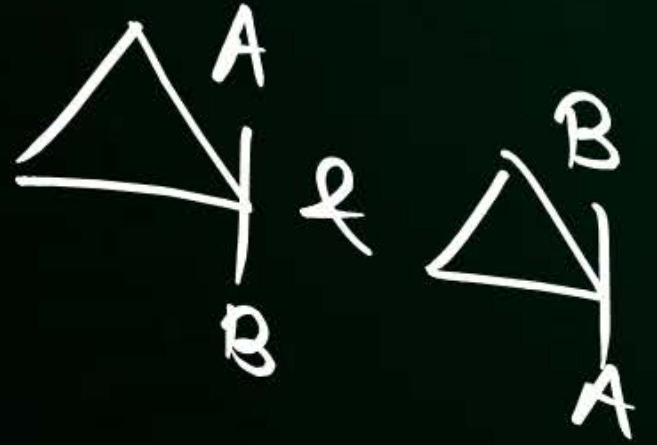
Minimum 2 sp^3 carbon must be attached at different site to show G.I in cycloalkanes.



are same conf. G.I does not Exhibits

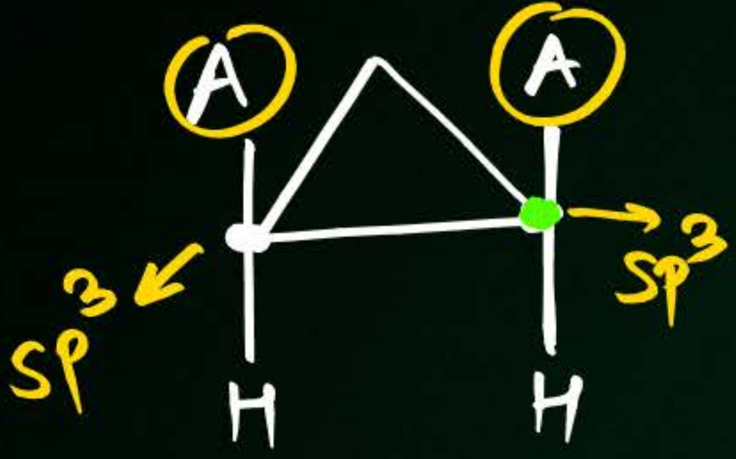


" " " "

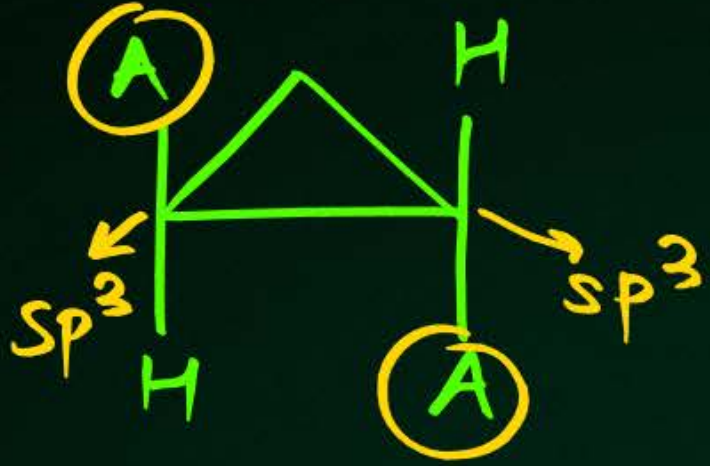


same G I ✗

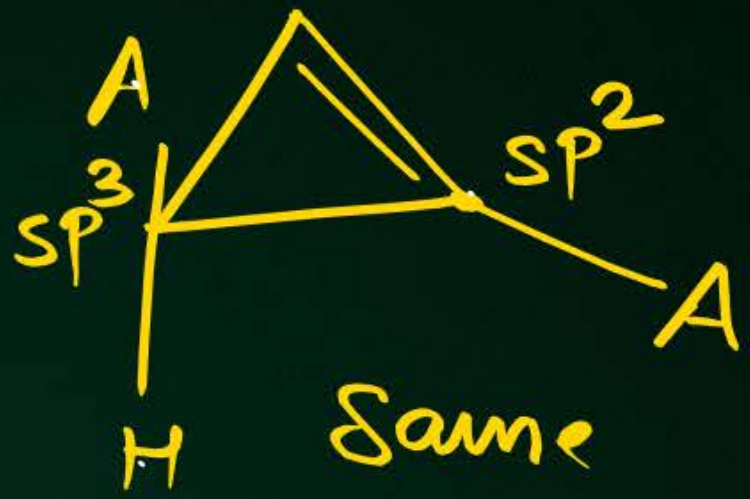
Mono & di sub on same 'C' do not exhibit G I


A
A
sp^3
sp^3
H
H

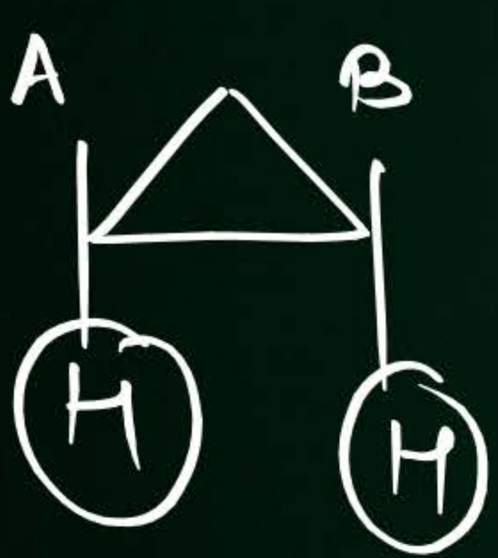
Cis


A
H
sp^3
sp^3
H
A

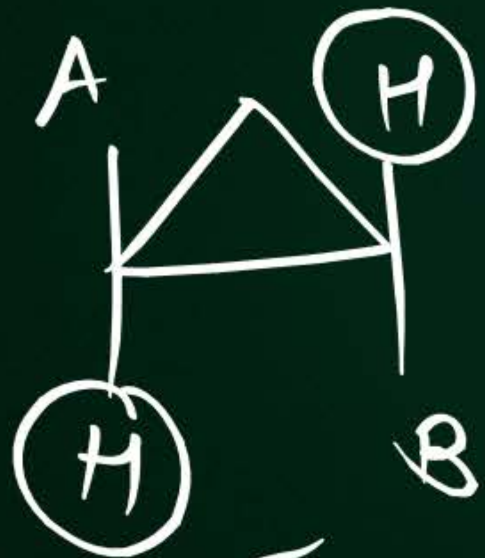
Trans



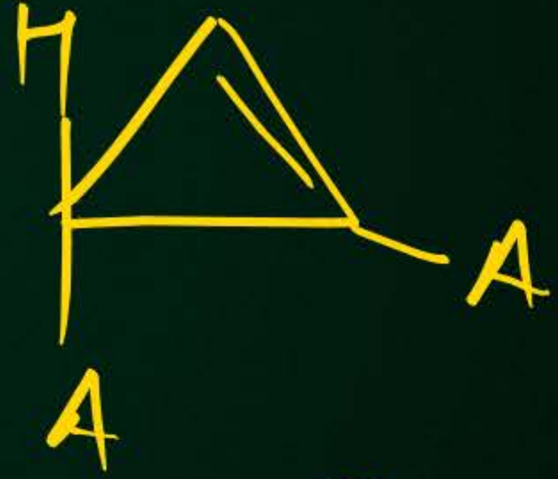
Same



Cis

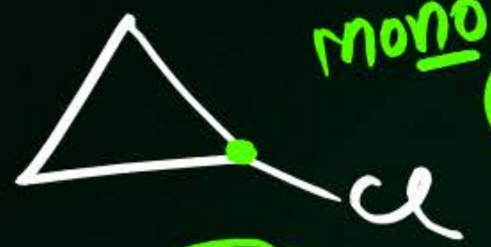


Trans

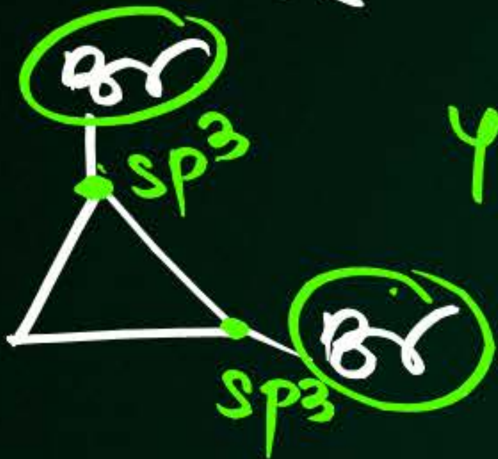


GI X

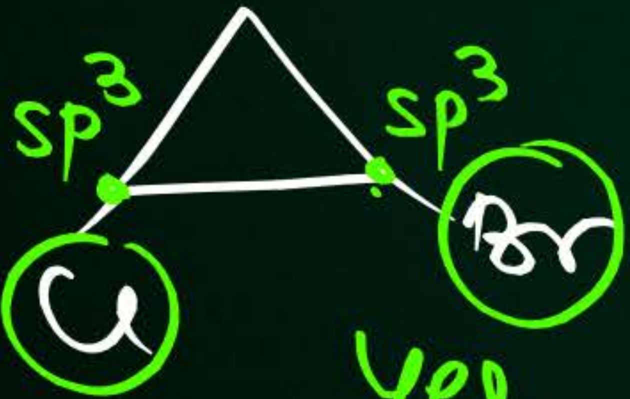
Q. G.I Exhibits or not

①


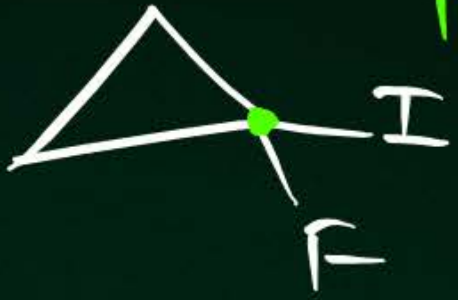
mono NO

②

Br
sp3
Br
sp3

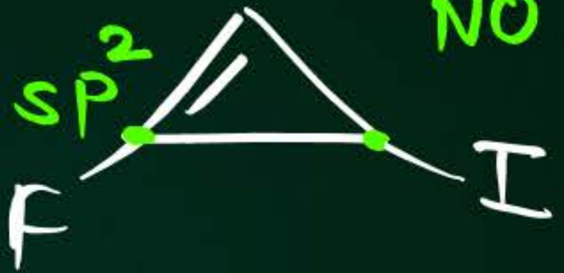
yes

③

sp3
sp3
Cl
Br

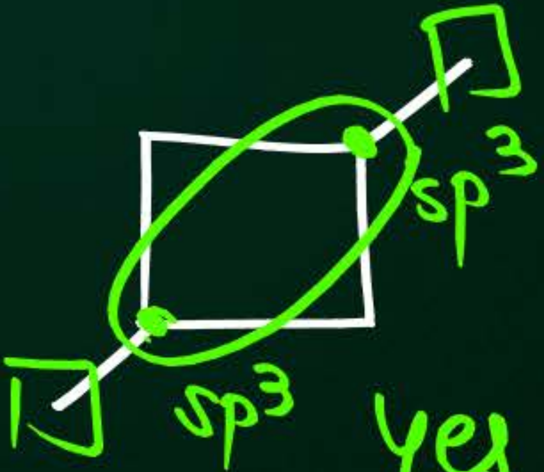
yes

④


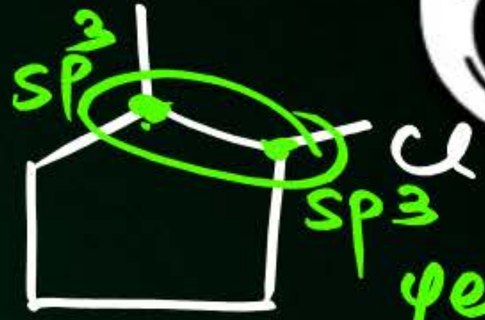
NO

⑤


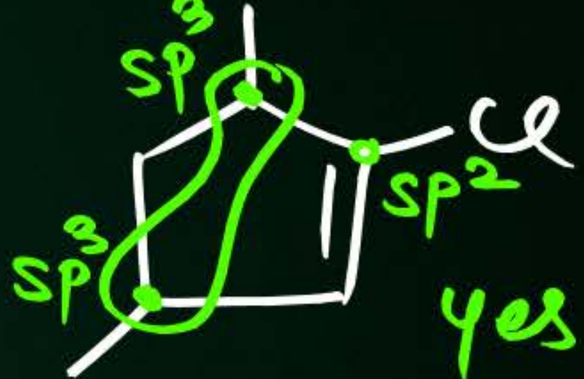
NO

⑥


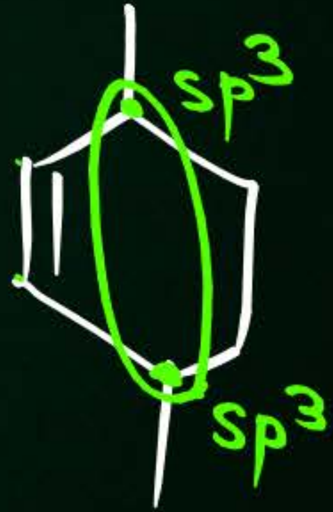
yes

⑦


yes

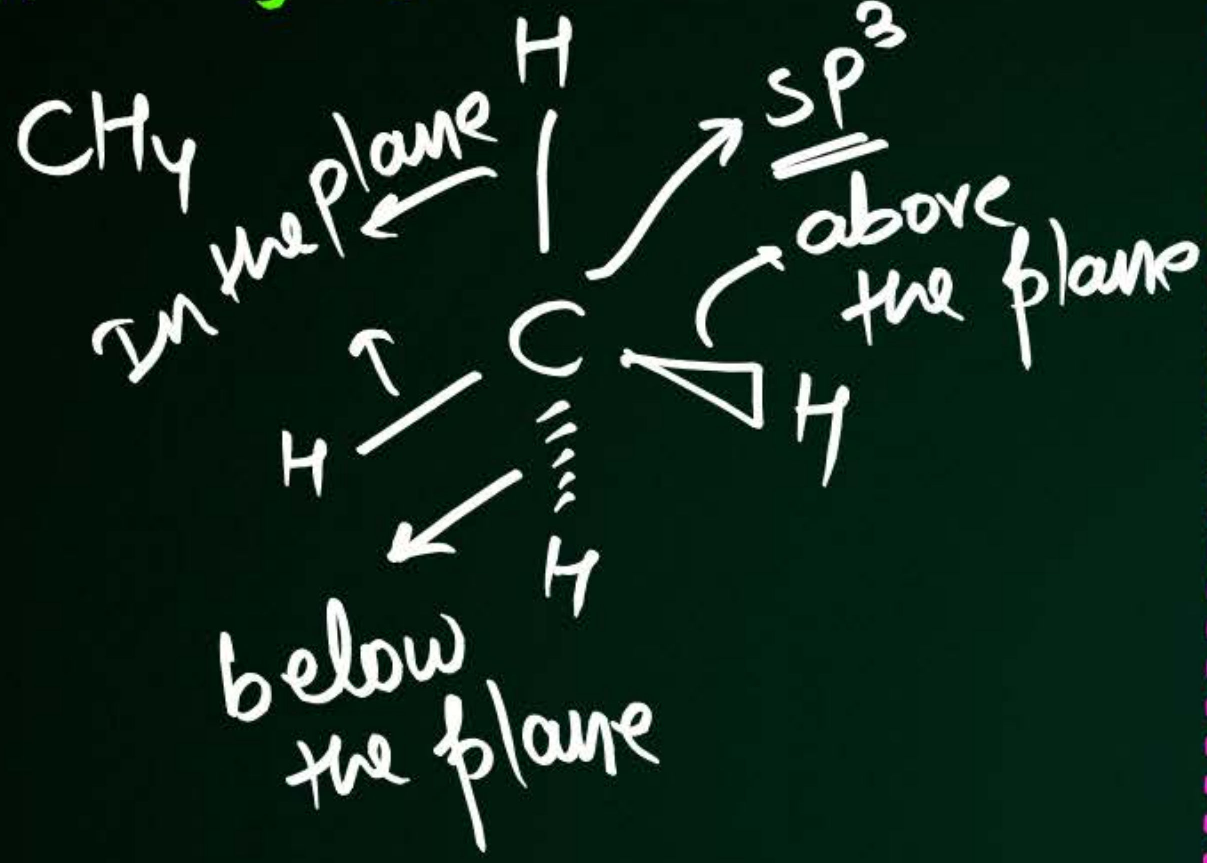
⑧

sp3
Cl
sp2
sp3

yes

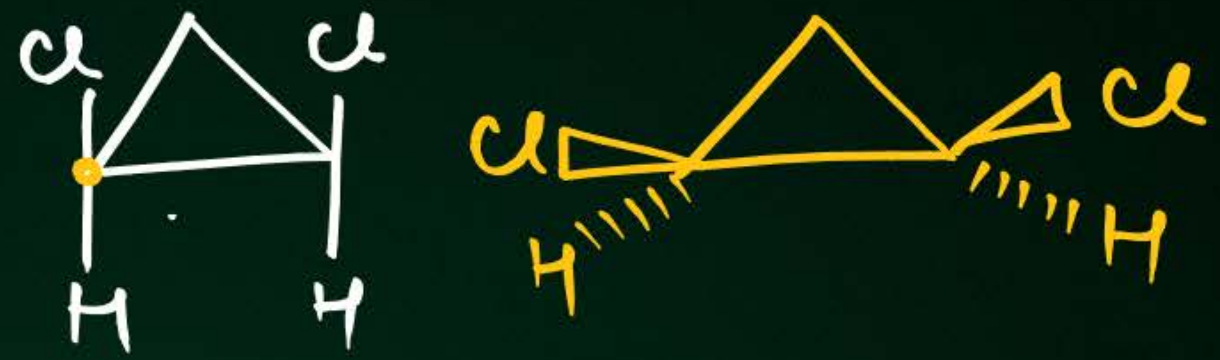
⑨


yes

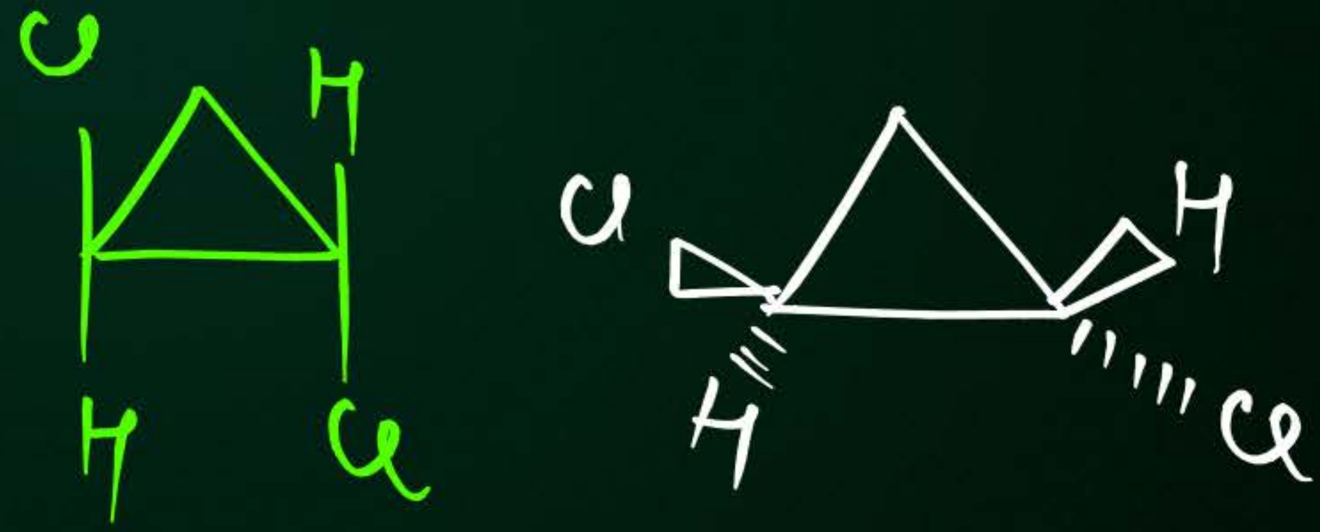
Dash-wedge formula


CH_4
H
sp^3
In the plane
above the plane
C
H
H
H
below the plane

Q Draw cis-1,2-Dichloro cyclopropane

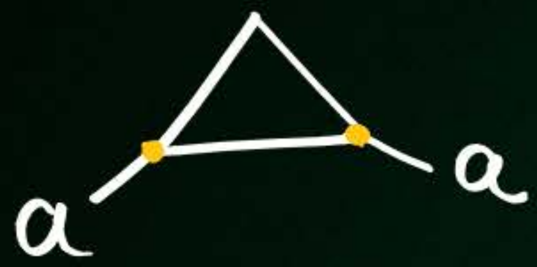

Cl
Cl
H
H
Cl
Cl
H
H

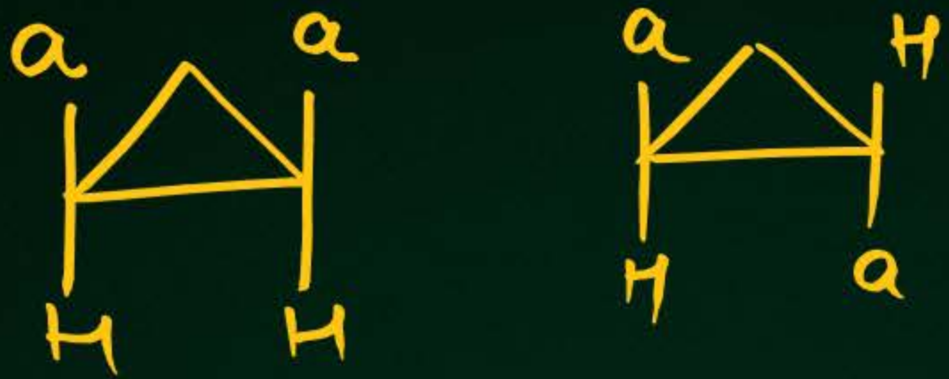
Q Draw Trans-1,2-Dichloro cyclopropane


Cl
H
H
Cl
Cl
H
H
Cl

Q find total no. of Geometrical isomers?

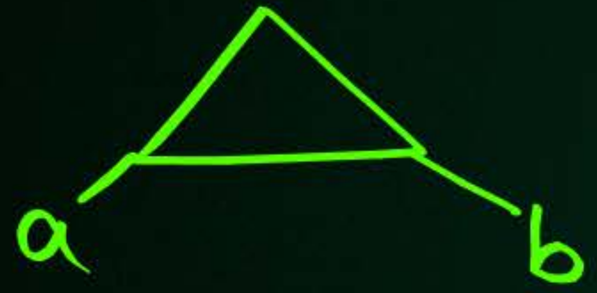
①

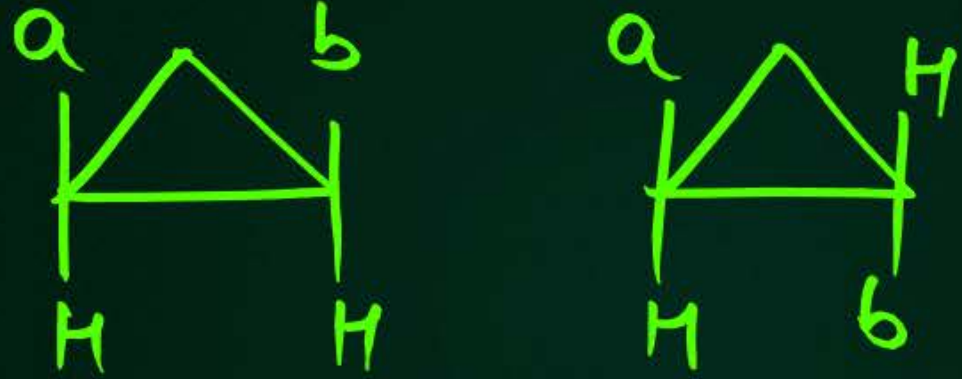




Ans ②

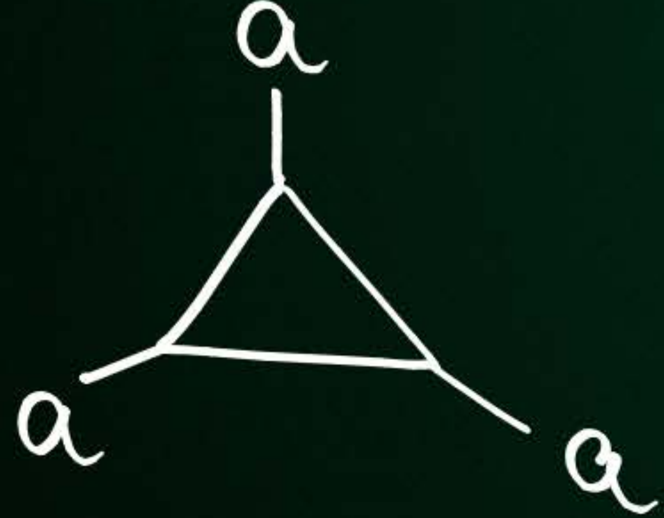
②

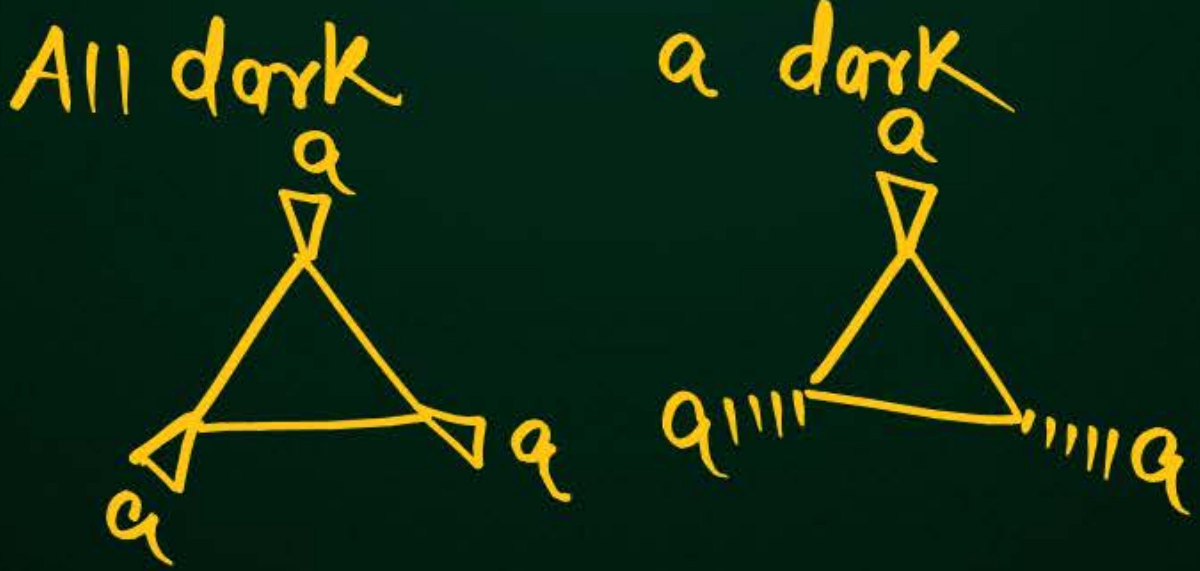




Ans ②

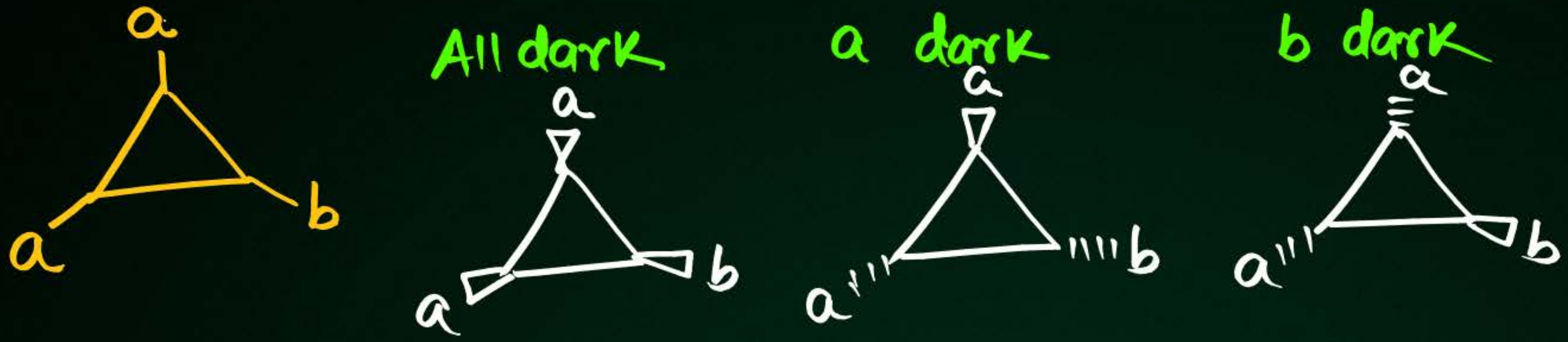
③




All dark
a
a
a
a dark
a
a
a

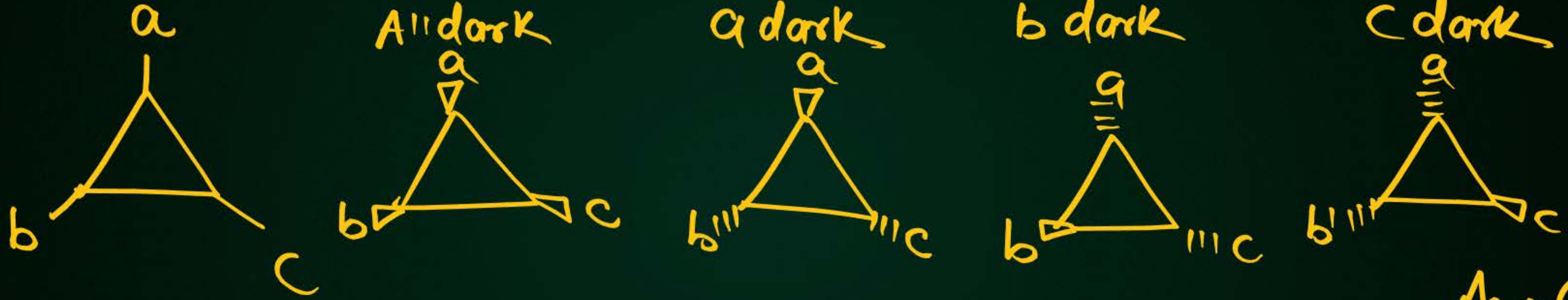
Ans ②

④


a
a
b
All dark
a
a
b
a dark
a
a
b
b dark
a
a
b

Ans ③

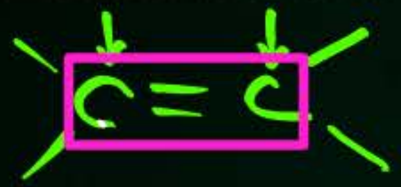
⑤


a
b
c
All dark
a
b
c
a dark
a
b
c
b dark
a
b
c
c dark
a
b
c

Ans ④

Special Cases

1. Cummulenes : odd no. of cummulative double bonds can exhibit G.I



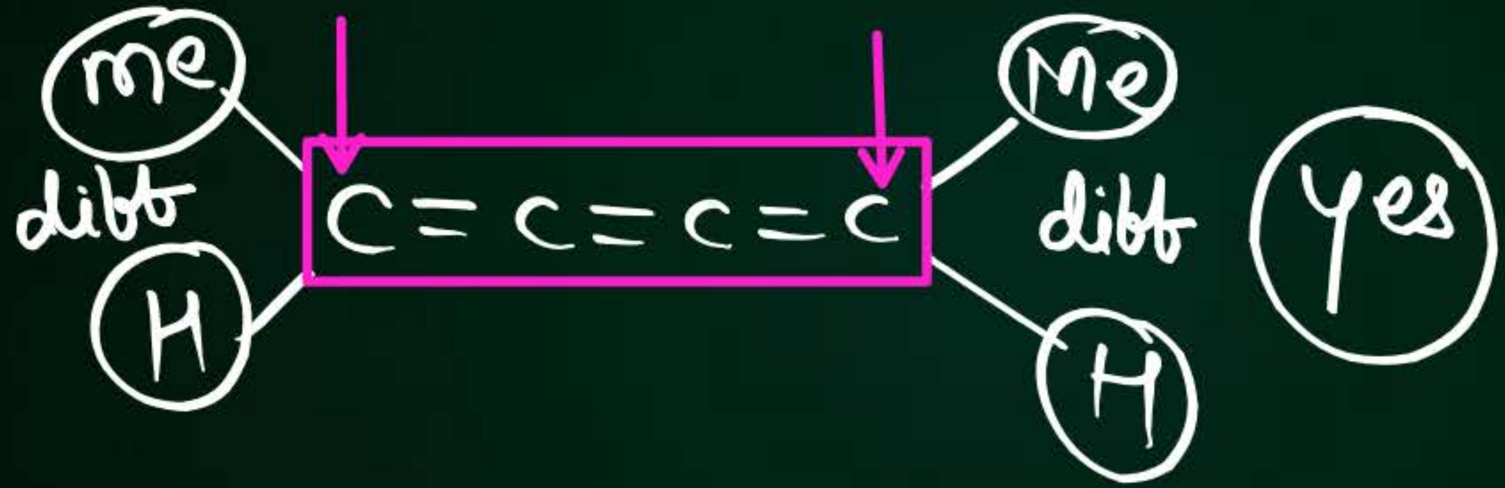
(1 D.B)

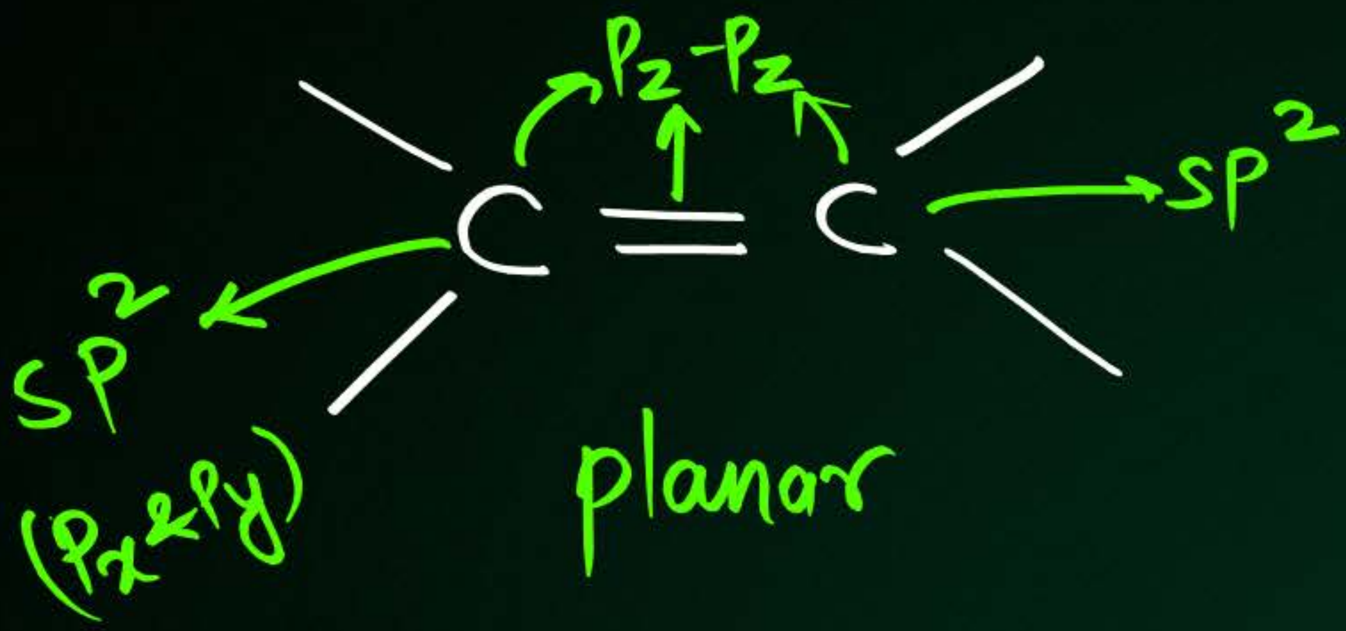
C=C=C=C

(3 D.B)

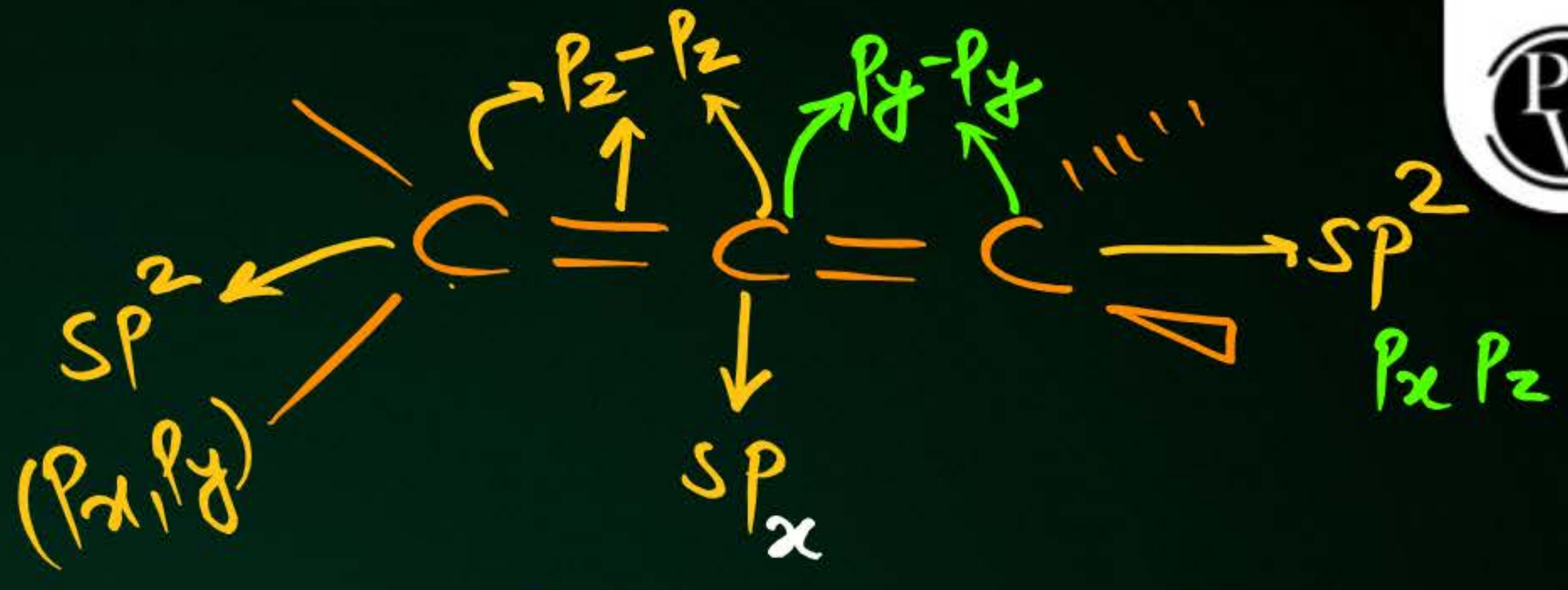
C=C=C=C=C=C ......

(5 D.B)

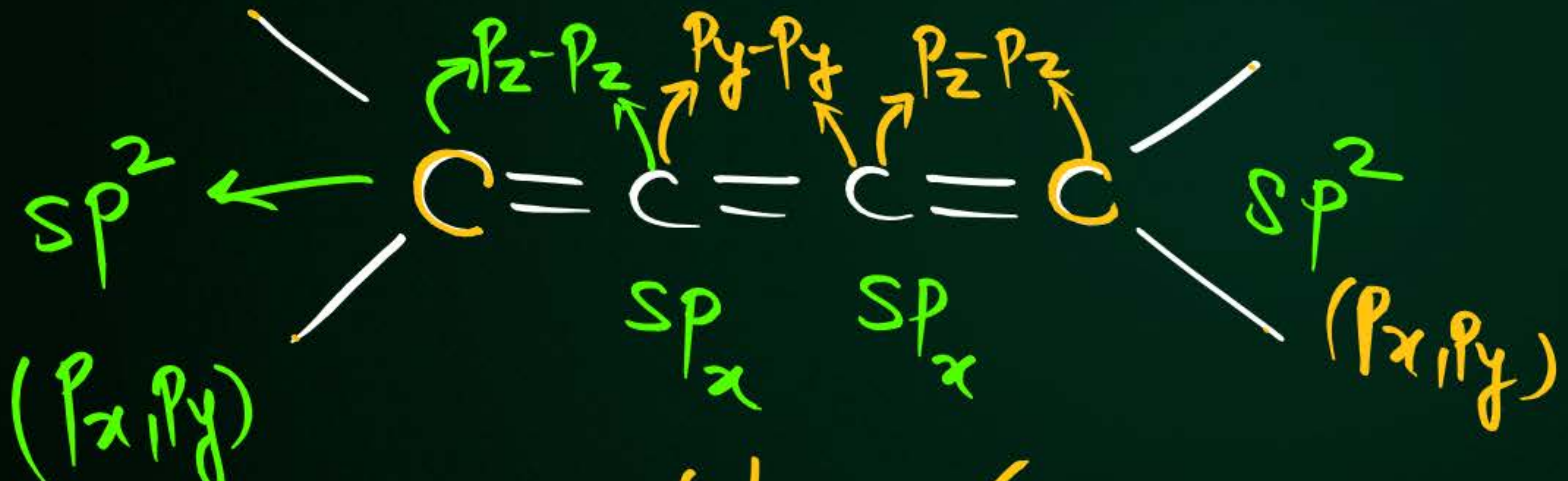

me
diff
H
C=C=C=C
Me
diff
H
Yes


$p_z - p_z$
sp^2
sp^2
$(p_x \& p_y)$

planar

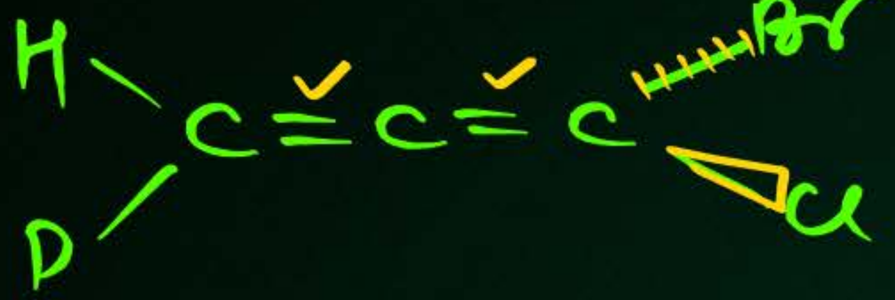

$p_z - p_z$
$p_y - p_y$
sp^2
(p_x, p_y)
sp_x
sp^2
$p_x\ p_z$

(Non planar)

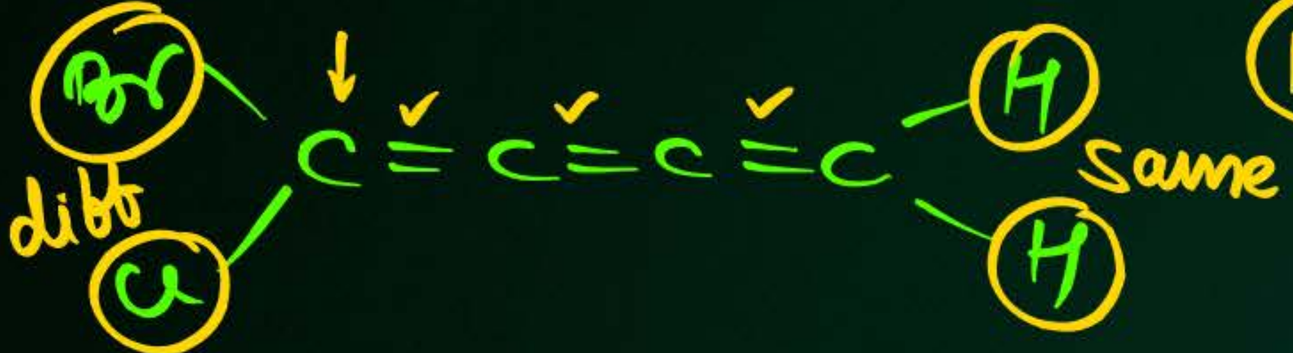

$p_z - p_z$
$p_y - p_y$
$p_z - p_z$
sp^2
(p_x, p_y)
sp_x
sp_x
sp^2
(p_x, p_y)

planar

Q G.I Exhibits or not ?.

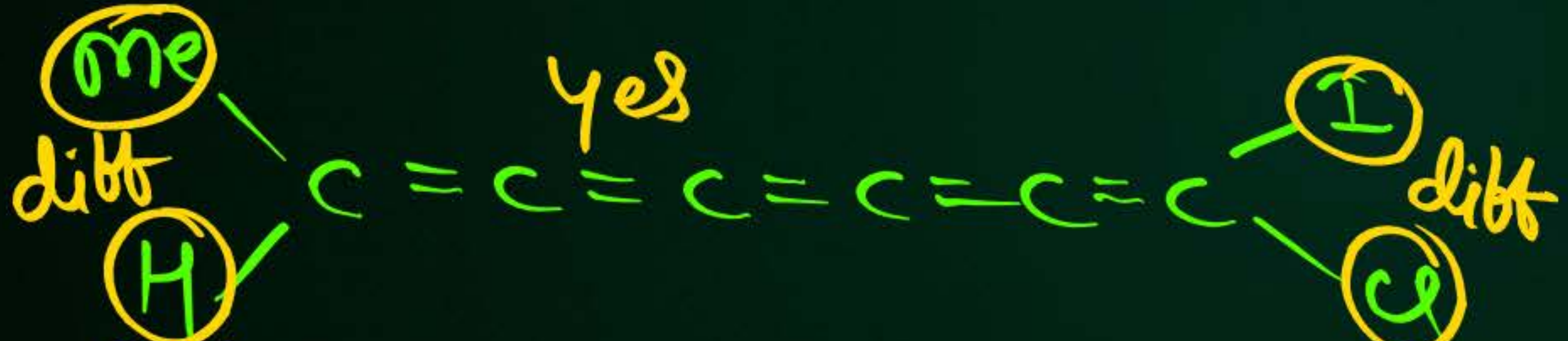
①


NO

②


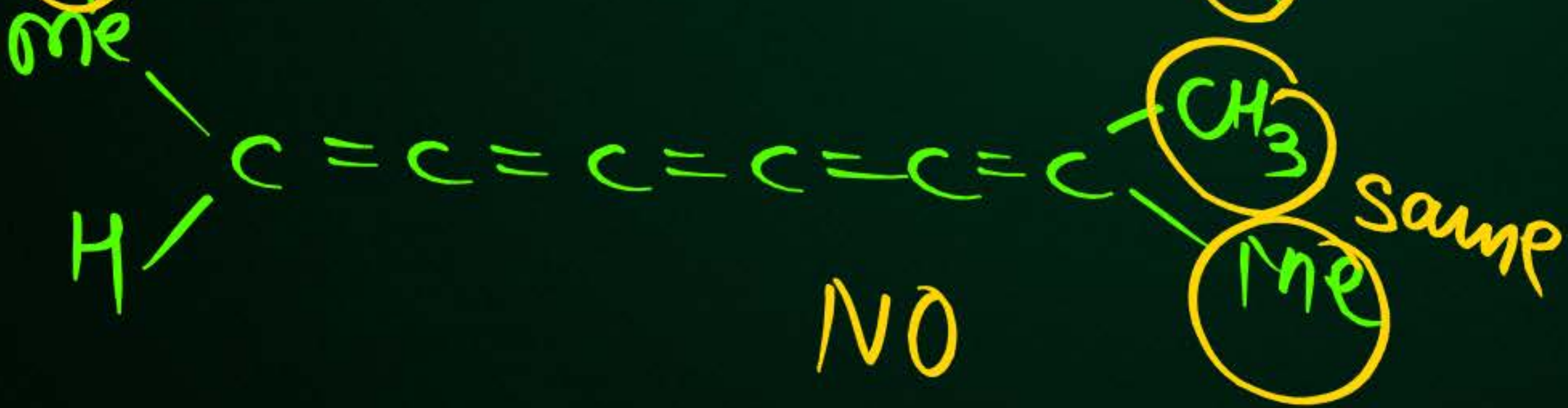
Br
Cl
diff
C=C=C=C
H
H
same

NO

③


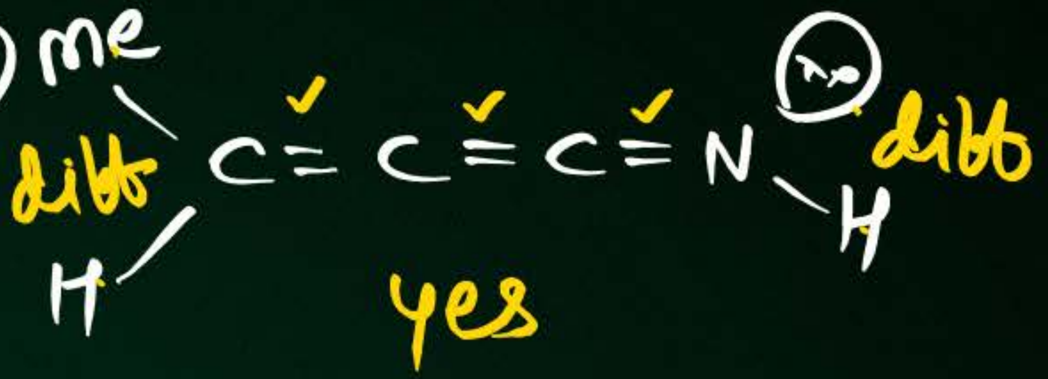
me
H
diff
C=C=C=C=C=C
I
Cl
diff

yes

④


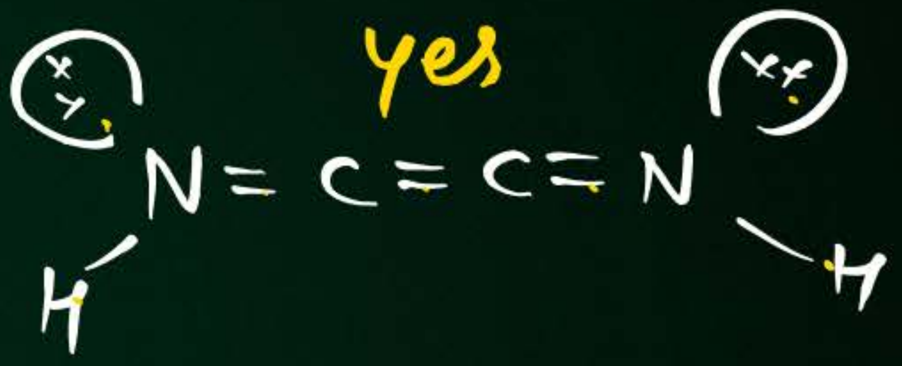
me
H
C=C=C=C=C=C
CH3
me
same

NO

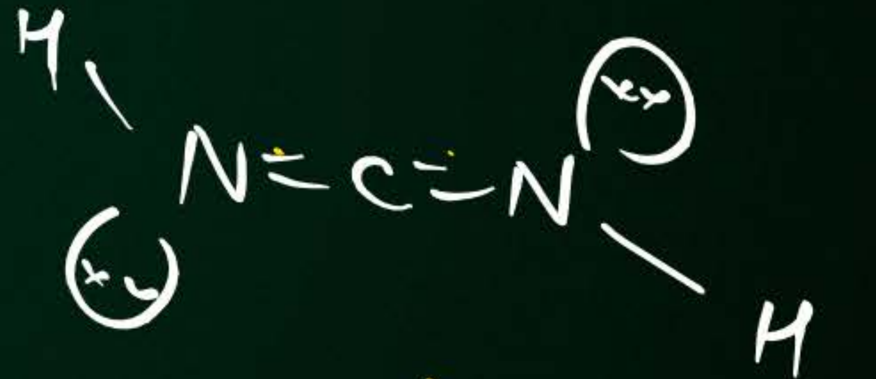
⑤


me
H
diff
C=C=C=N
H
diff

yes

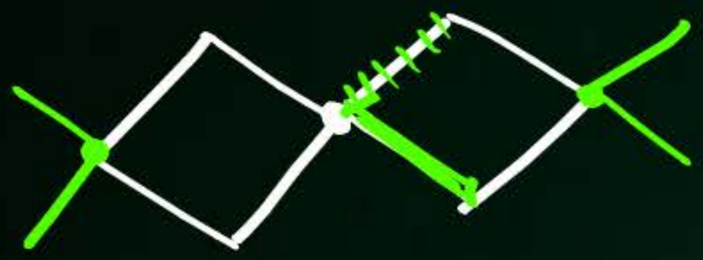
⑥


yes

⑦


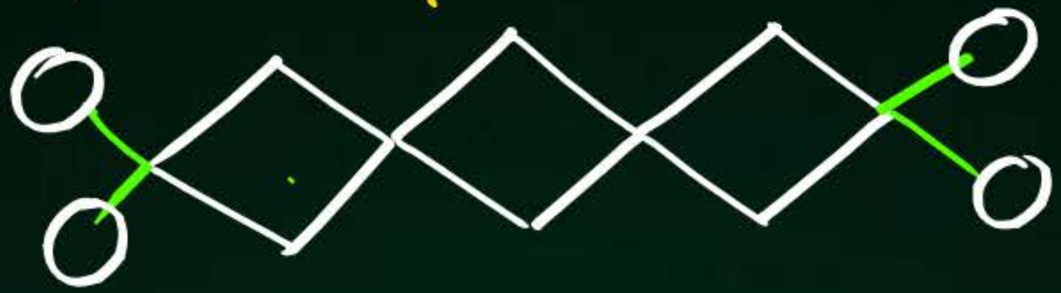
NO

2. Spiranes : odd no. of spiro comp can exhibit G.I.



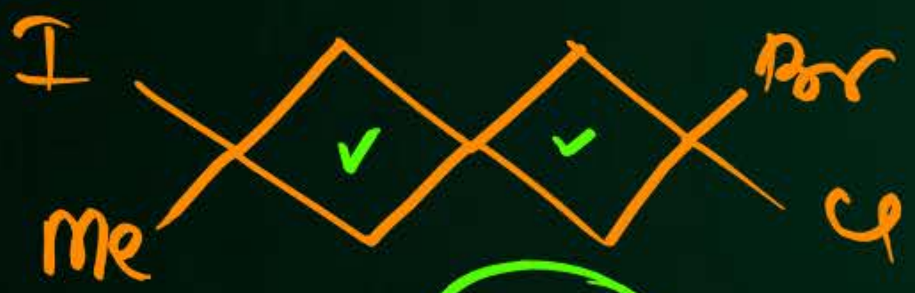
2 Ring

non planar



planar

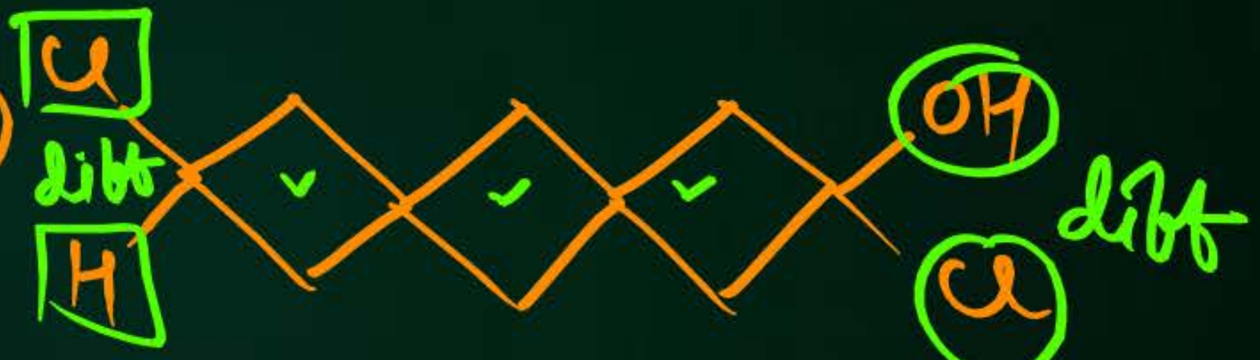
①



even

No

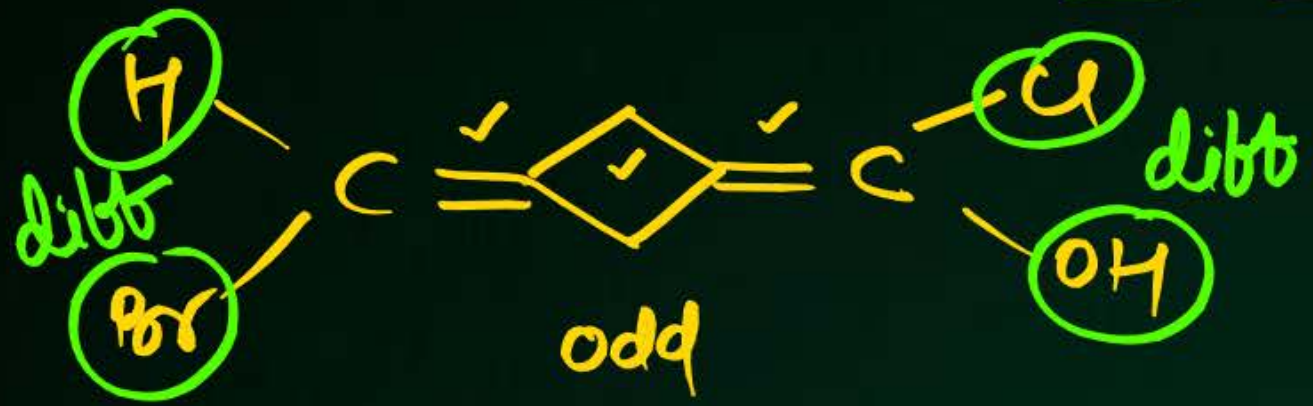
②


Cl
diff
H
OH
Cl
diff
✓
✓
✓

Yes

3. Spiranes + Cummulenes = odd no can exhibit G.I

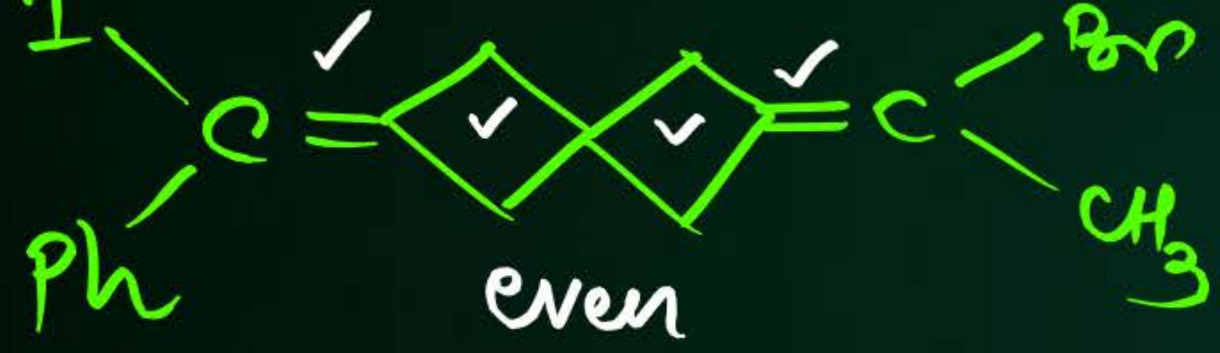
①



H
diff
Br
C
C
Cl
diff
OH
odd

yes

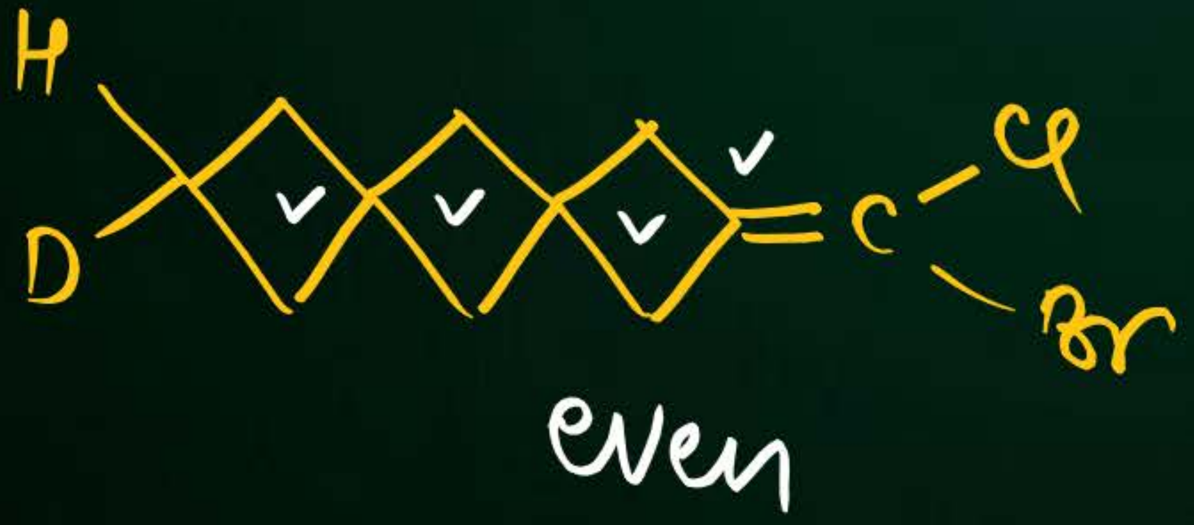
②



I
C
Ph
even
C
Br
CH3

NO

③

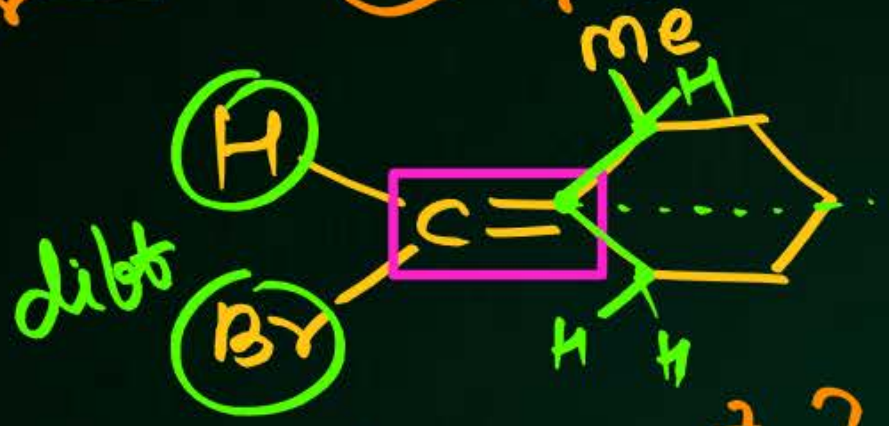


H
D
C
Cl
Br
even

NO

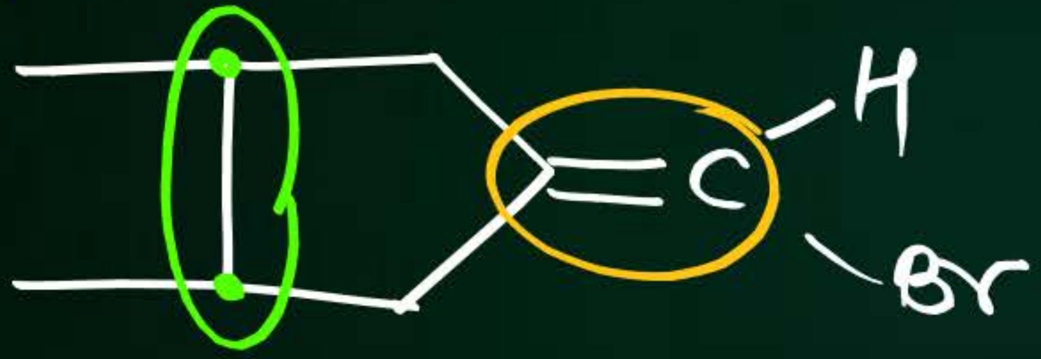
4. Cycloalkanes + Alkenes

÷ check double bond G.I


me
H
H
C=
diff
Br
H
H

yes

Q* G.I exhibits or not?



Yes

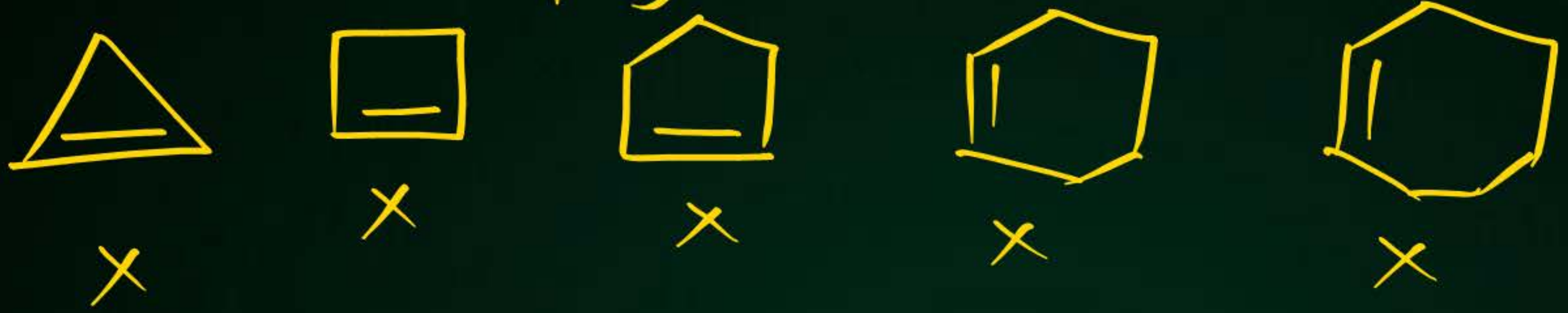
1) spiro + cumulene = even 'NO'

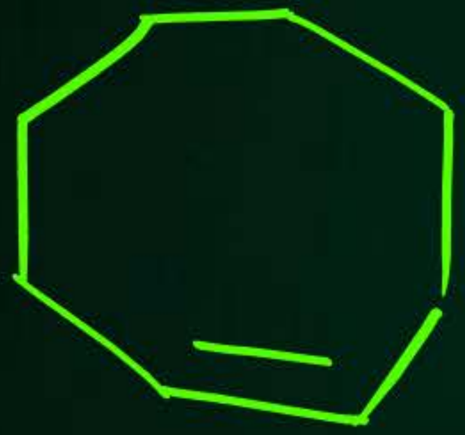
2) C=C 'NO'

3) ✓ cycloalkane yes

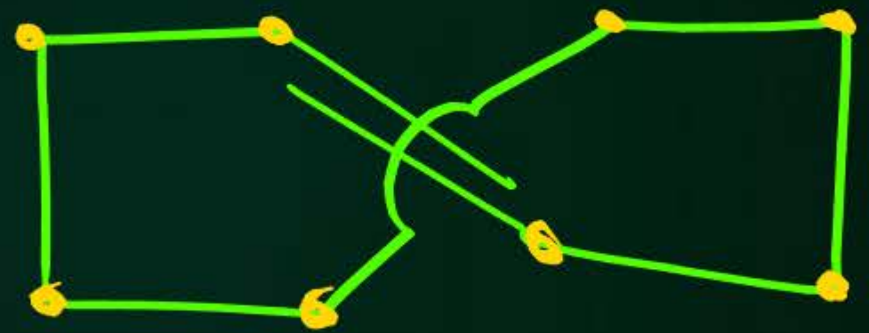
5. Cycloalkenes :

8 or above can exhibit G.I
ring



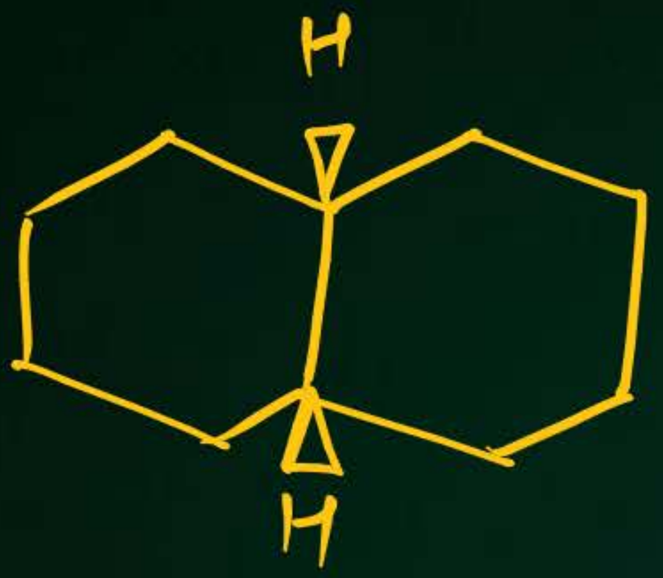


'Cis'
'Z'

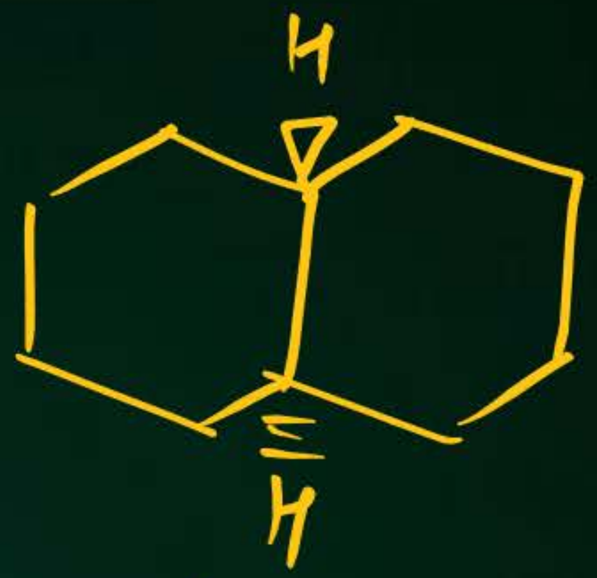


Trans
'E'

6. Bicyclo compounds

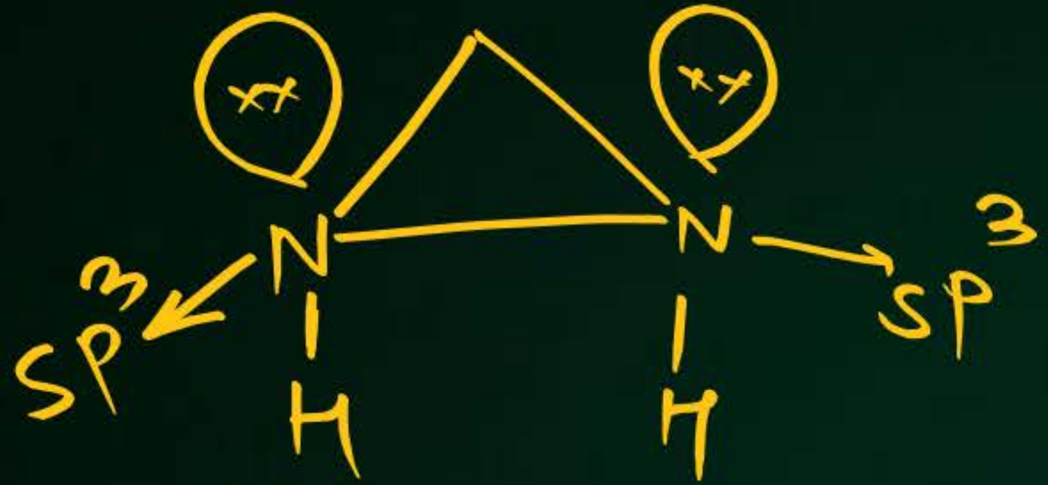


cis - Decalin



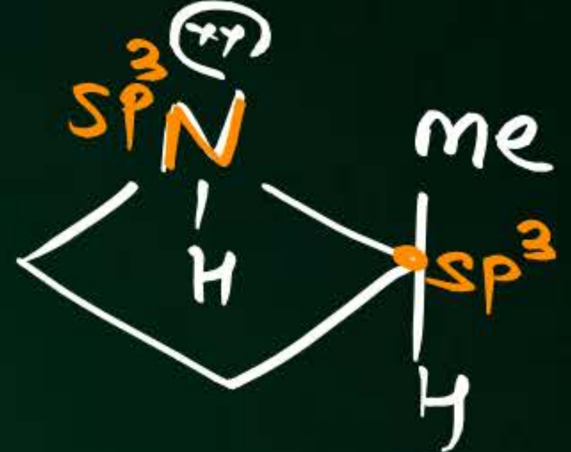
Trans - Decalin

7. Heterocyclic compounds : Same as cycloalkane


sp^3
N
H
N
H
sp^3

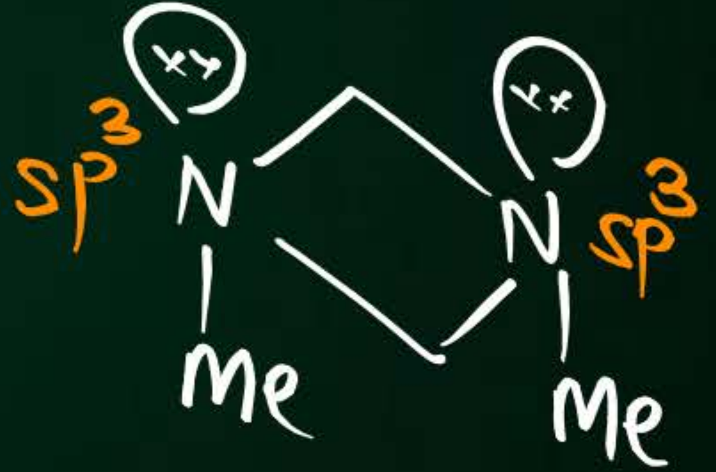
Q G.I Exhibits or not

①


sp^3
N
H
me
sp^3
H

yes

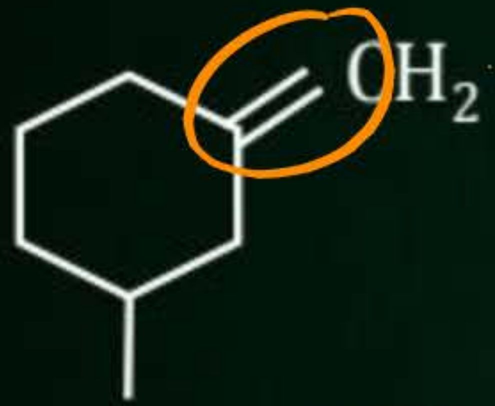
②


sp^3
N
Me
N
sp^3
Me

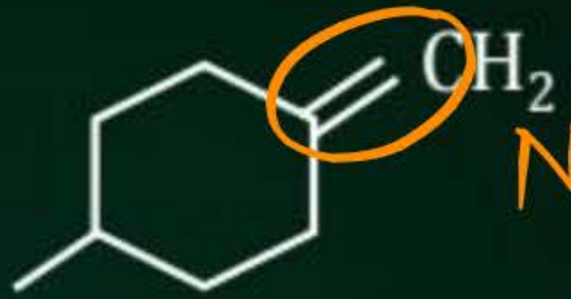
yes

QUESTION (AIIMS 2004)

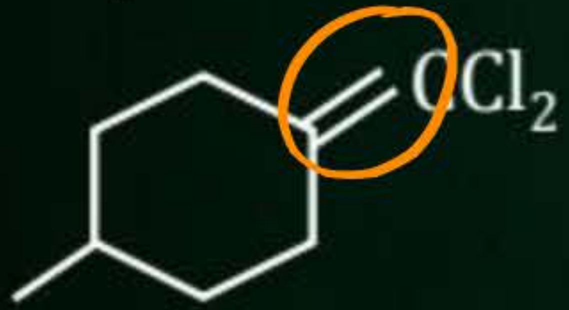
The geometrical isomerism is shown by

A


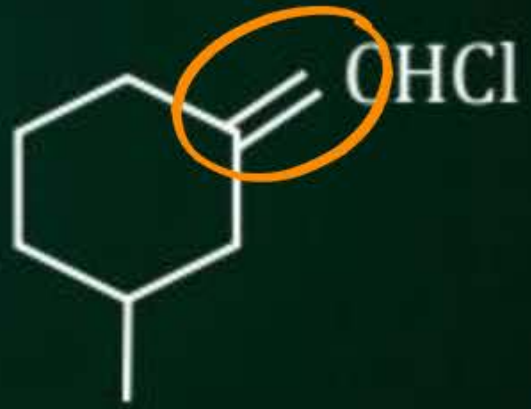
NO

B


NO

C


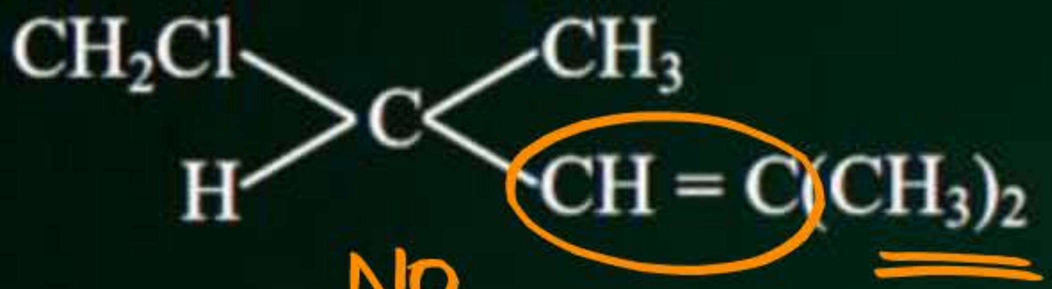
NO

[✓ D]


QUESTION

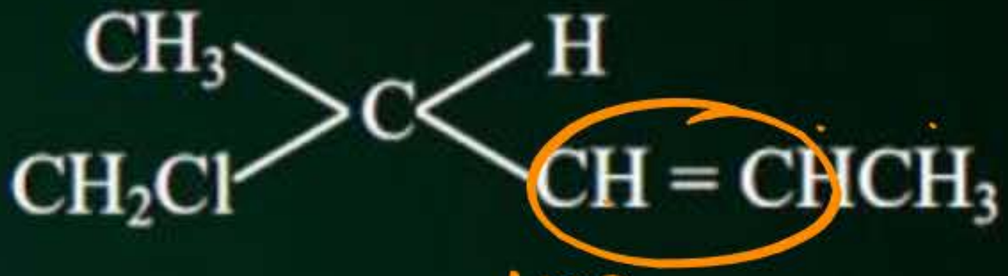
Which one of the following will not show geometrical isomerism ?

A ✓



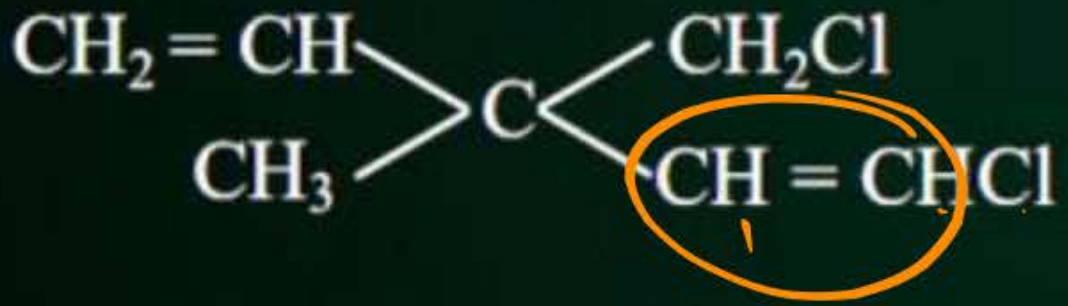
NO

B



yes

C



yes

D

yes

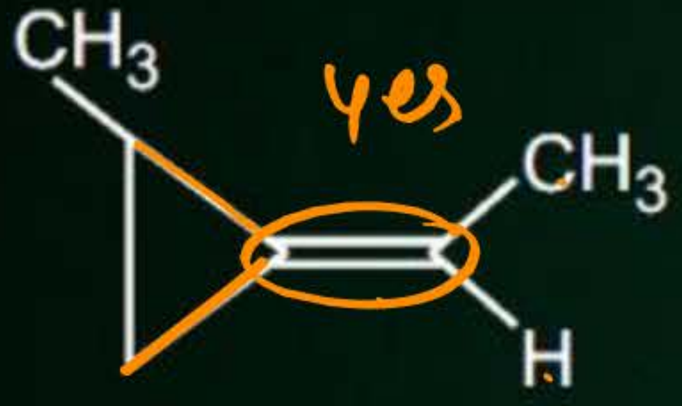
$CH_3CH_2CH=CHCH_2CH_3$

yes

QUESTION

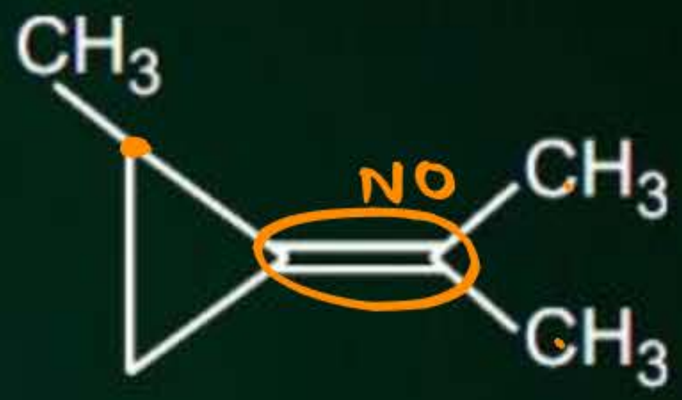
Among the following compounds, which cannot show geometrical isomerism?

(A)



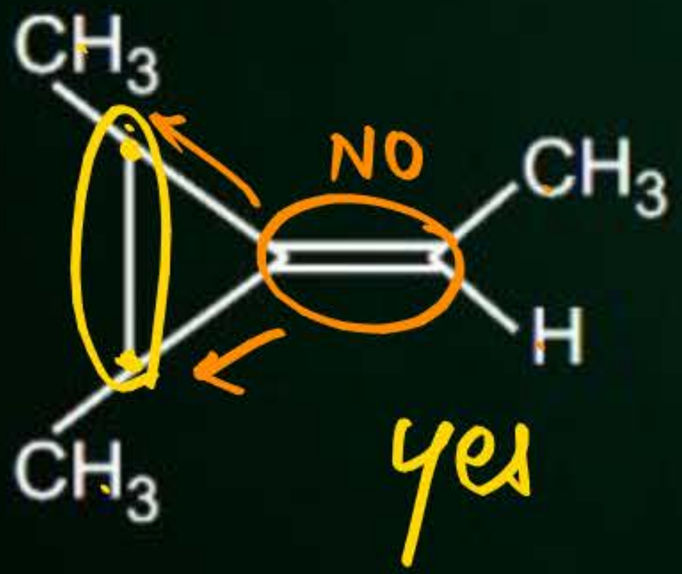
CH3
yes
CH3
H

(B)



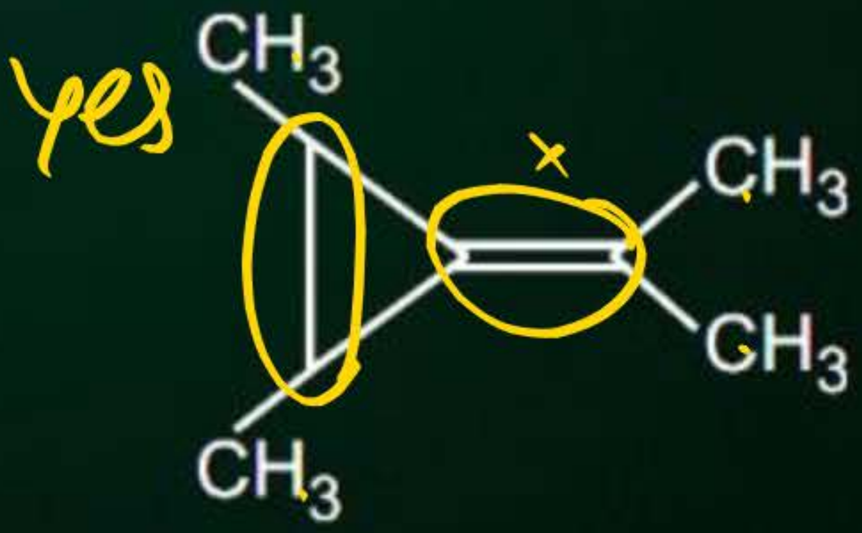
CH3
NO
CH3
CH3

(C)



CH3
NO
CH3
H
CH3
yes

(D)

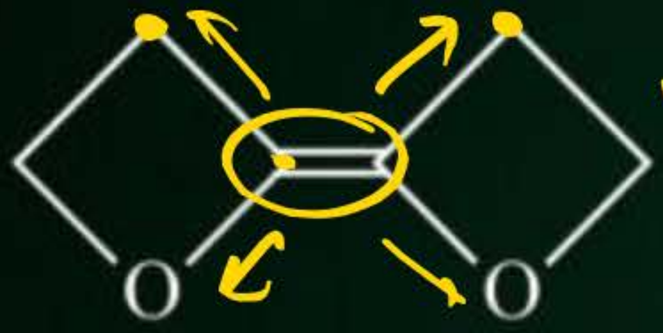


yes
CH3
×
CH3
CH3
CH3

QUESTION

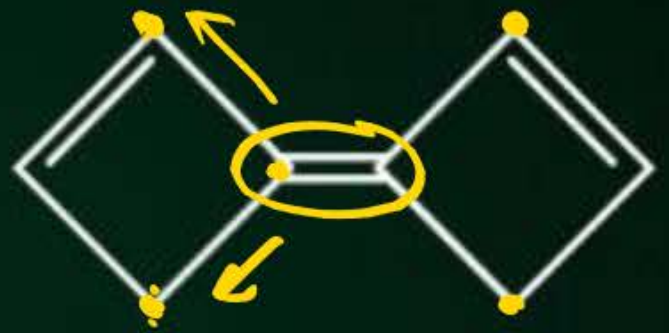
Which of the following compound will not show geometrical isomerism?

A



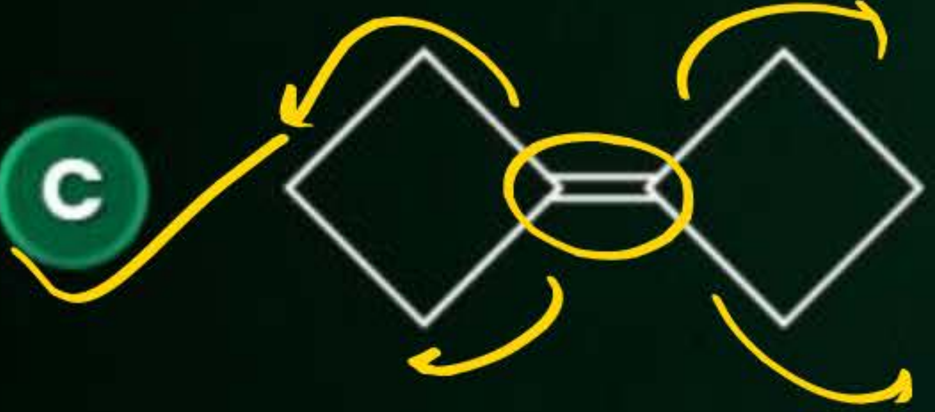
yes

B



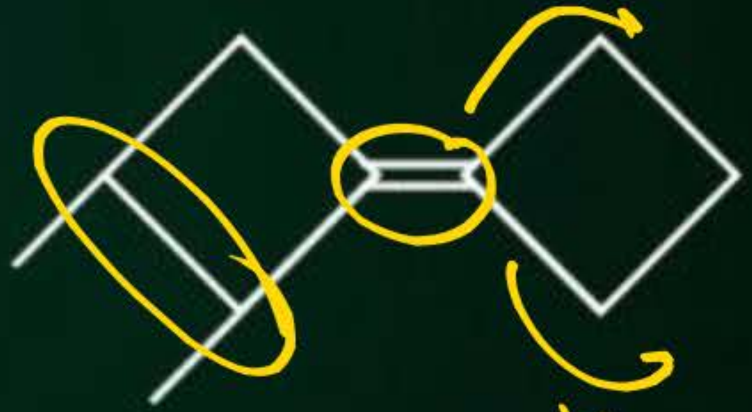
yes

C



NO

D

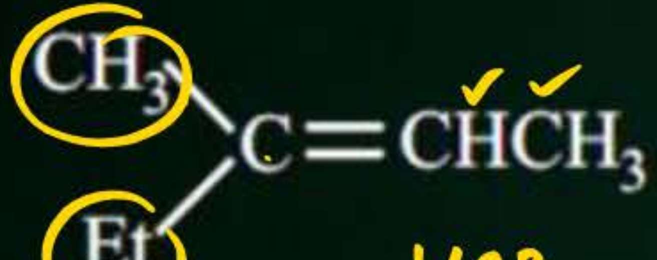


yes

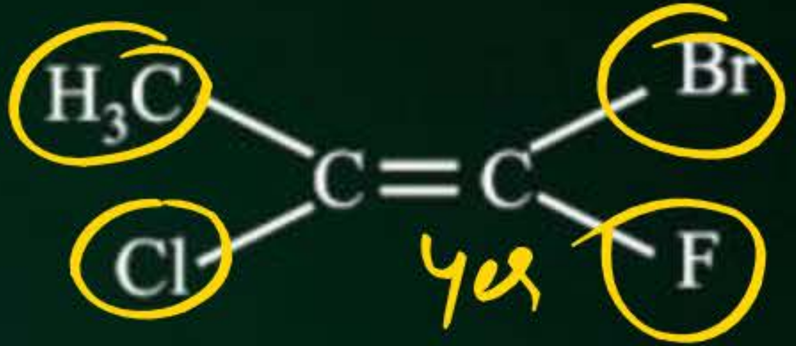
x

QUESTION

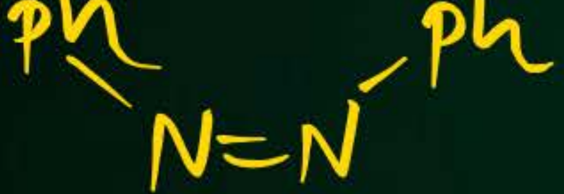
Which will not exhibit geometrical isomerism?

A


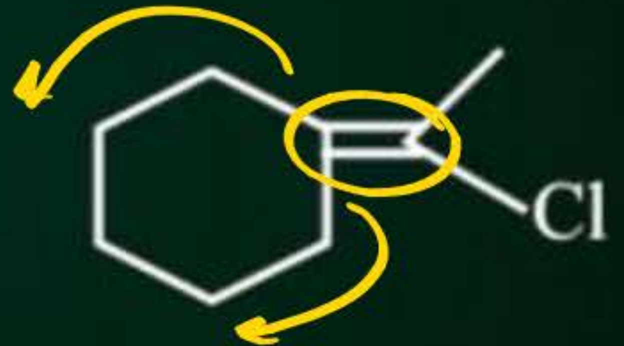
yes

B


yes

C Ph_2N_2


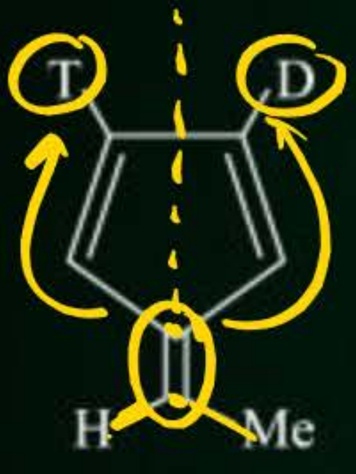
Yes

[✓ D]


QUESTION

Species which will not exhibit geometrical isomerism among the following is:

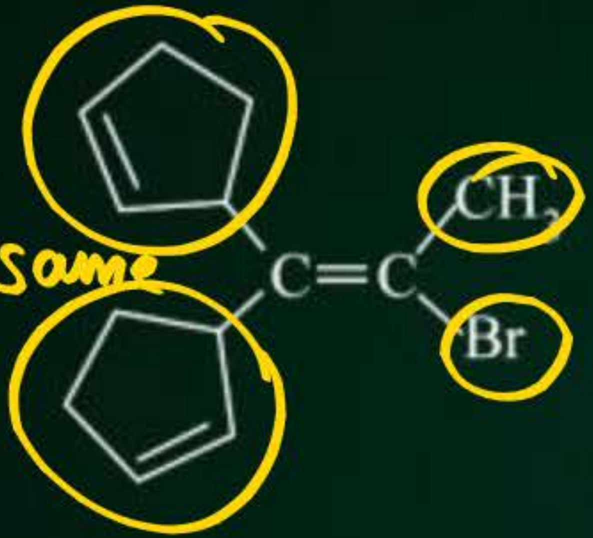
A



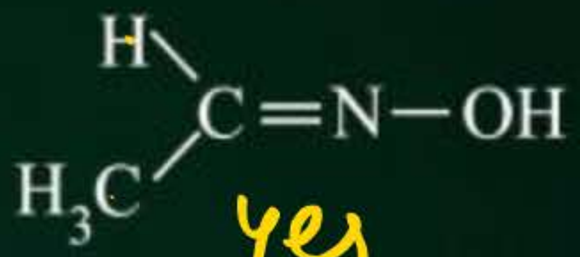
Yes

B ✓

same



C



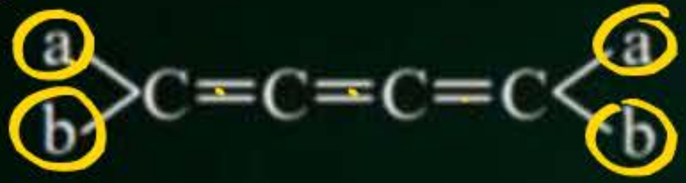
yes

D N_2H_2

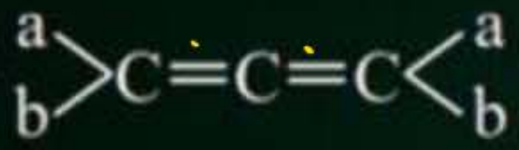
Yes $H-N=N-H$

QUESTION

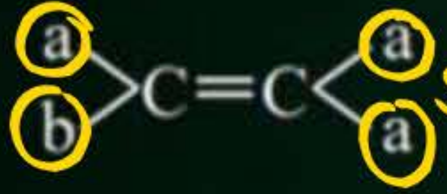
Which show geometrical isomerism?

✓ **A** 

${}^{a}_{b}{>}C{=}C{=}C{=}C{<}^{a}_{b}$

B 

${}^{a}_{b}{>}C{=}C{=}C{<}^{a}_{b}$ NO

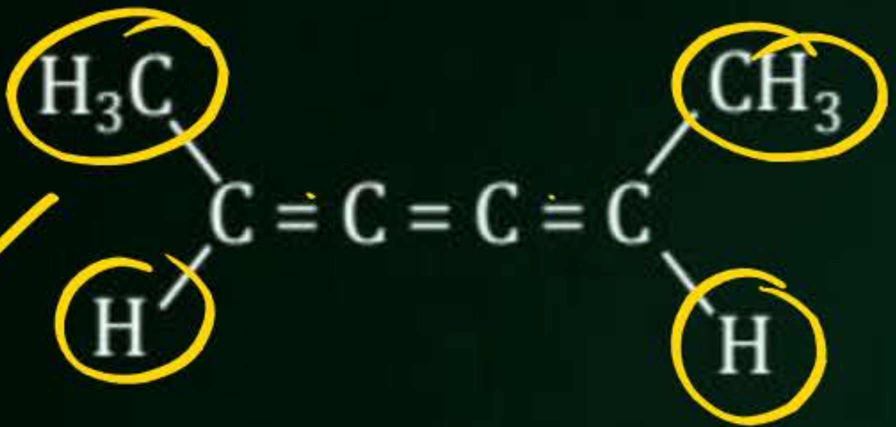
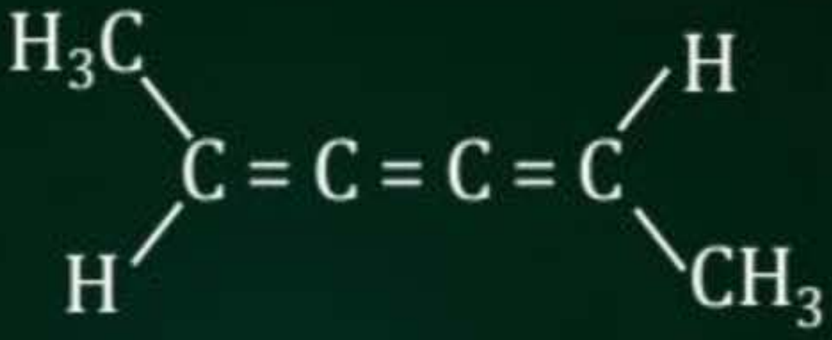
C × 

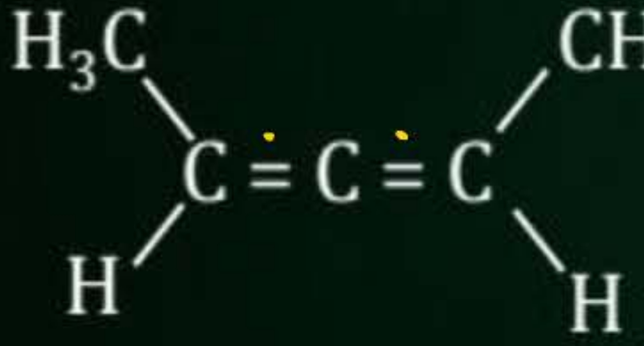
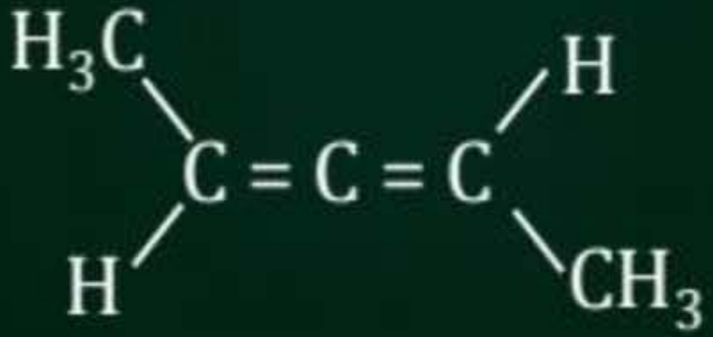
${}^{a}_{b}{>}C{=}C{<}^{a}_{a}$ Same

D All

QUESTION

Which of the following pairs are geometrical isomers?

[✓ A]

and


B

NO and


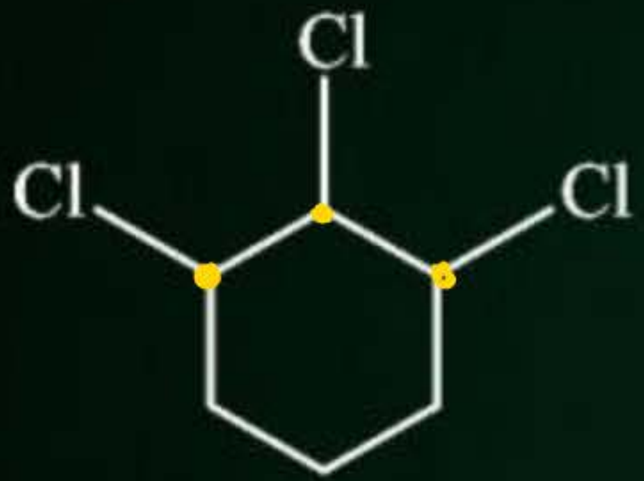
C Both (A) and (B)

D None of the above

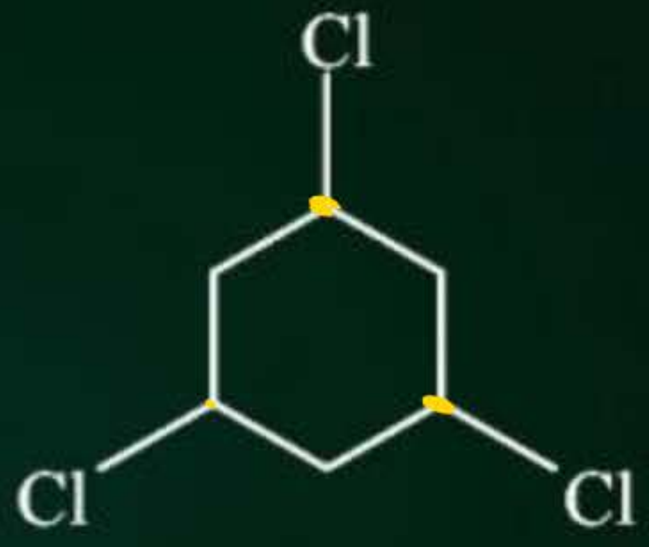
QUESTION

Which of the following compounds does not have any geometrical isomers?

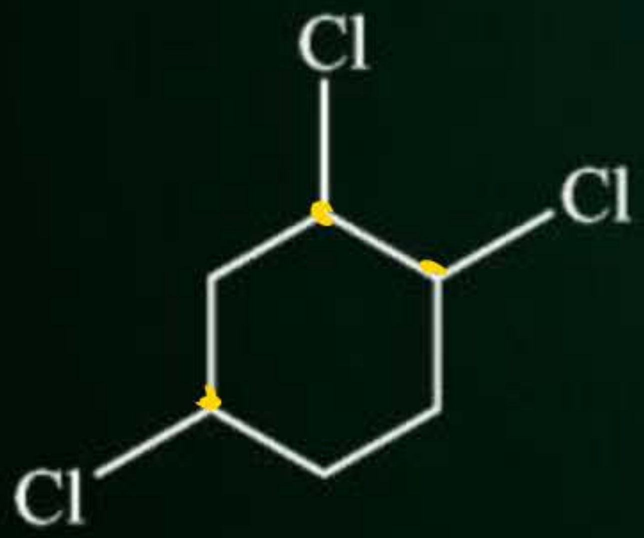
A



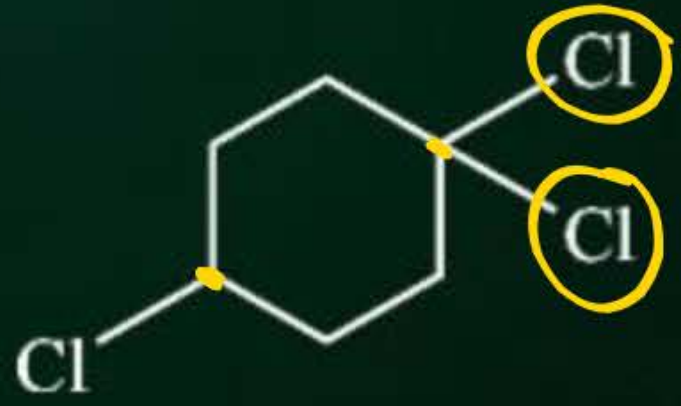
B



C



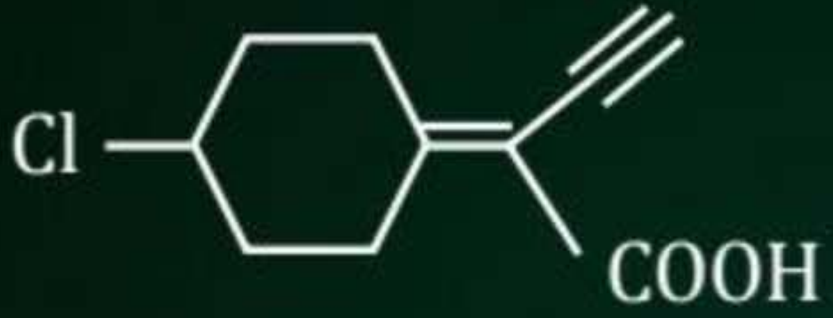
[✓ D]



Home Work

QUESTION ①

What are the correct designations for the structure below?



A E, E

B Z, E

C E, Z

D No stereoisomerism is possible

QUESTION 02

Which of the following compounds does not exhibit geometric isomerism?

- (A) 1,1-Dichloro-2-butene
- (B) 1,2-Dichloro-2-butene
- (C) 1,1-Dichloro-1-butene
- (D) 2,3-Dichloro-2-butene.

QUESTION 03

Which of the following compounds could exhibit geometrical isomerism?

(1) 3, 4-dimethylhex-3-ene
(2) 2-methylpent-2-ene
(3) 1, 6-dichlorohex-3-ene

A (1) and (2) only

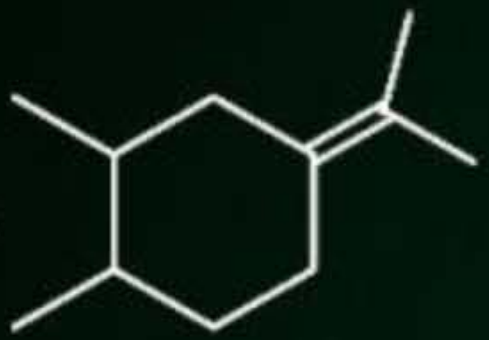
B (1) and (3) only

C (2) and (3) only

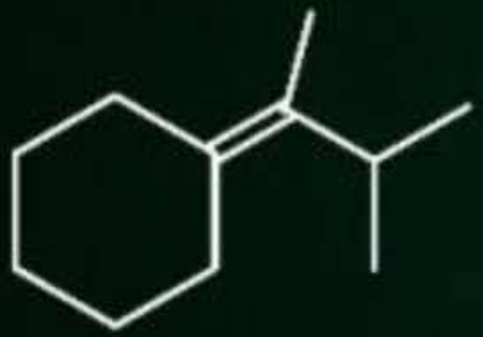
D (1), (2) and (3)

QUESTION ④

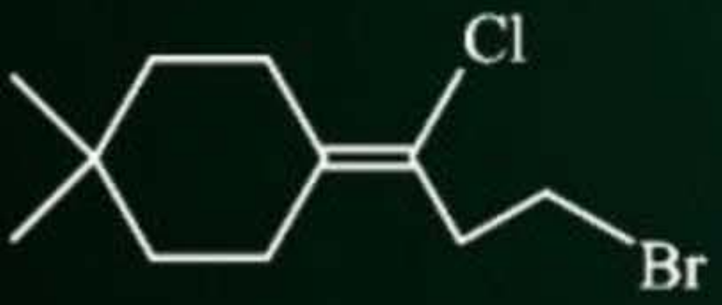
A ⇒



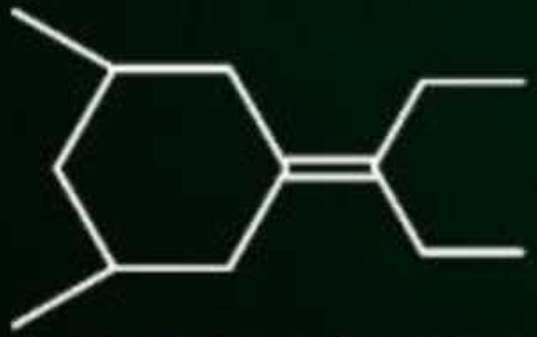
B ⇒



C ⇒



D ⇒



Which of the following compounds can show Geometrical isomerism?

Ⓐ A, B, D

Ⓑ B, C

Ⓒ A, D

Ⓓ C, D

QUESTION 05

Which of the following cannot exist in *syn* and *anti* form?

- A $Ph - N = N - OH$
- B $PH - N = N - Ph$
- C $Ph - CH = N - OH$
- D $Ph_2C = N - OH$

QUESTION 06

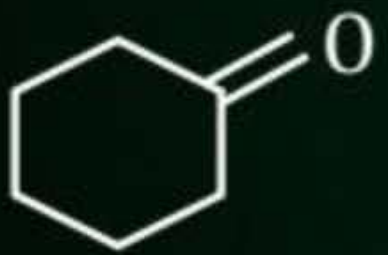
Which of the following compounds will not exhibit geometrical isomerism ?

A $CH_3-CH=CH-COOH$

B $Br-CH=CH-Br$

C $C_6H_5-CH=N-OH$

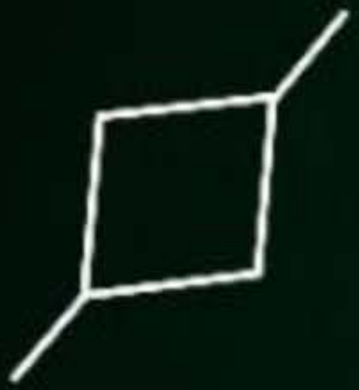
D



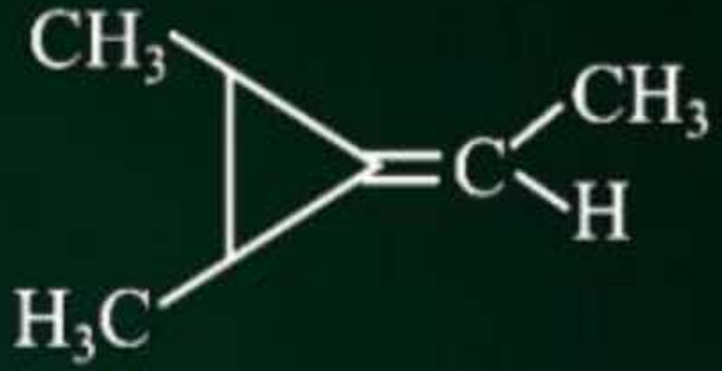
QUESTION 07

Geometrical isomerism is not shown by?

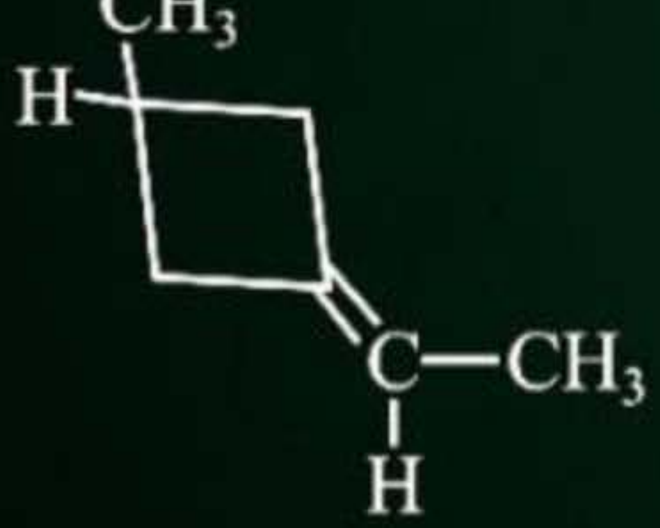
A



B


CH_3
CH_3
C
H
H_3C

C

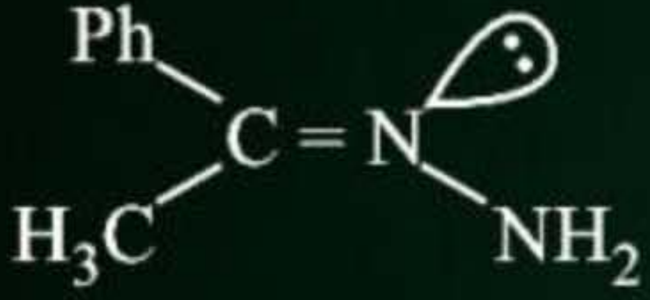


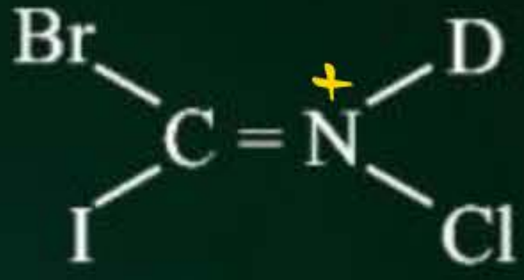
D

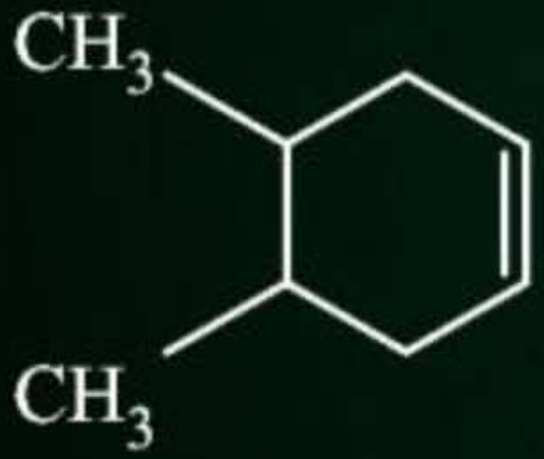
$Ph{-}CH{=}CH{-}CH_3$

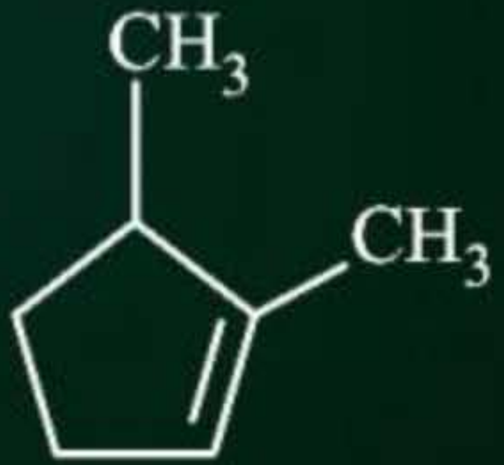
QUESTION 08

Which of the following will not show geometrical isomerism?

A

Ph
C=N
H3C
NH2

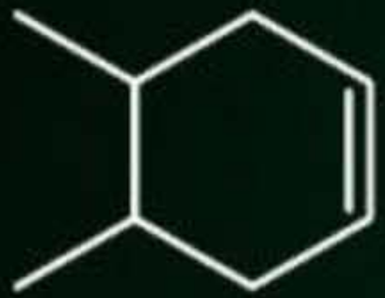
B


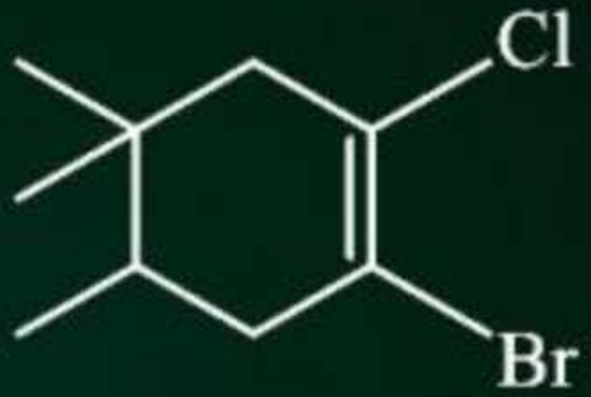
C


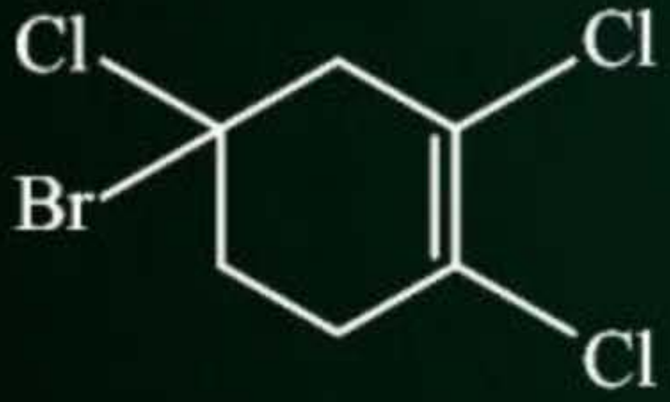
D


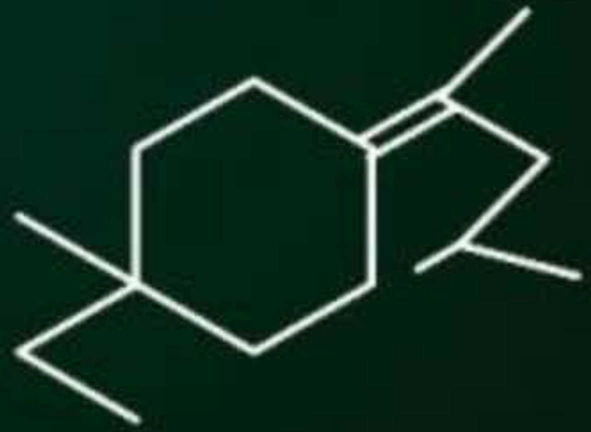
QUESTION 09

Which of the following compounds will show Geometrical isomerism?

A


B


C


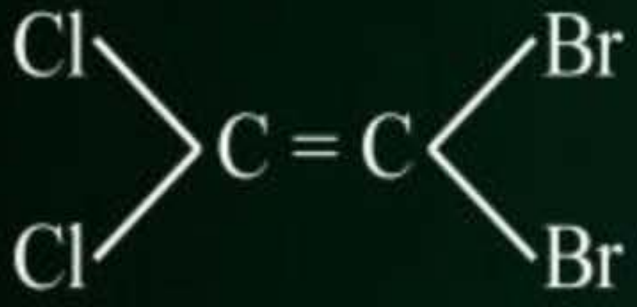
D


QUESTION 10

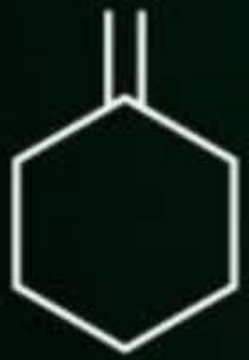
Which of the following compound show cis and trans isomerism?

(A) Cl – CH = CH – Cl

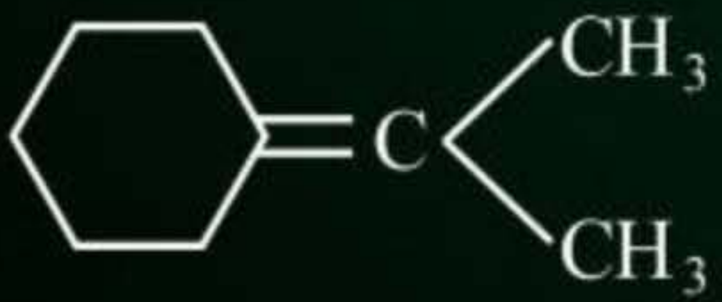
(B)


Cl
Cl
C = C
Br
Br

(C)



(D)



ANSWER KEY

1. D
2. C
3. B
4. C
5. D
6. D
7. C
8. D
9. A
10. A

Home Work From PW Module (Yakeen NEET)

Prarambh: Q 69, 106, 107, 110

Prabal: Q 23, 25

Thankyou!!

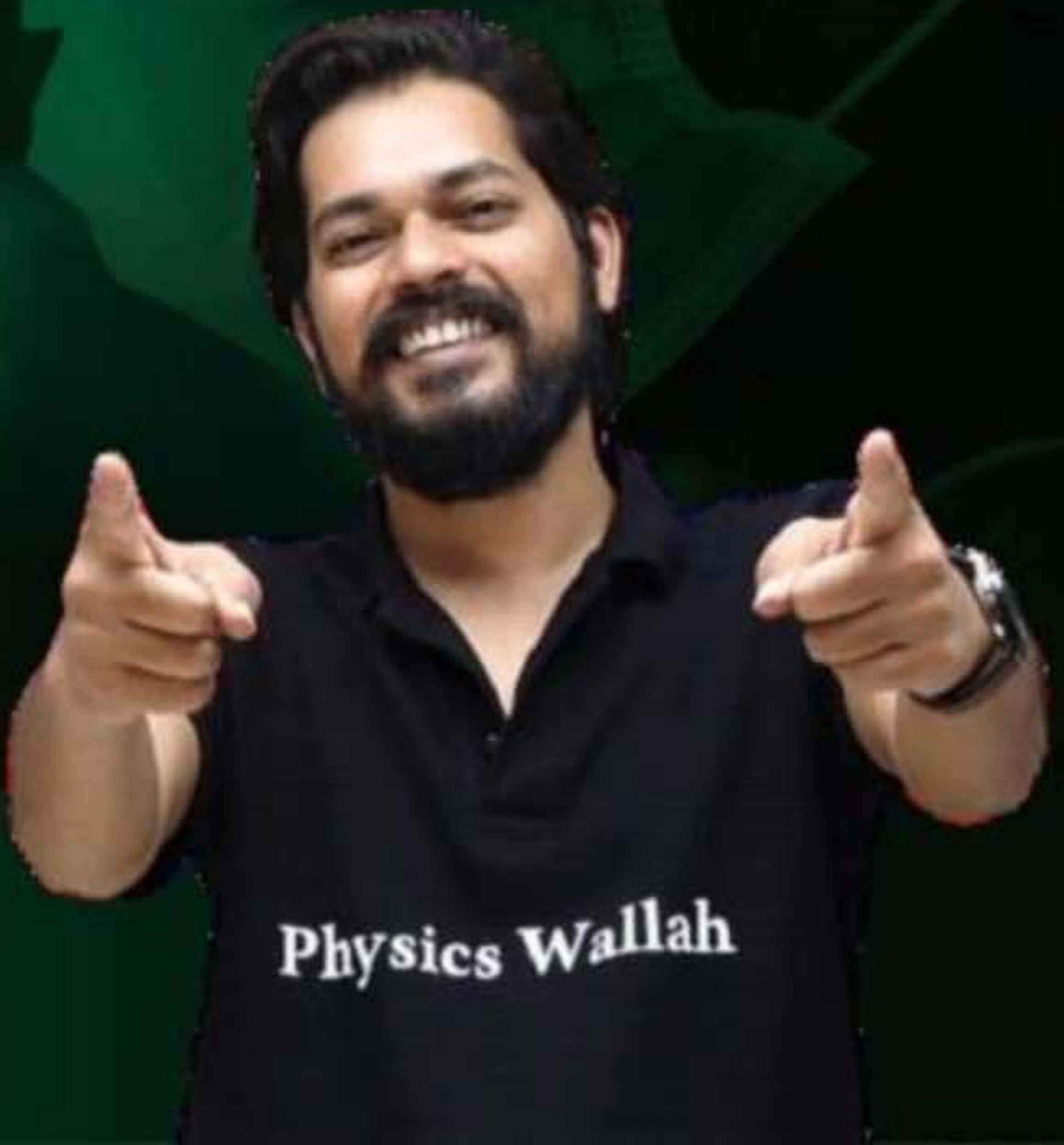
YAKEEN 2.0

FOR NEET 2025

Lecture- 07 | **Organic Chemistry**

Some Basic Principles and Techniques (ISOMERISM)

By- Pankaj Sir(POPU MAMA)


Physics Wallah

Topics *to be covered*

6 Nov

1. Calculation of no. of GI ✓
2. Chiral Carbon & Chiral Center ✓
3. Plane of Symmetry & Center of Symmetry ✓
4. Practice

My first class in PW

IUPAC
Lecture 1

IUPAC Nomenclature | Class11 (L1)

Pankaj Sir C...
721K subscribers

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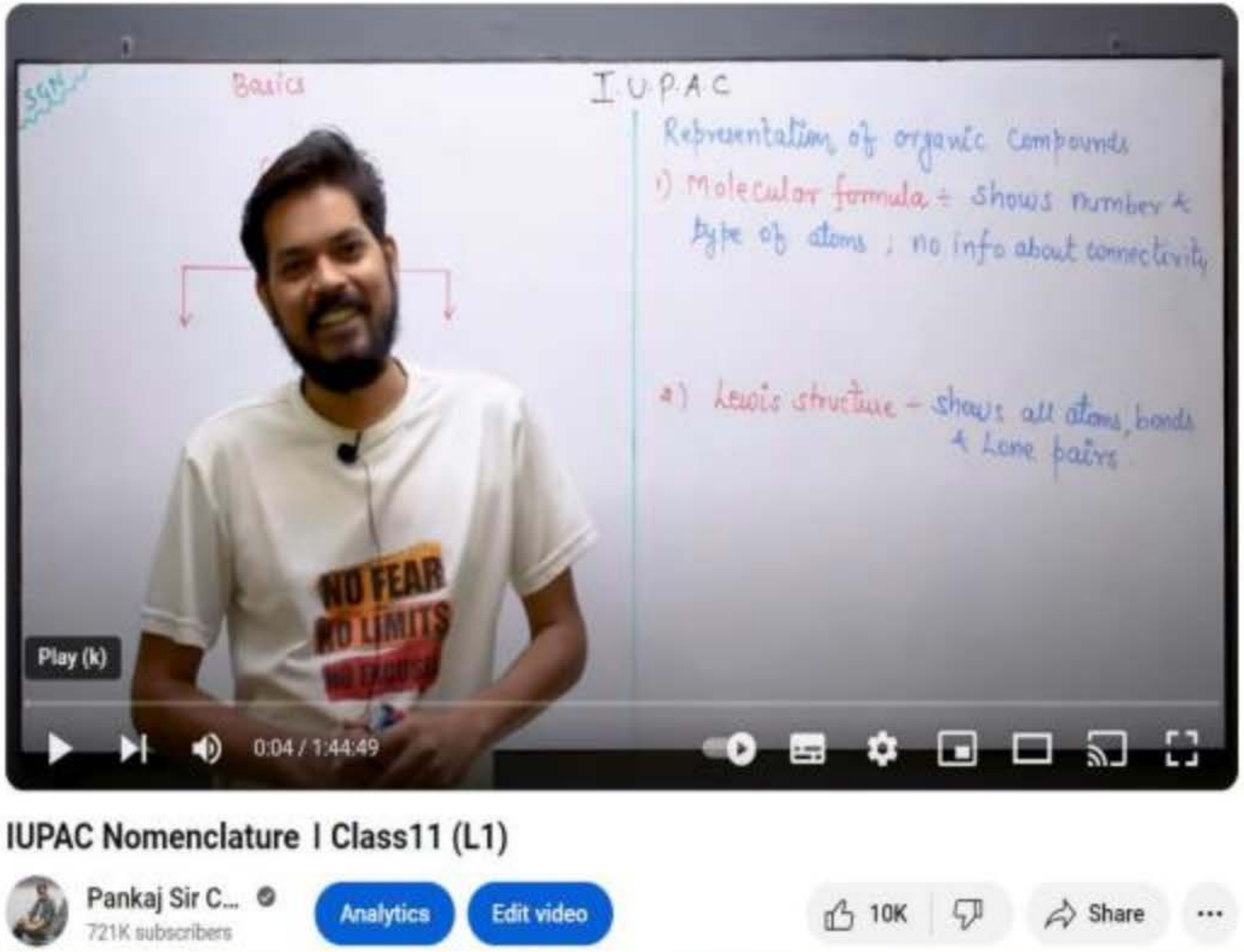

IUPAC Nomenclature | Class11 (L1)

Pankaj Sir C...
721K subscribers

SGN
Basics
IUPAC
Representation of organic compounds
1) Molecular formula :- shows number & type of atoms ; no info about connectivity
2) Lewis structure - shows all atoms, bonds & Lone pairs
NO FEAR
NO LIMITS
Play (k)
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Analytics
Edit video
10K
Share

Calculation of no. of G.I.

Case 1. If End groups are different. (Unsymmetrical)

Total G.I = 2^n

n= Stereogenic area (Site at which G.I exhibits)

Q diff $CH_3-\overset{\checkmark}{\boxed{CH=CH}}-\overset{\checkmark}{\boxed{CH=CH}}-\overset{\checkmark}{\boxed{CH=CH}}-CH_2-CH_3$ diff

Unsymm

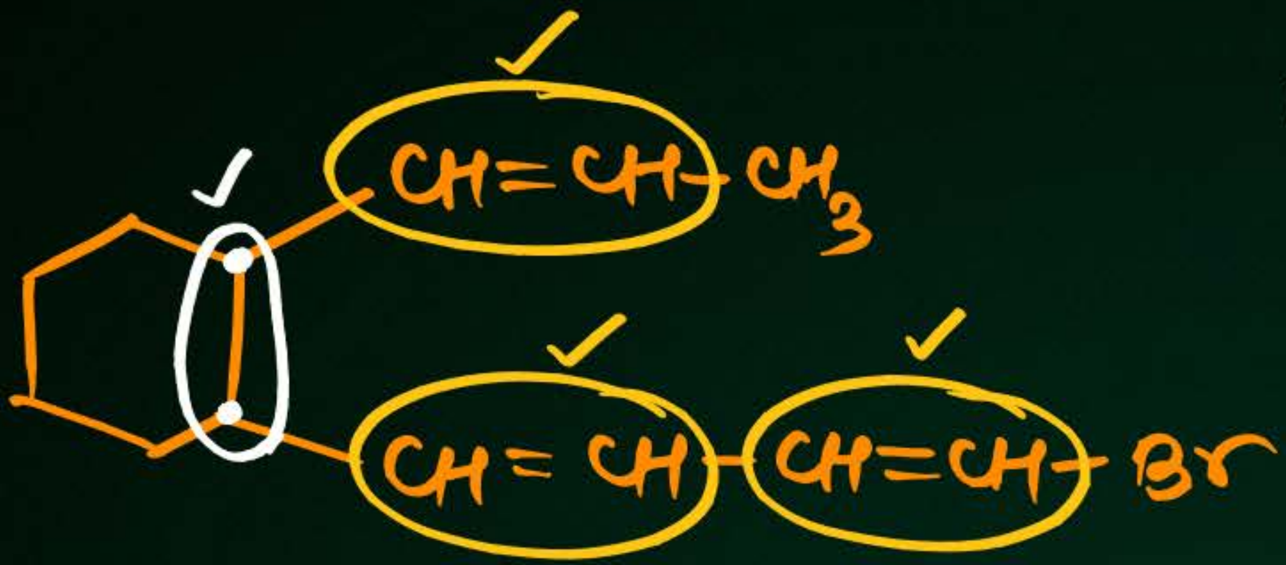
$n=3$

Total G.I = $2^3 = 8$

Q $CH_3-(\overset{\checkmark}{CH=CH})_4-Cl$

Total G.I = $2^n = 2^4 = 16$

Q

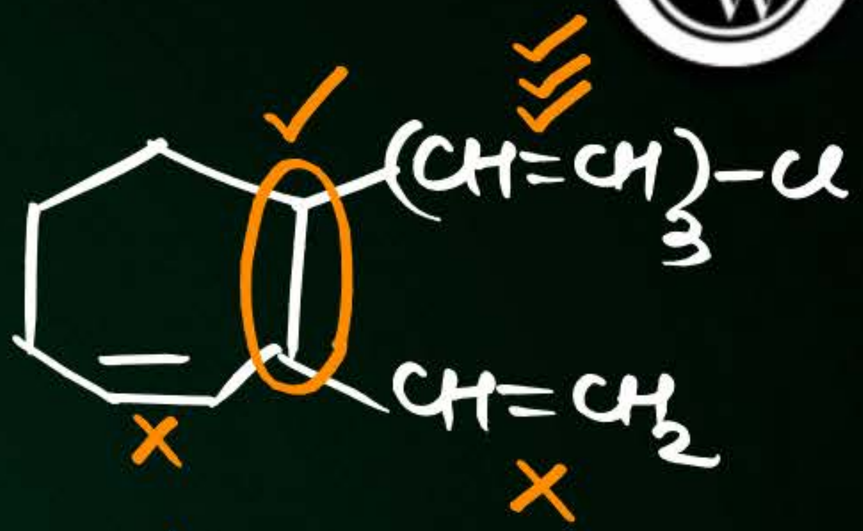


CH=CH-CH₃
CH=CH-CH=CH-Br
✓
✓
✓
✓

n=4

$2^4 = 16$

Q

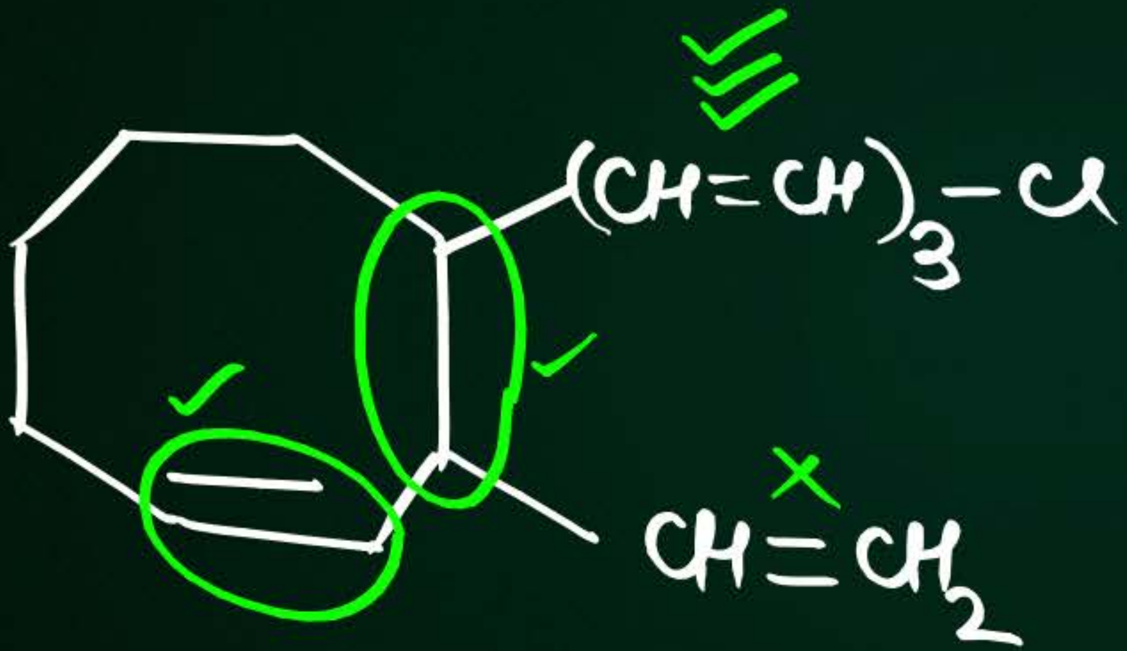


(CH=CH)₃-Cl
CH=CH₂
✓
✓
×
×

n=4

$2^4 = 16$

Q



(CH=CH)₃-Cl
CH=CH₂
✓
✓
✓
×

n=5

$2^5 = 32$

Calculation of no. of G.I.

Case 2. If End groups are same. (Symmetrical)

Total G.I $= 2^{n-1} + 2^{p-1}$

$p = \frac{n}{2}$ n = even

$p = \frac{n+1}{2}$ n = odd

Q ①

$$CH_3-\boxed{\overset{\checkmark}{CH=CH}}-\underset{Symm}{\boxed{\overset{\checkmark}{CH=CH}}}-\boxed{\overset{\checkmark}{CH=CH}}-CH_3$$

$n = 3$ $p = \frac{3+1}{2} = 2$

Total G.I $= 2^{3-1} + 2^{2-1} = 4 + 2 = 6$

②

$$CH_3-(CH=CH)_4-CH_3$$

$n = 4$ $p = \frac{4}{2} = 2$

Total G.I $= 2^{4-1} + 2^{2-1}$

$2^3 + 2^1$

$8 + 2 = 10$

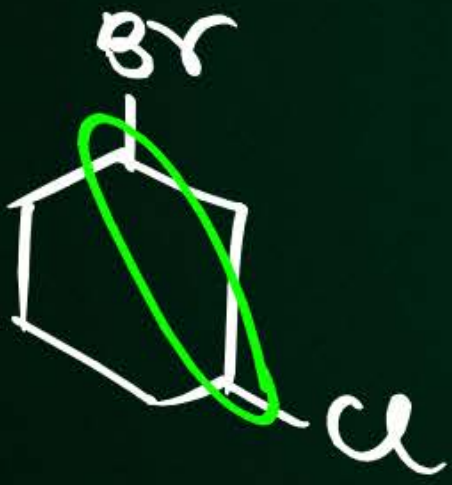
③ $CH_2 \overset{\times}{=} CH - \underbrace{(CH \overset{\checkmark}{=} CH)}_{}{}_3 - CH \overset{\times}{=} CH_2$

$n = 3 \quad P = \frac{3+1}{2} = 2$

$\text{Total G.I} = 2^{3-1} + 2^{2-1} = ⑥$

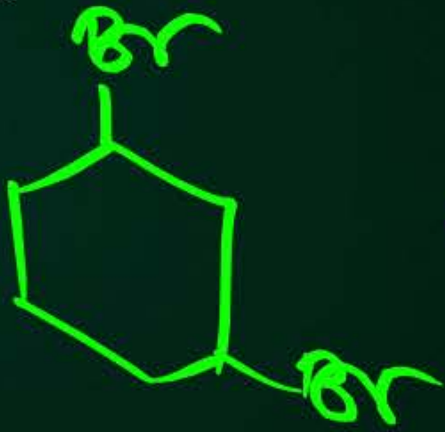
④ $CH_2 \underset{\times}{=} CH - \boxed{CH \overset{\checkmark}{\underset{\checkmark}{=}} CH} - CH \underset{\times}{=} CH_2$ ②

⑤



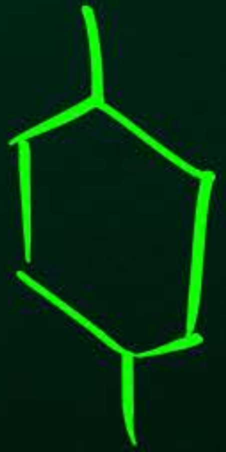
②

⑥



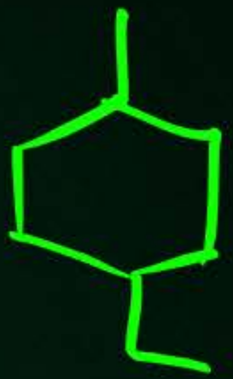
②

⑦



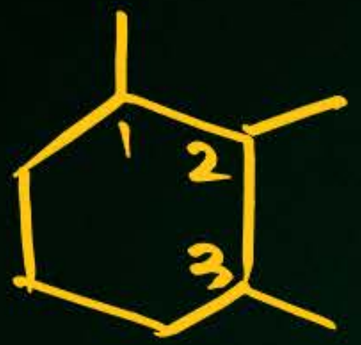
②

⑧

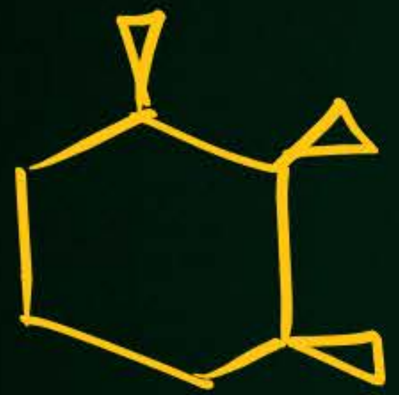


②

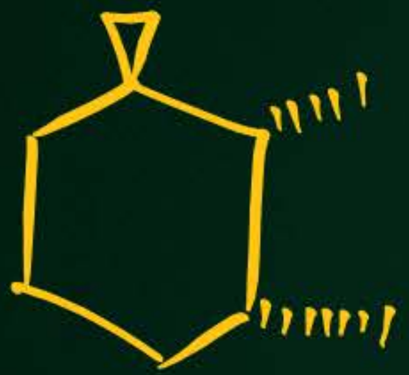
⑨



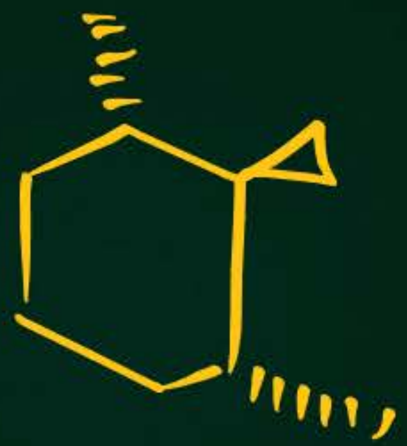
All dark



1 dark



2 dark



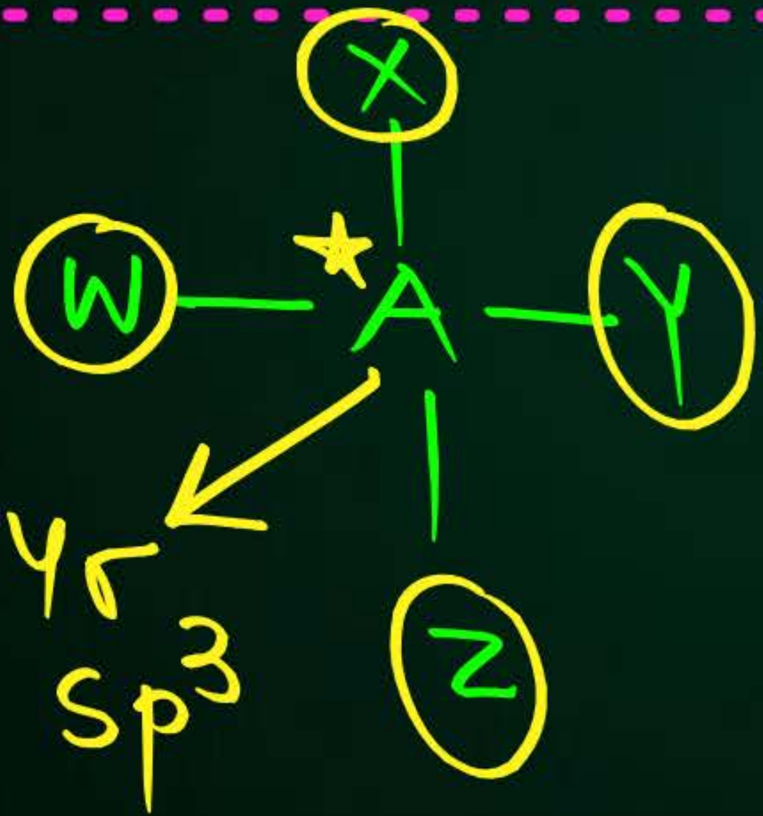
Ans ③

Optical Isomerism

Polarimeter EXP (Next turn)

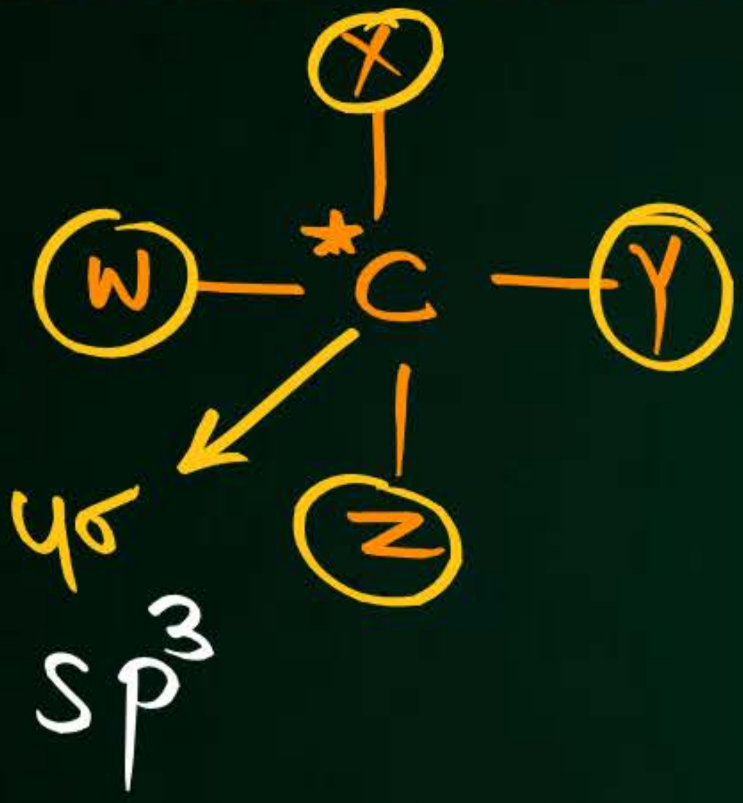
Basic Terms:

Chiral Centers: sp^3 tetrahedral atom attached with four different groups.

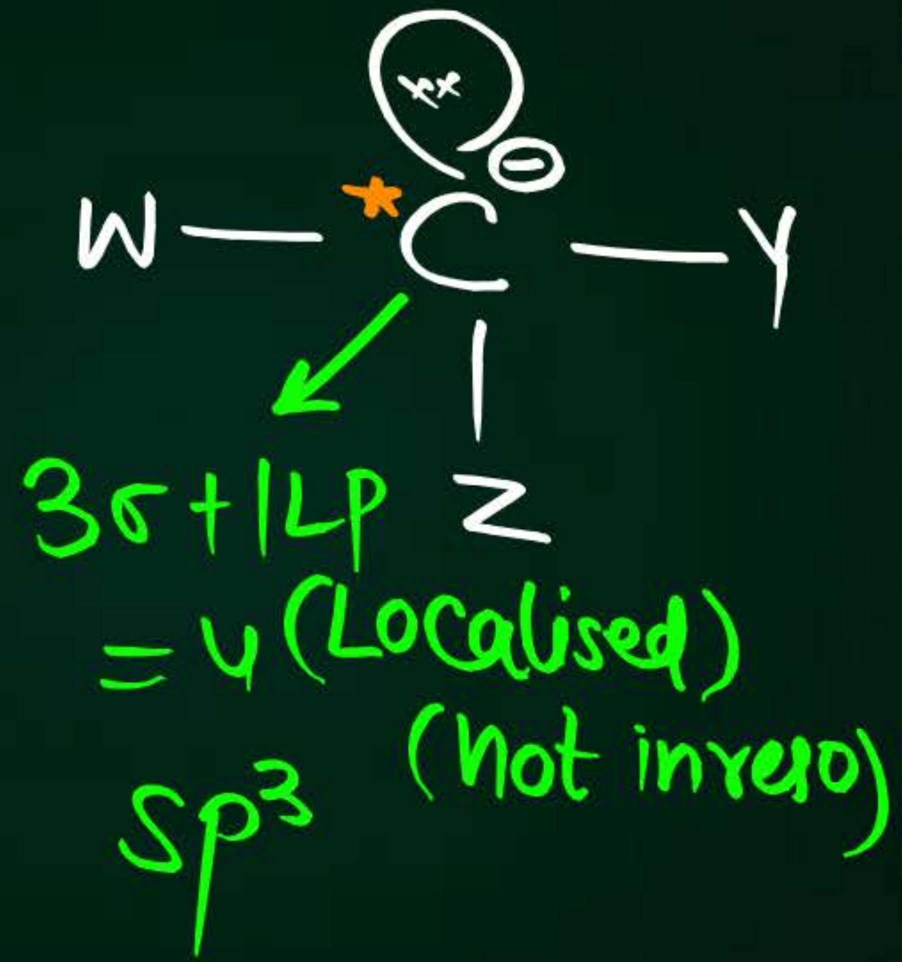


1. Chiral Carbons*

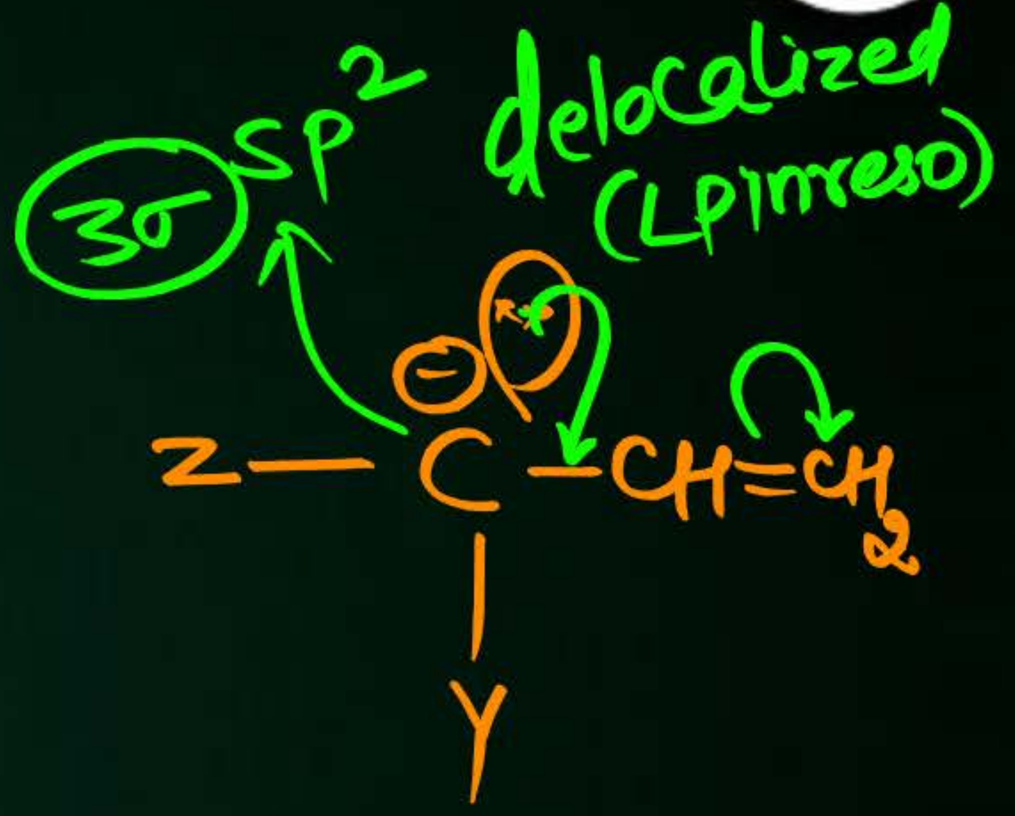
sp³ carbon atom attached with four different groups.



X
W
*C
Y
Z
4σ
sp³



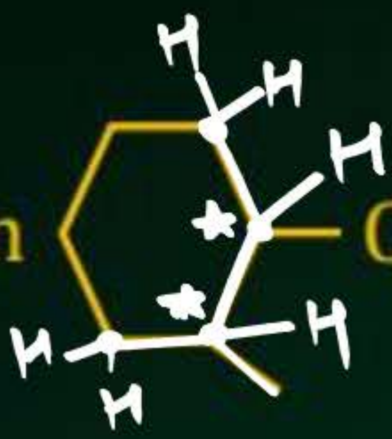
W
*C
Y
Z
3σ + 1LP
= 4 (Localised)
(not inreso)
sp³



3σ
sp²
delocalized
(LP in reso)
Z
C
CH=CH₂
Y

L.P L.P na Raha
Pyar pyar na Raha
hum toh lut gaye
chiral chiral
na Raha.

QUESTION

Number of chiral carbons in  Cl is:

[✓ A 2]

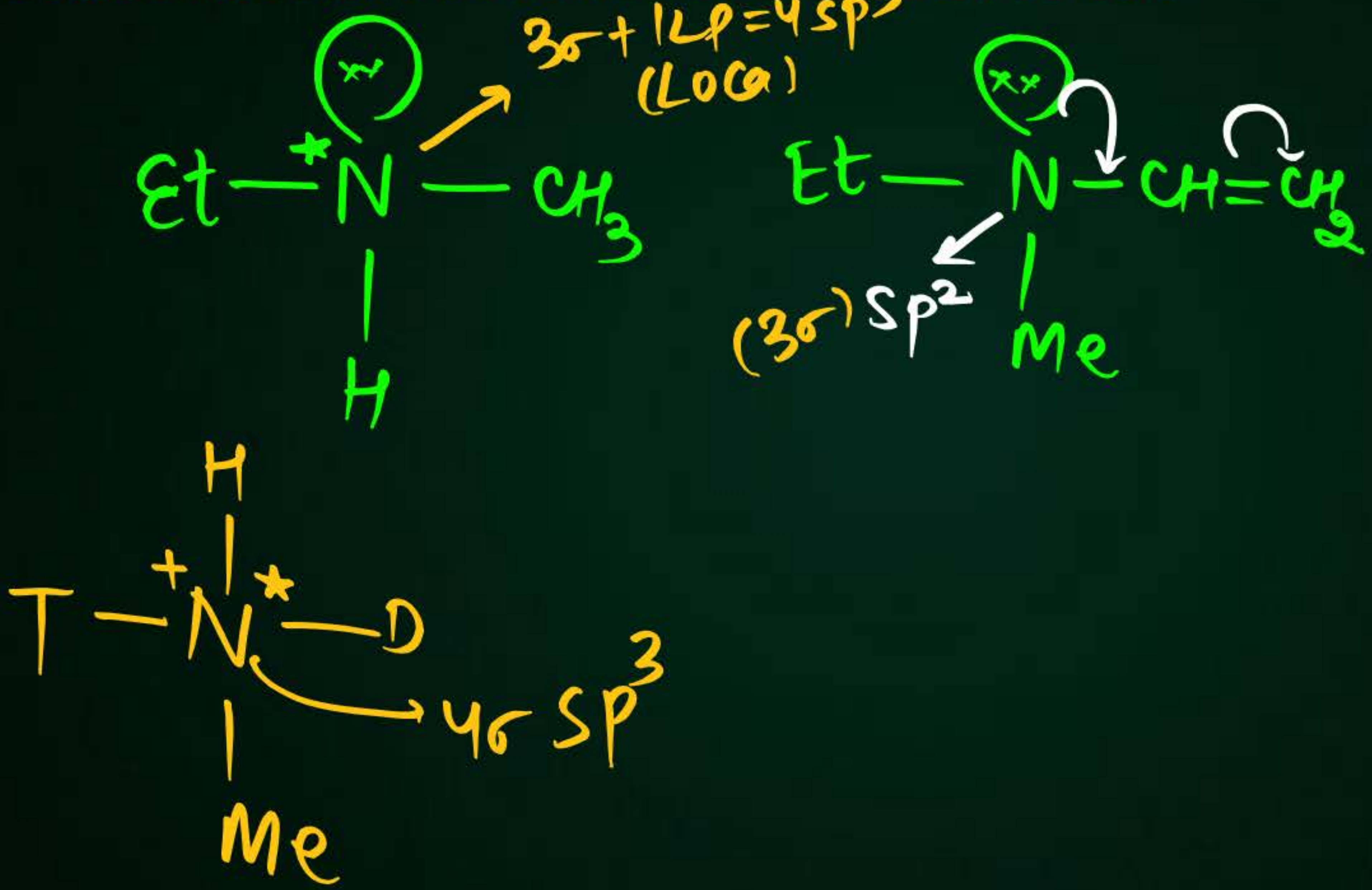
B 3

C 4

D 1

2. Chiral Nitrogen

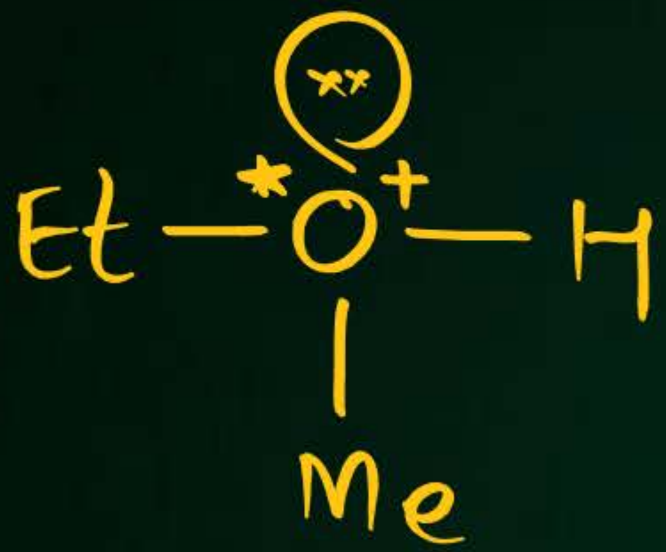
sp^3 Nitrogen atom attached with four different groups.



3σ + 1LP = 4 sp³
(LOCA)
Et
N
CH₃
H
Et
N
CH=CH₂
Me
(3σ) sp²
H
T
N
D
Me
4σ sp³

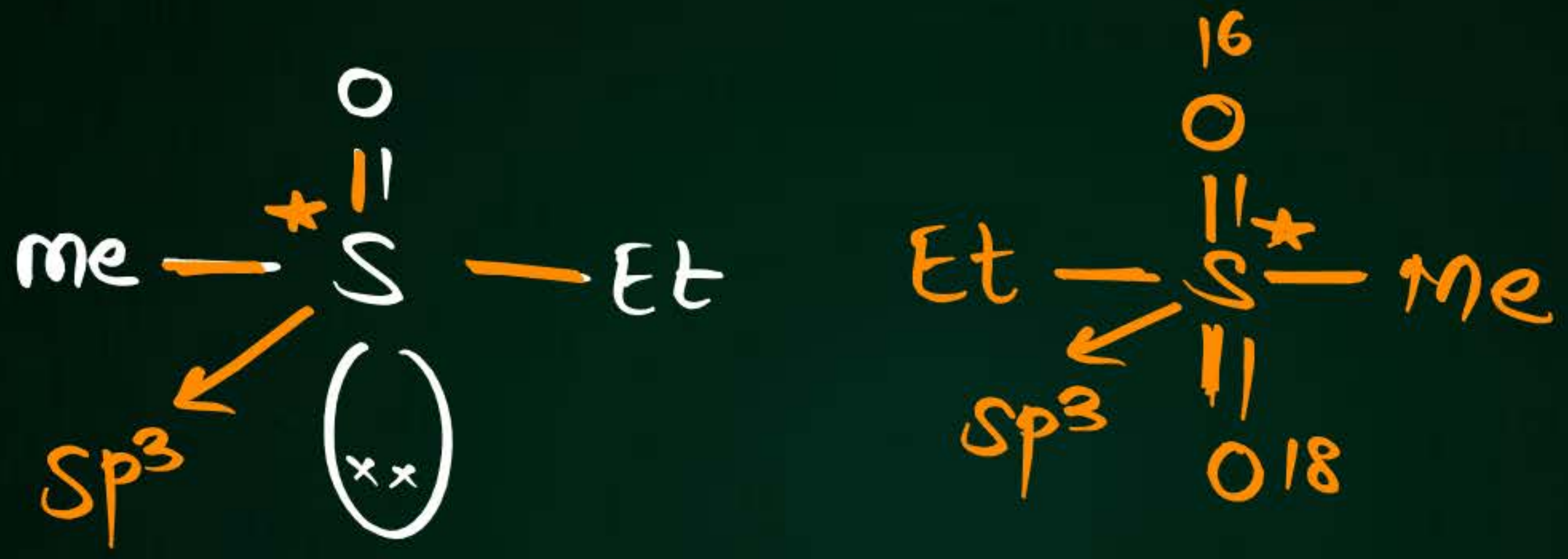
3. Chiral Oxygen

sp^3 Oxygen atom attached with four different groups.



4. Chiral Sulphur

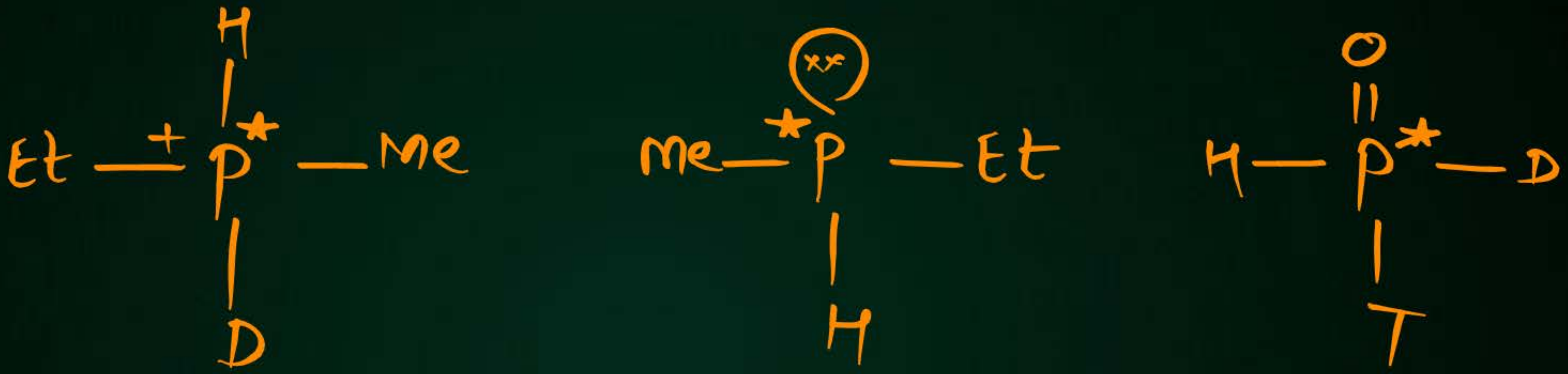
sp³ Sulphur atom attached with four different groups.



O
me
S
Et
Sp3
××
16
O
Et
S
me
Sp3
O18

5. Chiral Phosphorus

sp^3 Phosphorus atom attached with four different groups.



$$\mathrm{Et}\overset{+}{-}\overset{\mathrm{H}}{\underset{\mathrm{D}}{\mathrm{P}^{*}}}-\mathrm{Me} \qquad \mathrm{Me}-{}^{*}\overset{\times\times}{\underset{\mathrm{H}}{\mathrm{P}}}-\mathrm{Et} \qquad \mathrm{H}-\overset{\mathrm{O}}{\overset{\|}{\underset{\mathrm{T}}{\mathrm{P}^{*}}}}-\mathrm{D}$$

chiral Carbon

or

Stereogenic Carbon

or

Asymmetric Carbon

Sirf 'c' ki baat hogi

chiral center

or

Stereogenic center

or

Asymmetric center

C, N, O, S, P

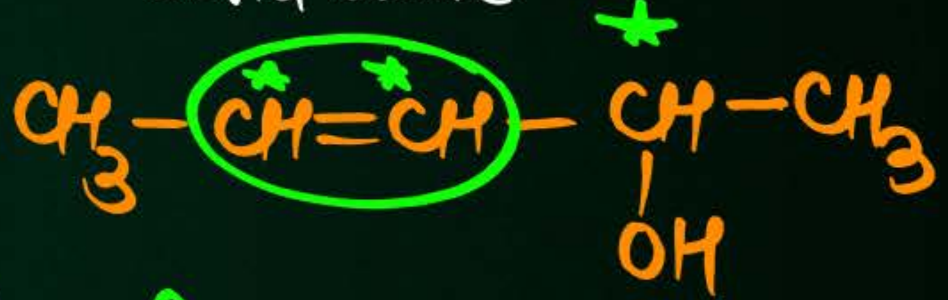
Sabki baat hogi

Stereo center
(S.C)

S.C = Geometrical center + chiral center

(sirf double bond wale)

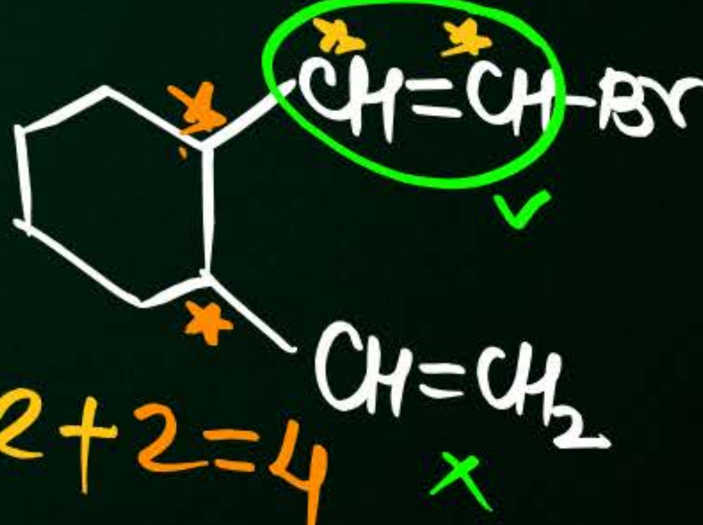
①



$CH_3-\overset{*}{CH}=\overset{*}{CH}-\underset{OH}{\overset{*}{CH}}-CH_3$

$S.C = 2 + 1 = 3$

②

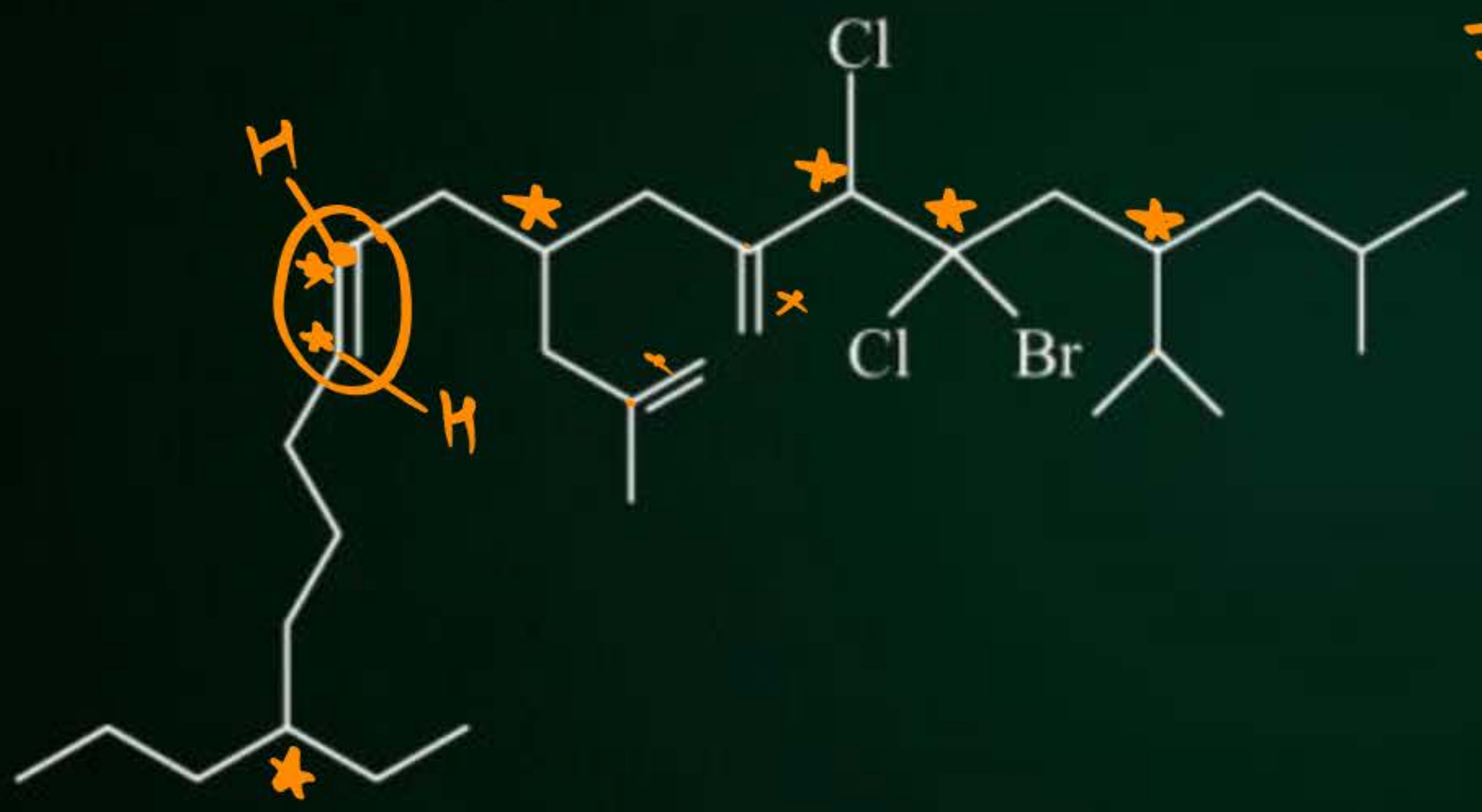


$S.C = 2 + 2 = 4$

QUESTION

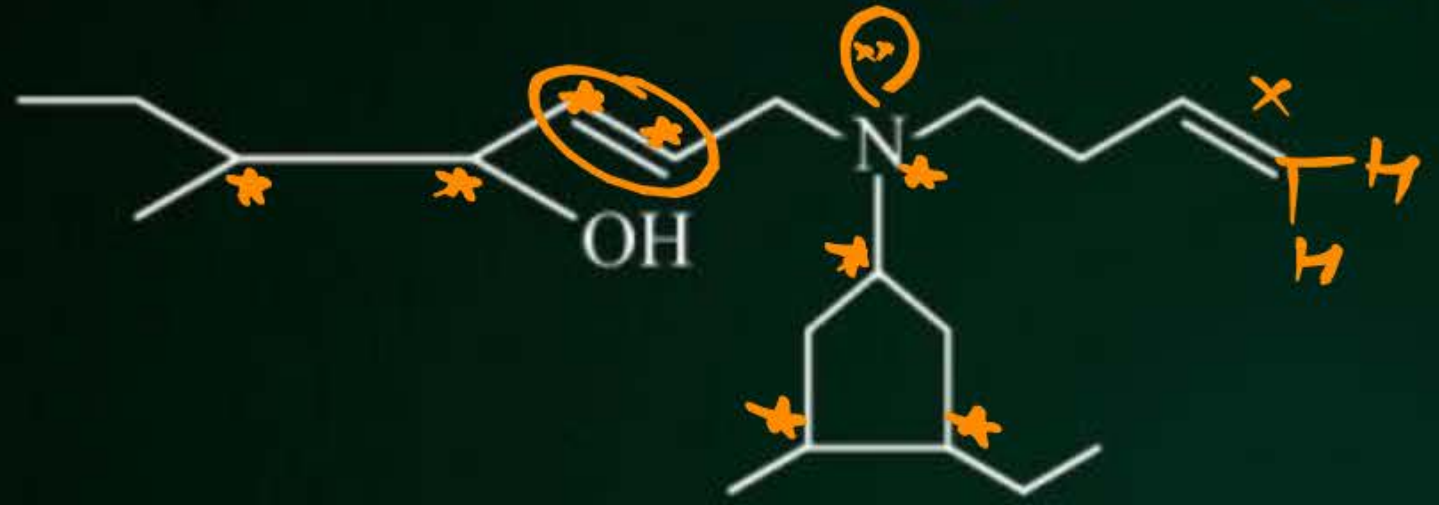
The number of stereo centers in given compound is:

S.C = 2 + 5
= 7



QUESTION

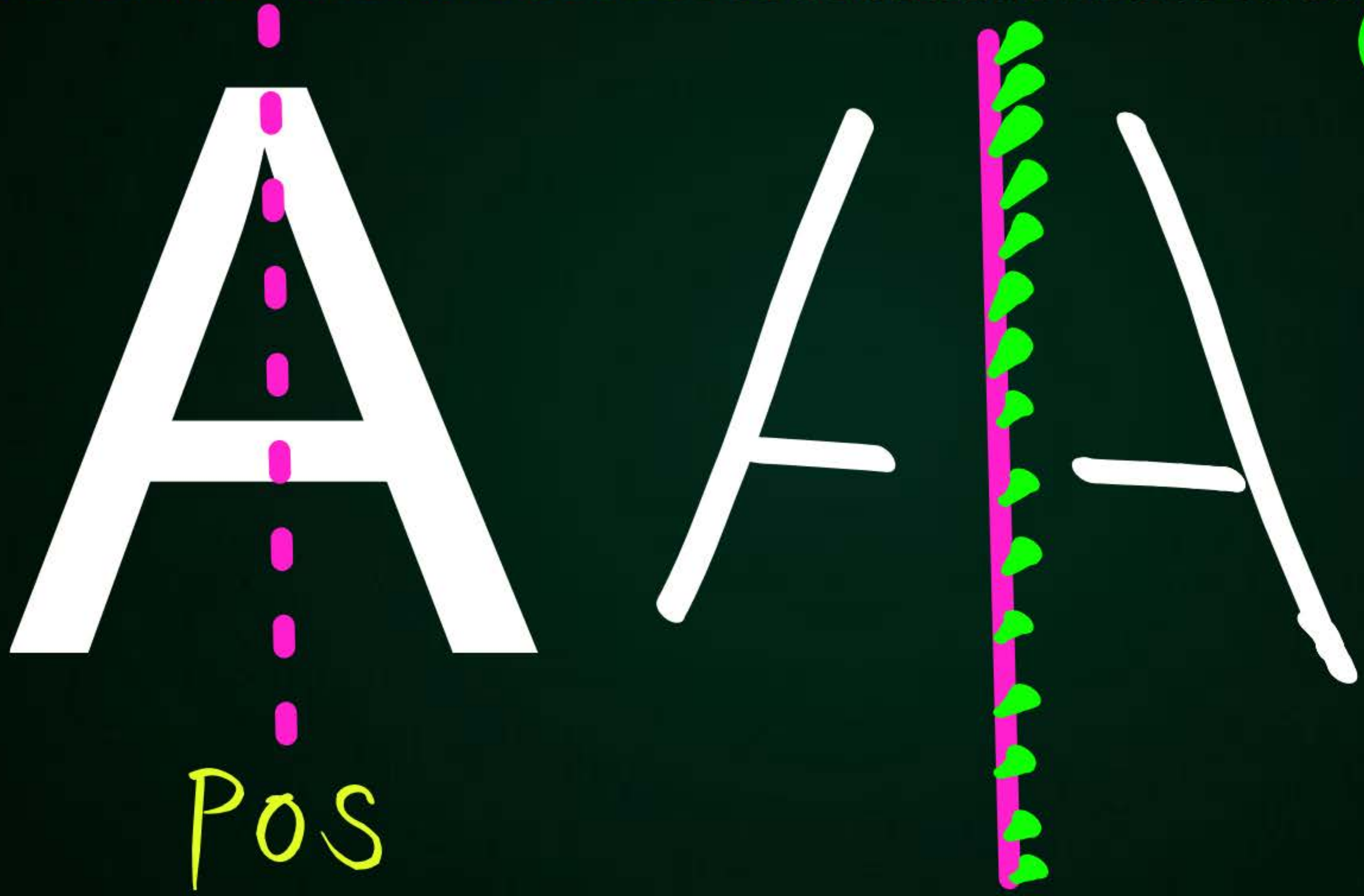
The number of stereo centers in given compound is:



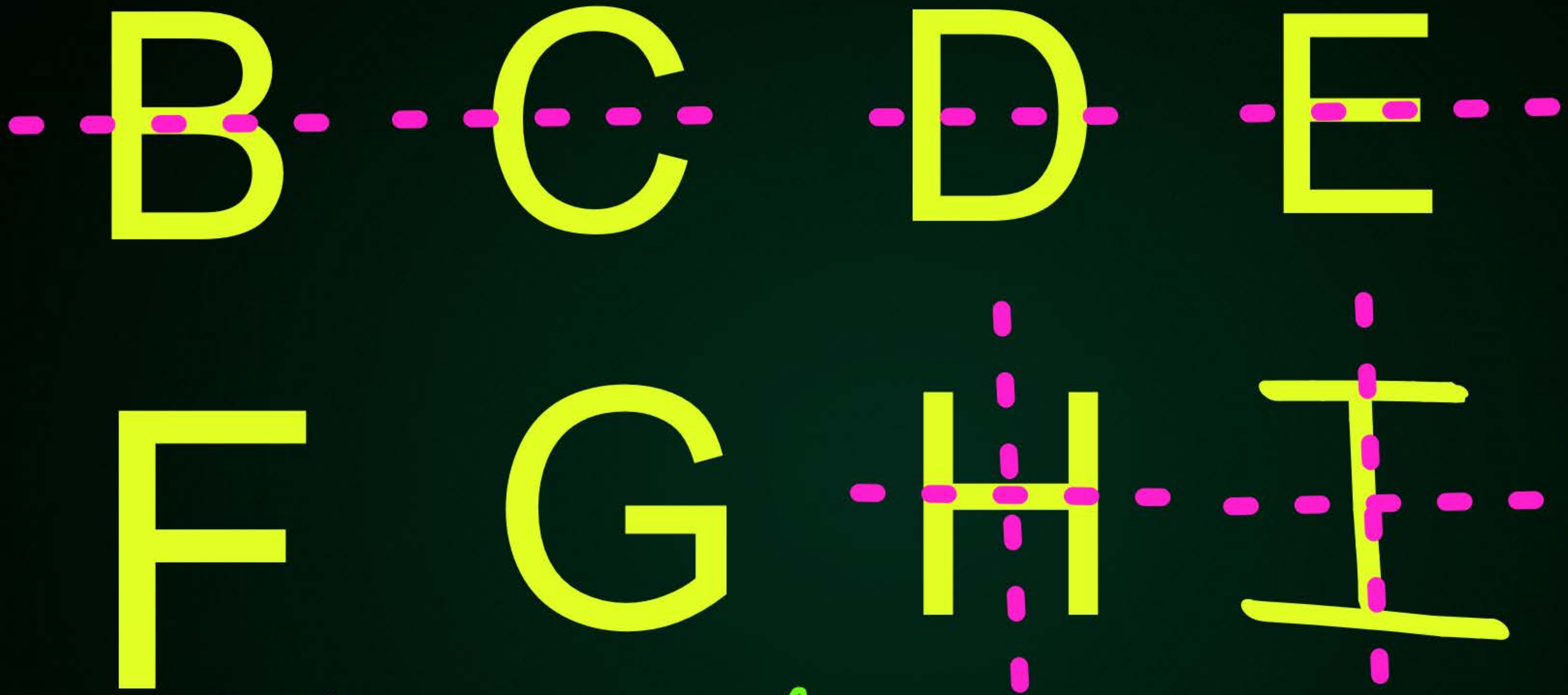
$S.C = 2 + 6 = 8$

POS (Plane of Symmetry)

An Imaginary plane which can divide a molecule into two equal parts.

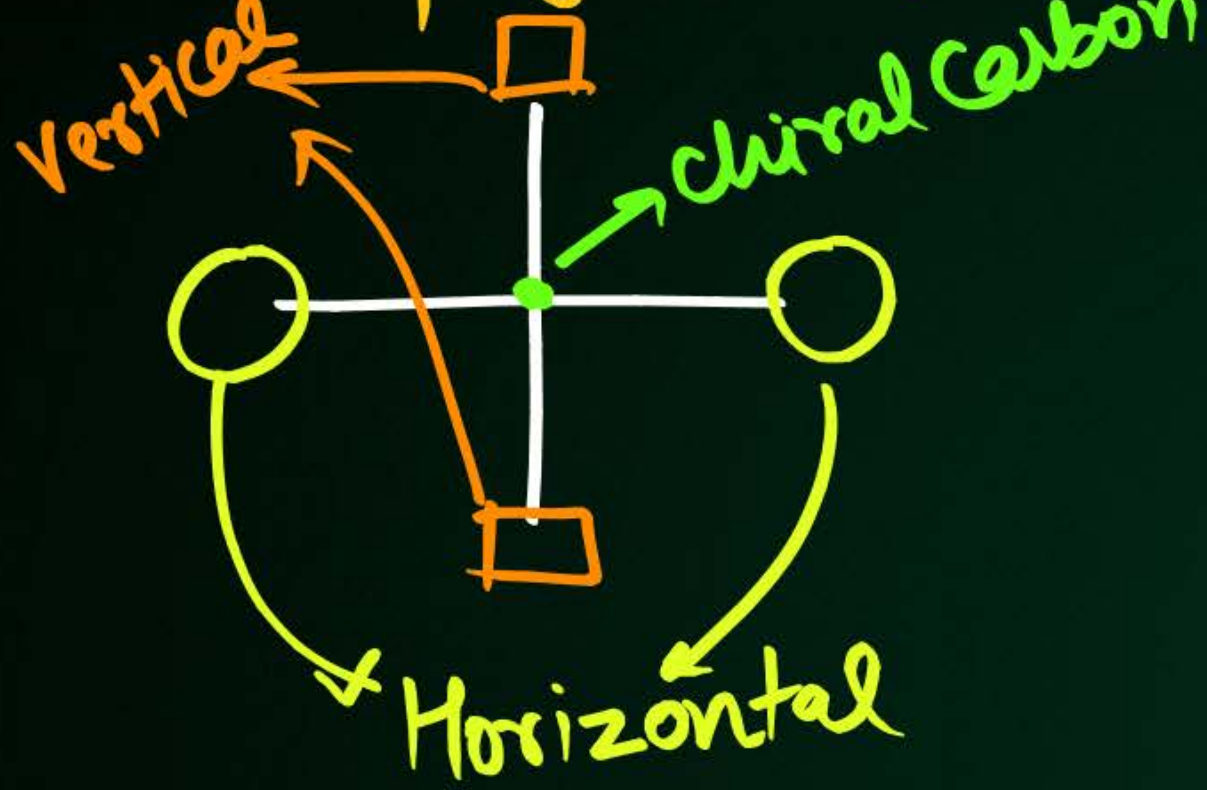


(These two equal parts are mirror image of each other)



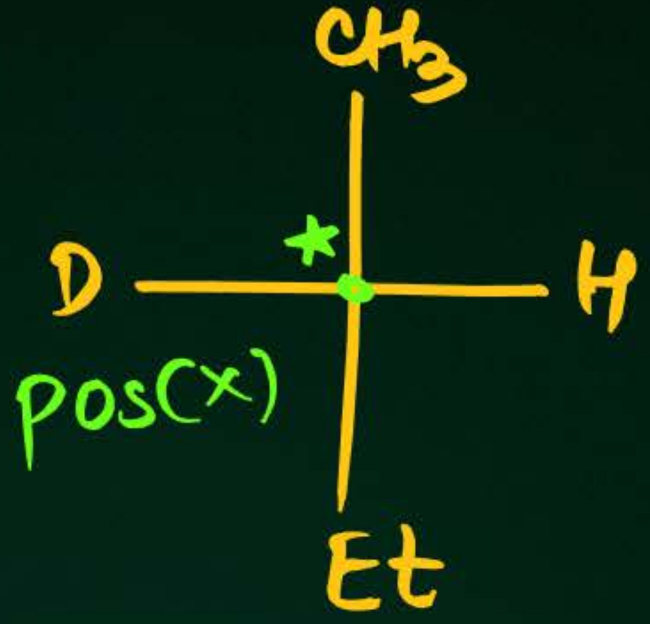
op point :- POS can be more than 1.

Fischer projection formula :

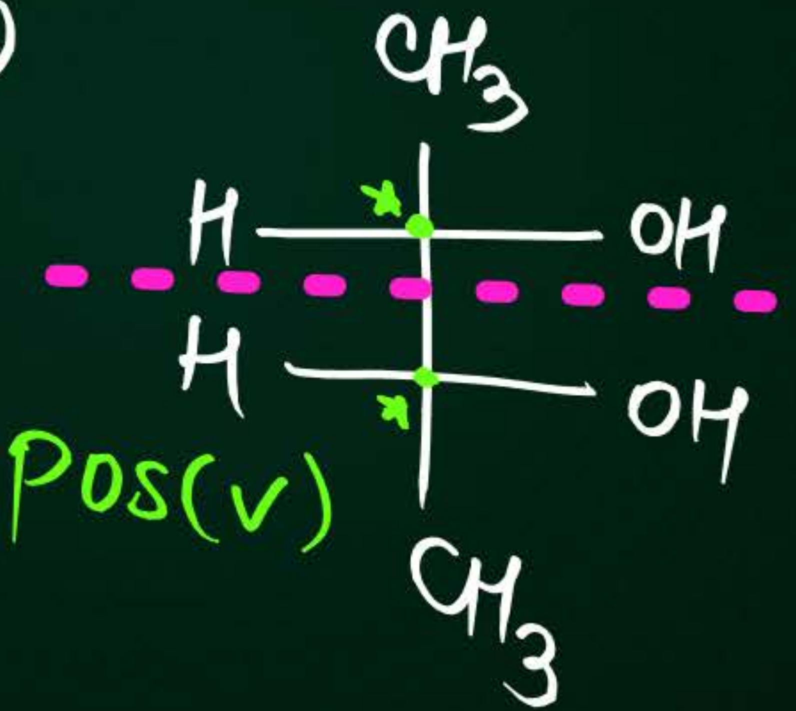

vertical
chiral carbon
Horizontal

Q find POS ?

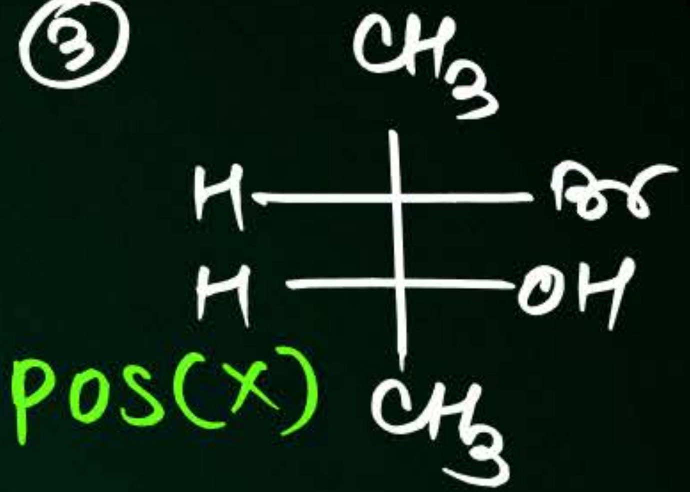
①


CH_3
D
H
Et
*
POS(x)

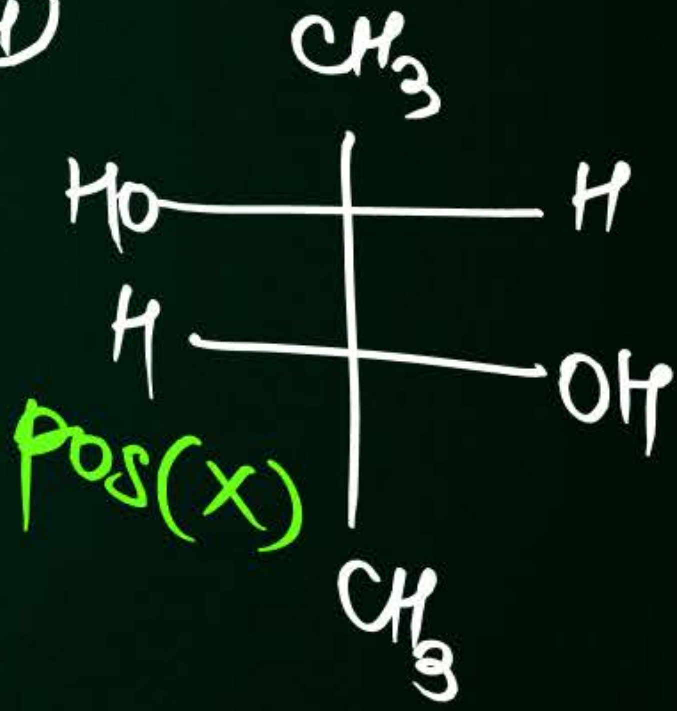
②


CH_3
H
OH
H
OH
CH_3
POS(✓)

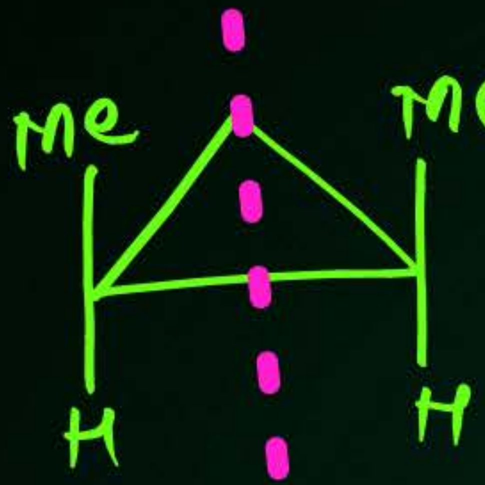
③


CH_3
H
Br
H
OH
CH_3
POS(X)

④

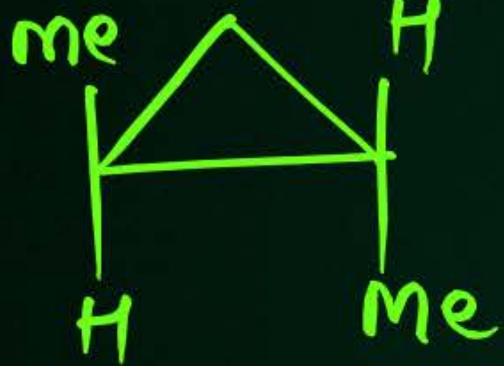

CH_3
HO
H
H
OH
CH_3
POS(X)

⑤



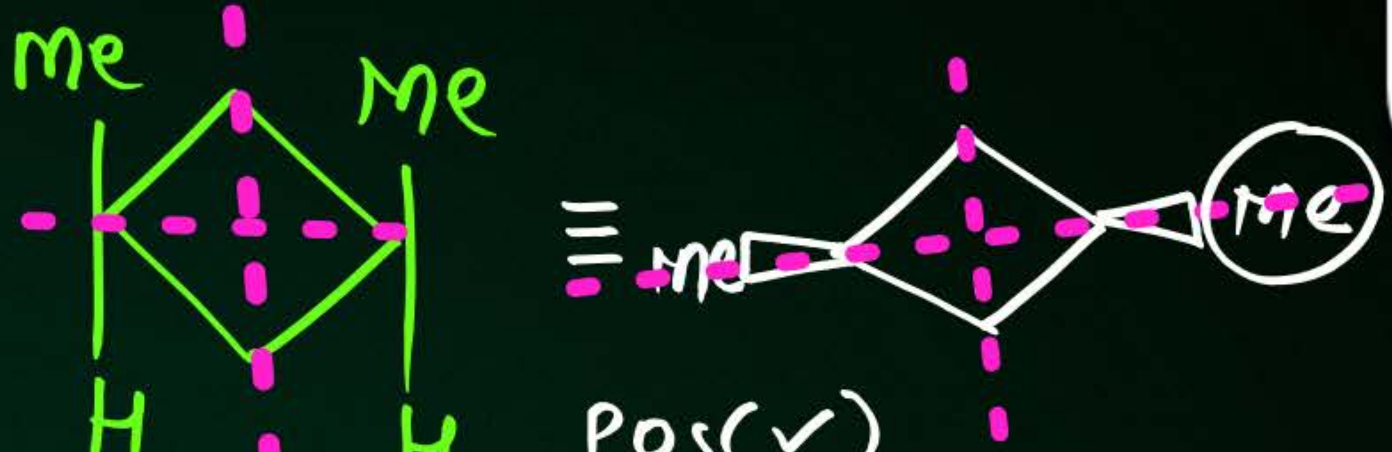
pos(✓)

⑥



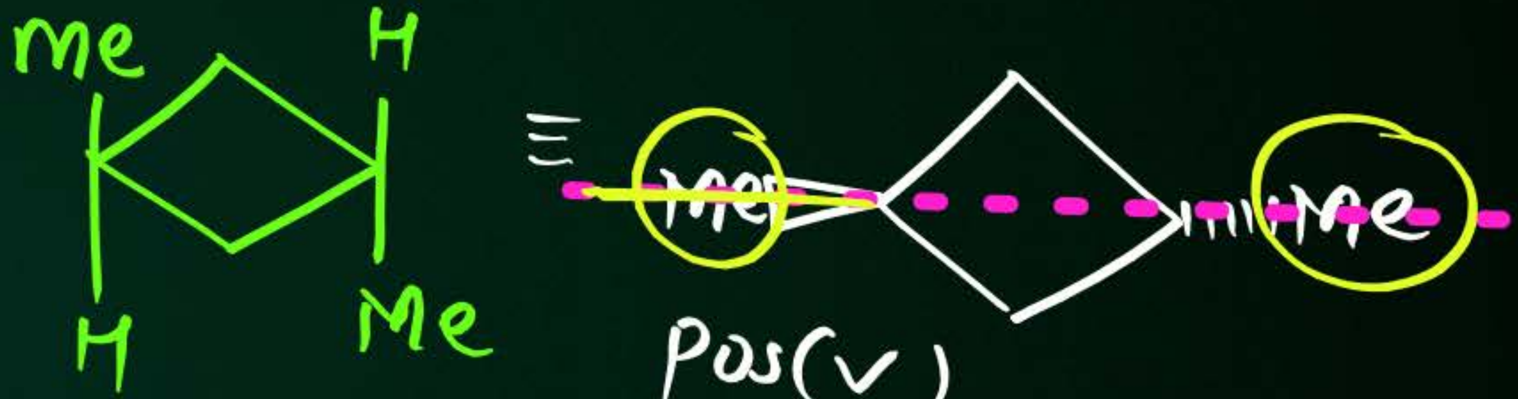
pos(x)

⑦


Me
Me
H
H
≡
Me
Me

pos(✓)

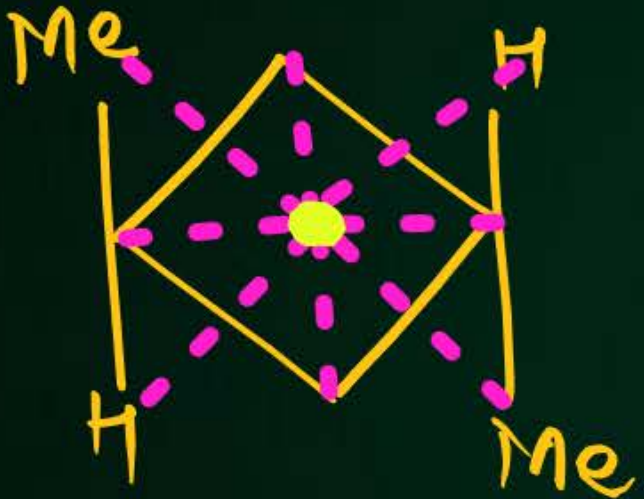
⑧


Me
H
H
Me
≡
Me
Me

pos(✓)

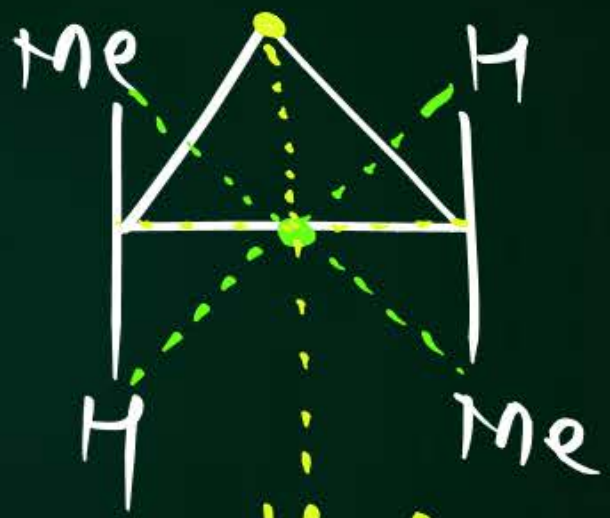
COS (Center of Symmetry)

An Imaginary point from which opposite lines are drawn same group will meet. (even no. of 'c' ki Ring main dekhna hai)



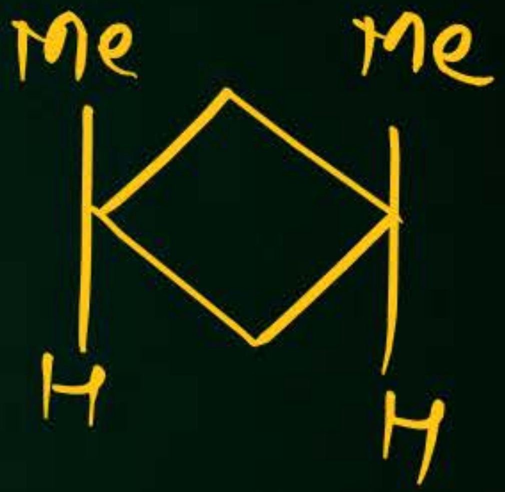
Cos(✓)

Op point :- cos '1' he hogi.

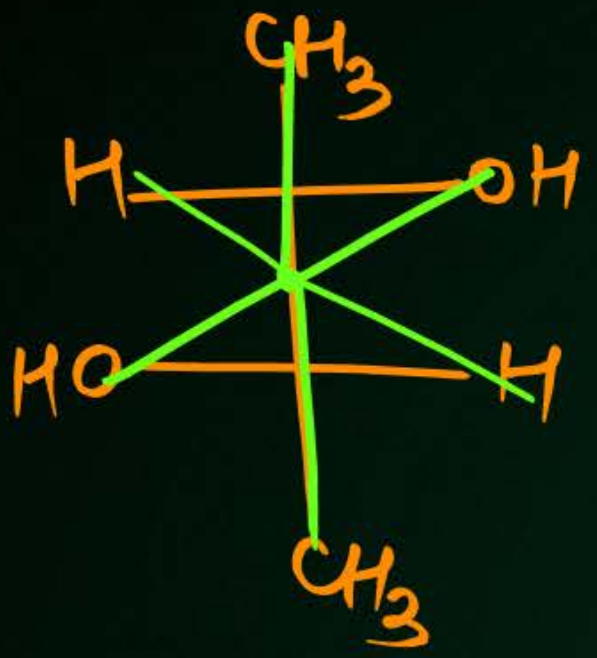


Hawa Hawai

Cos(×)



Cos(×)


CH3
H
OH
HO
H
CH3

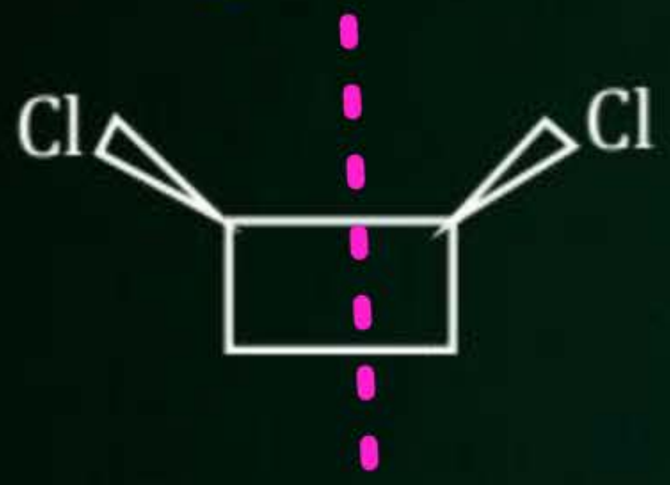
NO, Never, Not

oppoint ÷ open chain fischer projection formulae main Cos nahi dekhte hai, kyunki Neet ke syllabus main nahi hai.

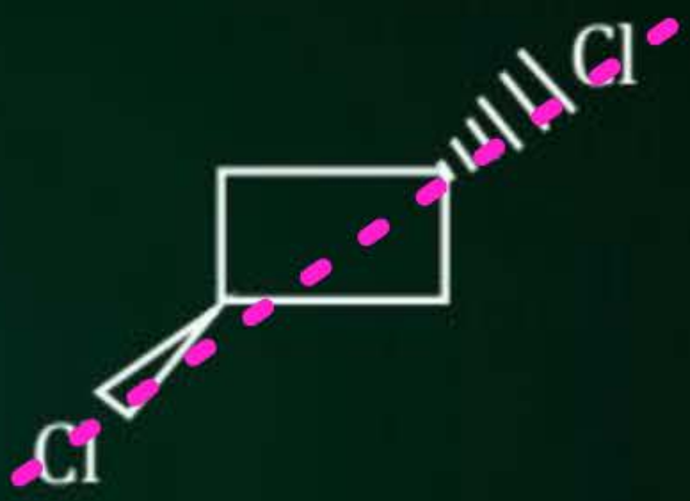
QUESTION

Which of the following compounds does not contains the plane of symmetry?

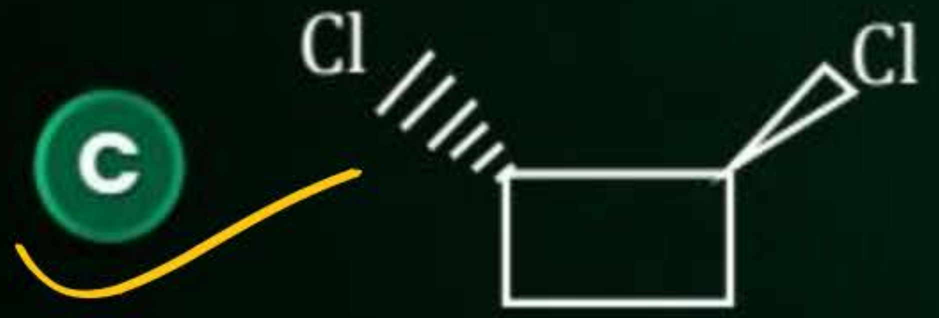
A



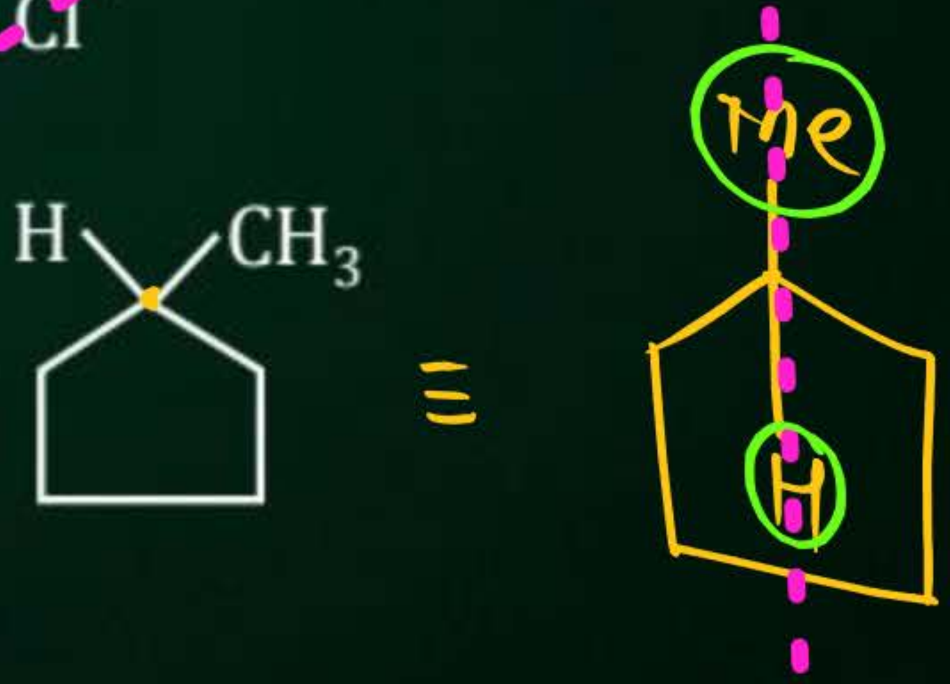
B



C



D



QUESTION

chiral

Which of the following has asymmetric carbon atom?

A ✗ CH_2Cl-CH_2Br

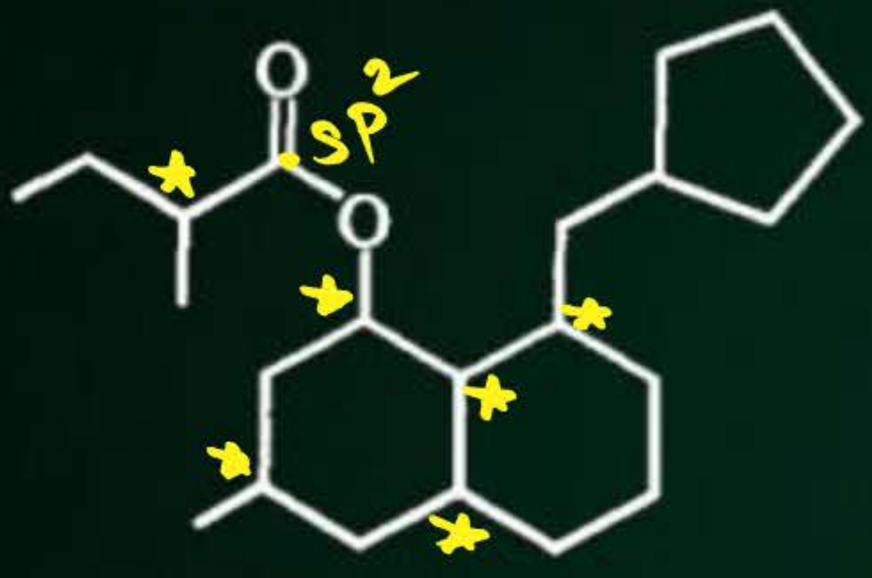
[✓ B] $CH_3\overset{*}{C}HDCl$

C ✗ CH_3CHCl_2

✗ D $CH_2Br-CHOH-CH_2Br$

QUESTION

How many chiral centers are in the following compound?



A 4

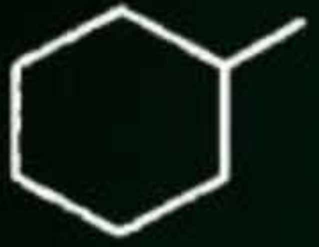
B 5

C [✓ 6]

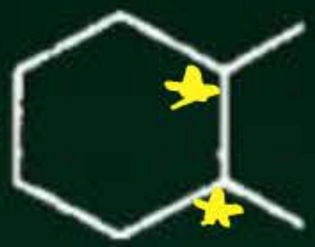
D 7

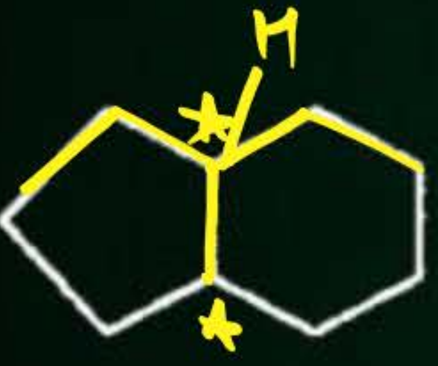
QUESTION

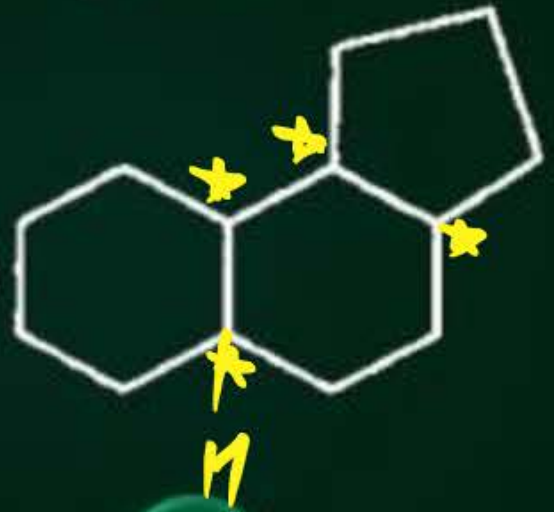
Identify number of chiral carbons in the following compounds.

(I)


0

(II)


(III)


(IV)


[✓ A] 0, 2, 2, 4

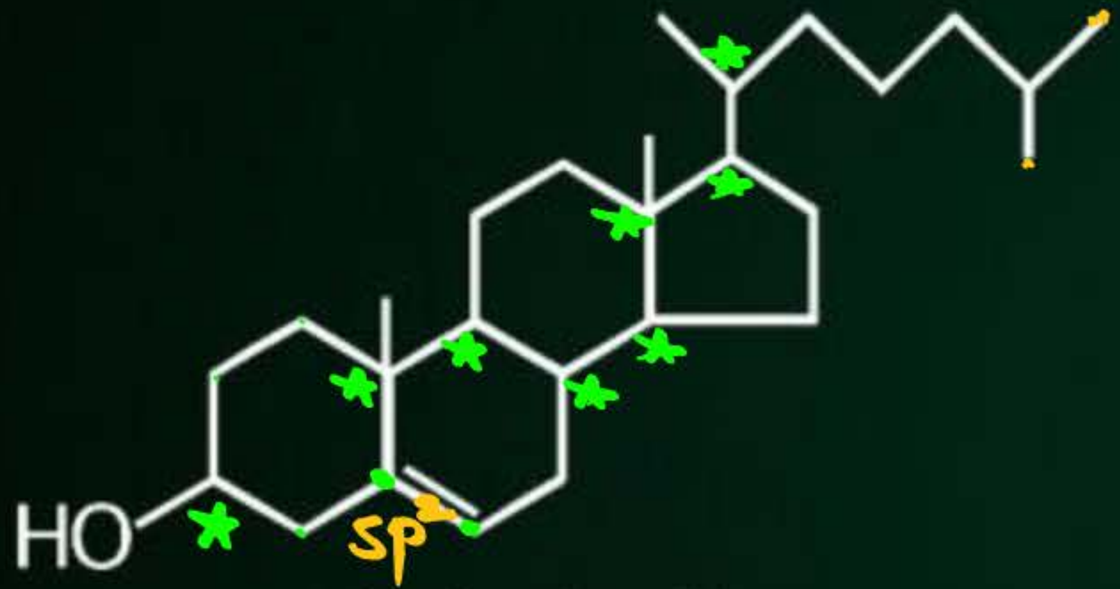
B 2, 2, 0, 4

C 1, 2, 2, 4

D 2, 2, 2, 4

QUESTION

Count the total number of chiral center.



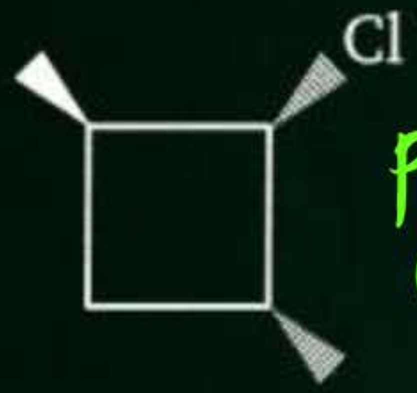
Cholesterol

Answer ÷ ⑧

QUESTION

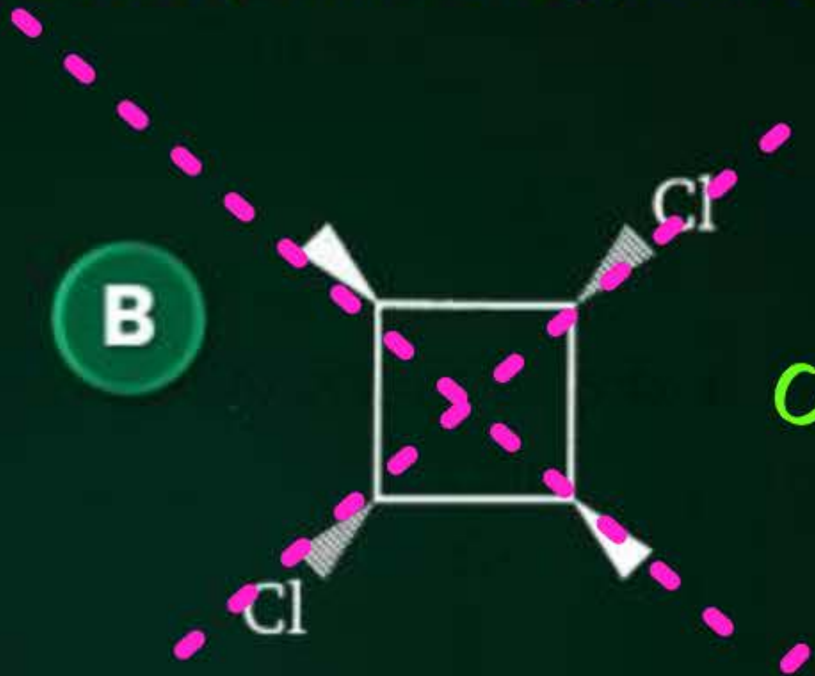
In which of the following compound, possess plane of symmetry as well as center of symmetry?

A



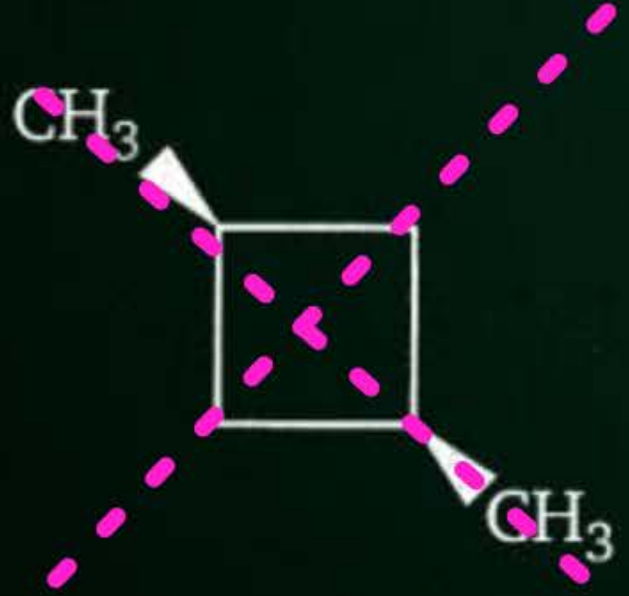
pos(x)
cos(x)

B

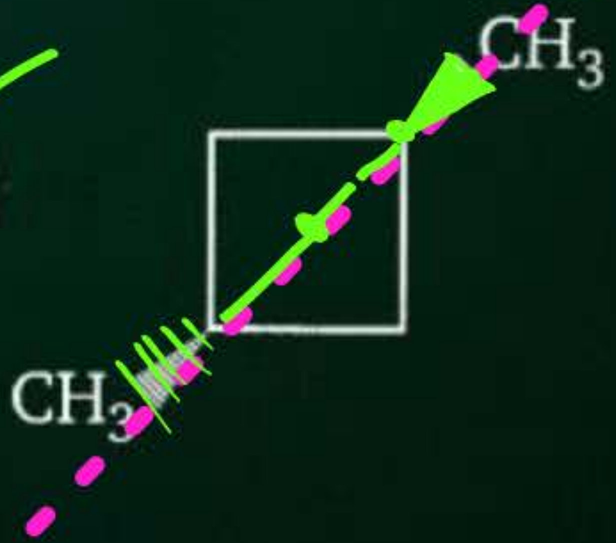


cos(x)

C



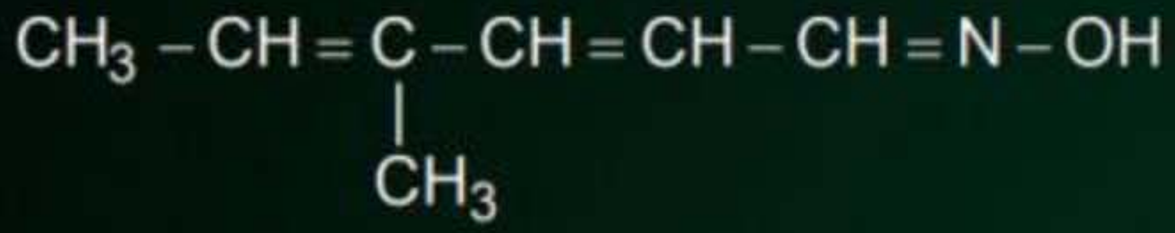
✓ **D**



Home Work

QUESTION 01

Find the number of geometrical isomers in:



$$CH_3-CH=\underset{\substack{|\\ CH_3}}{C}-CH=CH-CH=N-OH$$

(A) 2

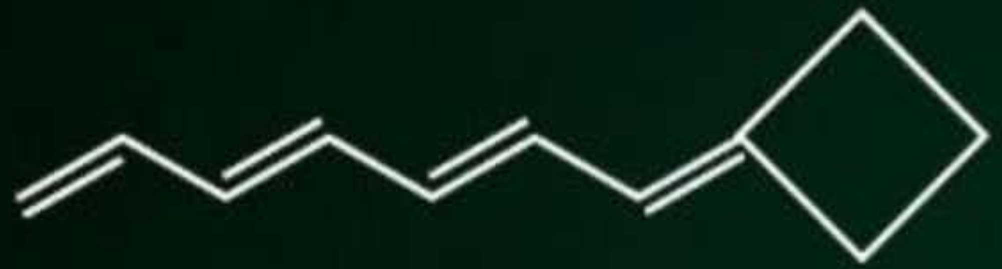
(B) 4

(C) 8

(D) 16

QUESTION 02

Total number of geometrical isomer of following compound.



Ⓐ 2

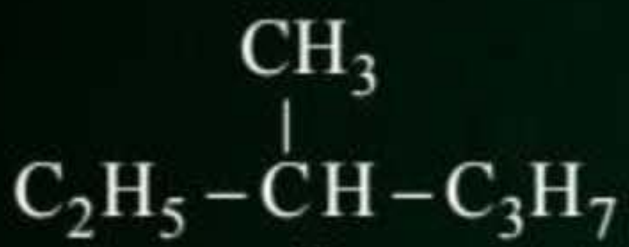
Ⓑ 4

Ⓒ 8

Ⓓ 16

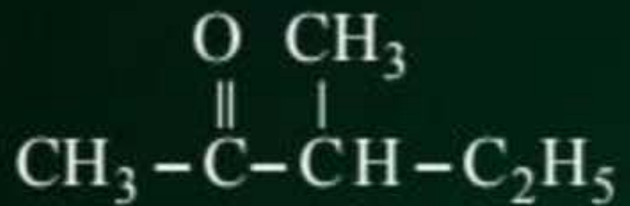
QUESTION 03

Among the following four structures I to IV:



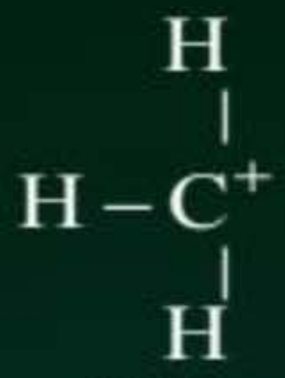
$$C_2H_5-\overset{CH_3}{\overset{|}{C}}H-C_3H_7$$

(I)



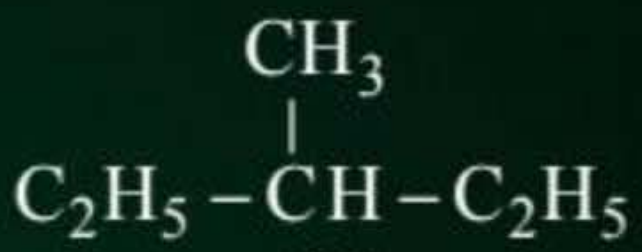
$$CH_3-\overset{O}{\overset{\|}{C}}-\overset{CH_3}{\overset{|}{C}}H-C_2H_5$$

(II)



$$H-\underset{\underset{H}{|}}{\overset{\overset{H}{|}}{C^+}}$$

(III)



$$C_2H_5-\overset{CH_3}{\overset{|}{C}}H-C_2H_5$$

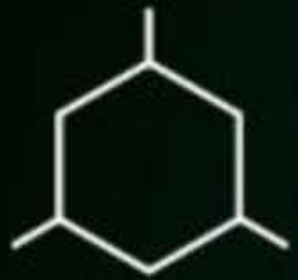
(IV)

- **A** all four have chiral carbons.
- **B** only (I) and (II) are chiral carbons.
- **C** only (III) is a chiral carbons.
- **D** only (II) and (IV) are chiral carbons.

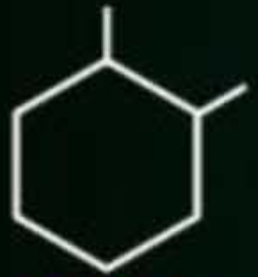
QUESTION 04

Find total number of Geometrical isomerism of following compounds.

$CH_3-CH=CH-CH=N-OH$ has x geometrical isomers



has y geometrical isomers



has z geometrical isomers

What is the value of x + y + z ?

(A) 16

(B) 8

(C) 4

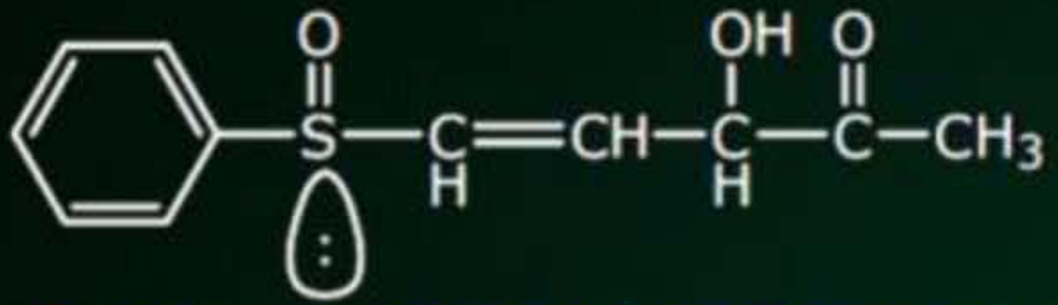
(D) 10

QUESTION 05

The number of geometrical isomers in case of a compound with the structure $CH_3-CH=CH-CH=CH-C_2H_5$ is:

- Ⓐ 4
- Ⓑ 3
- Ⓒ 2
- Ⓓ 5

QUESTION 06



Number of chiral centers are:

Ⓐ 1

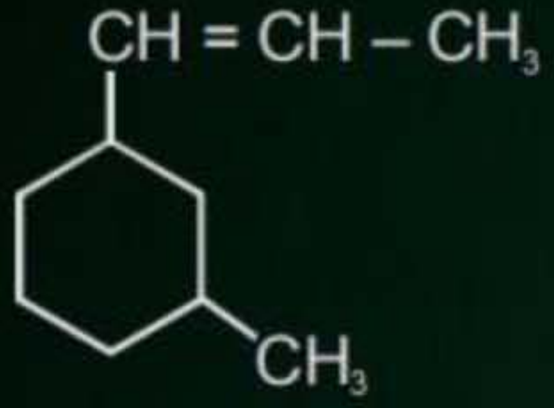
Ⓑ 2

Ⓒ 3

Ⓓ 4

QUESTION 07

Find the number of geometrical isomers in:


CH = CH – CH$_3$
CH$_3$

A 2

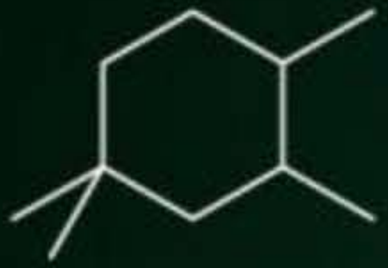
B 4

C 8

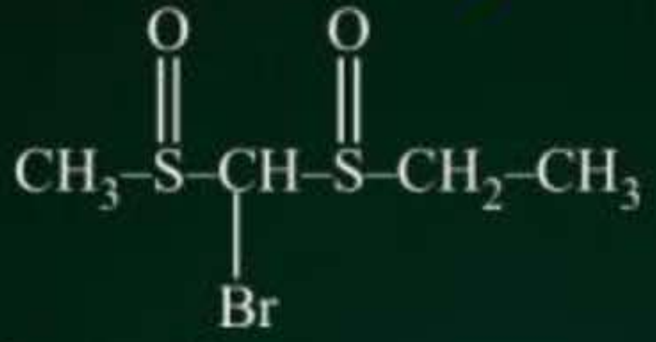
D 16

QUESTION 08

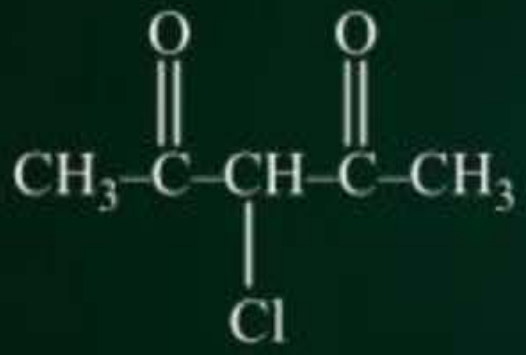
The total number of chiral center in compounds are respectively;



,



$$CH_3-\overset{\overset{O}{\|}}{S}-\underset{\underset{Br}{|}}{CH}-\overset{\overset{O}{\|}}{S}-CH_2-CH_3$$

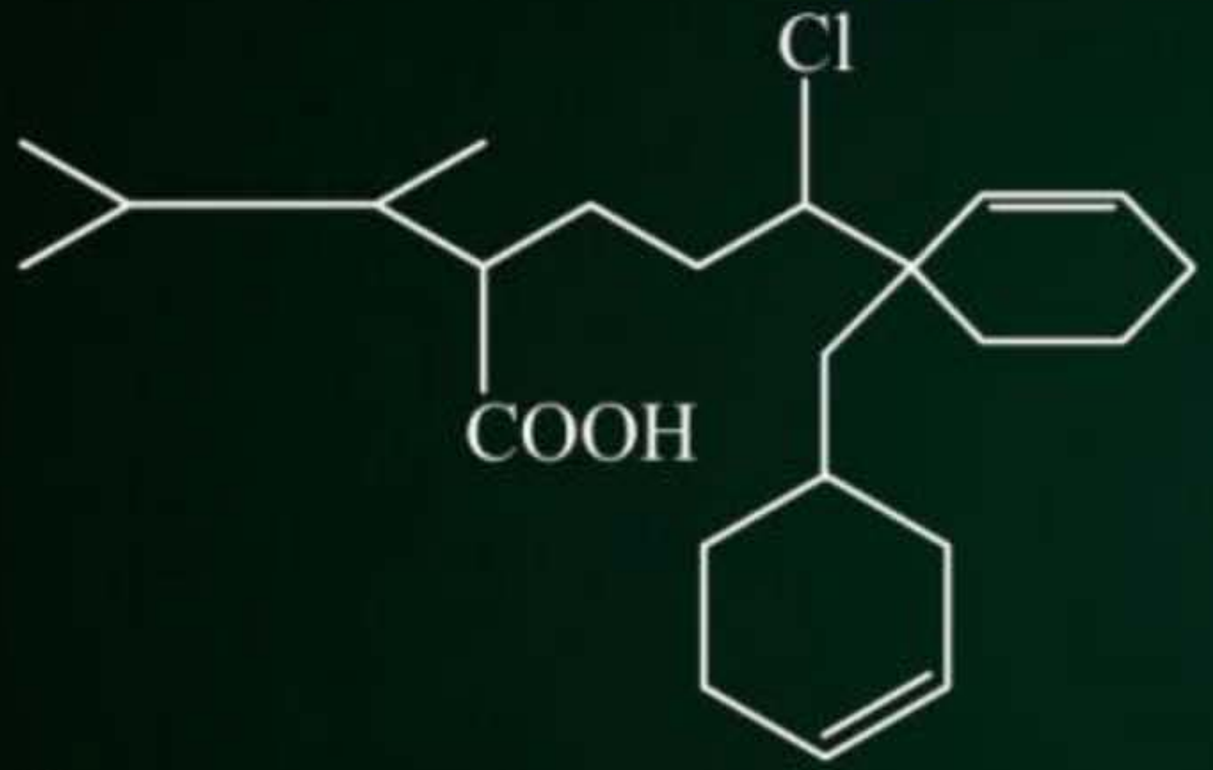


$$CH_3-\overset{\overset{O}{\|}}{C}-\underset{\underset{Cl}{|}}{CH}-\overset{\overset{O}{\|}}{C}-CH_3$$

- (A) 2, 1, 1
- (B) 2, 1, 0
- (C) 2, 3, 3
- (D) 2, 3, 0

QUESTION 09

The no. of chiral carbons in given compound is:



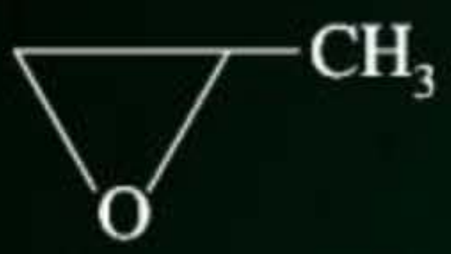
(A) 3

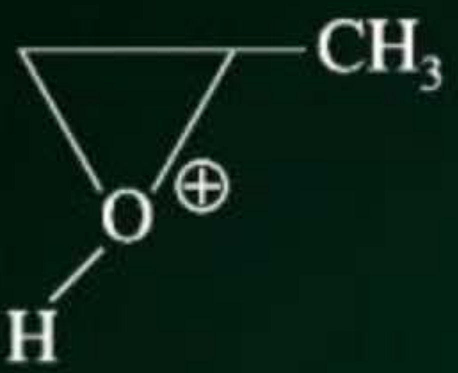
(B) 4

(C) 5

(D) 6

QUESTION 10





Number of chiral center present in above compounds are:

- **A** 1, 1
- **B** 1, 2
- **C** 2, 1
- **D** 2, 3

ANSWER KEY

1. C
2. B
3. B
4. B
5. A
6. B
7. B
8. D
9. C
10. B

Home Work From PW Module (Yakeen NEET)

Prarambh: Q 72, 73, 105

Prabal: Q 26

Thank you!!

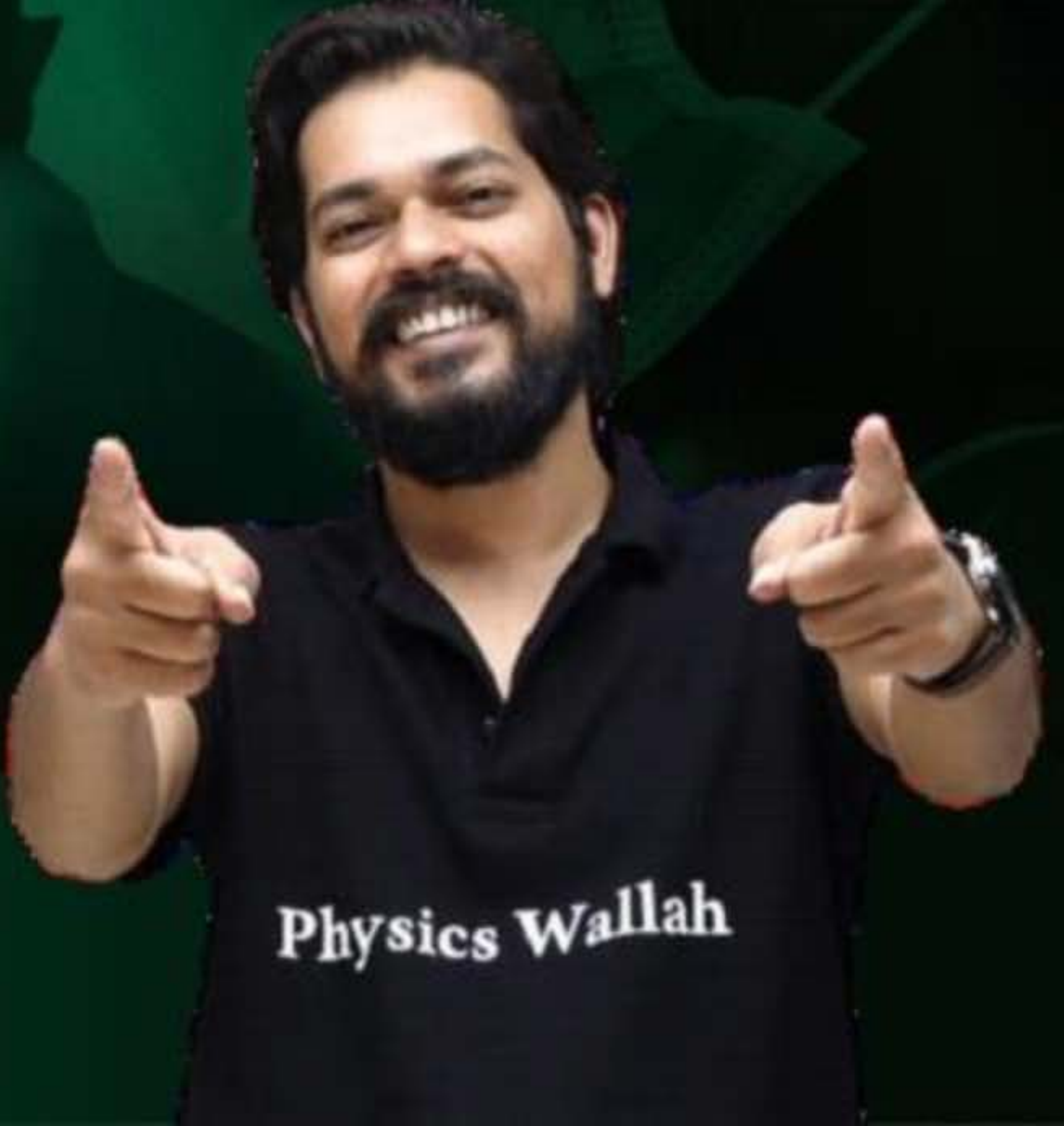
YAKEEN 2.0

FOR NEET 2025

Lecture- 08 | **Organic Chemistry**

Some Basic Principles and Techniques (ISOMERISM)

By- Pankaj Sir(POPU MAMA)


Physics Wallah

Topics *to be covered*

1. Polarimeter Experiment ✓
2. Optical Active/Optical Inactive Compounds ✓
3. Practice

Last turn Recap :-

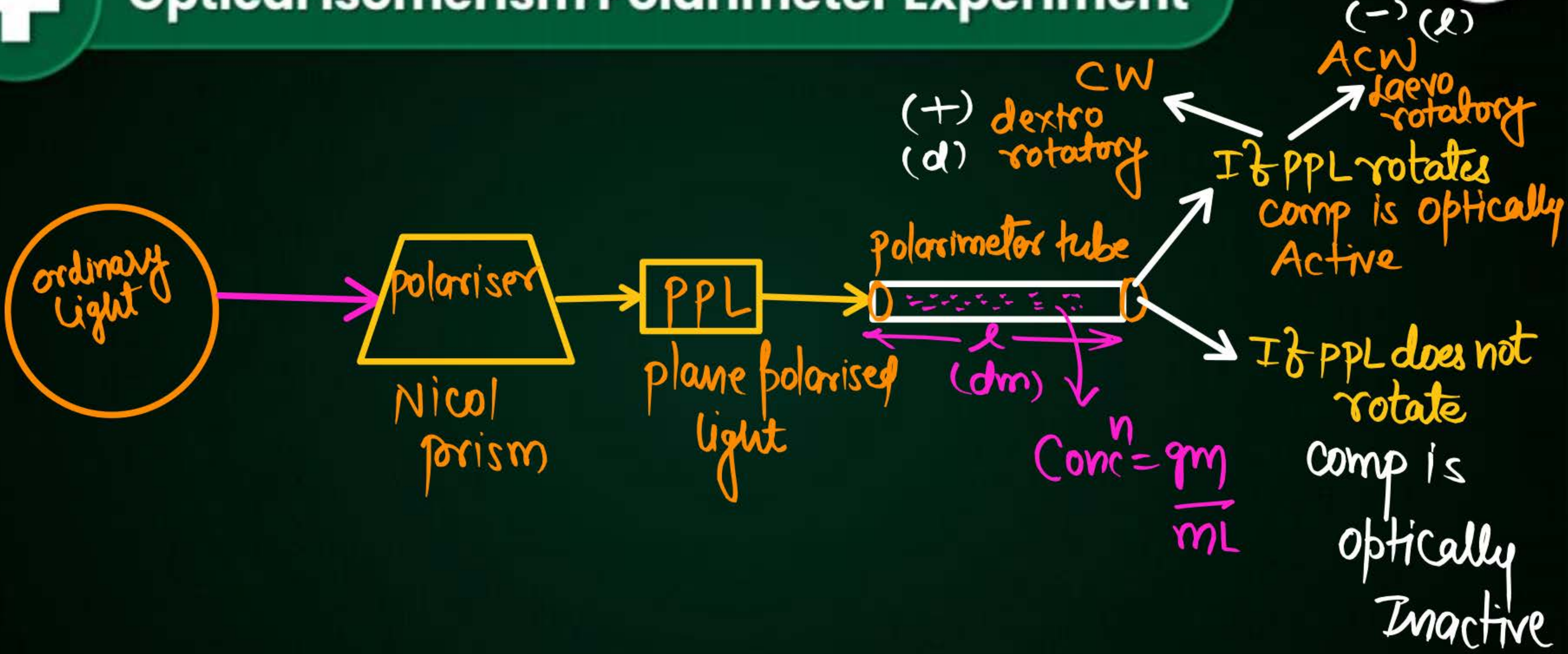
chiral centers ✓

S.C ✓

POS ✓

COS ✓

Optical Isomerism Polarimeter Experiment



ordinary light

polariser

Nicol prism

PPL

plane polarised light

Polarimeter tube

l (dm)

$\text{Conc}^n = \frac{\text{gm}}{\text{mL}}$

If PPL rotates comp is optically Active

CW

(+) dextro rotatory

(d)

ACW

(−) (l)

Laevo rotatory

If PPL does not rotate

comp is optically Inactive

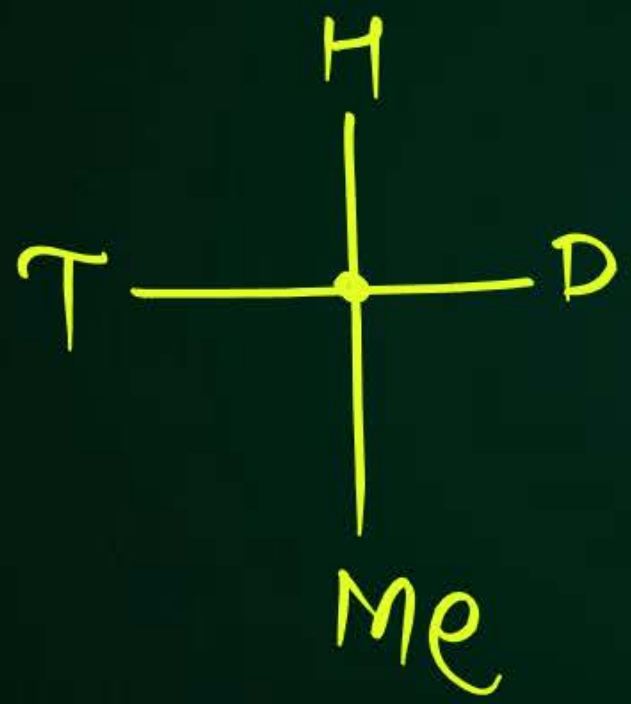
Condition for exhibition of Optical Isomerism

POS	COS	Comment
✓	✓	O.I.A
✓	✗	O.I.A
✗	✓	O.I.A
✗	✗	O.A

Condition for exhibition of Optical Isomerism

A. If only one chiral carbon is present.

ALWAYS O.A



POS X

COS X

O.A

Condition for exhibition of Optical Isomerism

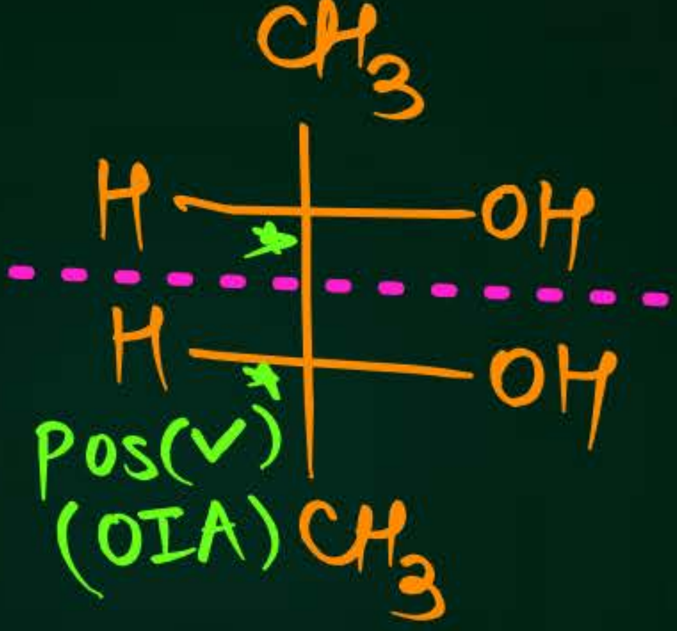
B. If more than one chiral carbons are present.

(i) If molecule is acyclic.

check only POS

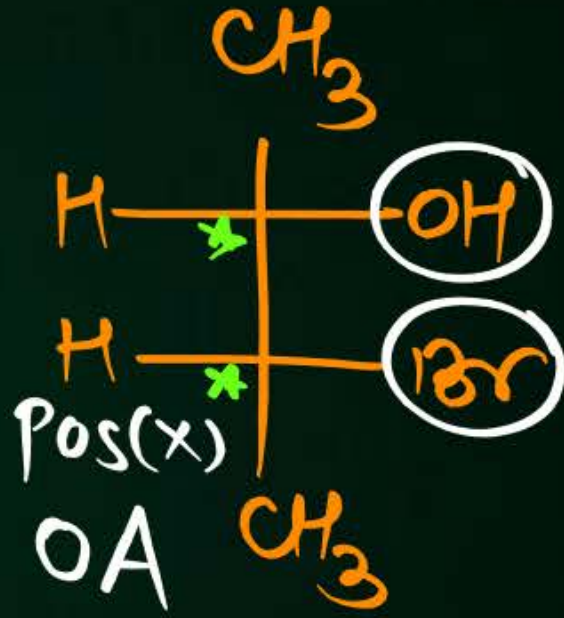
POS ✓ OIA

POS × OA



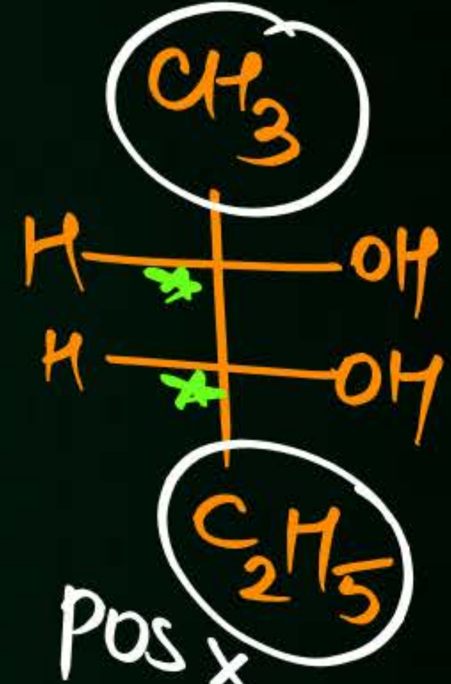
CH_3
H
OH
*
H
OH
*
CH_3

POS(✓)
(OIA)



CH_3
H
OH
*
H
OH
*
CH_3

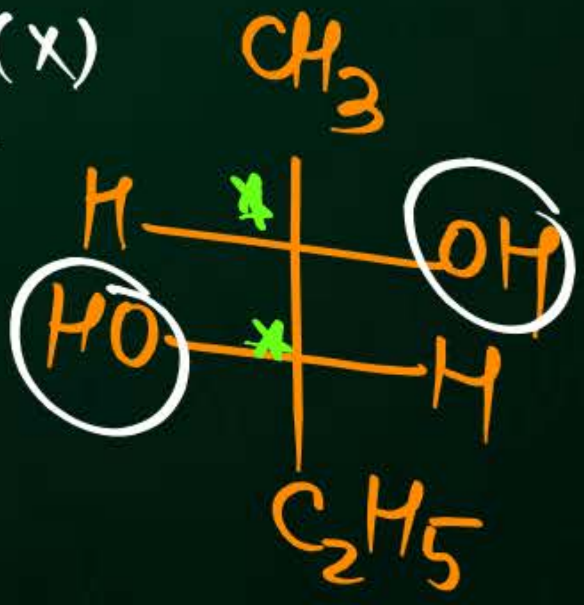
POS(x)
OA



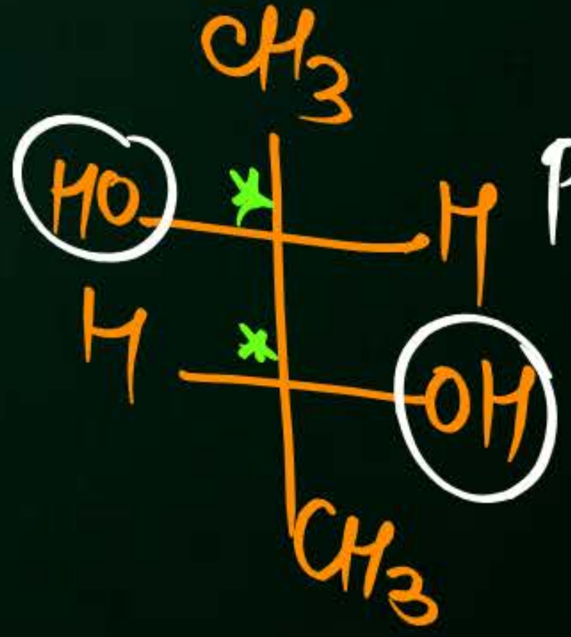
CH_3
H
OH
*
H
OH
*
C_2H_5

POS x
OA

POS(x)
OA



CH_3
H
OH
*
HO
H
*
C_2H_5



CH_3
HO
H
*
H
OH
*
CH_3

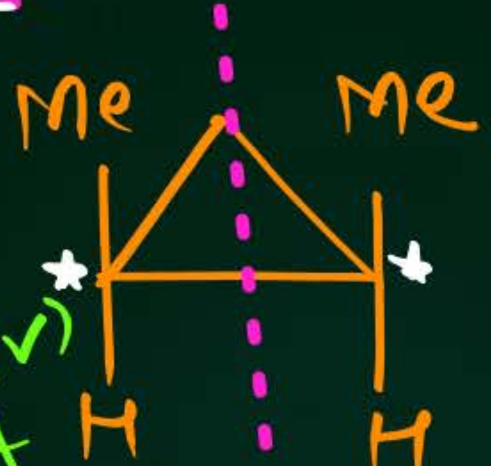
POS(x)
OA

Condition for exhibition of Optical Isomerism

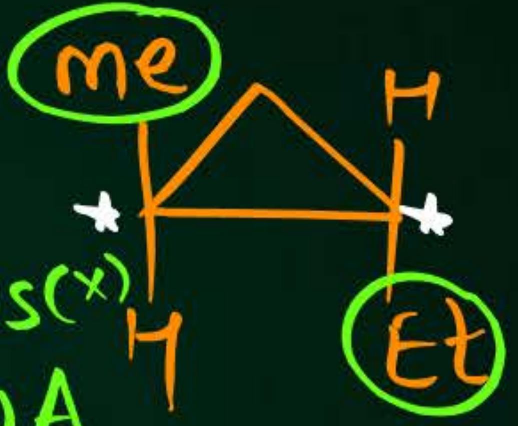
B. If more than one chiral carbons are present.

(ii) If molecule is cyclic with odd ring.

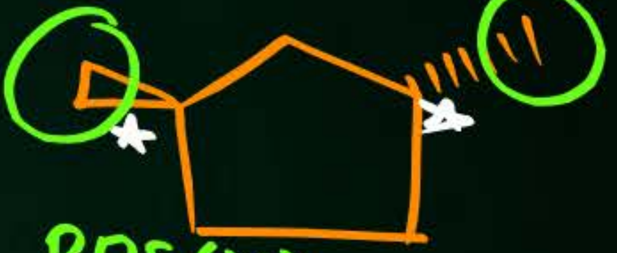
check pos only
Pos(✓) OIA
Pos(x) OA



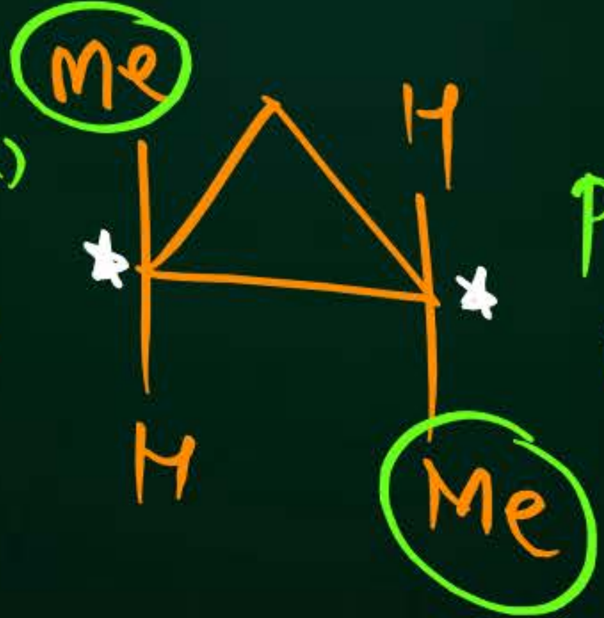
Pos(✓)
OIA



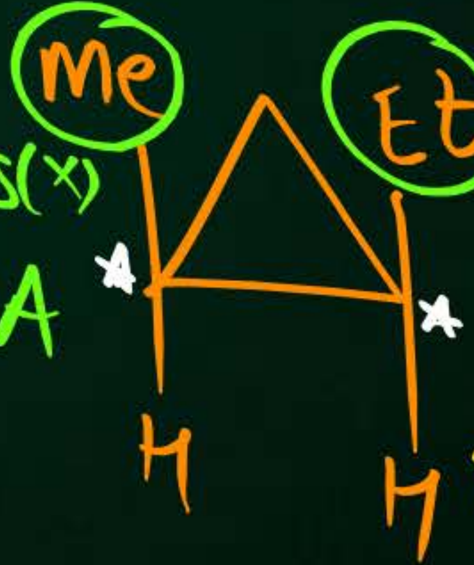
Pos(x)
OA



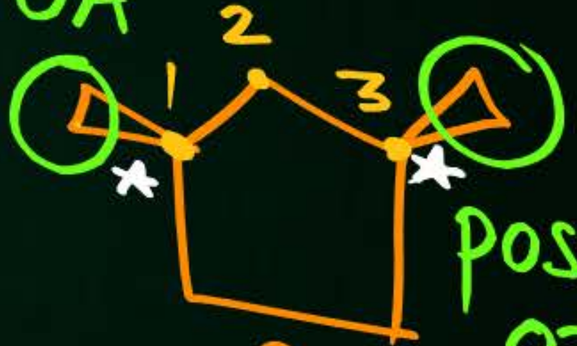
Pos(x)
OA



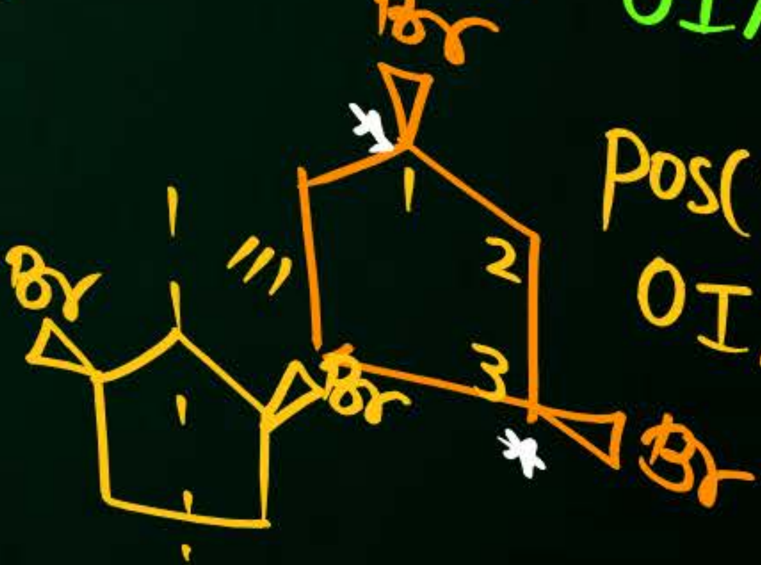
Pos(x)
OA



Pos(x)
OA



Pos(✓)
OIA



Br
*
1
2
3
Br
Br
Br
*

Pos(✓)
OIA

Condition for exhibition of Optical Isomerism

B. If more than one chiral carbons are present.

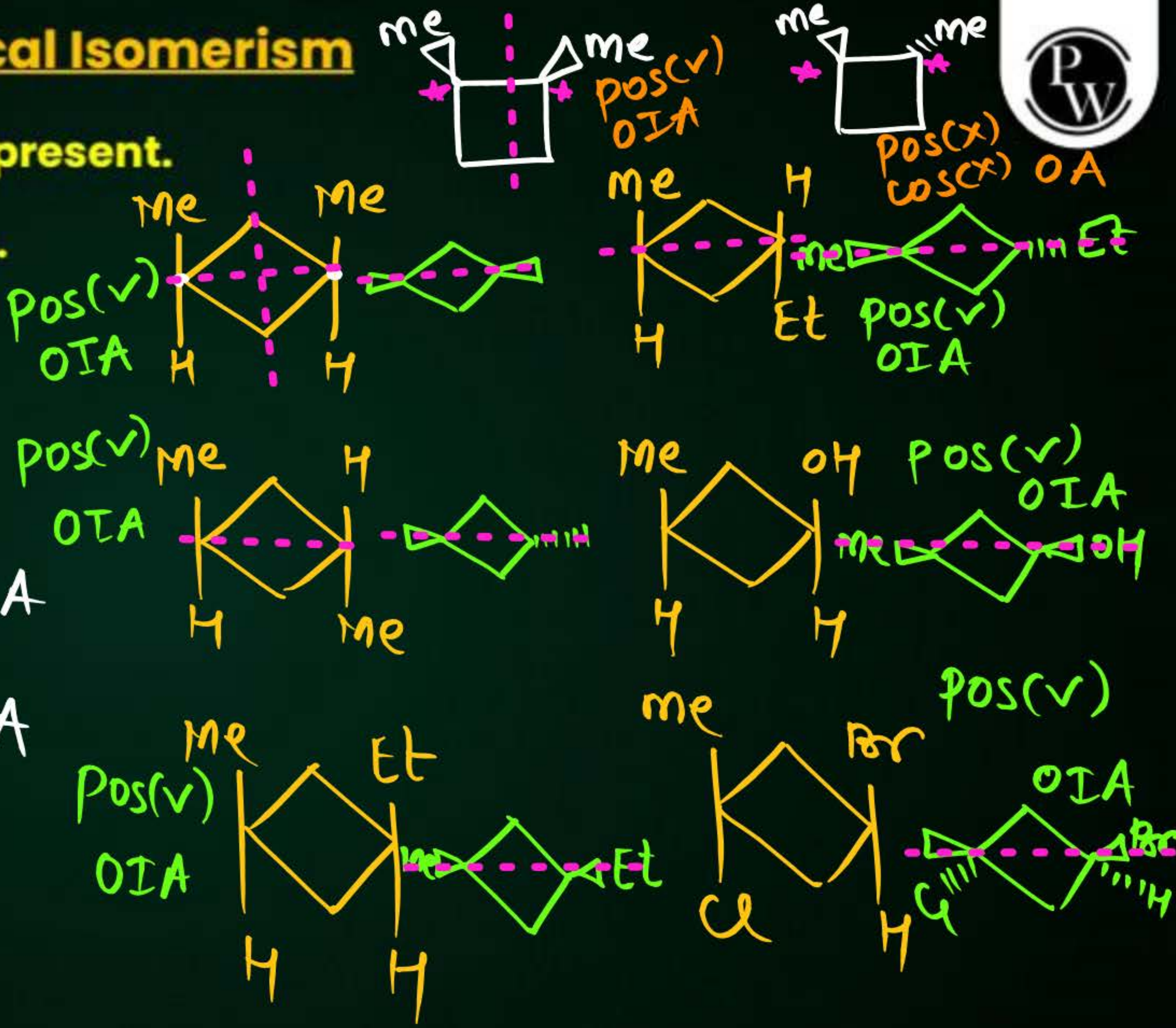
(iii) If molecule is cyclic with even ring.

check pos & cos both

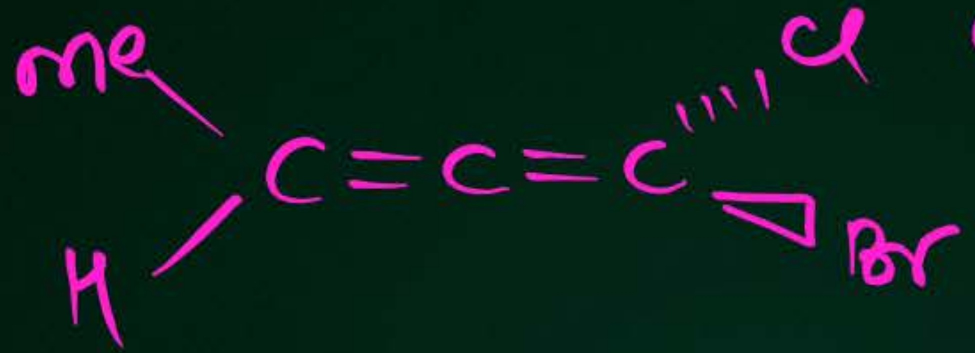
Pos ✓ OIA

Pos × cos ✓ OIA

Pos × cos × OA


me
me
pos(✓)
OIA
me
me
pos(×)
cos(×) OA
Me
Me
Pos(✓)
OIA
H
H
me
H
H
Et
me
Et
pos(✓)
OIA
pos(✓)
OIA
Me
H
H
Me
Me
OH
H
H
Me
OH
pos(✓)
OIA
Pos(✓)
OIA
Me
Et
H
H
Me
Et
me
Br
Cl
H
pos(✓)
OIA
Cl
Br
H

Chiral carbon is not essential condⁿ


me
H
C=C=C
Cl
Br

chiral carb(X)

OA

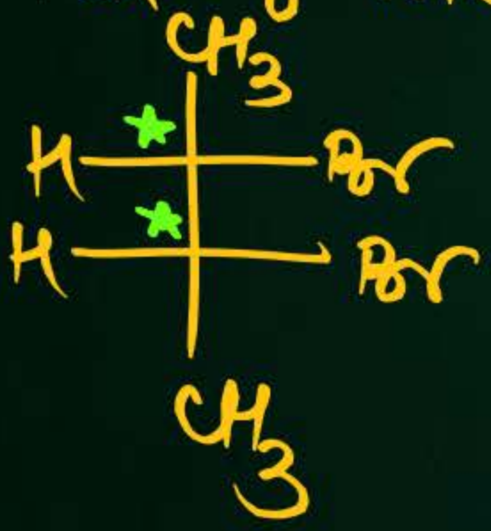
Next turn

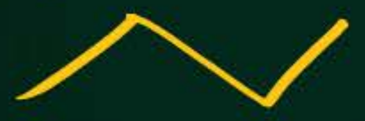
OP Points

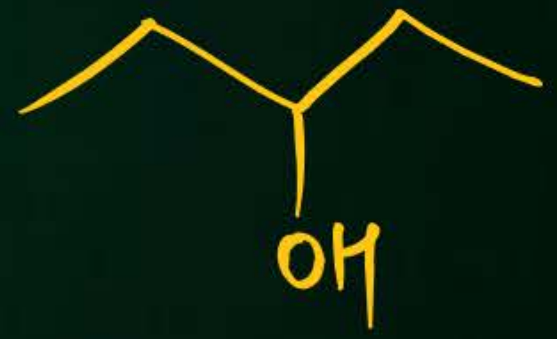
1. Chiral Molecule ⟶ Optically Active
2. Chiral Molecule have chiral centers (T/F) ✓

Asymmetric center
or

Q which of the following have chiral centers ?

✓ A)


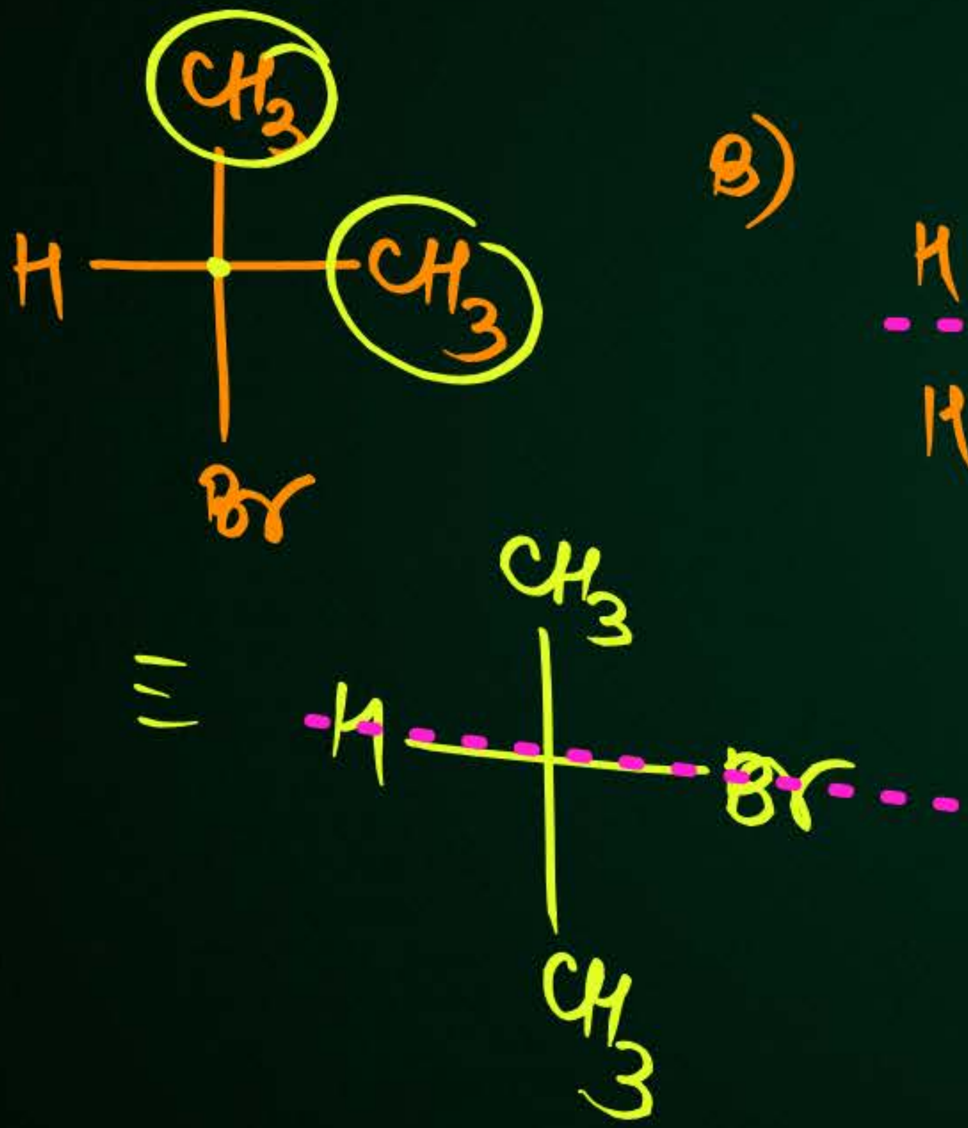
B)


C)


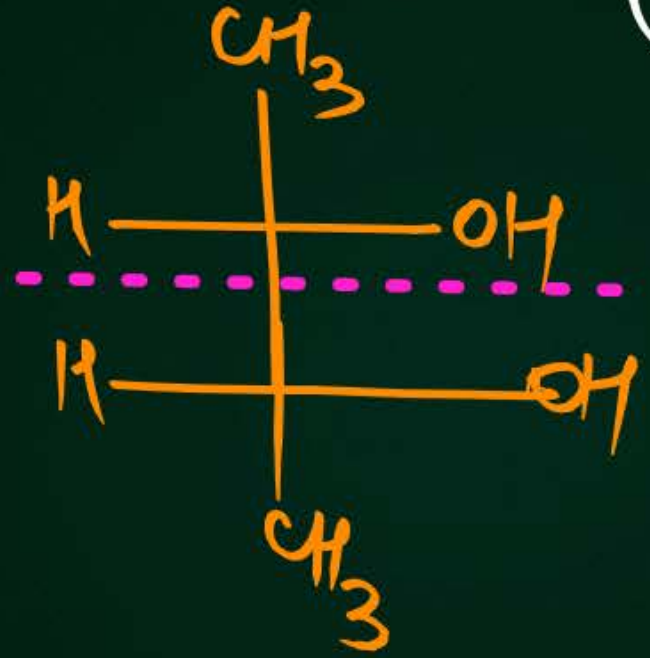
D) CH_4

Q which of the following is chiral ?
or
chiral molecule
or
optically active

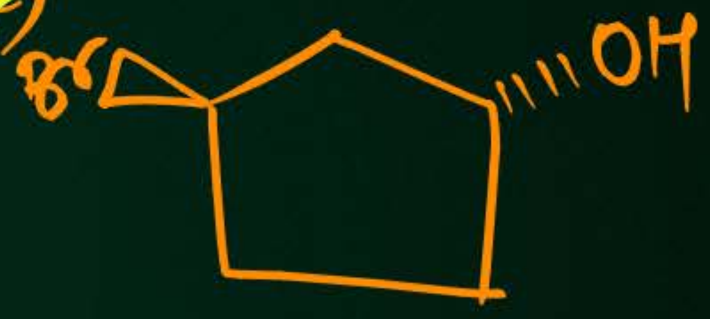
A)


CH3
H
CH3
Br
≡
CH3
H
Br
CH3

B)

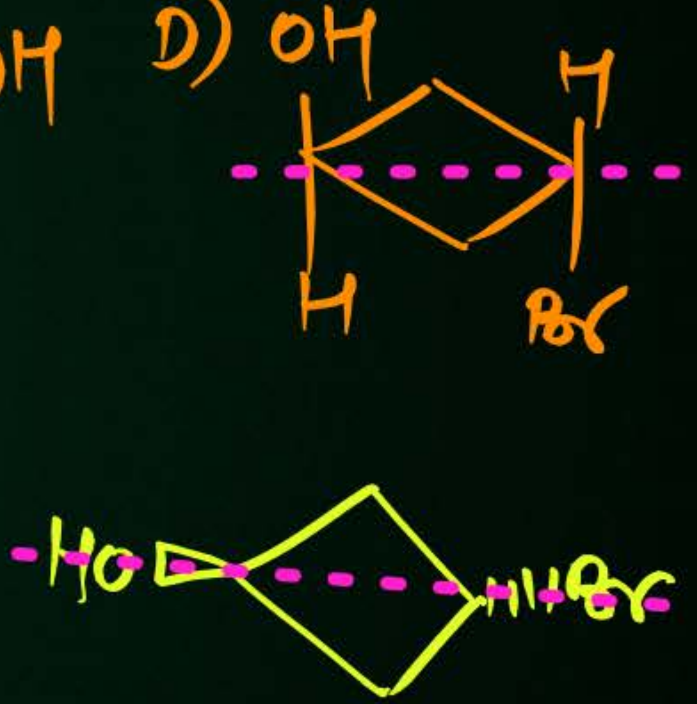

CH3
H
OH
H
OH
CH3

C)



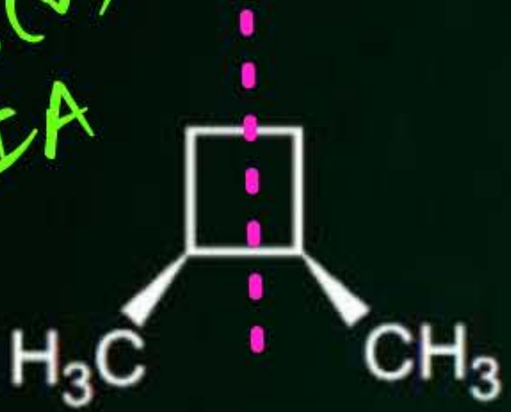
POS(x)
OA

D)

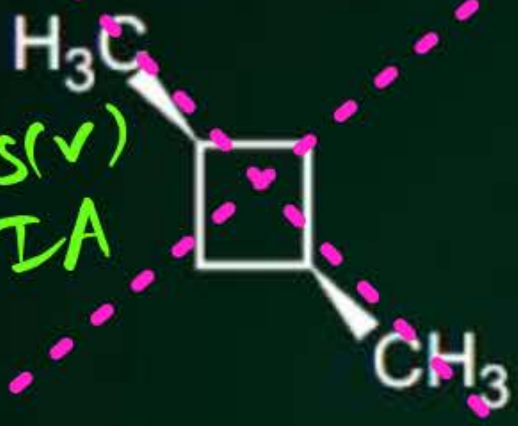

OH
H
H
Br
HO
Br

QUESTION

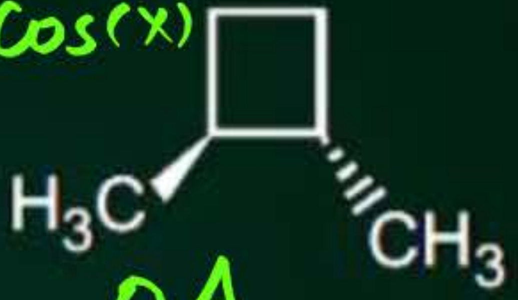
How many of the following compounds are optically active?



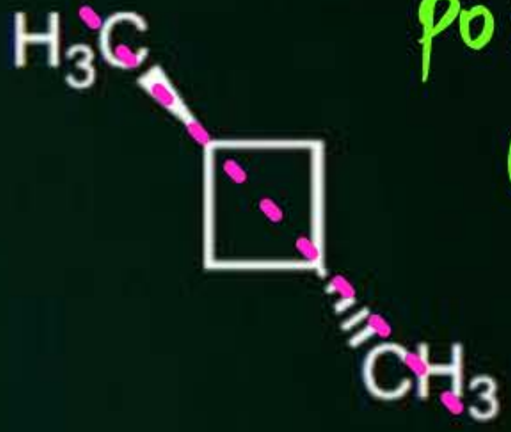
pos(✓)
OIA



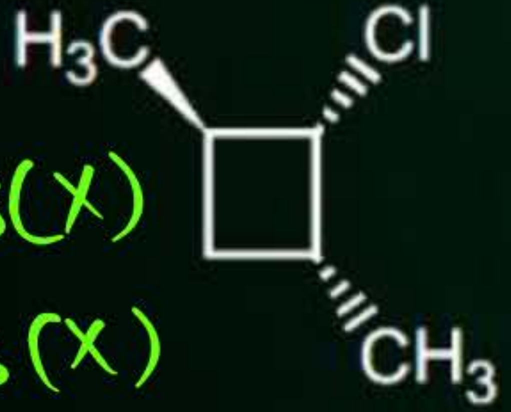
pos(✓)
OIA



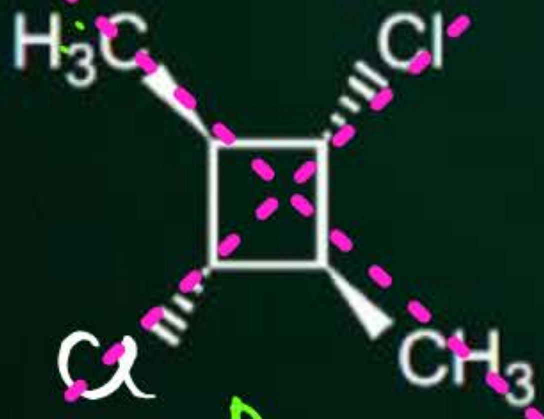
Pos(X)
Cos(X)
OA



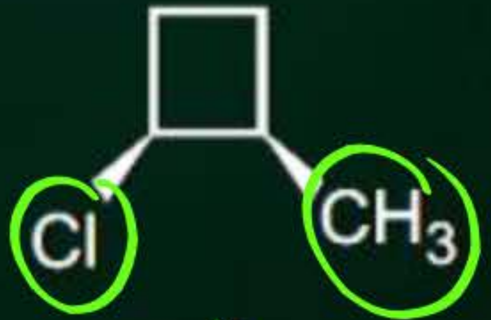
pos(✓)
OIA



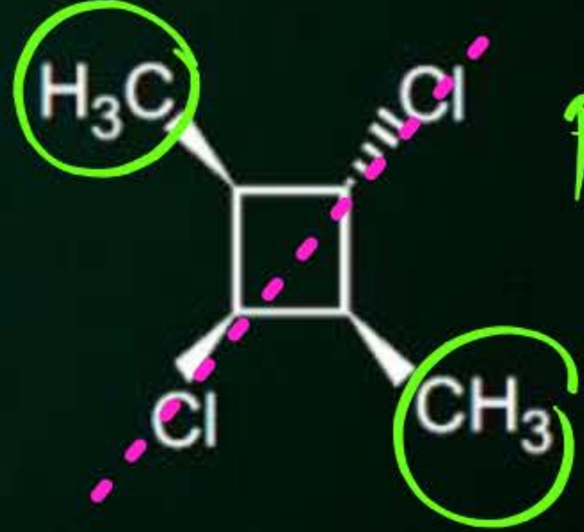
Pos(X)
cos(X)
OA


H$_3$C
Cl
Cl
CH$_3$

Pos(✓)
OIA



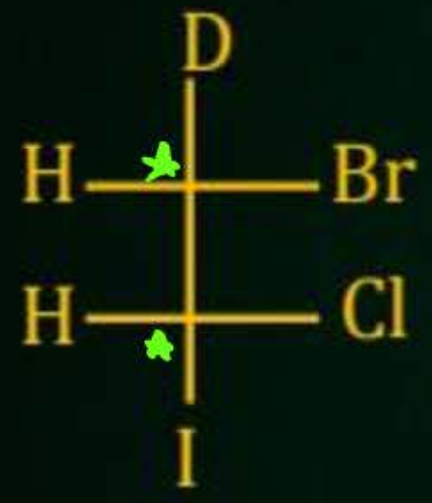
Pos(X) OA
Cos(X)


H$_3$C
Cl
Cl
CH$_3$

pos(✓)
OIA

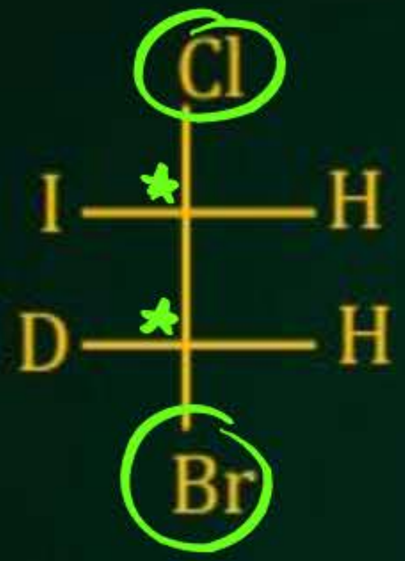
QUESTION

The below two compounds given below are optically Active or not?



POS(x)

OA



POS(x)

OA

QUESTION

Pick out the correct statements:

(chiral)

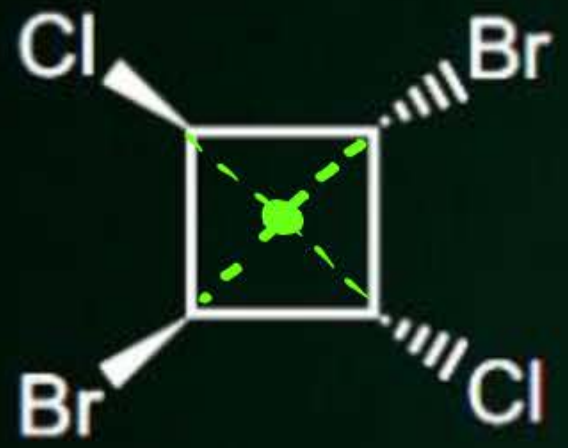
✓ (i) if a compound has just one asymmetric carbon atom, it is always chiral.

✓ (ii) if a compound has more than one asymmetric carbon atoms, it may or may not be chiral.

- **A** (i) is correct
- **B** (ii) is correct
- [✓ **C**] (i) and (ii) are correct
- **D** None of these

QUESTION

Is the following compound optically active?



Pos(x)

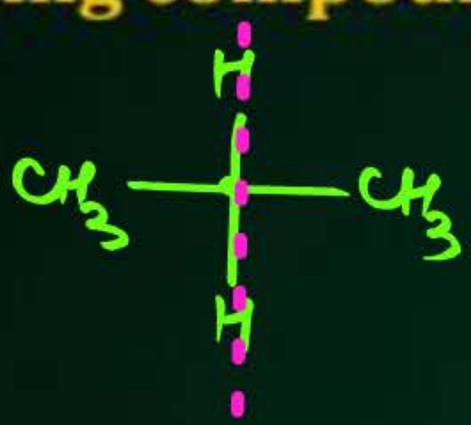
cos(✓)

OIA

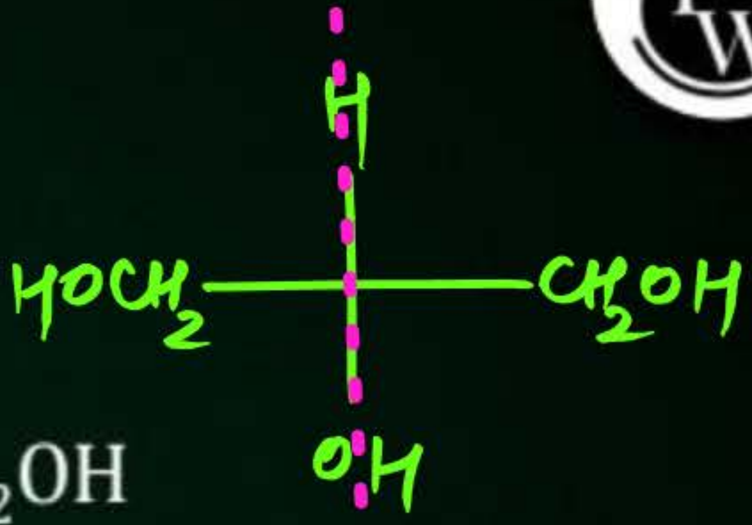
QUESTION

Which of the following compound shows optical isomerism?

(A) × $CH_3CH_2CH_3$

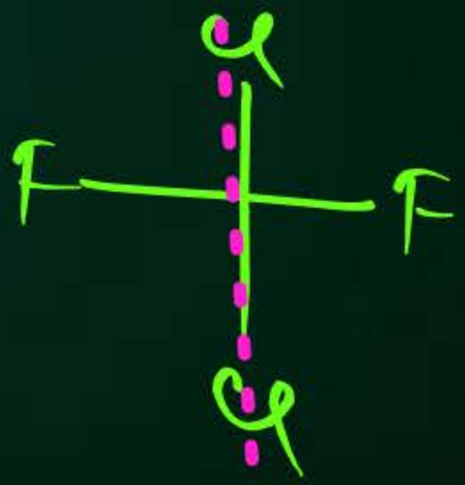


× (B) $CH_2OH\overset{\checkmark}{C}HOHCH_2OH$


H
HOCH2
CH2OH
OH

(C) ✓ $CH_3\overset{*}{C}HOHC_2H_5$

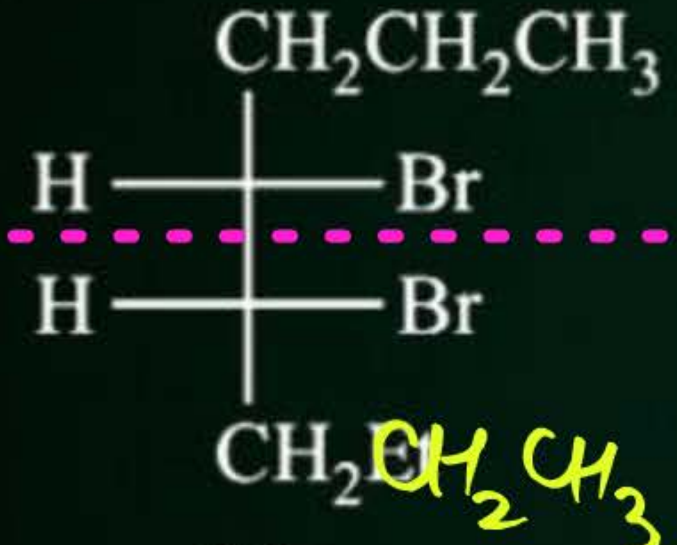
× (D) CCl_2F_2



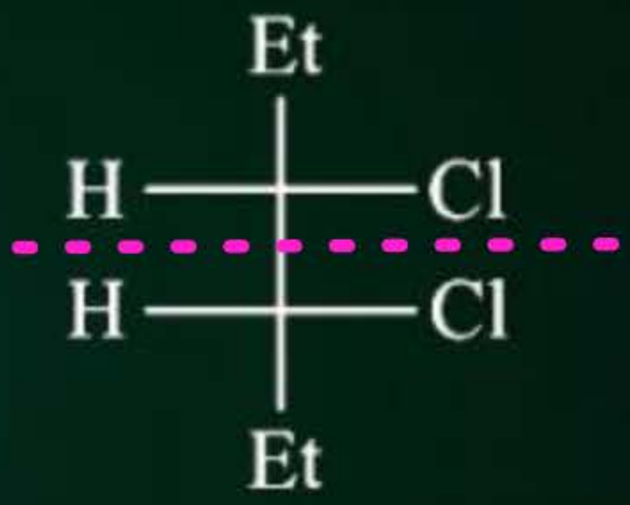
QUESTION

Which of the following is optically active?

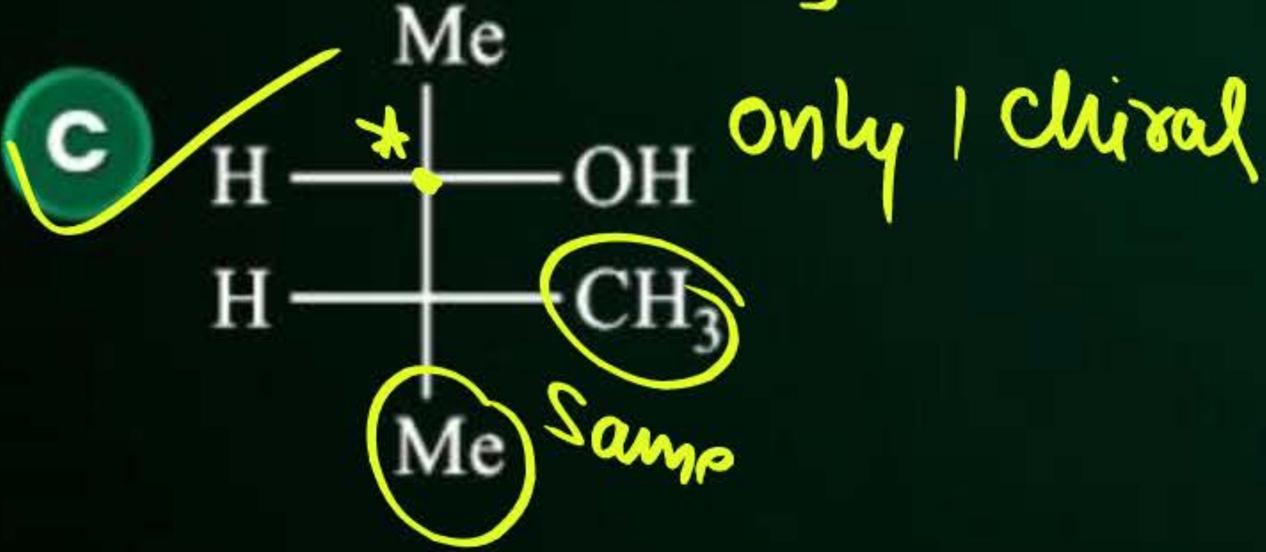
A


$CH_2CH_2CH_3$
H
Br
H
Br
CH_2Et
CH_2CH_3

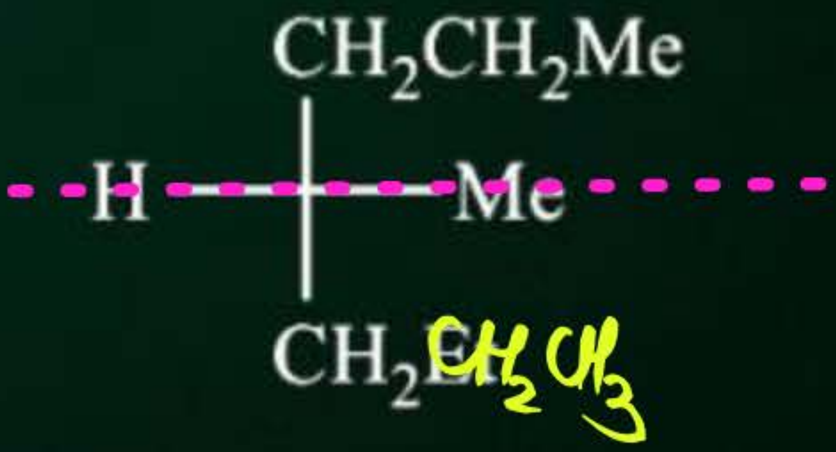
B


Et
H
Cl
H
Cl
Et

C


Me
*
H
OH
only 1 chiral
H
CH_3
Me
Same

D


CH_2CH_2Me
H
Me
CH_2Et
CH_2CH_3

QUESTION

Ignoring specific markings, which of the following objects are chiral?

(I) a shoe OA

(II) a book OIA

(III) a pencil OIA

(IV) a pair of shoes (consider the pair as one object) OIA

(V) a pair of scissors

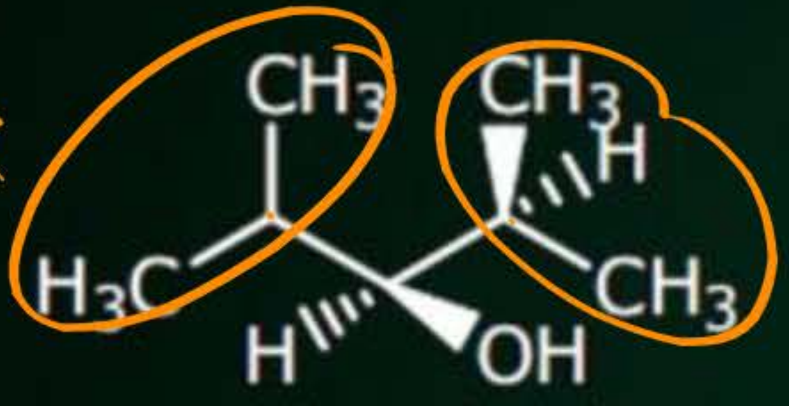
OA

- **A** I only
- [✓ **B**] I & V
- **C** I, IV, V
- **D** III, IV, V

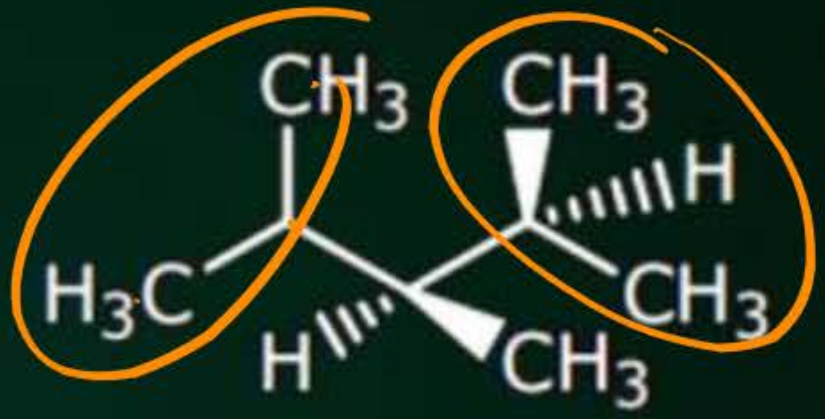
QUESTION

Which of the following structures represents a chiral compounds?

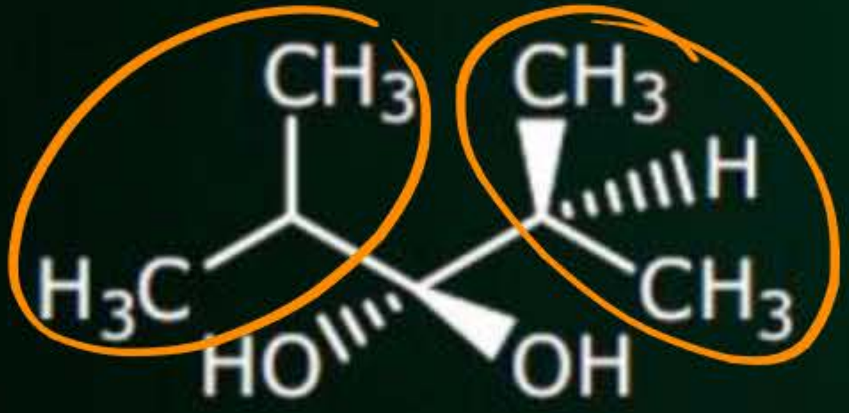
A ✗



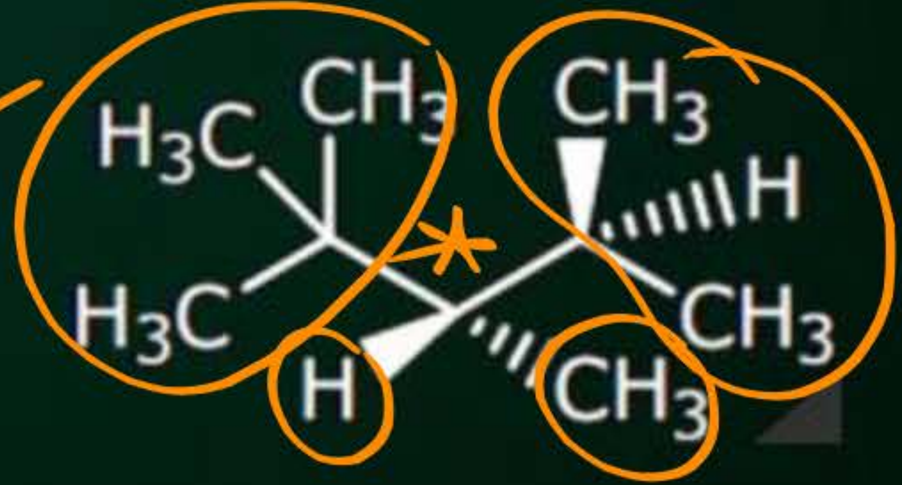
B ✗



C



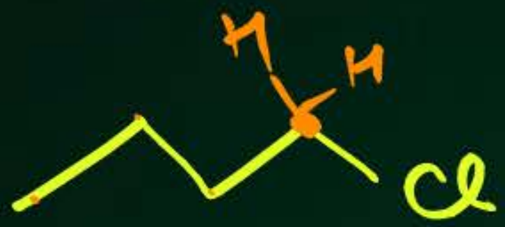
[✓ **D**]

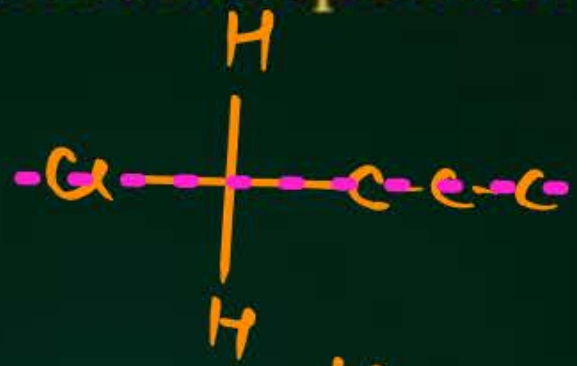


QUESTION

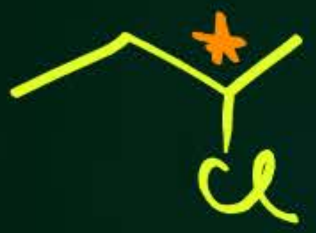
Which of the following compound is chiral compound?

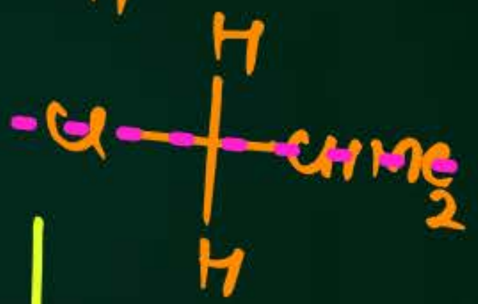
A 1-Chlorobutane



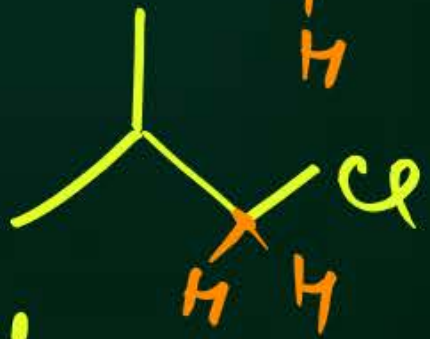


[✓ **B**] 2-Chlorobutane

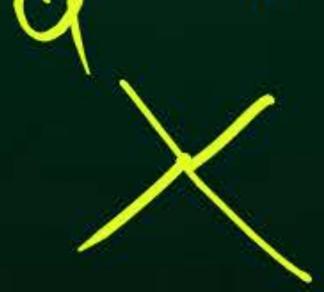


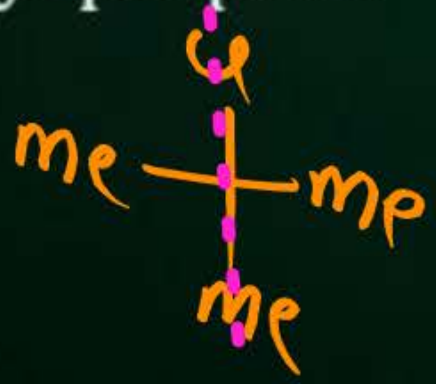


C 1-Chloro-2-methyl propane



D 2-Chloro-2-methyl propane





Home Work

QUESTION 01

Assertion: Optical isomerism is based on the symmetry of a molecule.
Reason: A molecule which has no plane of symmetry is described as chiral.

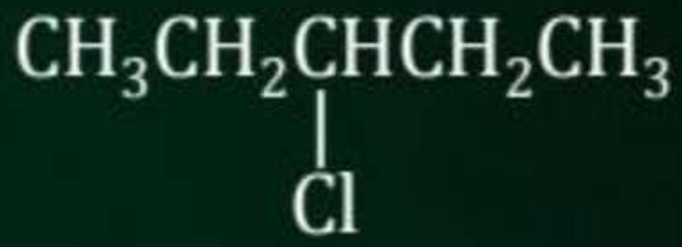
- (A) Both Assertion and Reason are correct and Reason is the correct explanation for Assertion.
- (B) Both Assertion and Reason are correct but Reason is not the correct explanation for Assertion.
- (C) Assertion is correct but Reason is incorrect.
- (D) Both Assertion and Reason are incorrect.

QUESTION 02

Which of the following is a chiral molecule?

(A) $ClCH_2CH_2CH_2CH_2CH_3$

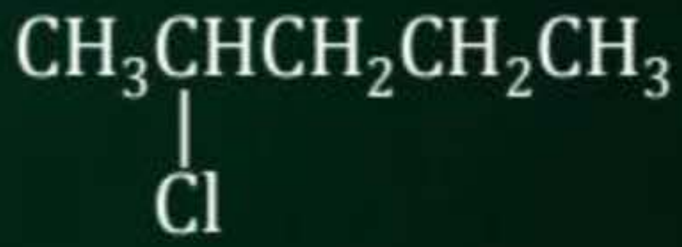
(B)



$CH_3CH_2\underset{\underset{Cl}{|}}{C}HCH_2CH_3$

(C) $ClCH{=}CHCH_2CH_2CH_3$

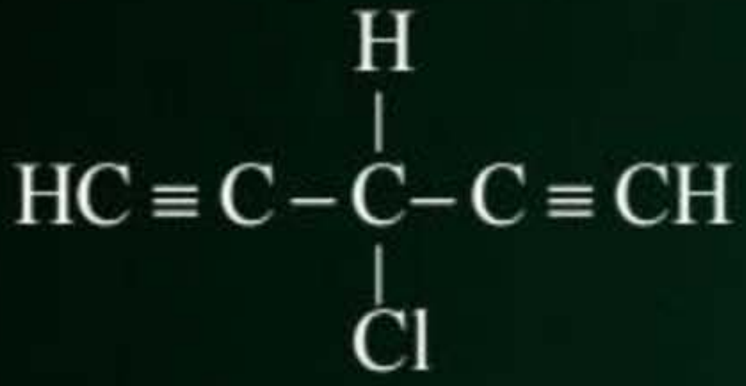
(D)

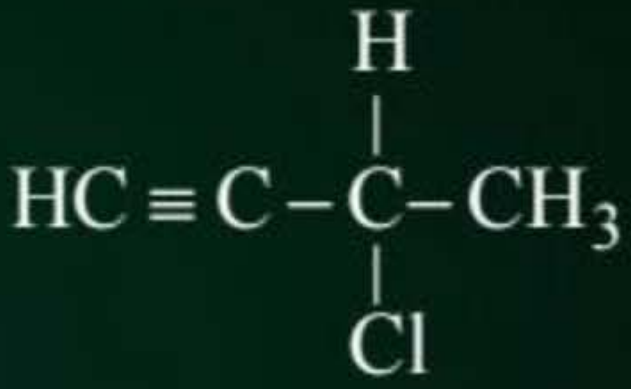


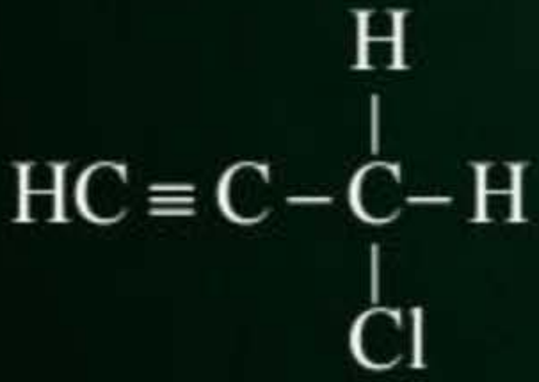
$CH_3\underset{\underset{Cl}{|}}{C}HCH_2CH_2CH_3$

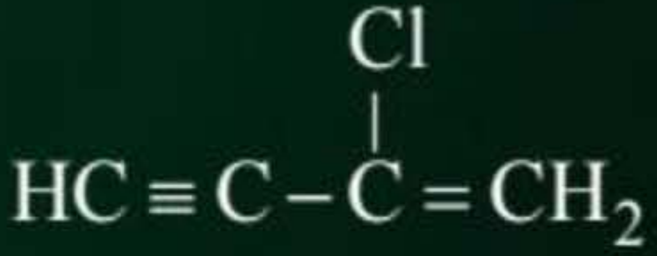
QUESTION 03

Which of the following is most likely to show optical isomerism?

A

$HC\equiv C-\overset{\overset{H}{|}}{\underset{\underset{Cl}{|}}{C}}-C\equiv CH$

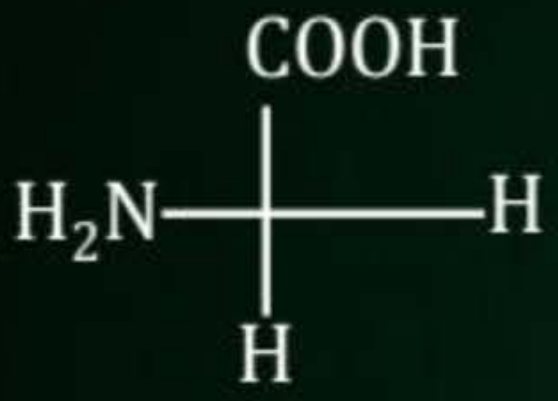
B

$HC\equiv C-\overset{\overset{H}{|}}{\underset{\underset{Cl}{|}}{C}}-CH_3$

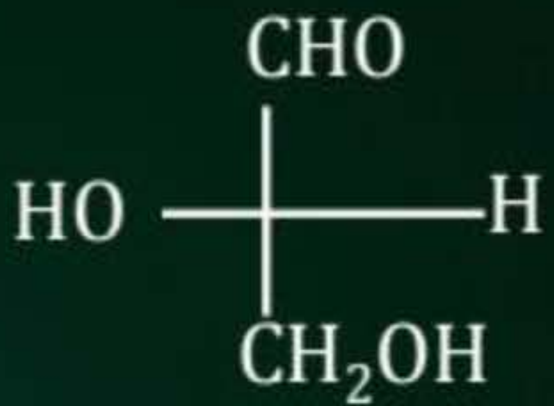
C

$HC\equiv C-\overset{\overset{H}{|}}{\underset{\underset{Cl}{|}}{C}}-H$

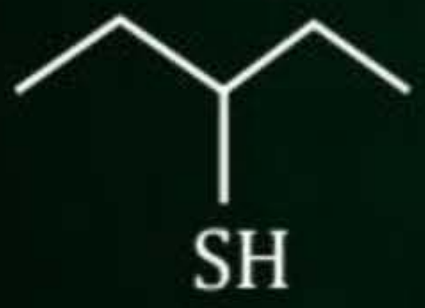
D

$HC\equiv C-\overset{\overset{Cl}{|}}{C}=CH_2$

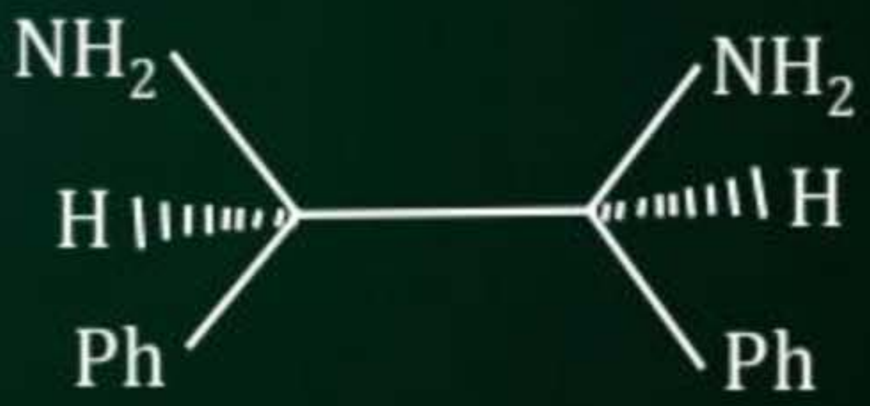
QUESTION 04

Which of the following molecules is expected to rotate the plane of polarised light?

A 

B 
CHO
HO
H
CH_2OH

C 

D 
NH_2
H
Ph
NH_2
H
Ph

QUESTION 05

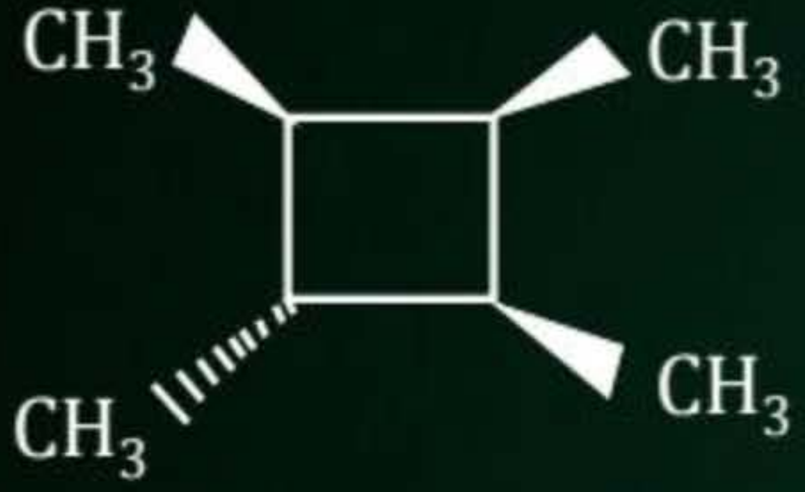
Which of the following optically active?

- Ⓐ Butane
- Ⓑ 4-Methyl heptane
- Ⓒ 3-Methyl heptane
- Ⓓ 2-Methyl heptane

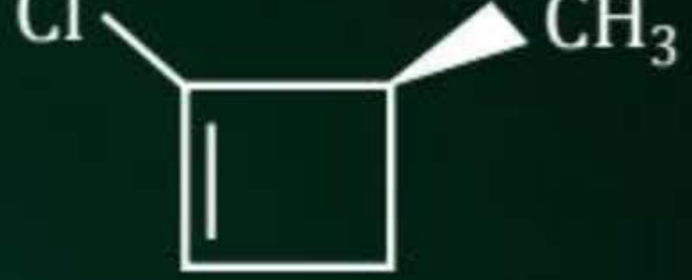
QUESTION 06

In which of the following compound have plane of symmetry?

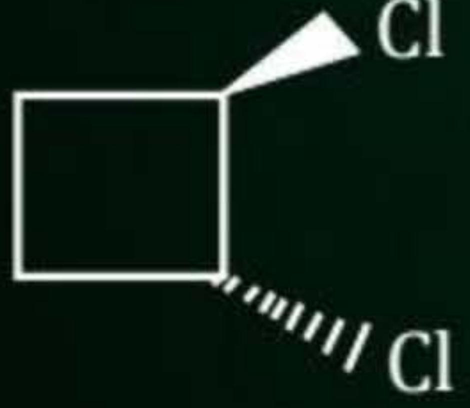
(A)


CH3
CH3
CH3
CH3

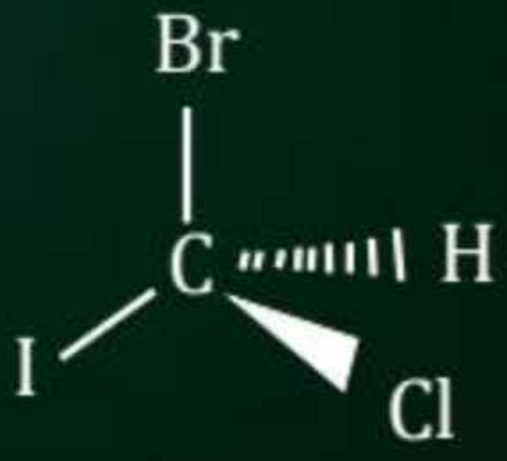
(B)



(C)



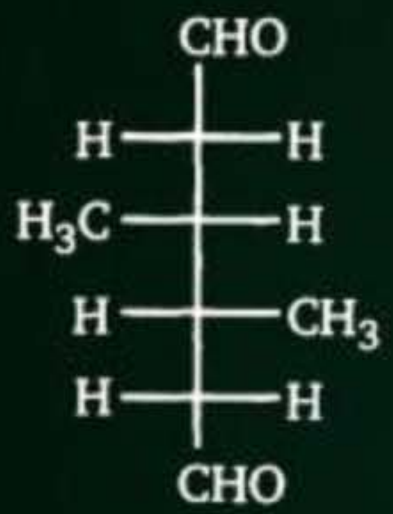
(D)



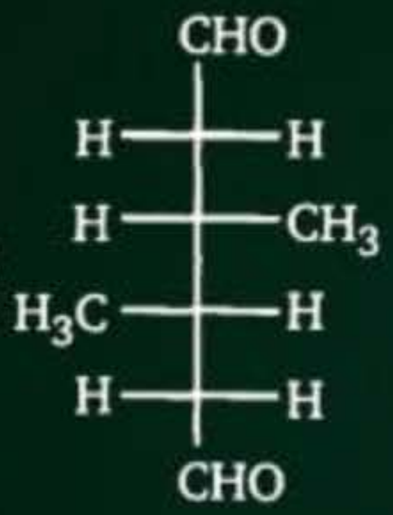
QUESTION 07

Which of the following statements best describes the stereochemical relationships of compound I, II and III shown below ?

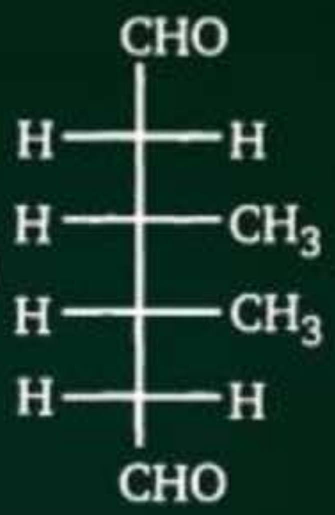
(I)



(II)



(III)



(A) All compounds are chiral

(B) Only I is chiral

(C) I and II are chiral

(D) None of these

QUESTION 08

Which of the following will exhibit chirality?

- **A** Neopentane
- **B** Isopentane
- **C** 3-Methylhexane
- **D** 2-Methylhexane

QUESTION 09

A compound with molecular formula C_7H_{16} shows optical isomerism. The compound will be:

A 2, 3-dimethyl pentane

B 2, 2-dimethyl pentane

C 2-methyl hexane

D none of the above

QUESTION 10

Which of the following compounds is expected to be optically active?

A $(CH_3)_2CHCHO$

B $CH_3CH_2CH_2CHO$

C $CH_3CH_2CH(Br)CHO$

D $CH_3CH_2CBr_2CHO$

ANSWER KEY

1. C
2. D
3. B
4. B
5. C
6. A
7. C
8. C
9. A
10. C

Home Work From PW Module (Yakeen NEET)

Prarambh: Q 65, 67, 108, 111

Prabal: Q 23, 27

Parikshit: Q 32

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NEET	Dropper	Test 01	Utkarsh Mishra	700	720	3	AURAIYA
NEET	Dropper	Test 01	Anand Chauhan	695	720	4	SIDDHARTHNAGAR
NEET	Dropper	Test 01	Muskan Kumari	691	720	5	KATIHAR
NEET	Dropper	Test 01	Ankit Yadav	690	720	6	WEST DELHI
NEET	Dropper	Test 01	Akshat Upadhyay	690	720	7	BANDA
NEET	Dropper	Test 01	Aditya Raj	690	720	8	NALANDA
NEET	Dropper	Test 01	Garima	687	720	9	HANUMANGARH
NEET	Dropper	Test 01	Monami Bera	687	720	10	EAST MIDNAPORE

DROPPER NEET REAL TEST 02 SYLLABUS

Overview

Exam Date	Mode	Pattern	Test No.	Physics	Chemistry	Botany	Zoology
Sunday, November 10, 2024	Offline	NEET	Test 2	Circular Motion Work, energy and power Centre of mass and System of Particles Rotational Motion Gravitation Mechanical Properties of Solids	Chemical Kinetics Structure of Atom Classification of Elements and Periodicity in Properties Chemical Bonding and Molecular Structure	Anatomy of Flowering Plants Respiration in Plants	Locomotion & Movement Neural Control & Coordination

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11th NEET REAL TEST SERIES SYLLABUS

Cohort	Class	Name of the Test	Exam Date	Mode	Physics	Chemistry	Botany	Zoology
NEET	11	Test 1	13-Oct-2024	Online	Basic Maths & Calculus (Mathematical Tools) Vectors Units and Measurements Motion in a straight line	Structure of Atom Some Basic Concepts of Chemistry Classification of Elements and Periodicity in Properties	Cell - The Unit of Life Cell Cycle and Cell Division	Structural Organization in Animals Breathing and Exchange of Gases

12th NEET REAL TEST SERIES SYLLABUS

Cohort	Class	Name of the Test	Exam Date	Mode	Physics	Chemistry	Botany	Zoology
NEET	12	Test 1	13-Oct-2024	Online	Electric Charges and Fields Electrostatic Potential and Capacitance	Solution Electrochemistry	Sexual Reproduction in Flowering Plant	Human Reproduction

DROPPER NEET REAL TEST SERIES SYLLABUS

Cohort	Class	Name of the Test	Exam Date	Mode	Physics	Chemistry	Botany	Zoology
NEET	Dropper	Test 1	13-Oct-2024	Online	Basic Maths & Calculus (Mathematical Tools) Vectors Units and Measurements Motion in a straight line Motion in a plane Circular motion Laws of motion	Some Basic Concept of Chemistry Redox Reaction Solutions Thermodynamics Equilibrium Electrochemistry	Cell - The Unit of Life Cell Cycle and Cell Division The Living World Biological Classification Plant Kingdom Morphology of Flowering Plants	Structural Organization in Animals Breathing and Exchange of Gases Body Fluids and Circulation Excretory Products & their Elimination

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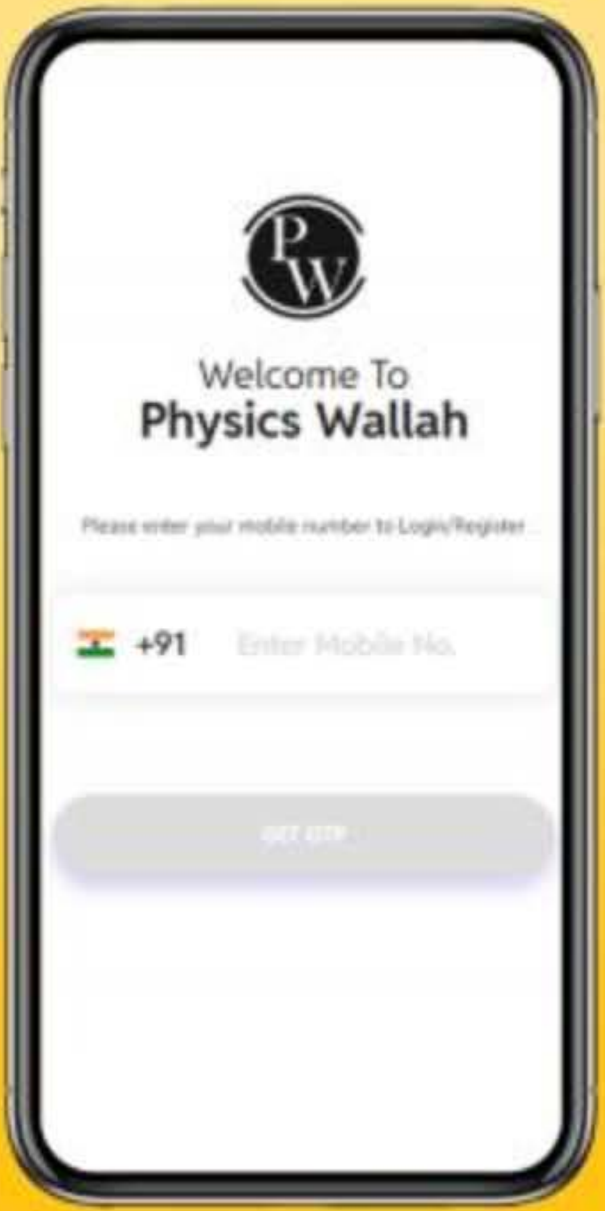
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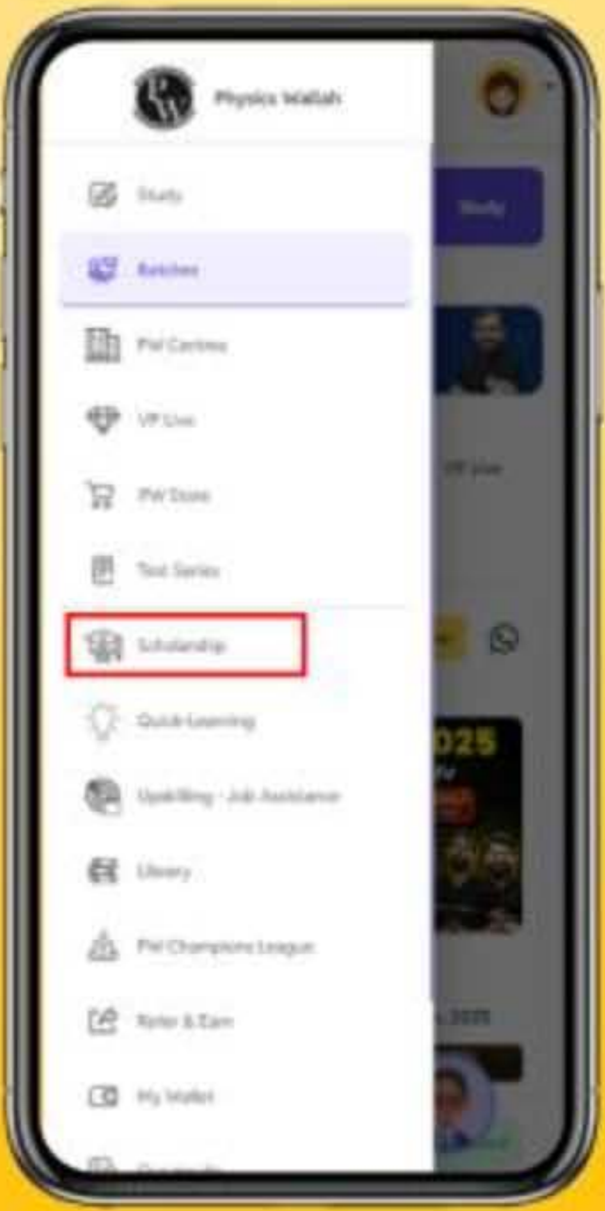
LOG INTO THE APP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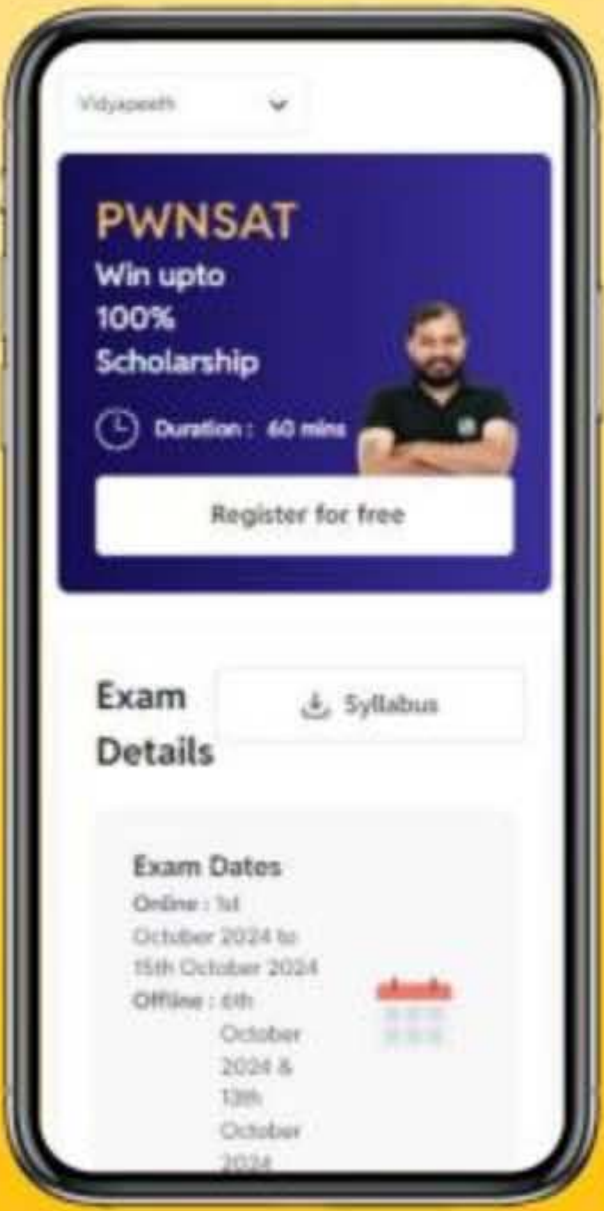
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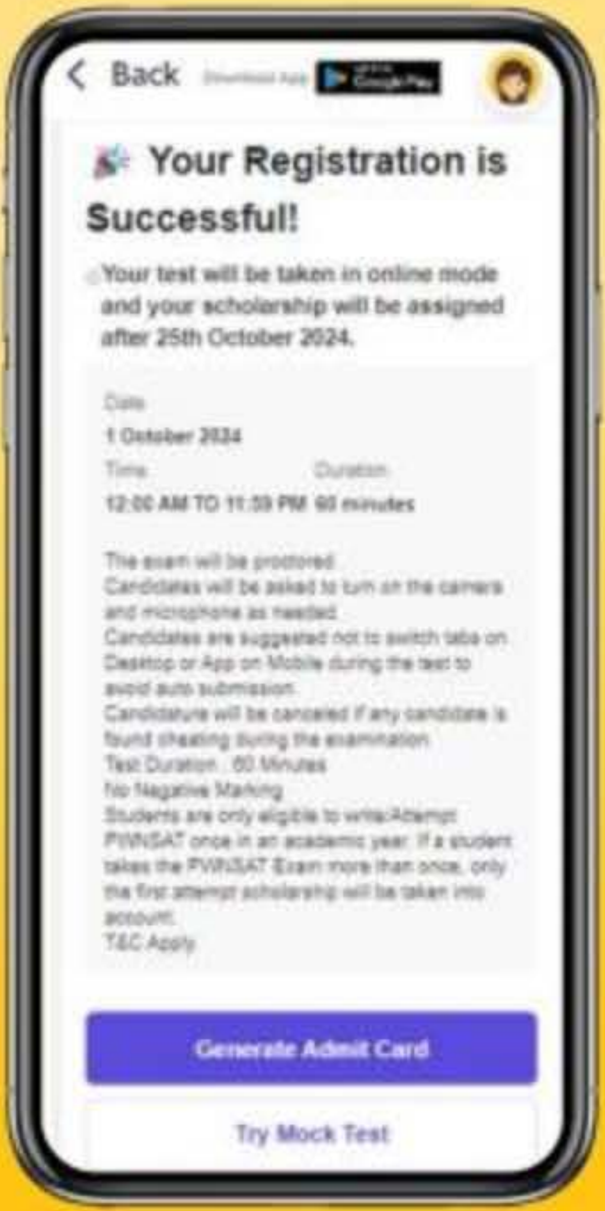
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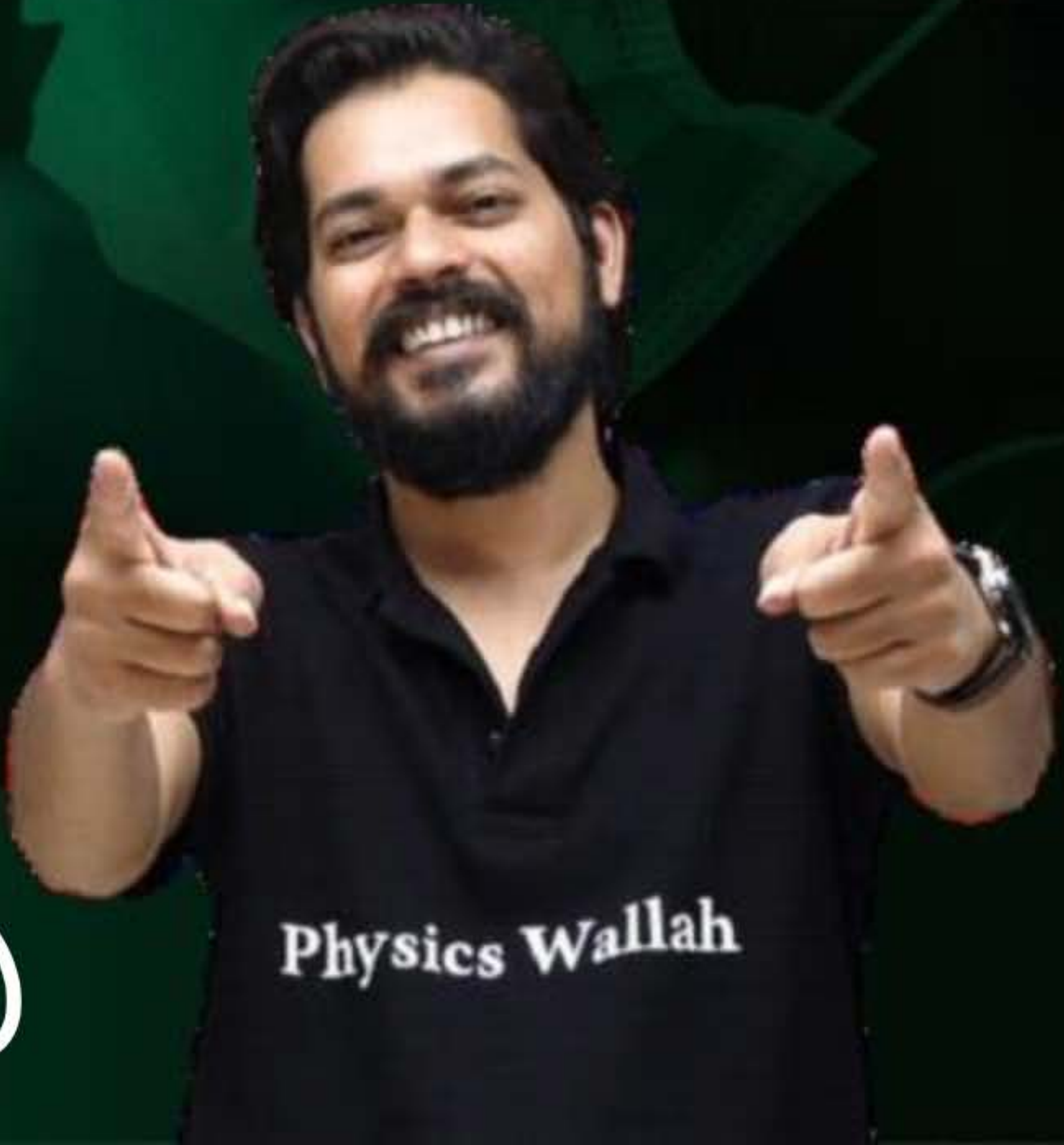
Lecture- 09 **Organic Chemistry**

Some Basic Principles and Techniques (ISOMERISM)

By- Pankaj Sir (POPU MAMA)


Physics Wallah

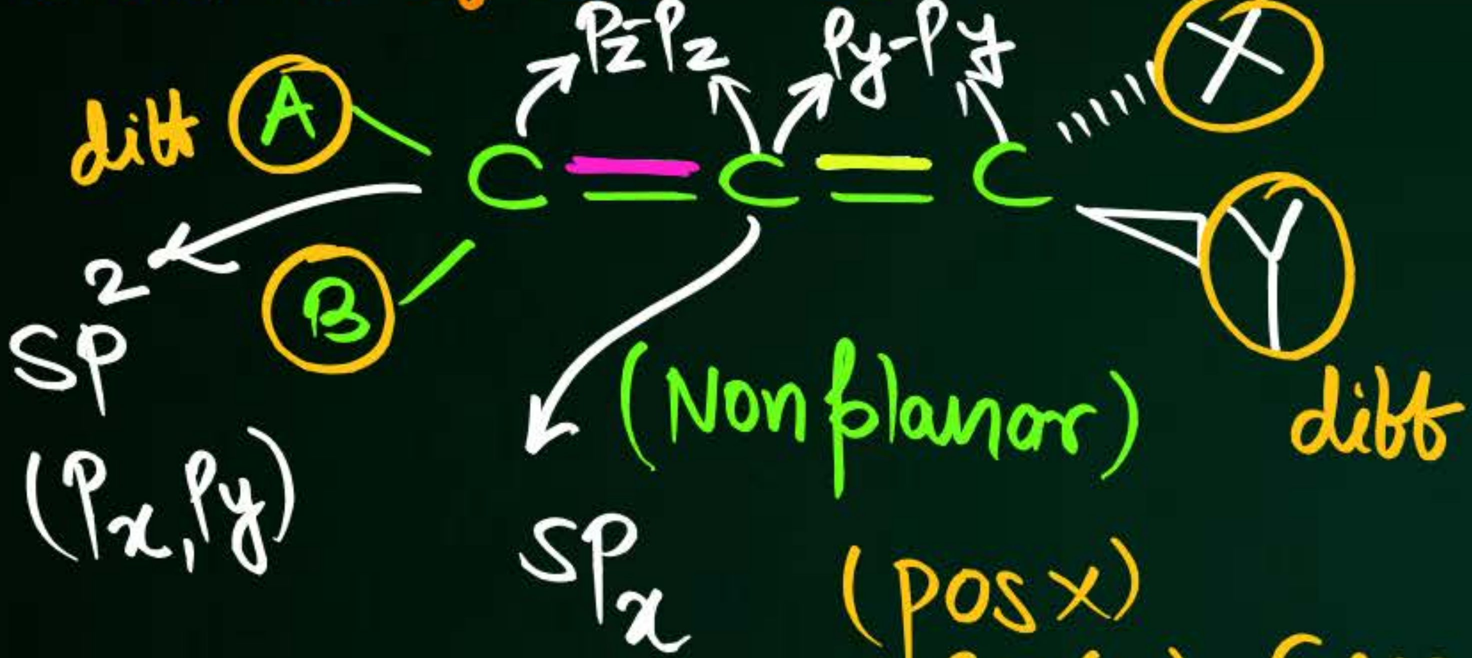
Topics *to be covered*

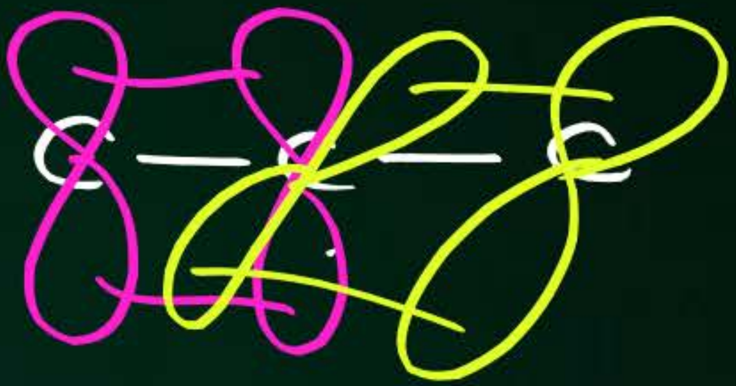
1. Special cases of Optical Isomerism ,relation b/w comp
2. Meso compounds, Racemic Mixture & Resolution
3. D/L Configuration, Erythro & Threo
4. Practice

Optical isomerism without chiral centers

1. Cummulenes (check only pos)

even no of cummulative double bonds can exhibits O.I

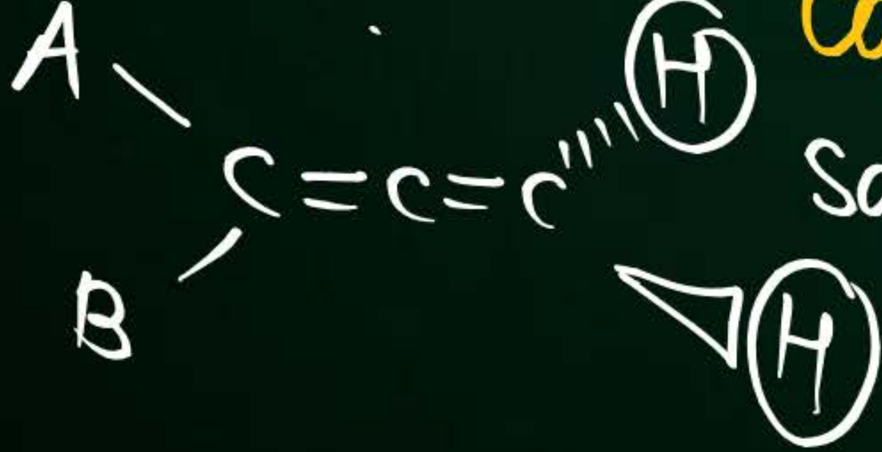

diff
A
B
sp^2
(p_x, p_y)
p_z-p_z
p_y-p_y
C=C=C
X
Y
diff
(Nonplanar)
sp_x



(pos x)
cos(x) (cos hamesha nahi hogi)

O.A or chiral comp

Q

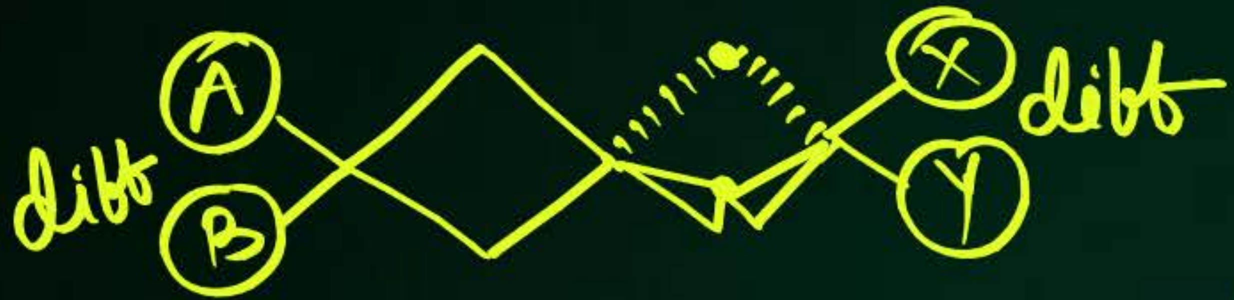


Same O.I.A

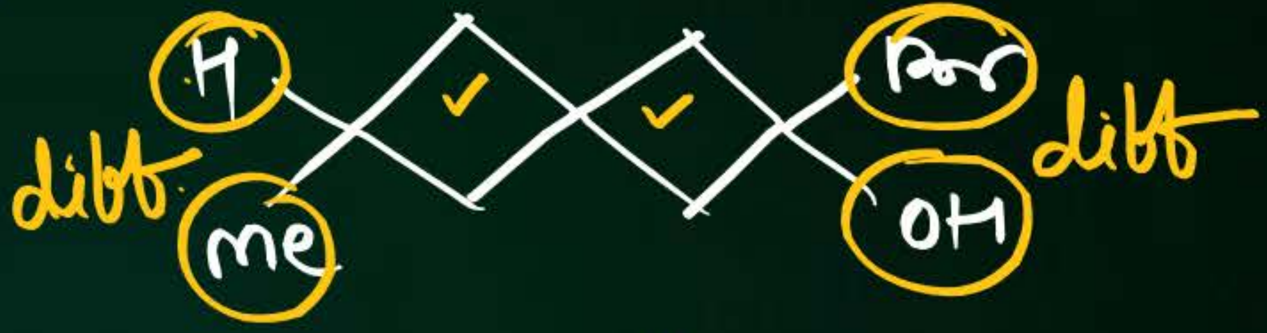
Achiral comp

2. Spiranes

even no. of cummulative rings can exhibits O.I

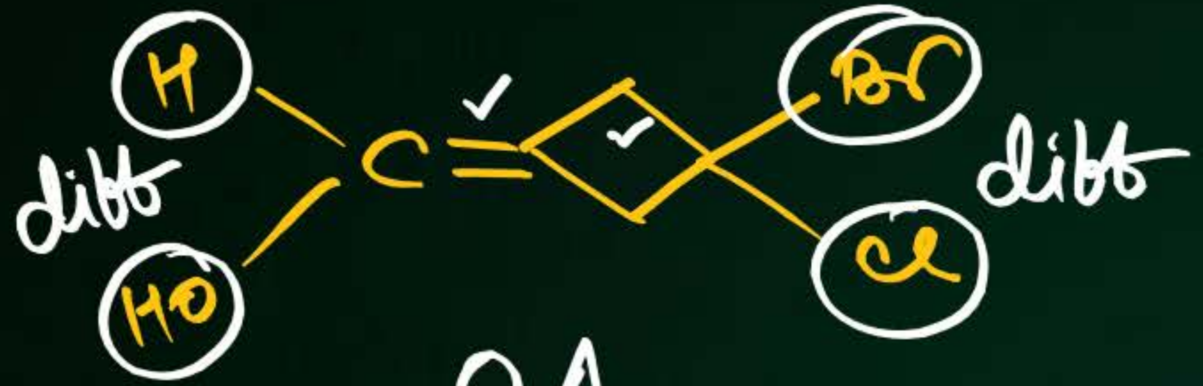

diff
A
B
X
Y
diff

O.A


diff.
H
me
Br
OH
diff

O.A

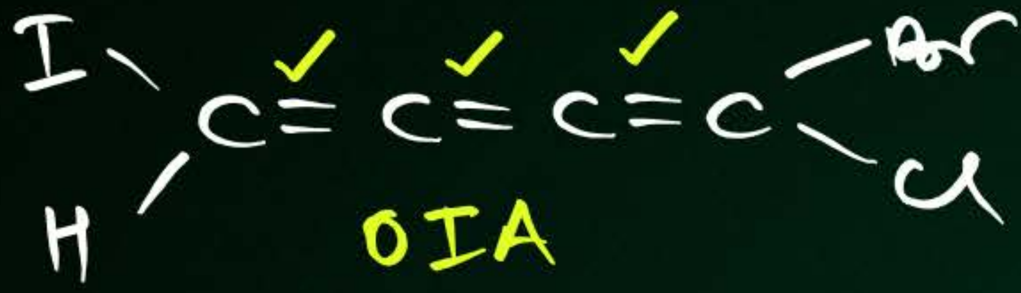
3. Cummulenes + Spiranes = even no can exhibits O.I


H
diff
HO
C
Br
Cl
diff

OA
(chiral comp)

Q OA or OIA ?

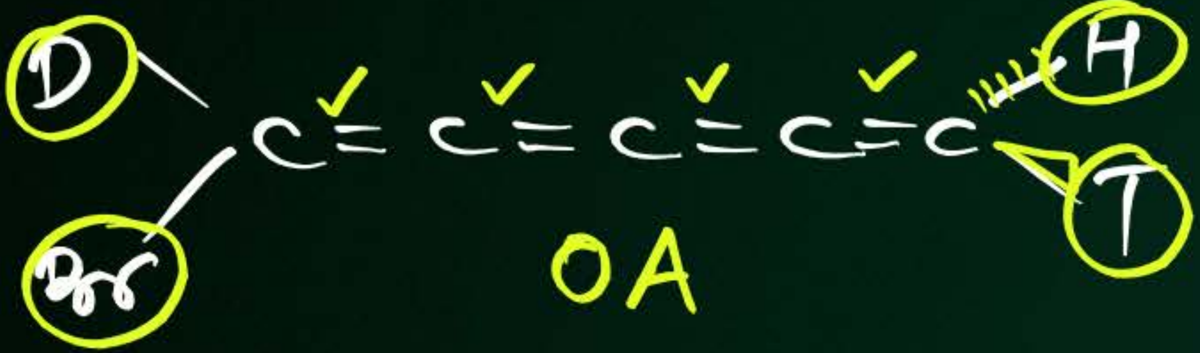
①



I
H
C=C=C=C
Br
Cl

OIA

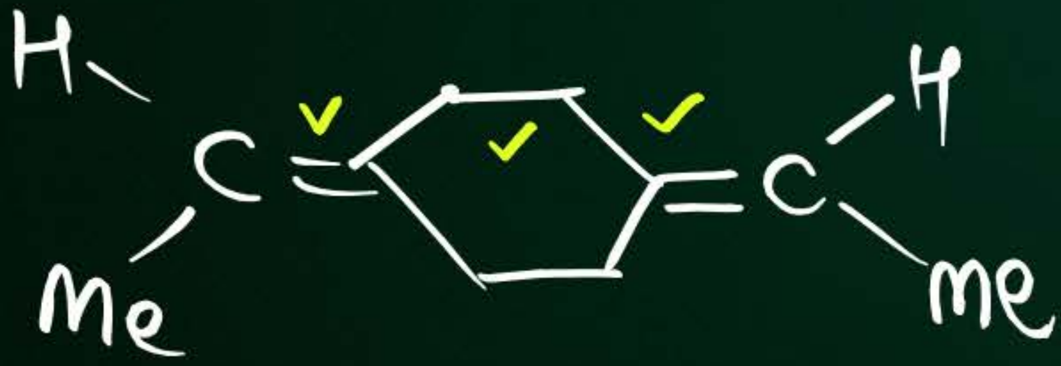
②



D
Br
C=C=C=C=C
H
T

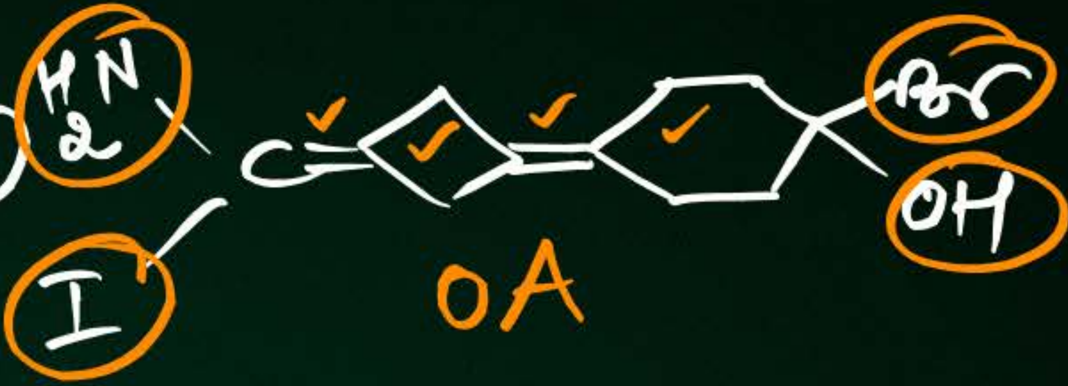
OA

③



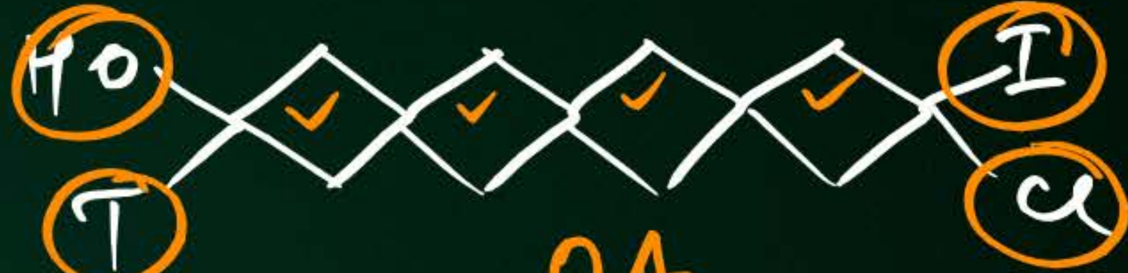
OIA

④



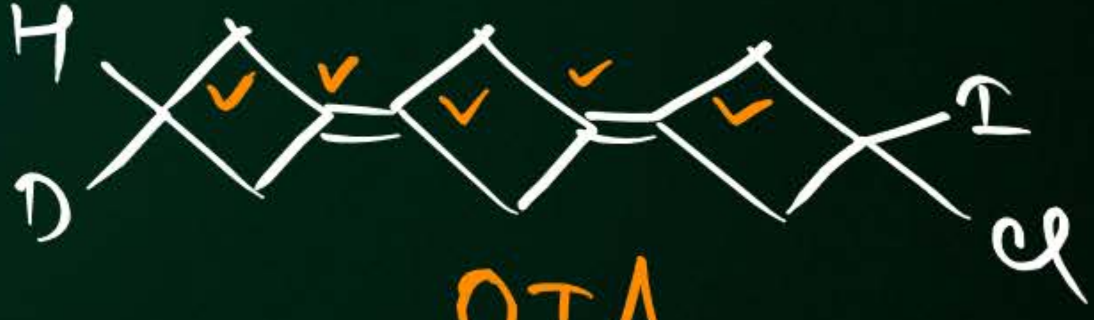
OA

⑤



OA

⑥



OIA

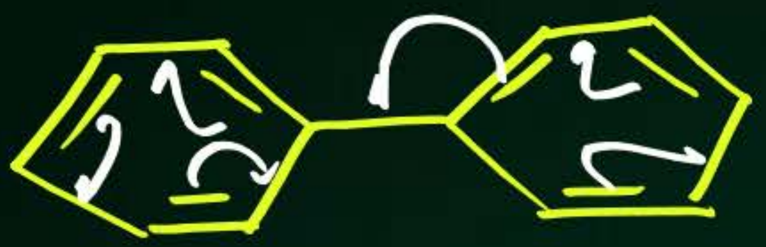
4. Biphenyls

Two –

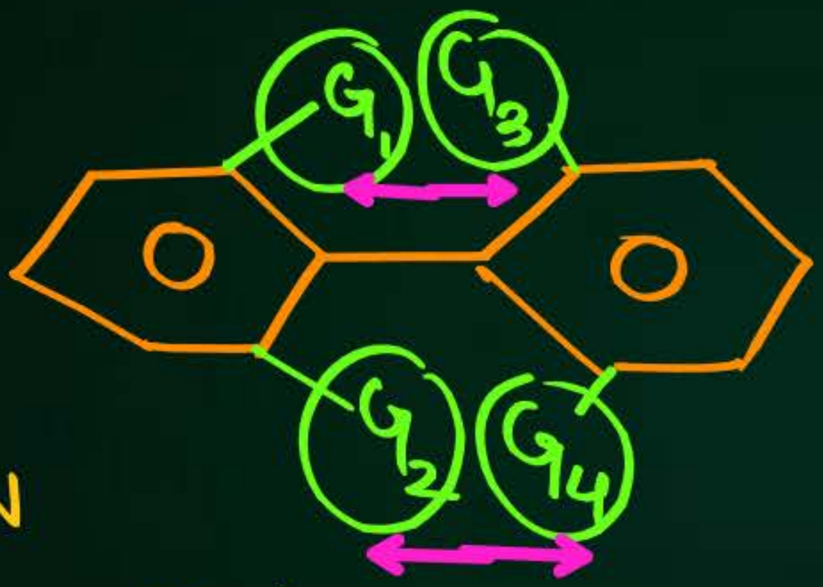
R, NO_2, SO_3H, CHO
$COOH$ etc
Cl, Br, I

G_1, G_2 G_3 G_4
bulky groups

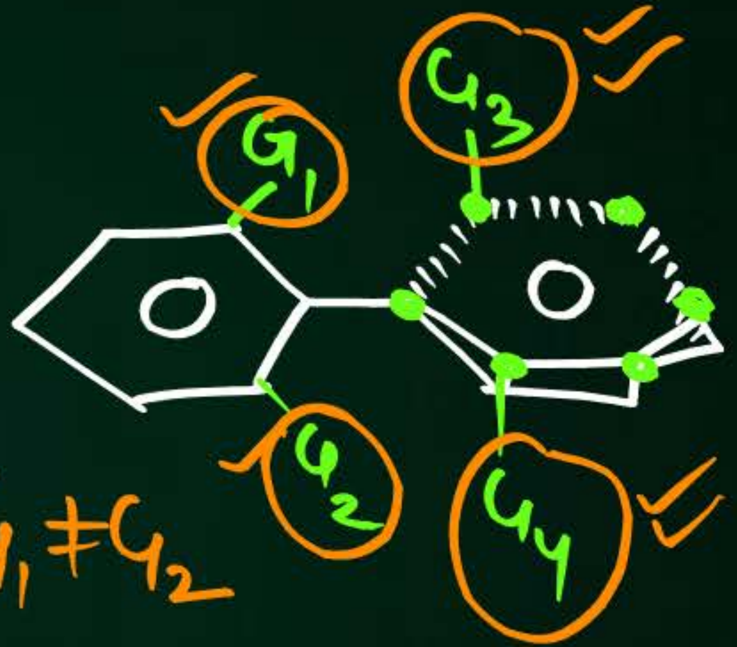
Except H, D, T, CN
F, OH, NH_2 (2nd period)
etc



planar due to resonance



$\Rightarrow$

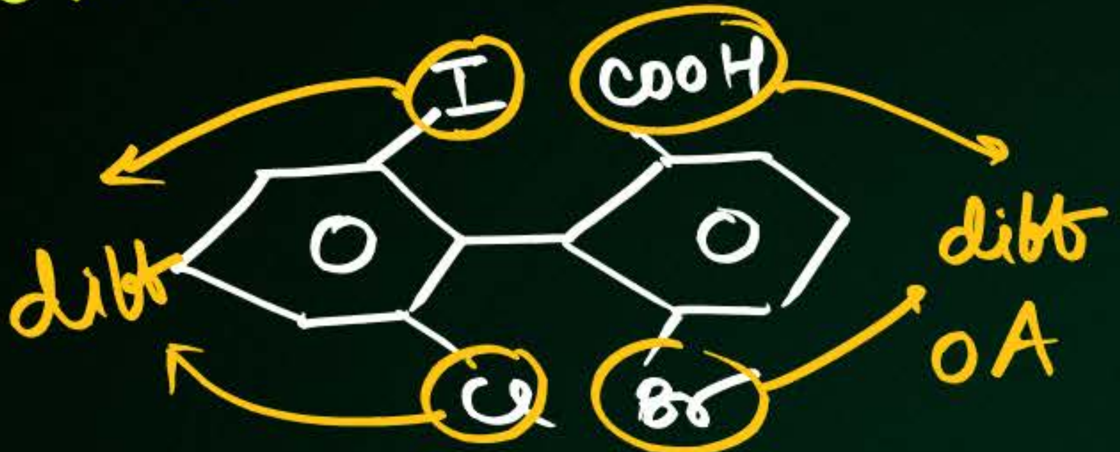


$G_1 \neq G_2$

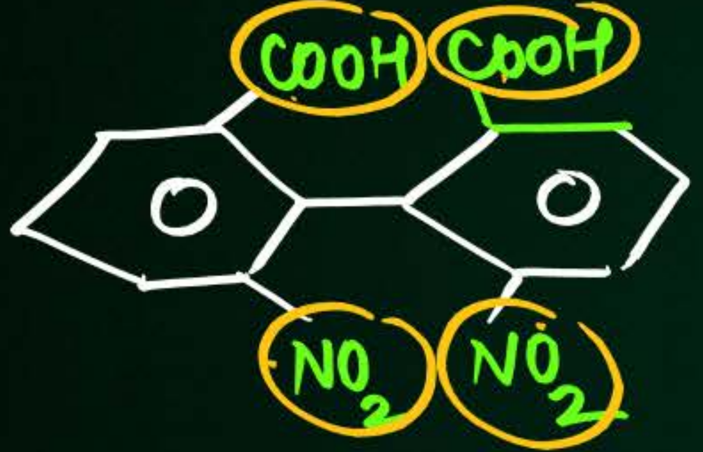
$G_3 \neq G_4$

nonplanar
due to
repulsion
b/w bulky
groups

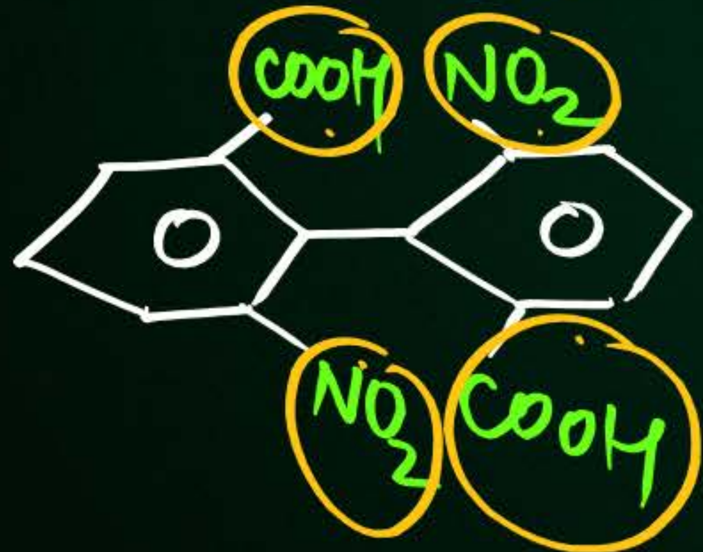
Q O·A or O·I·A ?

①

I
COOH
Cl
Br
diff
diff

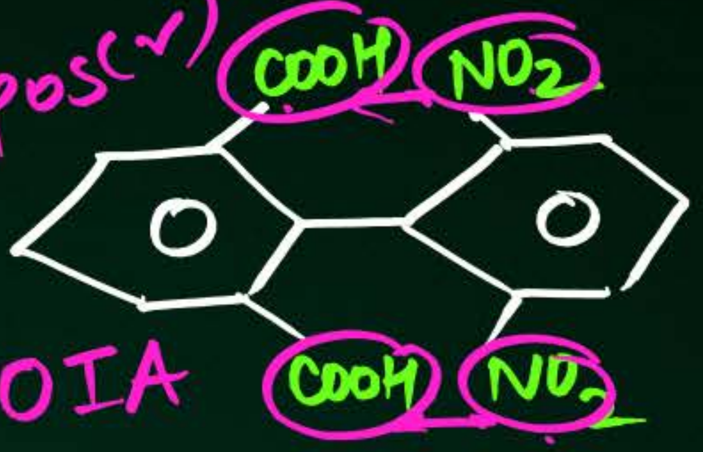
OA

②

COOH
COOH
NO2
NO2

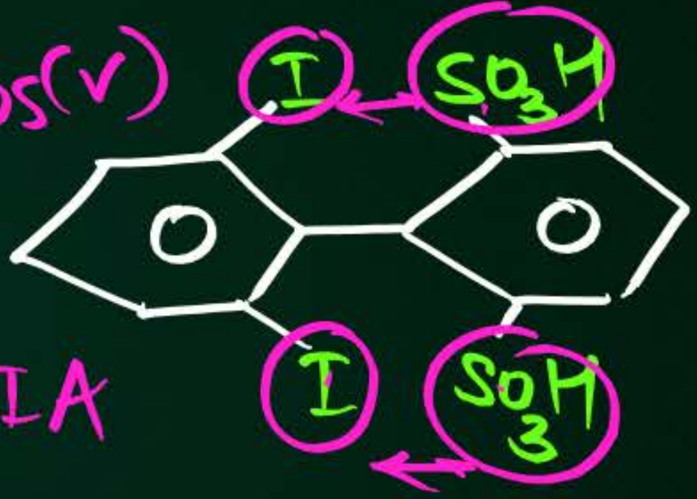
OA

③

COOH
NO2
NO2
COOH

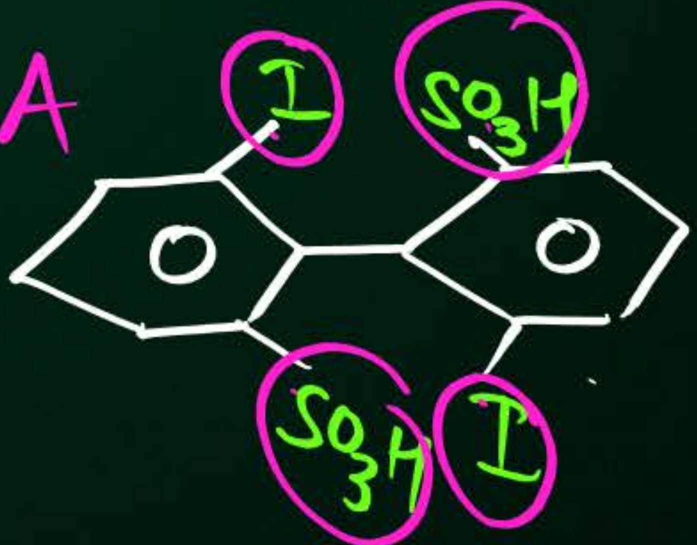
OA

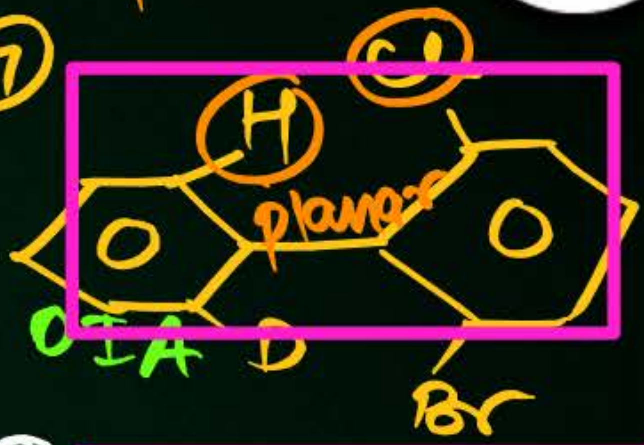
④ pos(✓)

COOH
NO2
COOH
NO2

OIA

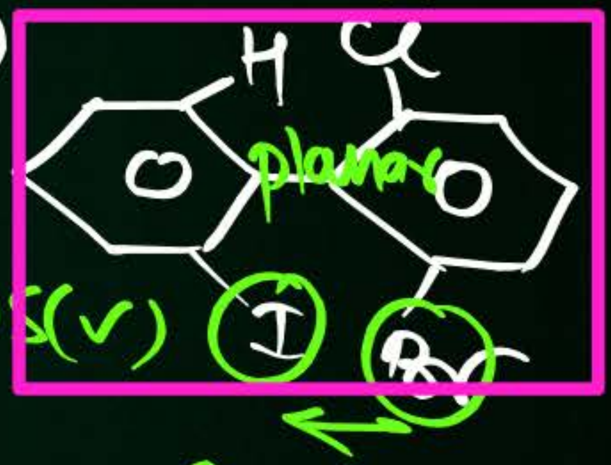
⑤ pos(✓)

I
SO3H
I
SO3H

OIA

⑥ OA

I
SO3H
SO3H
I

⑦ pos(✓)

H
Cl
planar
Br

OIA

⑧ pos(✓)

H
Cl
planar
I
Br

OIA

Relation b/w compounds

Case ① for 1 chiral carbon

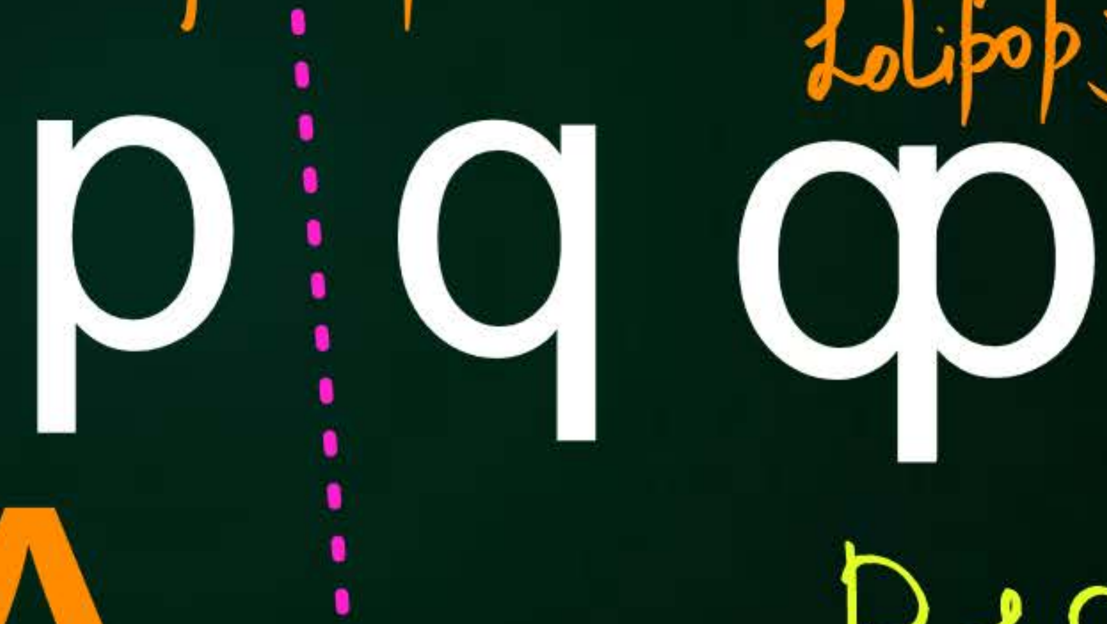
Identical

(Same compounds)
or
(Homomers)

Enantiomers

Non superimposable mirror images.

Lolipop jaisa

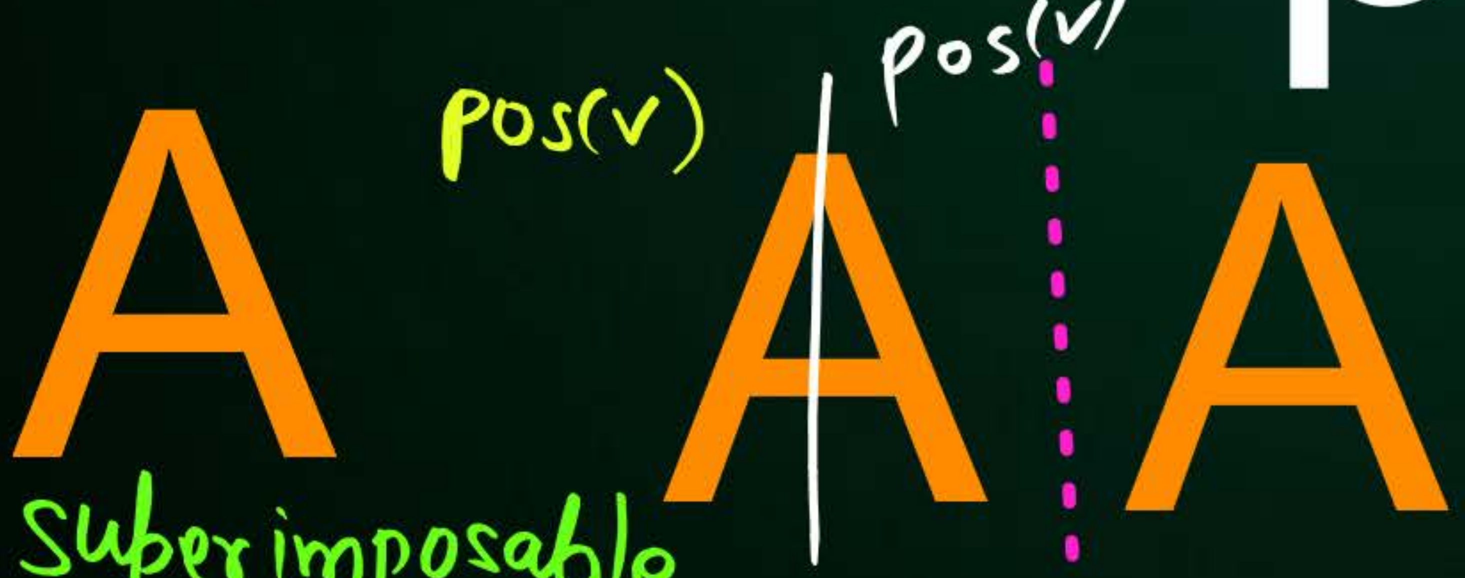


non superimposab

P & q are Enantiomer

pos(x)
P → OA

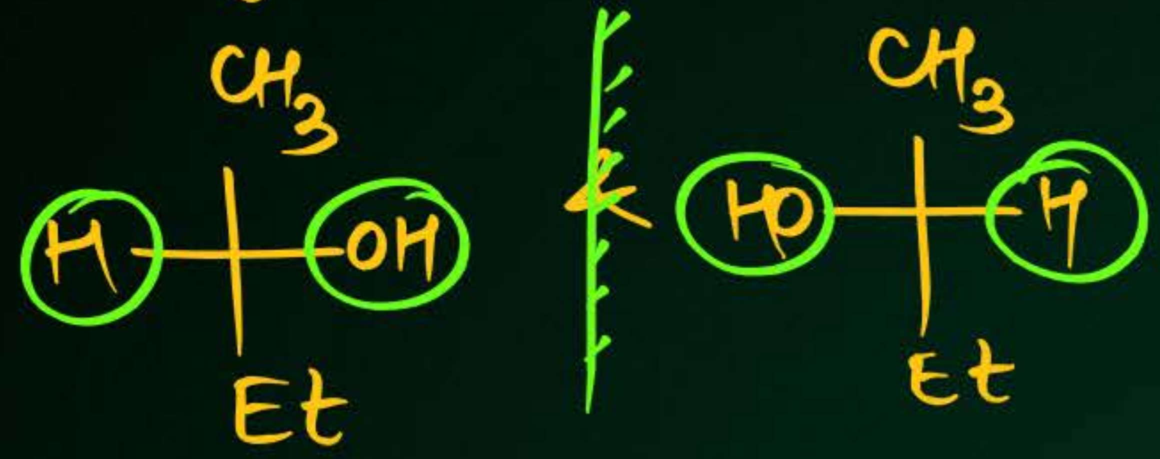
pos(x) q → O.A



superimposable
(O.I.A) ✓

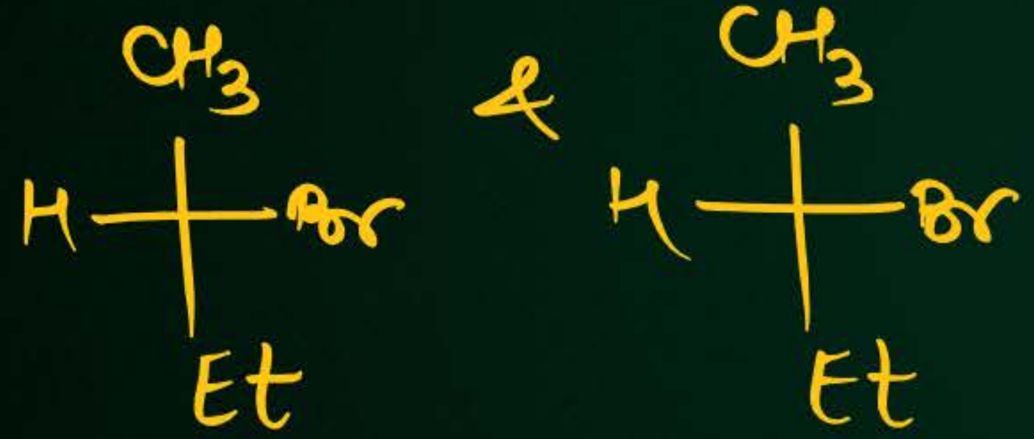
Q. Identify the relation ?.

①


CH3
H
OH
Et
CH3
HO
H
Et

$\boxed{E}$

②

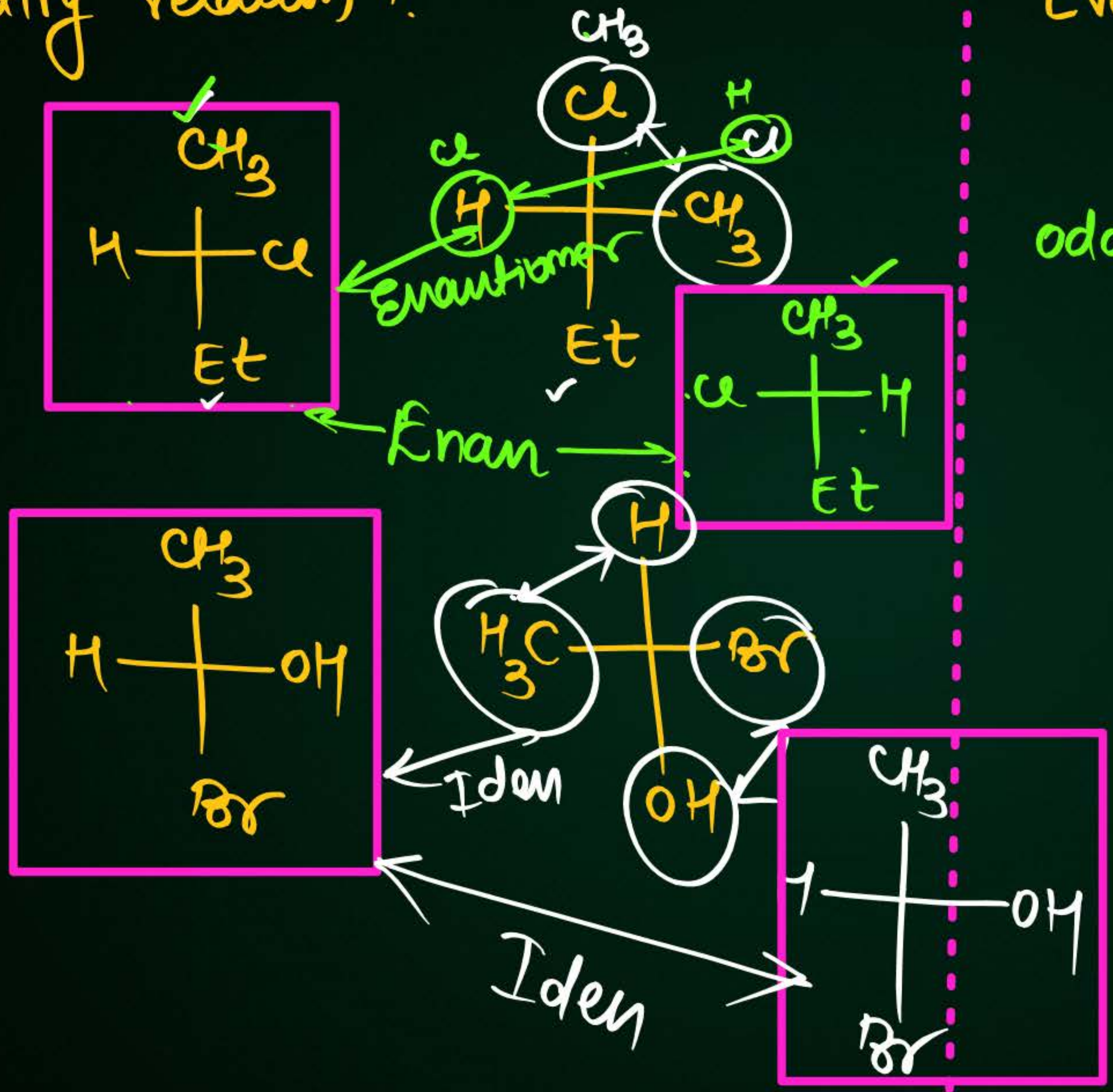

CH3
H
Br
Et
&
CH3
H
Br
Et

$\boxed{I}$

Q. Identify relation ?.

①

②


CH3
H
Cl
Et
Cl
CH3
H
Cl
H
CH3
Et
Enantiomer
Enan
CH3
Cl
H
Et
CH3
H
OH
Br
H
H3C
Br
OH
Iden
CH3
H
OH
Br
Iden

Even no. of interchange or Exchange

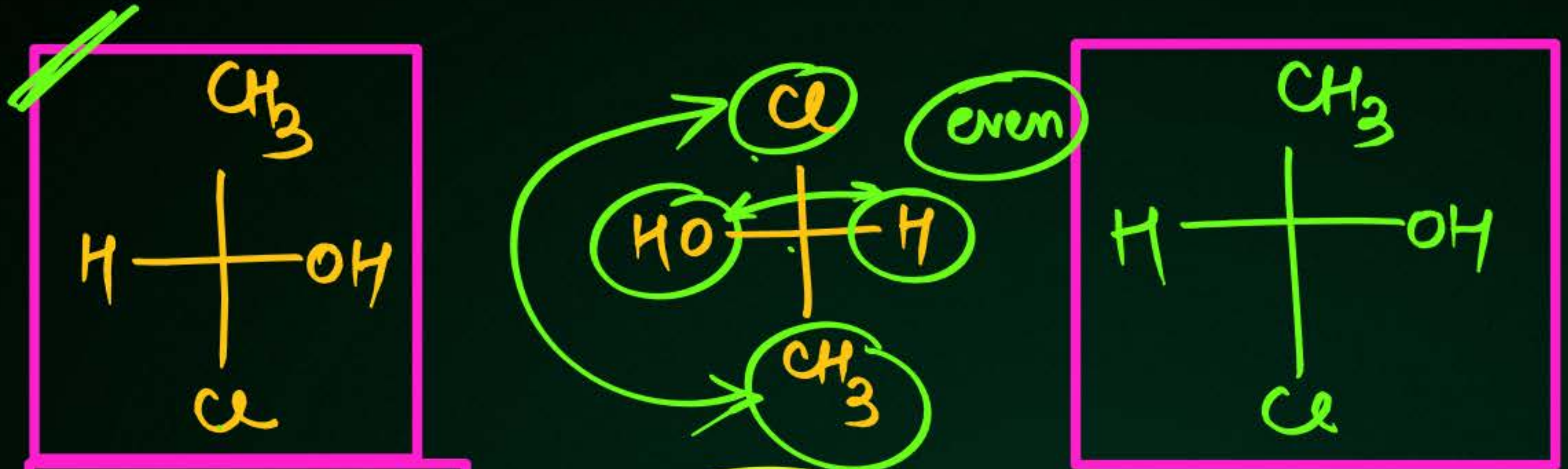
Identical

odd no. of interchange or Exchange

Enantiomer

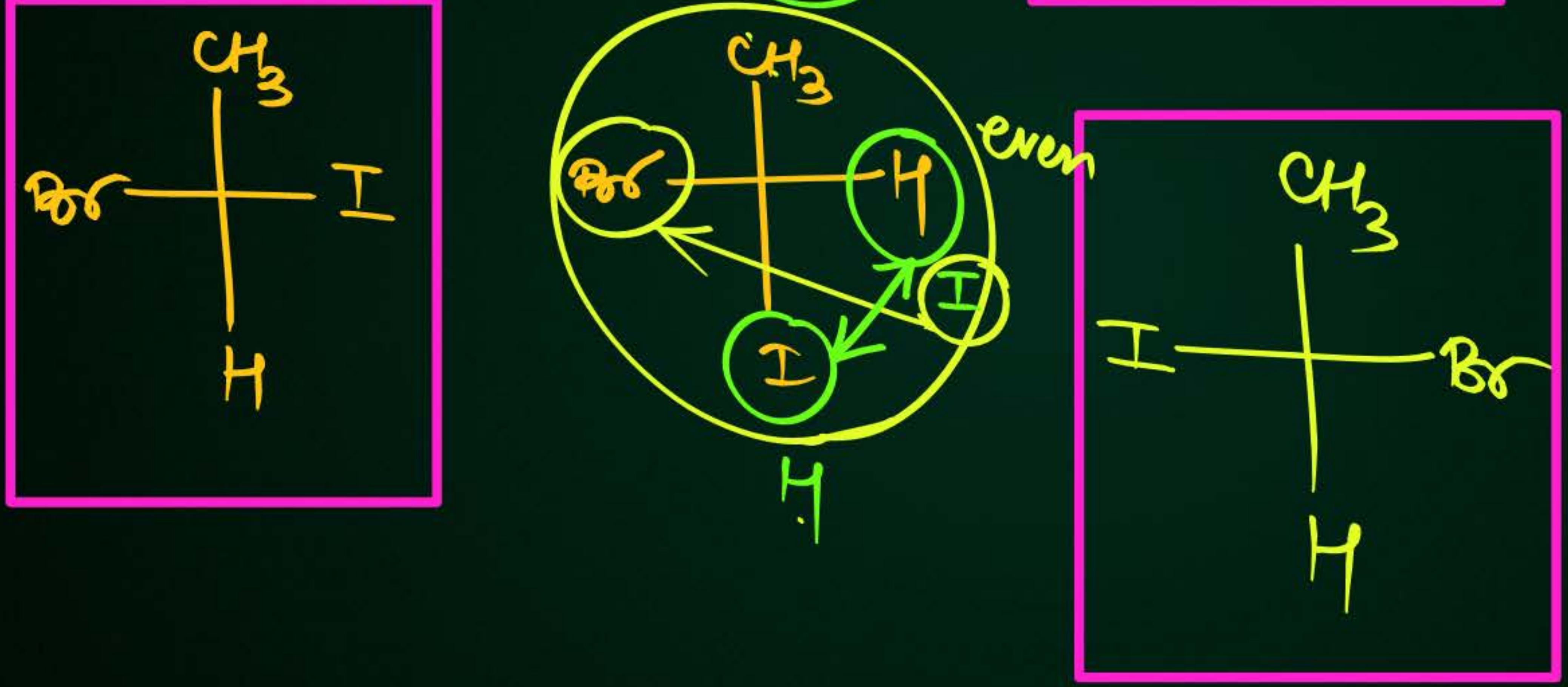
Q

①


CH3
H
OH
Cl
Cl
HO
H
CH3
even
CH3
H
OH
Cl

Identical

②


CH3
Br
I
H
CH3
Br
H
I
I
even
H
CH3
I
Br
H

Enantiomer

Case ② In two chiral carbons

Identical

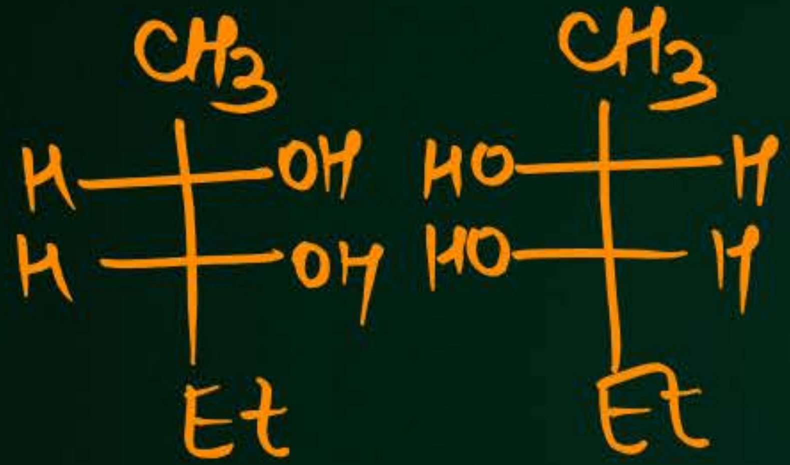
Enan

Diastereomers

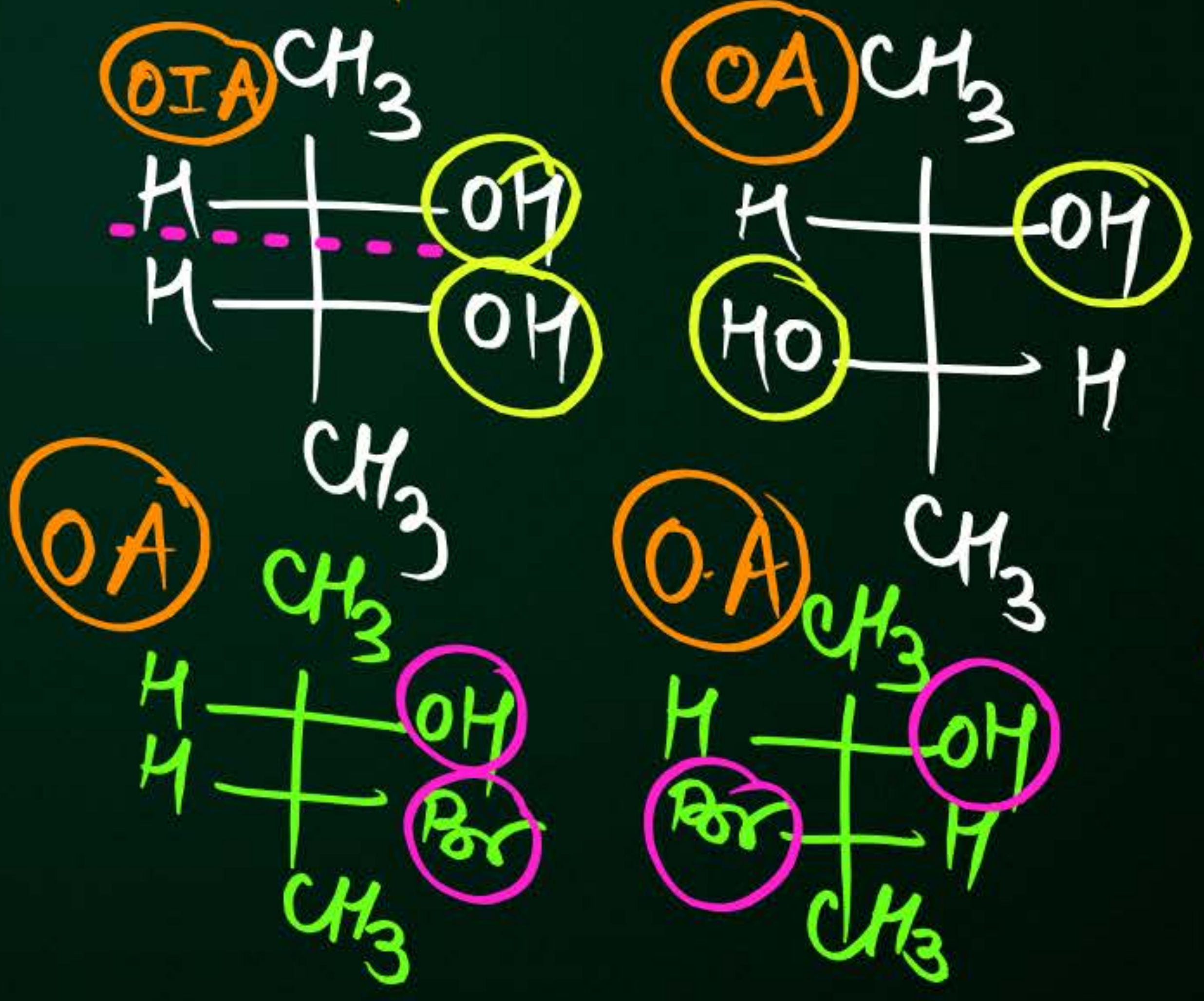
Geodias:

Comp which are not mirror images.

optical dias.


CH3
H
OH
H
OH
Et
CH3
HO
H
HO
H
Et

Enan

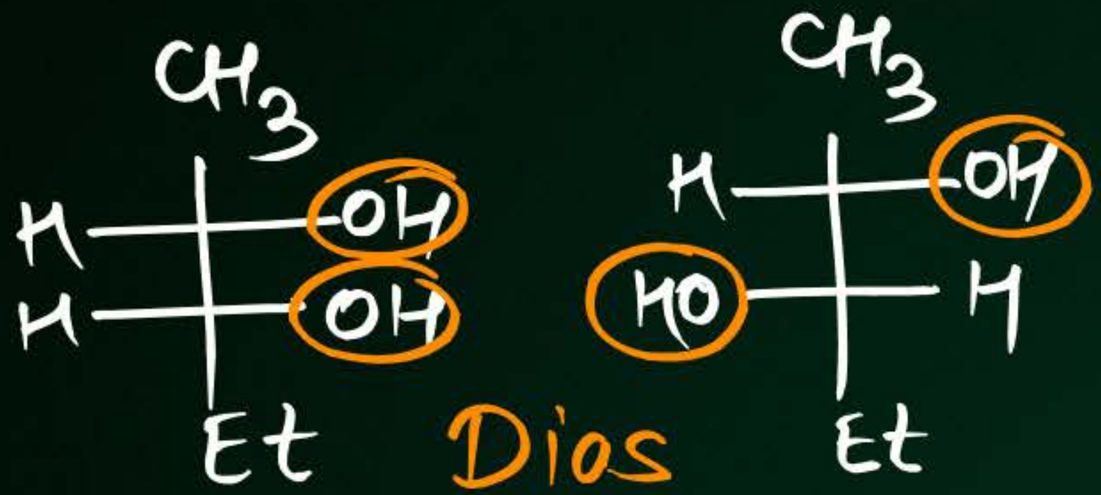

OIA
CH3
H
OH
H
OH
CH3
OA
CH3
H
OH
HO
H
CH3
OA
CH3
H
OH
H
Br
CH3
O.A
CH3
H
OH
Br
H
CH3

Dias

Dias

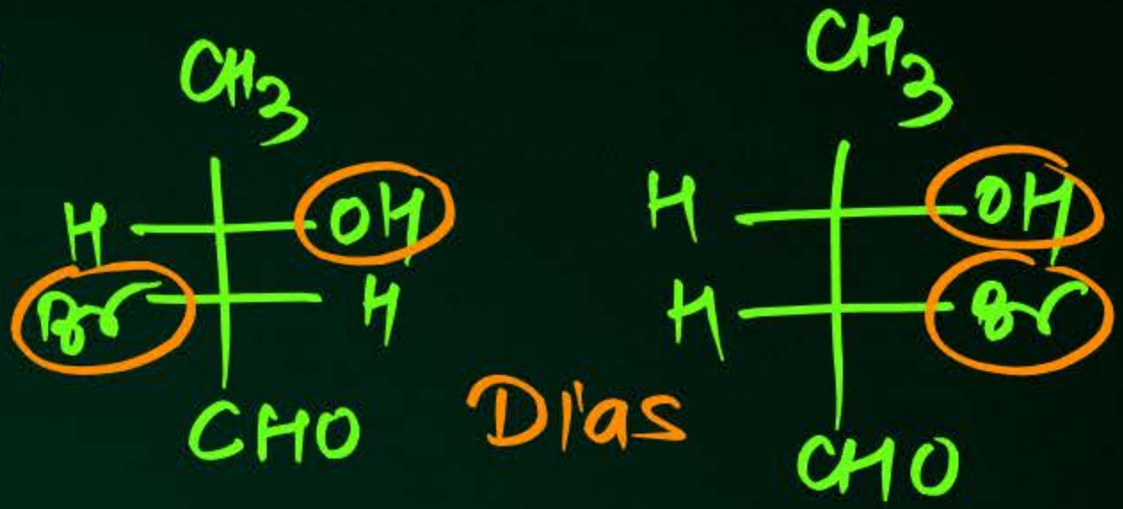
Q. find the relation?

①


CH3
H
OH
H
OH
Et
CH3
H
OH
HO
H
Et

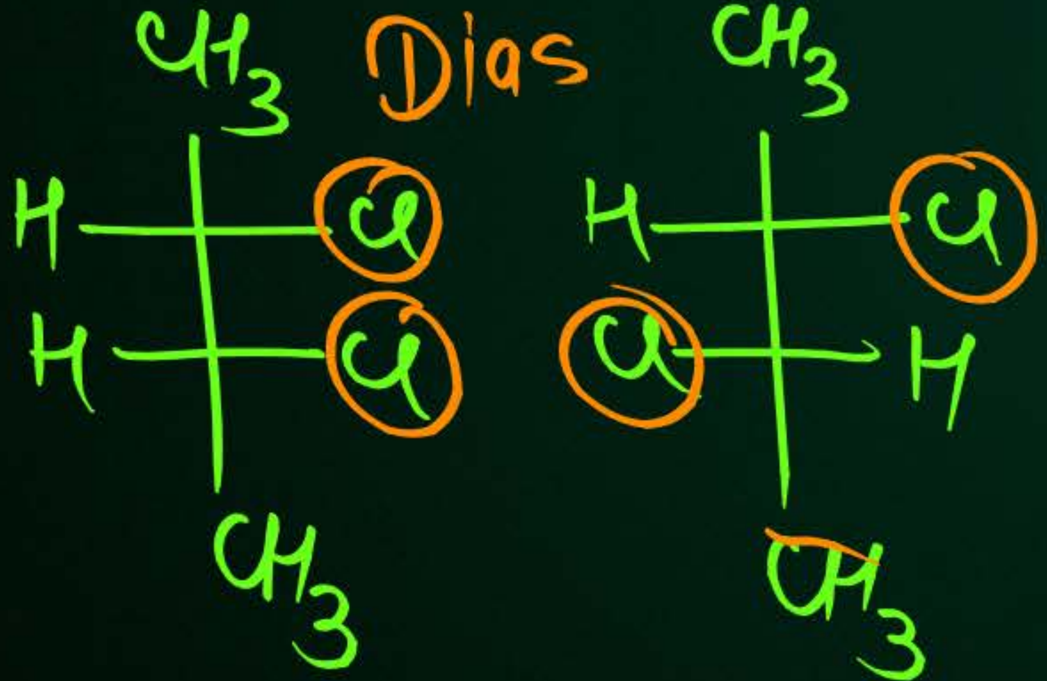
Dias

②


CH3
H
OH
Br
H
CHO
CH3
H
OH
H
Br
CHO

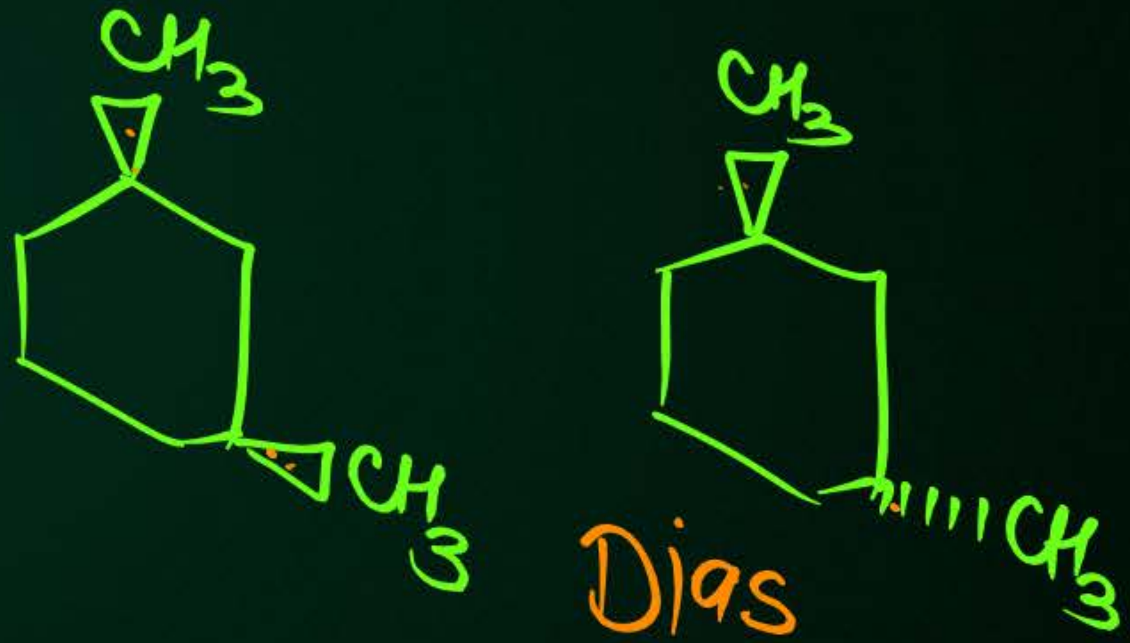
Dias

③

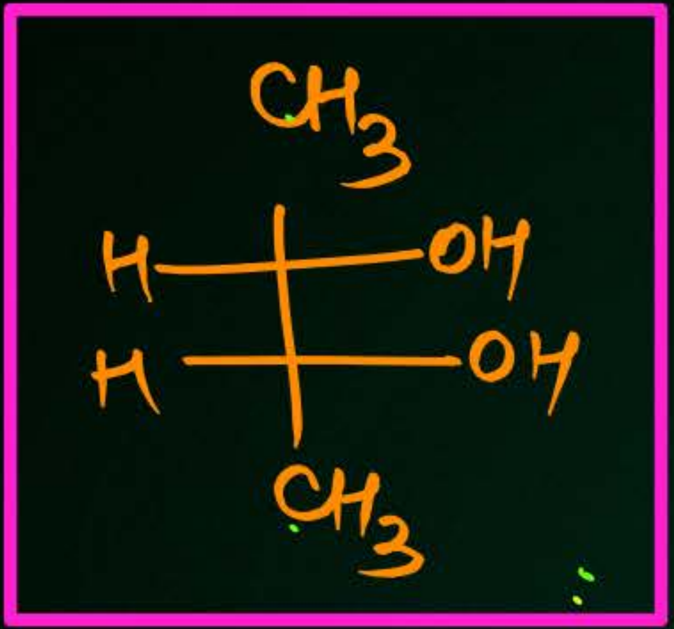

CH3
H
Cl
H
Cl
CH3
CH3
H
Cl
Cl
H
CH3

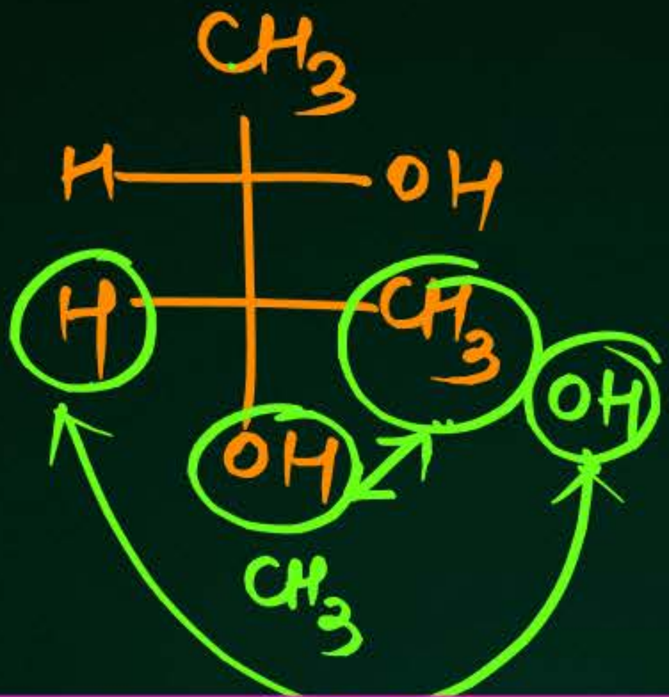
Dias

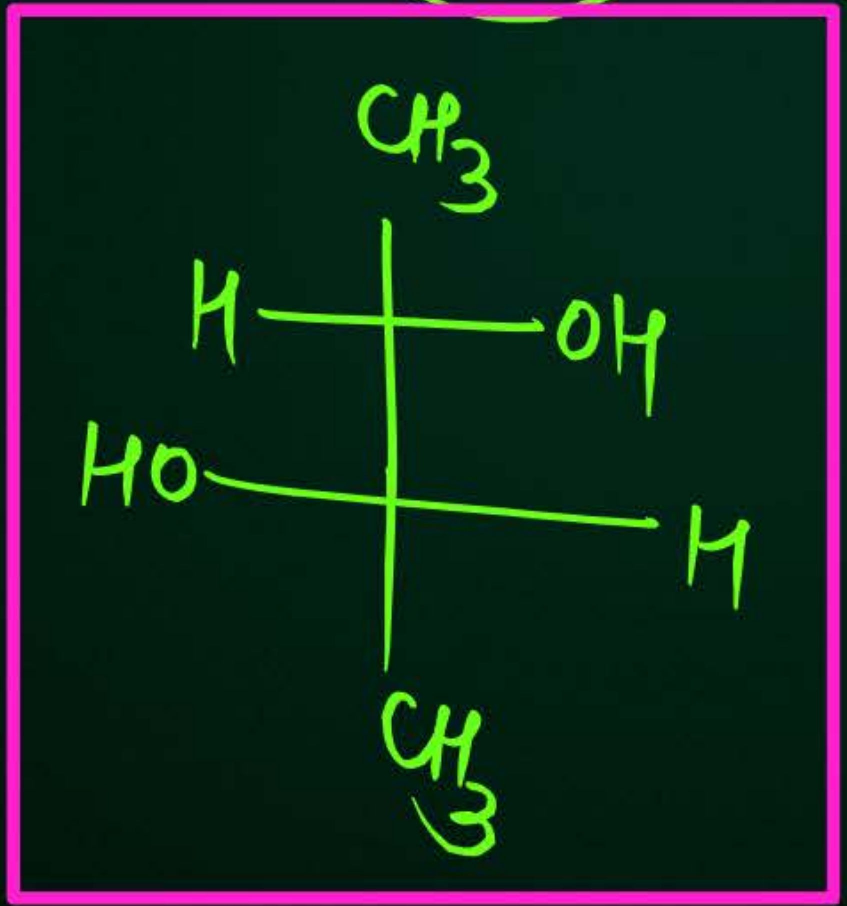
④


CH3
CH3
CH3
CH3

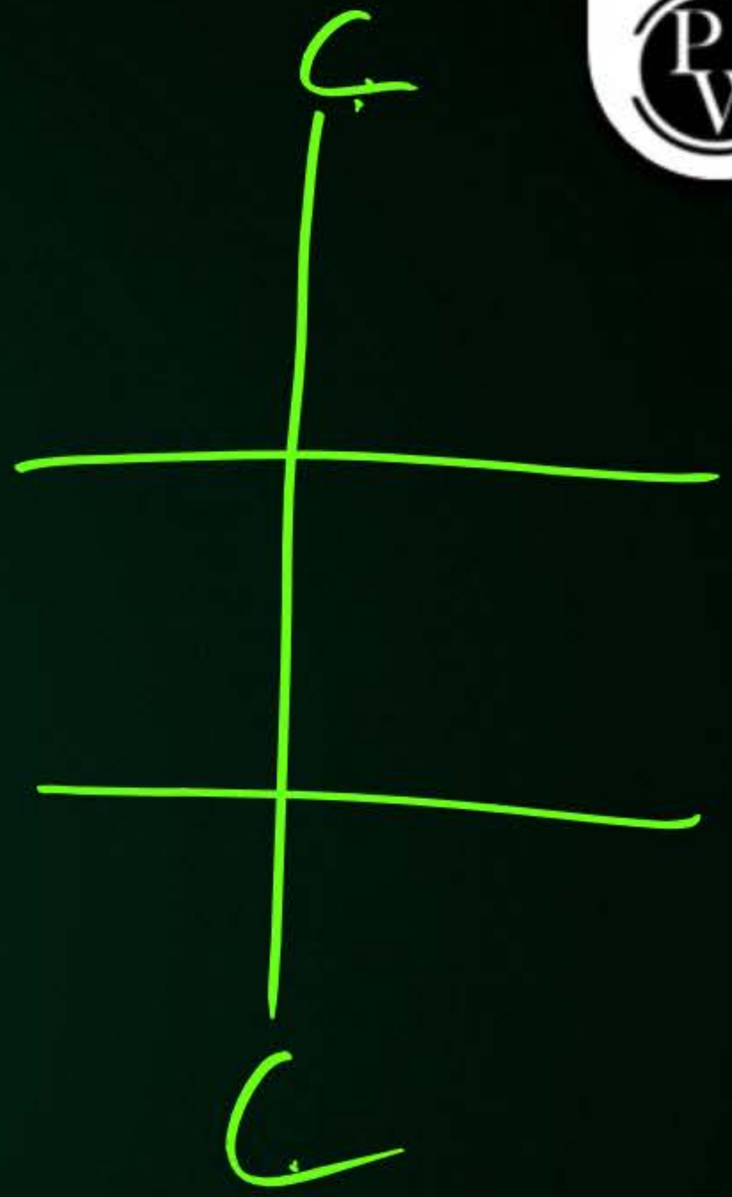
Dias


CH3
H
OH
H
OH
CH3

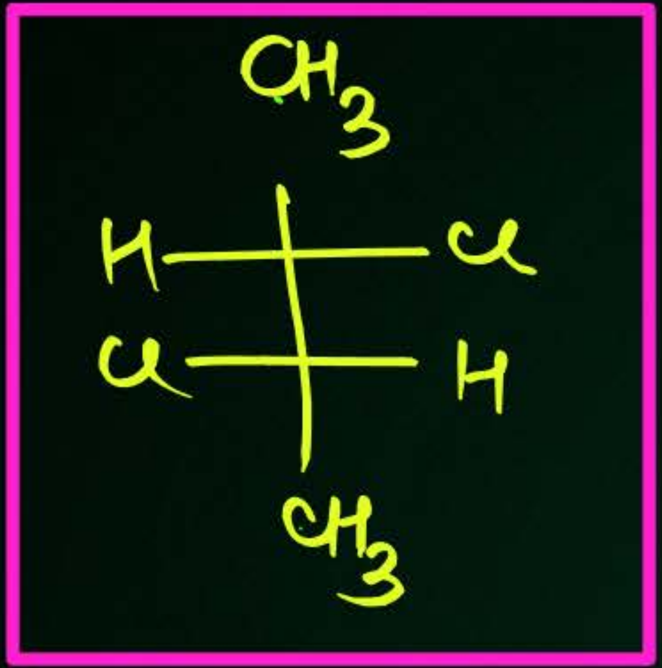

CH3
H
OH
H
CH3
OH
OH
CH3

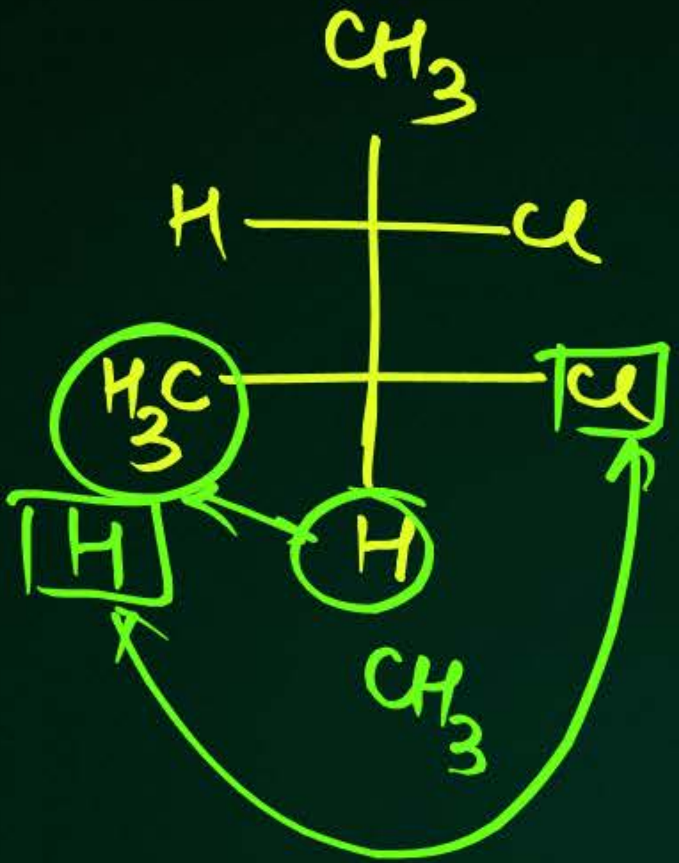

CH3
H
OH
HO
H
CH3

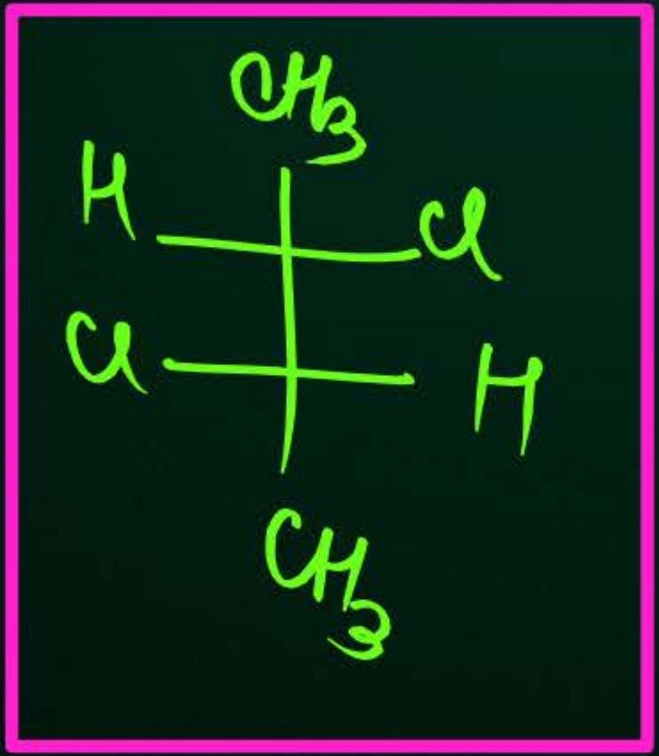
Dias

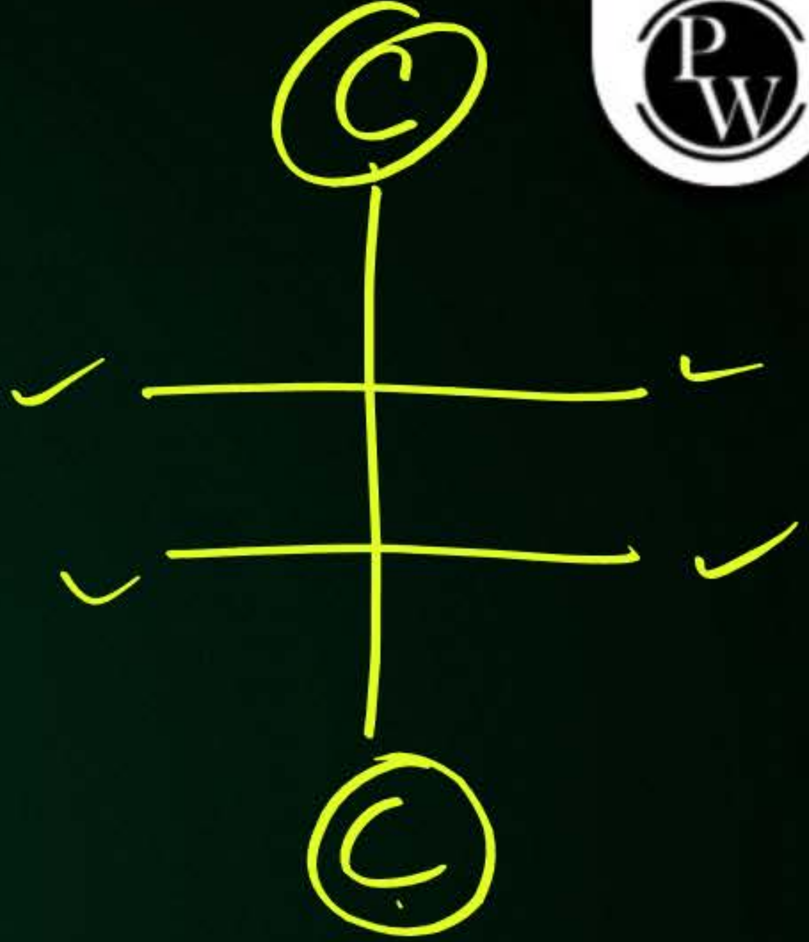


Q


CH3
H
Cl
Cl
H
CH3

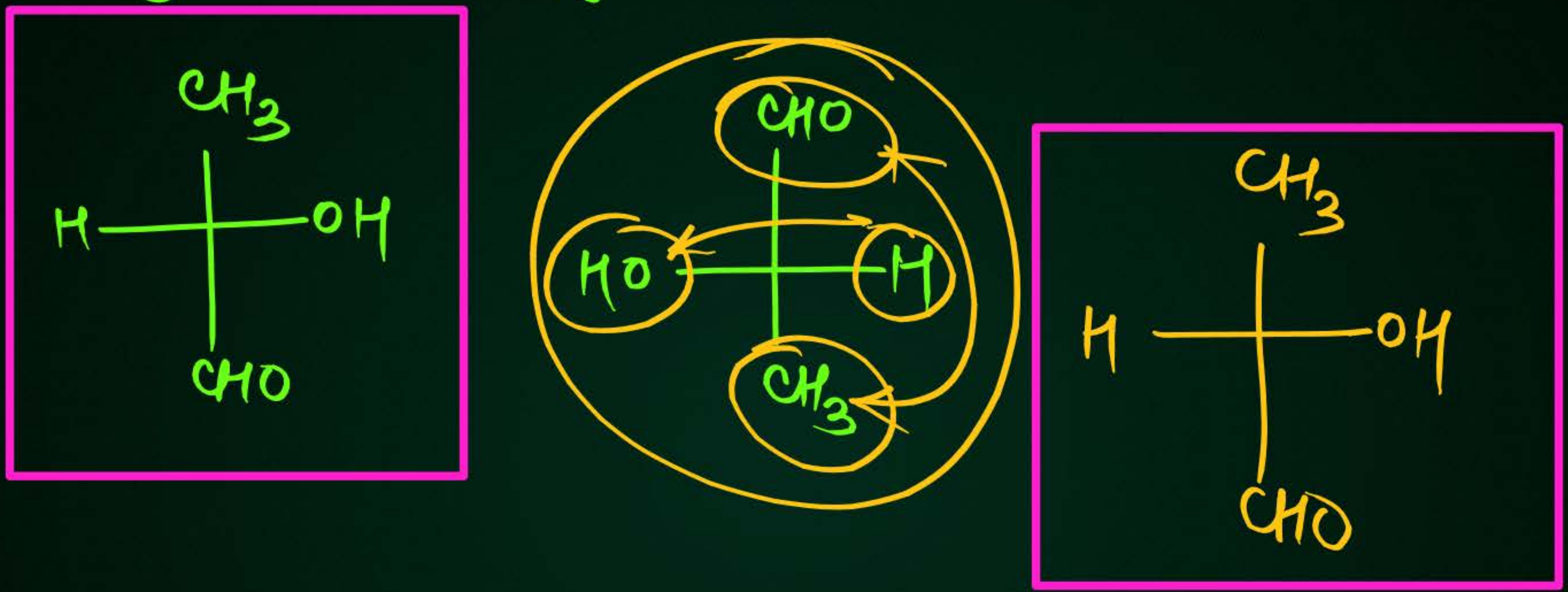

CH3
H
Cl
H3C
Cl
H
H
CH3


CH3
H
Cl
Cl
H
CH3



Identical

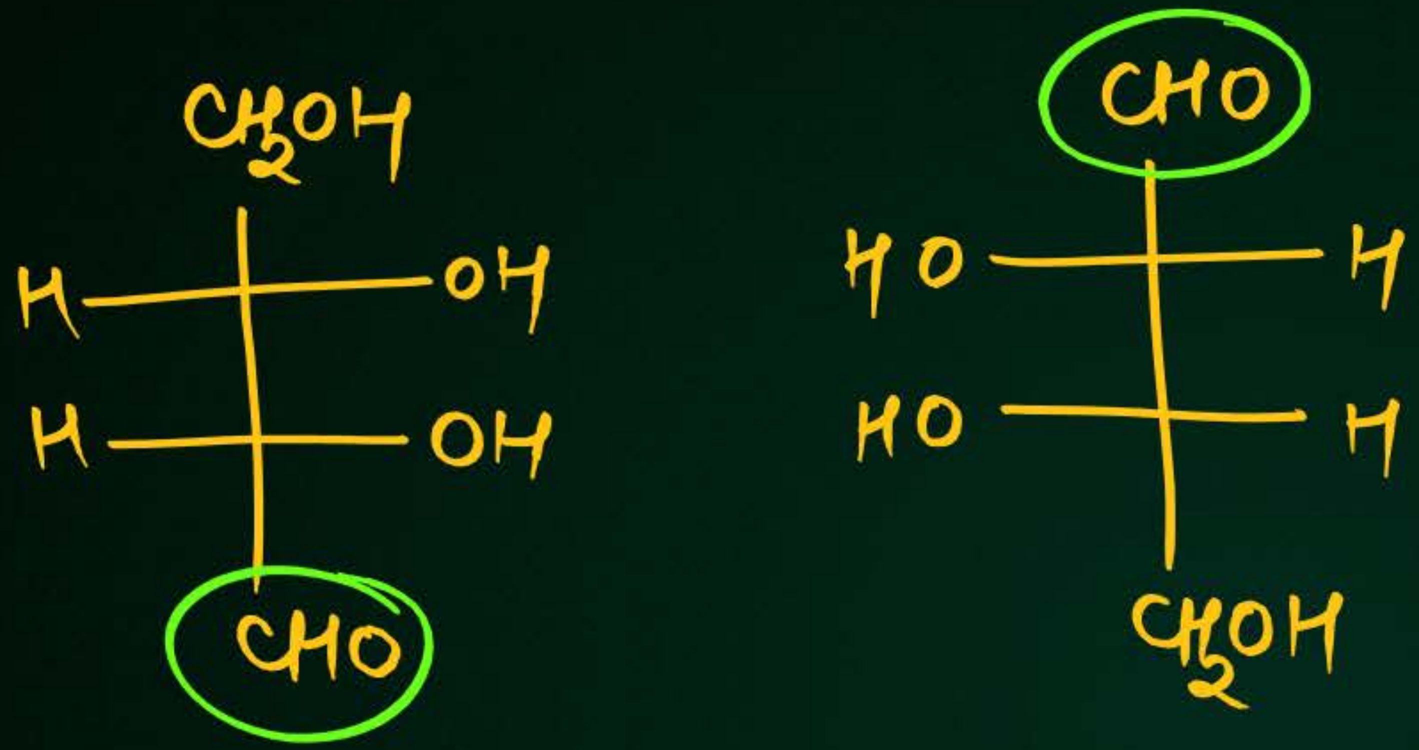
By rotating 180° of any comp we get identical molecule.



CH_3
H
OH
CHO
CHO
HO
H
CH_3
CH_3
H
OH
CHO

Identical

Q** find relation


CH2OH
H
OH
H
OH
CHO
CHO
HO
H
HO
H
CH2OH

Identical

Home Work From PW Module (Yakeen NEET)

Prarambh: Q 102

Prabal: Q 23, 27

Parikshit: Q 32

Thank you!!

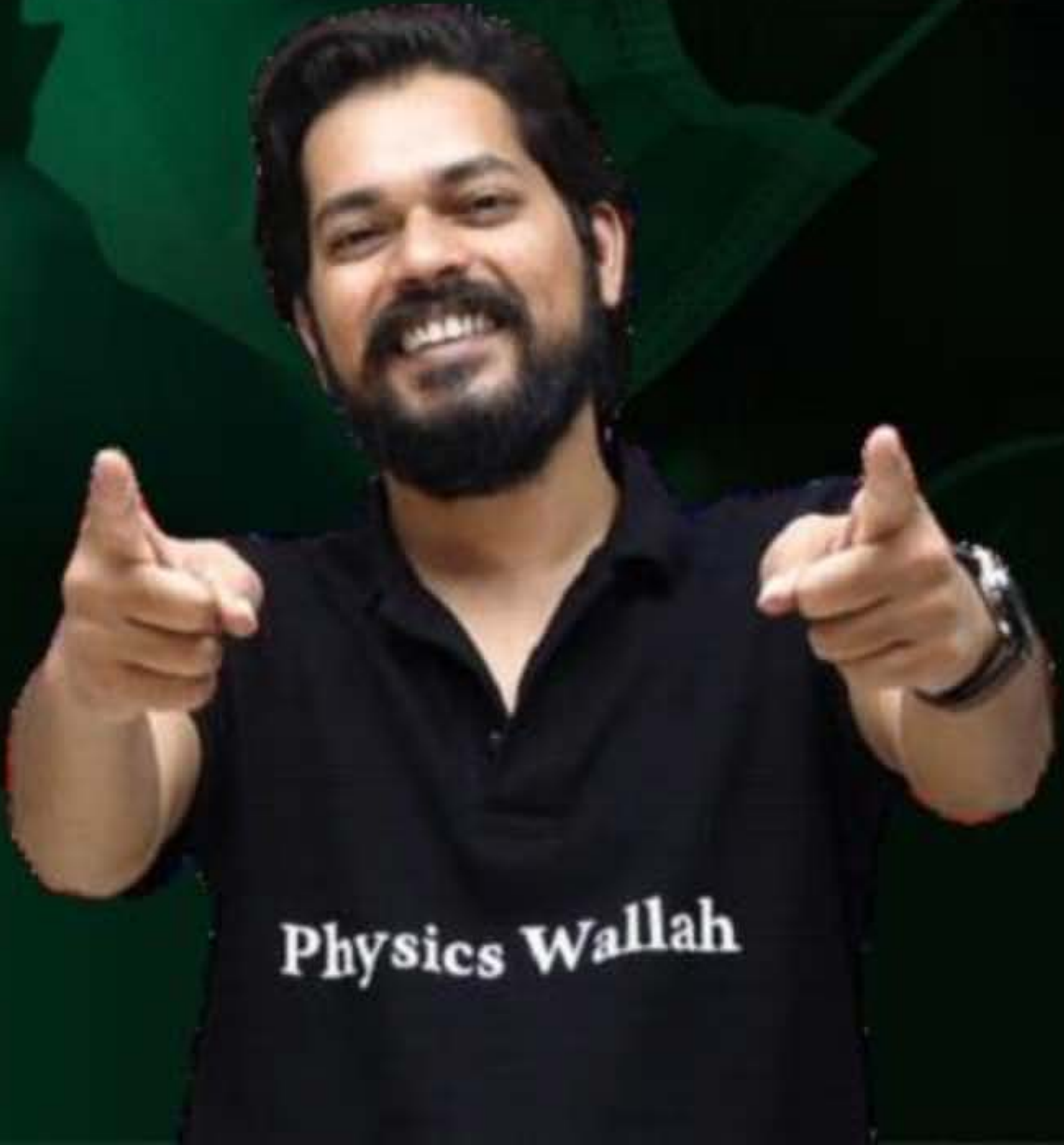
YAKEEN 2.0

FOR NEET 2025

Lecture- 10 | **Organic Chemistry**

Some Basic Principles and Techniques (ISOMERISM)

By- Pankaj Sir(POPU MAMA)


Physics Wallah

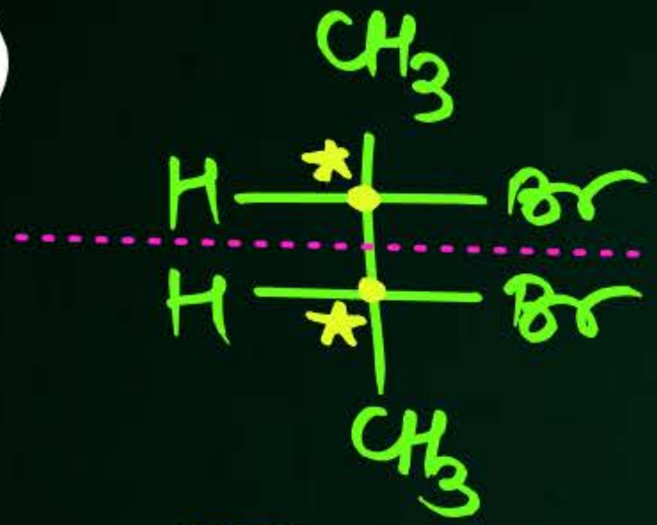
Topics *to be covered*

1. Meso compounds ✓, Racemic Mixture ✓ & Resolution ✓
2. D/L Configuration ✓, Erythro ✓ & Threo
3. Practice

Meso Compounds:

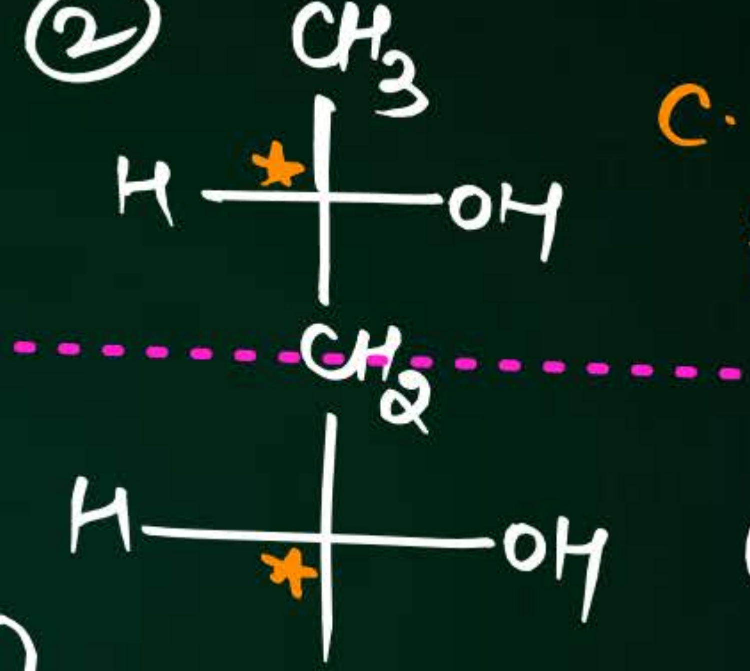
1. Optical isomers having two or more chiral center with POS/COS.

①


CH3
H
Br
H
Br
CH3

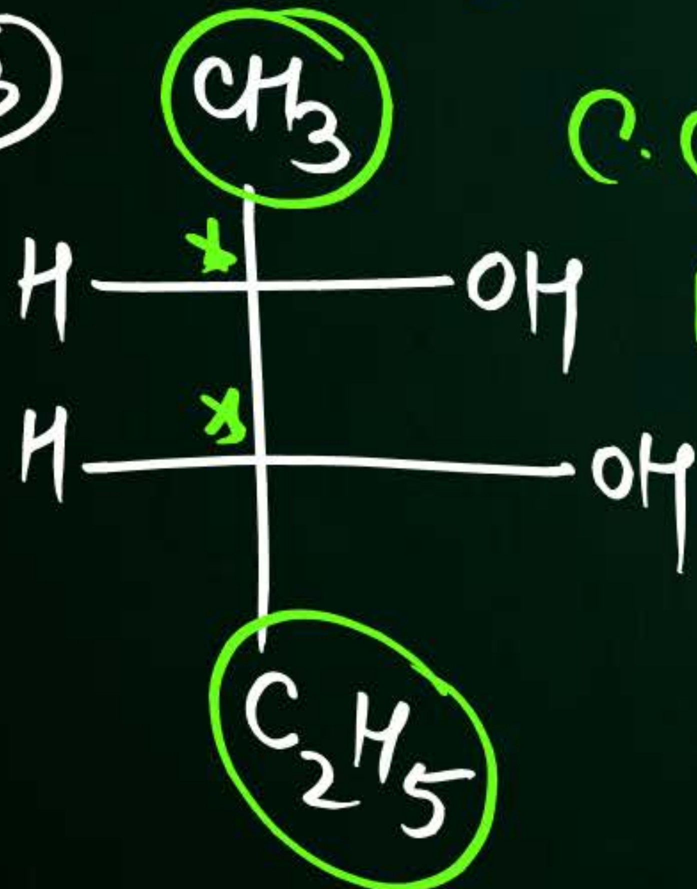
C.car = 2
POS(✓)
Meso(✓)

②


CH3
H
OH
CH2
H
OH

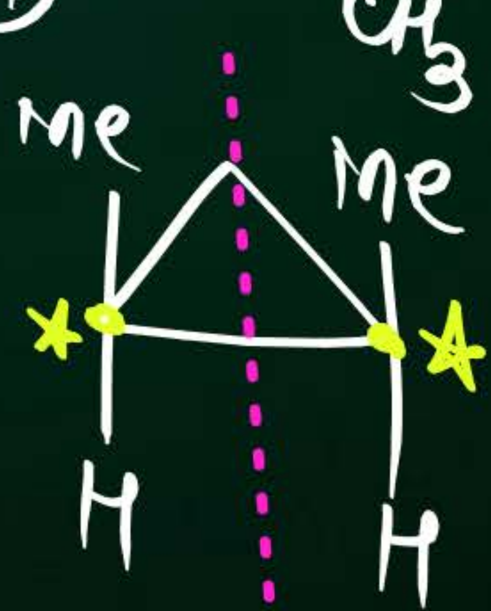
C. Car(2)
POS(✓)
meso(✓)

③


CH3
H
OH
H
OH
C2H5

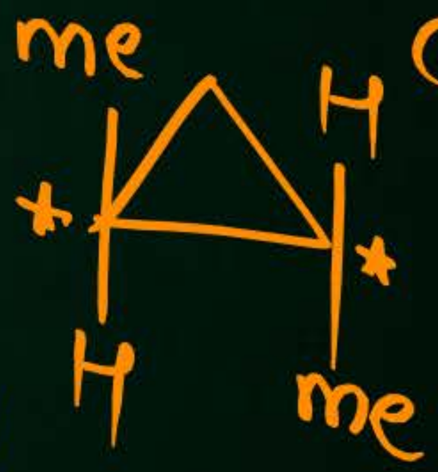
C.Car = 2
POS(X)
meso(X)

④

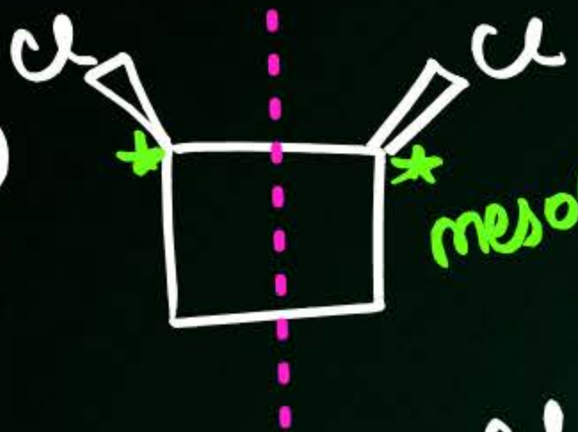


C.Car(2)
POS(✓)
meso(✓)

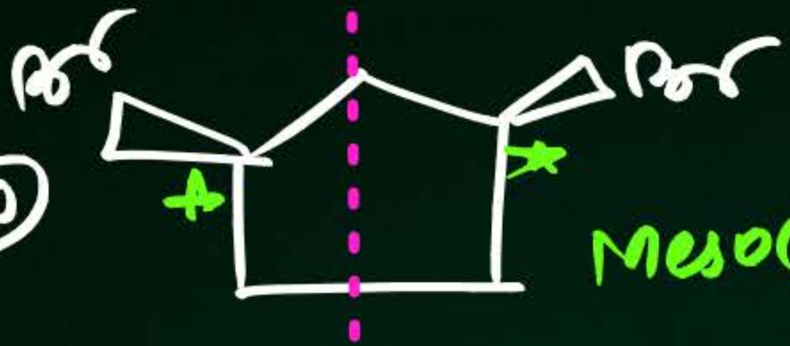
⑤



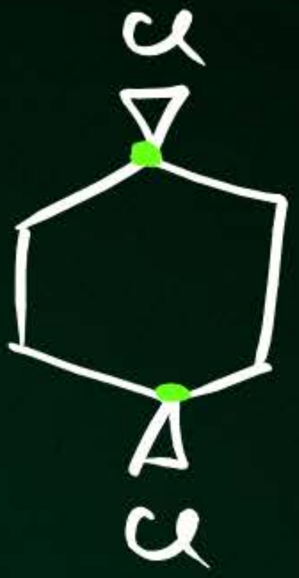
C.Car(2)
POS(X)
meso(X)

⑥


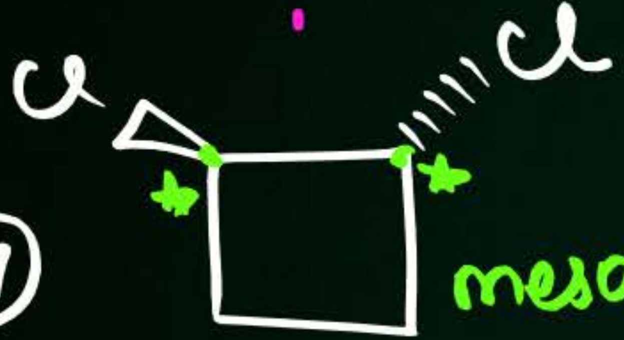
meso(✓)

⑩


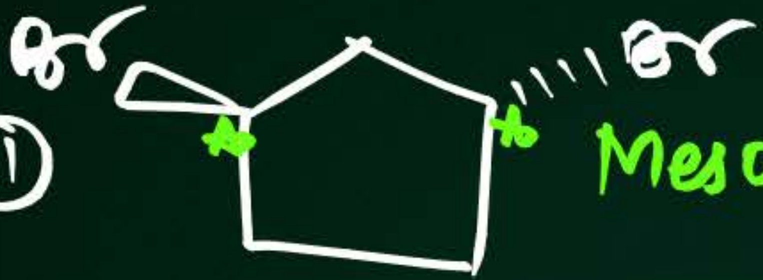
Meso(✓)

⑭


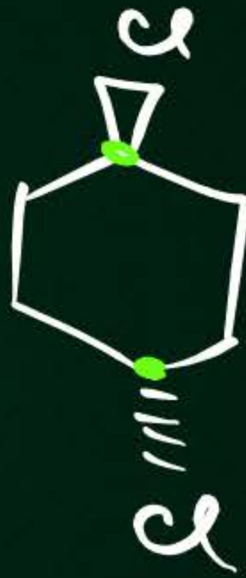
Meso(X)

⑦


meso(X)

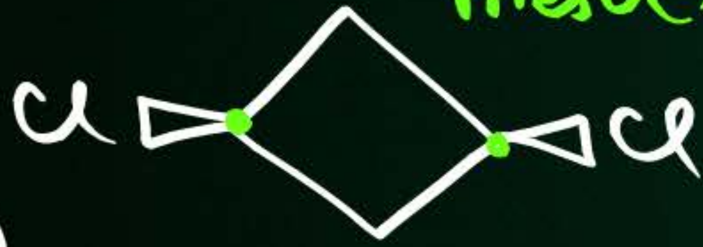
⑪


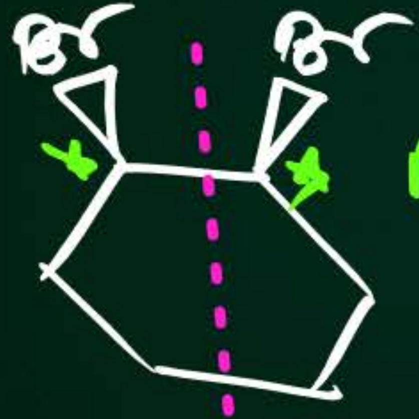
Meso(X)

⑮


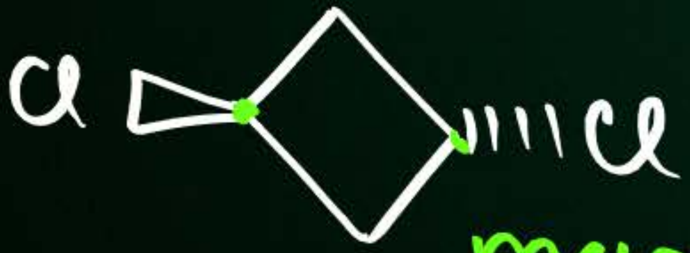
Meso(X)

meso(X)

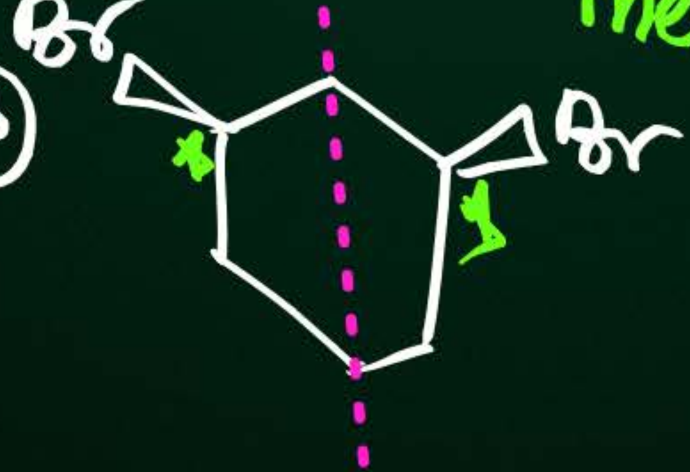
⑧


⑫


Meso(✓)

⑨


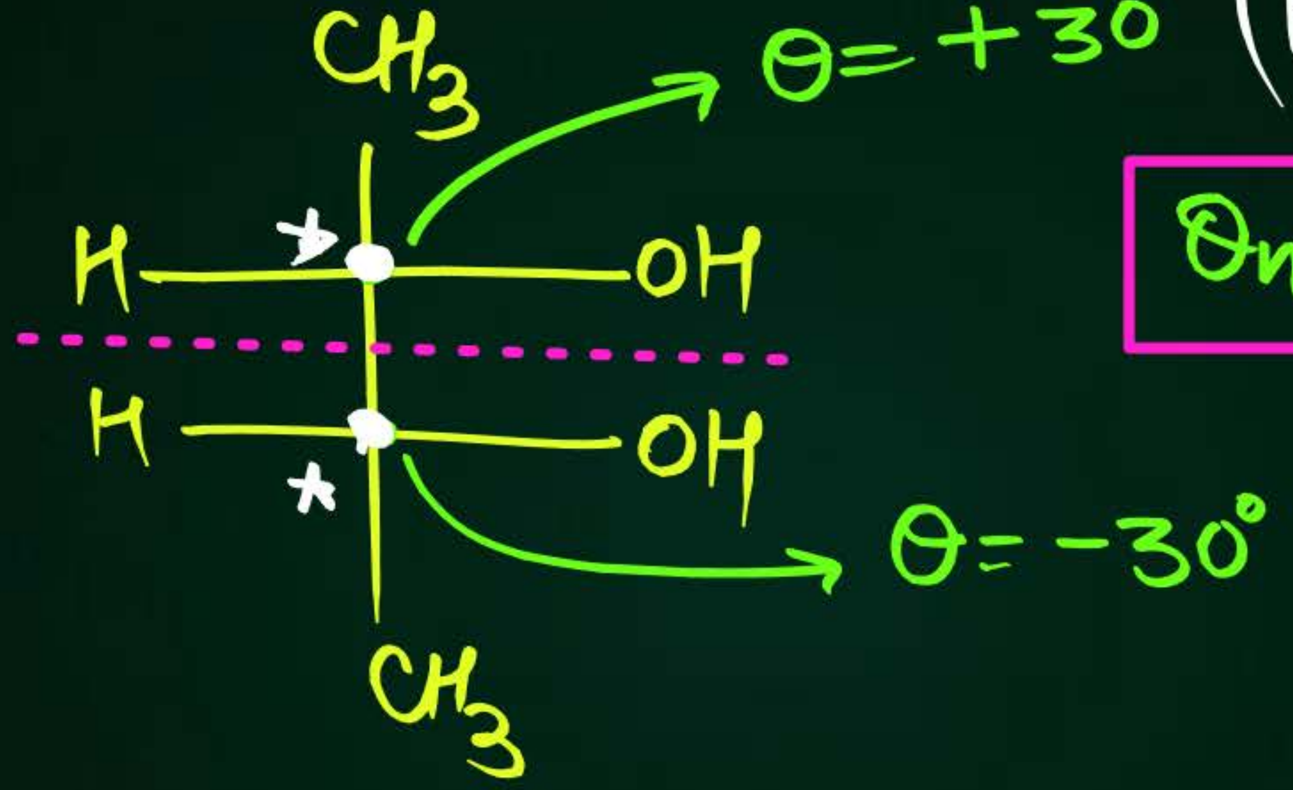
meso(X)

⑬


meso(✓)

2. Meso compounds are optically inactive due to internal compensation.

↓ Cancellation of optical rotation


CH3
H
OH
H
OH
CH3
*
*
θ = +30°
θ = −30°

(Polarimeter Exp)

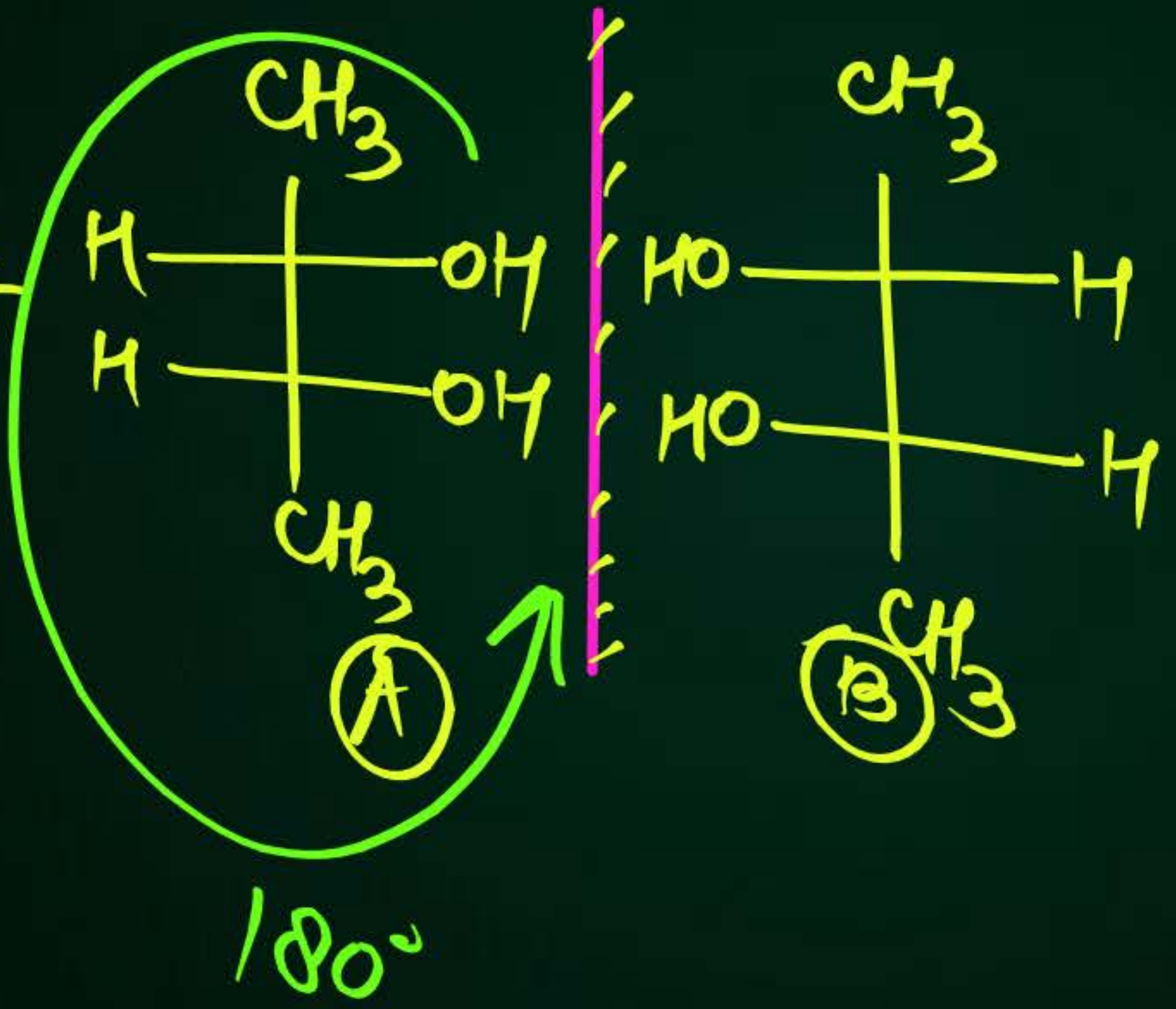
$\boxed{\theta_{net} = 0}$

Optically Inactive

3. Mirror image of meso compounds represent its identical molecule.

4. Meso compounds cannot have enantiomers.

Ⓐ & Ⓑ are identical

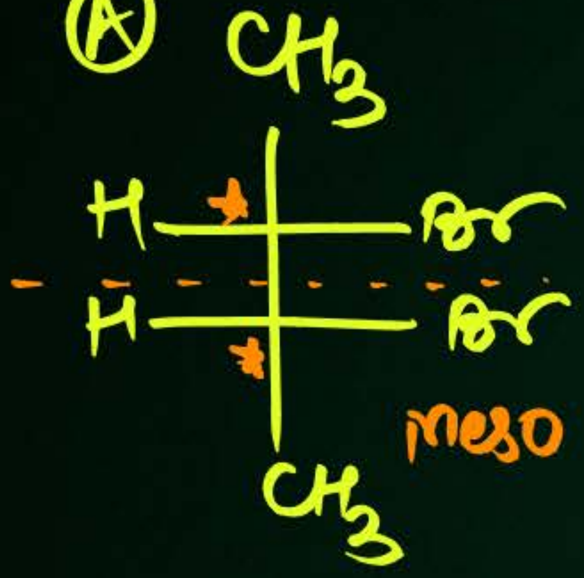

CH3
H
OH
H
OH
CH3
Ⓐ
180°
CH3
HO
H
HO
H
CH3
Ⓑ

~~Enantiomers~~

Q find the relation

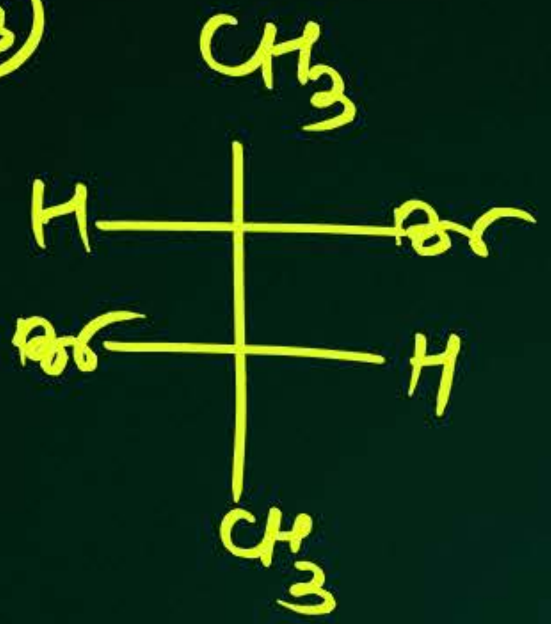
①

Ⓐ

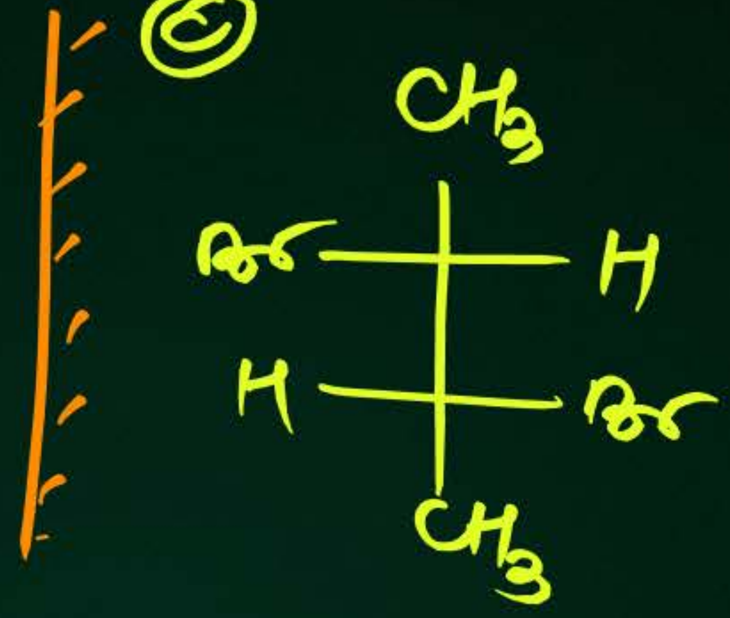

CH3
H
Br
H
Br
CH3

meso

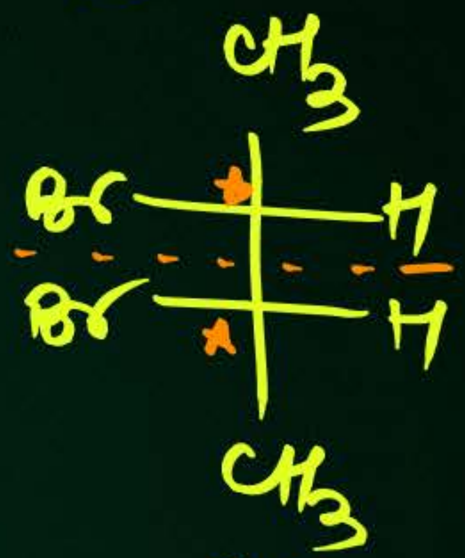
Ⓑ


CH3
H
Br
Br
H
CH3

Ⓒ


CH3
Br
H
H
Br
CH3

Ⓓ


CH3
Br
H
Br
H
CH3

meso

Ⓐ & Ⓑ Dia

Ⓐ & Ⓒ Dia

Ⓐ & Ⓓ Iden

Ⓑ & Ⓒ Enan

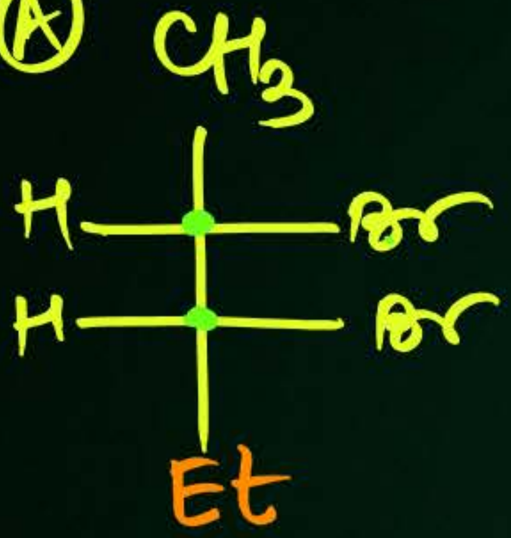
Ⓑ & Ⓓ Dia

Ⓒ & Ⓓ Dia

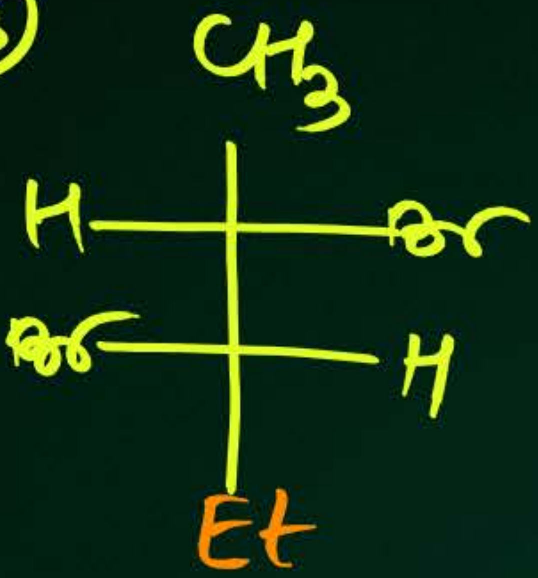
Q find the relation

①

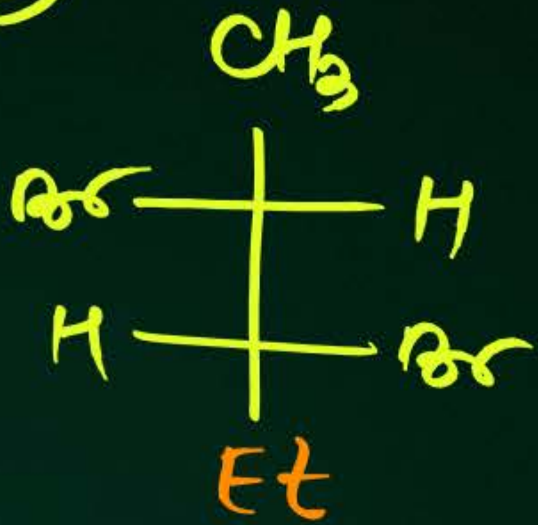
Ⓐ


CH3
H
Br
H
Br
Et

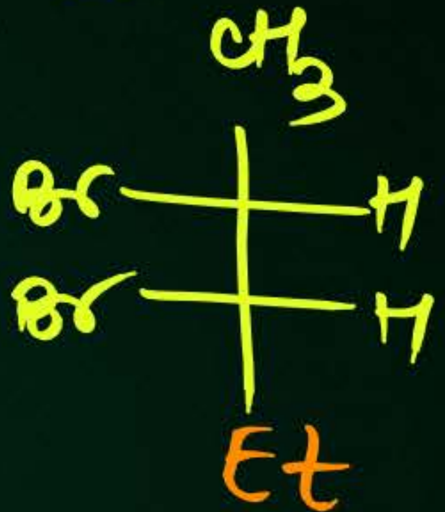
Ⓑ


CH3
H
Br
Br
H
Et

Ⓒ


CH3
Br
H
H
Br
Et

Ⓓ


CH3
Br
H
Br
H
Et

Ⓐ & Ⓑ Dia

Ⓐ & Ⓒ Dia

Ⓐ & Ⓓ Enan

Ⓑ & Ⓒ Enan

Ⓑ & Ⓓ Dia

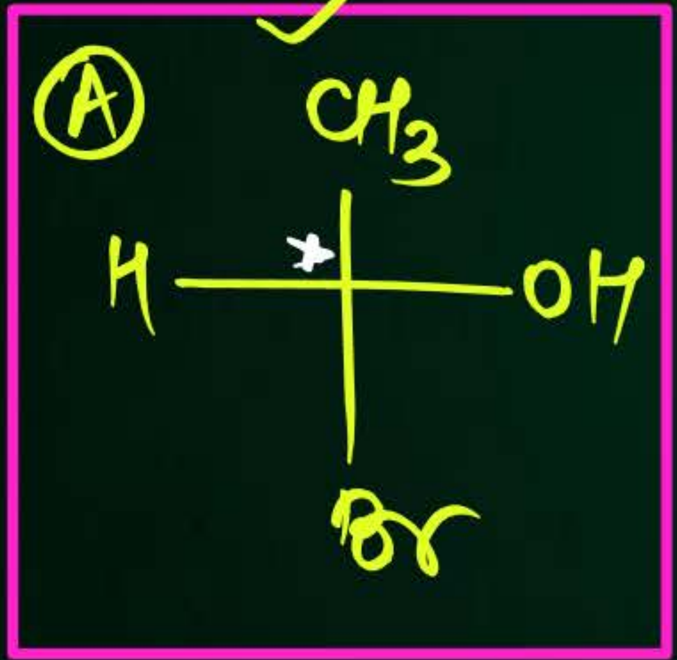
Ⓒ & Ⓓ Dia

Racemic Mixture:

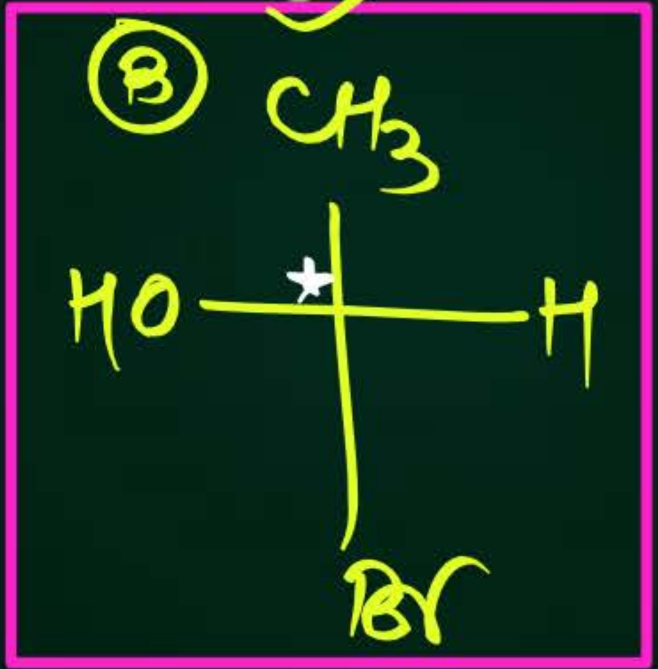
(Enantiomers pair)
R.M

1. Equimolar mixture of two enantiomers.
2. RM is optically inactive due to external compensation.
3. Each enantiomer is optically active.

Ⓐ & Ⓑ are Enan.

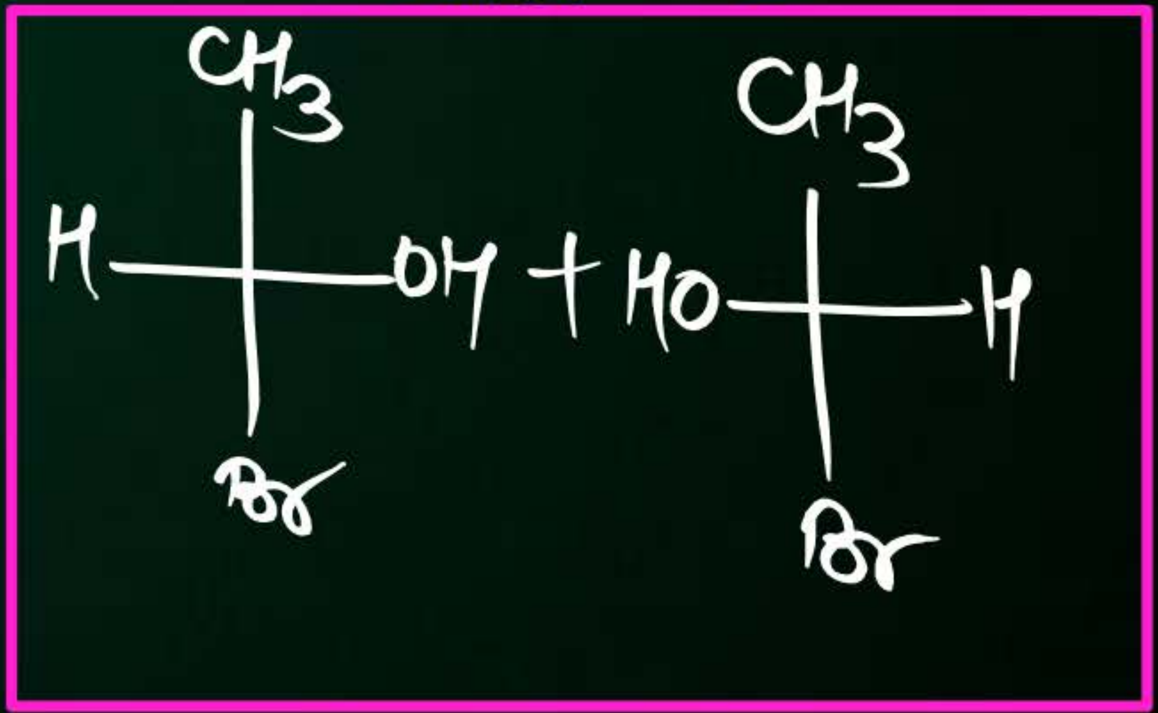


OA
$\theta = +50°$



OA
$\theta = -50°$

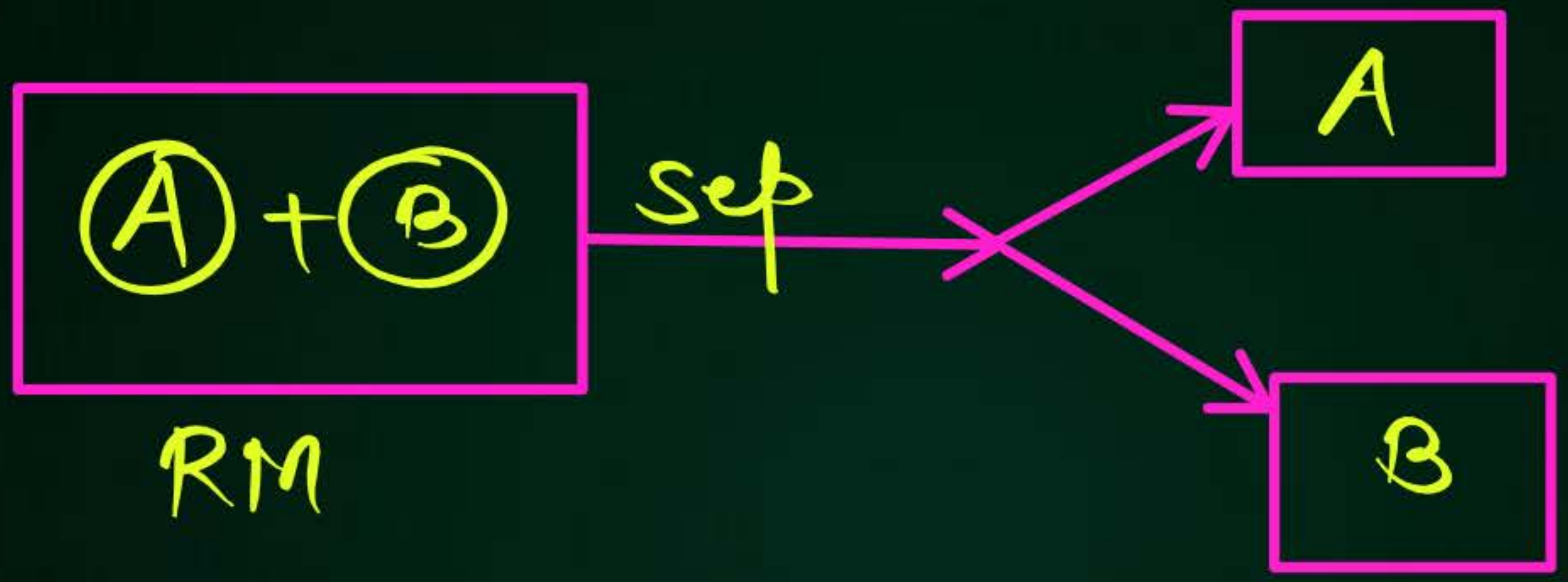
$\theta_{net} = 0$


CH_3
H
OH
+
HO
H
CH_3
Br
Br

O.I.A

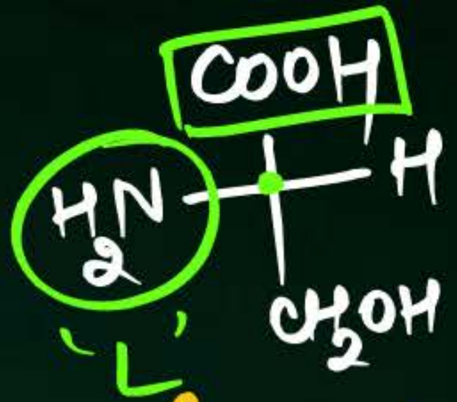
Resolution:

Separation of Enantiomers from RM is called resolution.



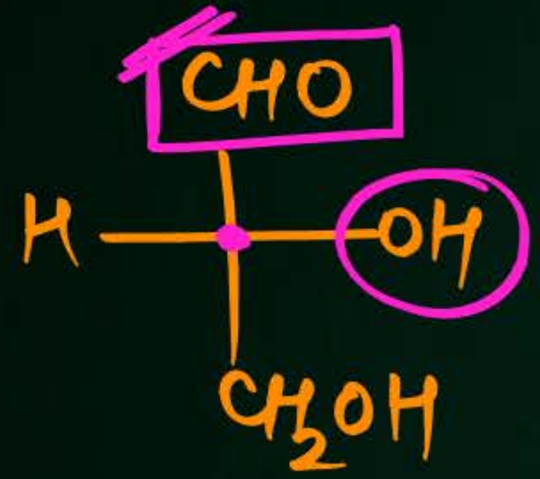
D/L Configuration:

for carbohydrates & Amino acids


COOH
H_2N
H
CH_2OH
'L'

Serine

IUPAC


CHO
H
OH
CH_2OH

D-Glyceraldehyde

1) Top position par highest priority group rakhenge

2) vertical par 'C' hone chaiye

3) check Last chiral carbon

If 'OH'/NH_2 Right 'D'

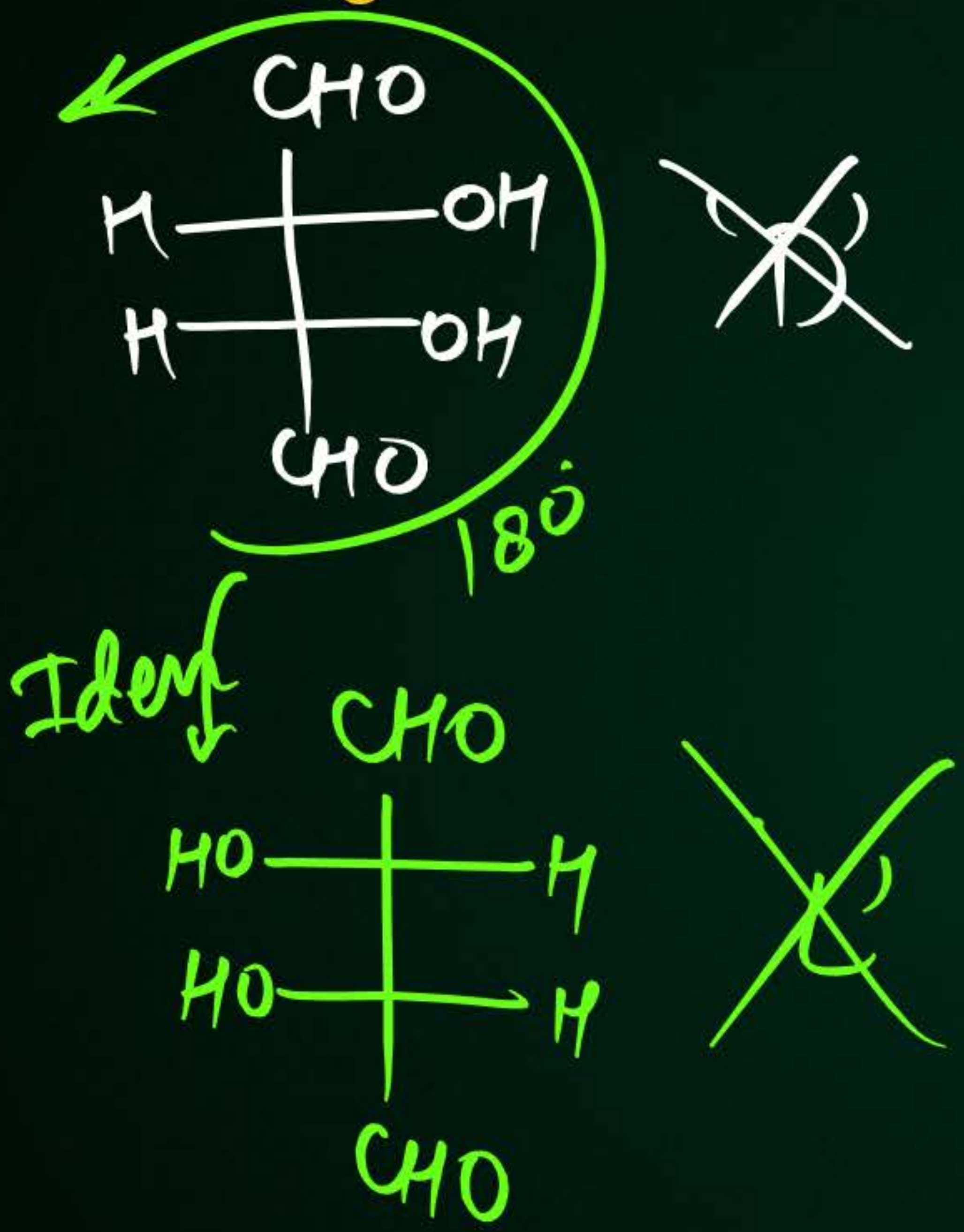
If 'OH'/NH_2 left 'L'

maha op point

'D' ka matlab 'd' nahi hota

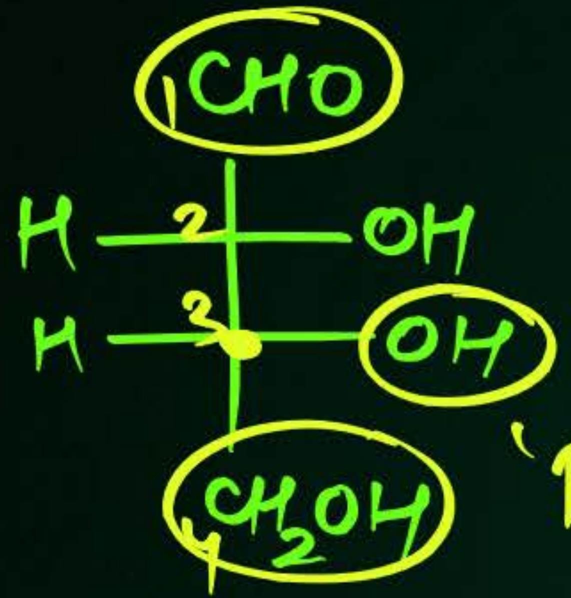
'L' " " 'l' " "

D/L config is not valid for symm comp:


CHO
H
OH
H
OH
CHO
180°
Iden
CHO
HO
H
HO
H
CHO

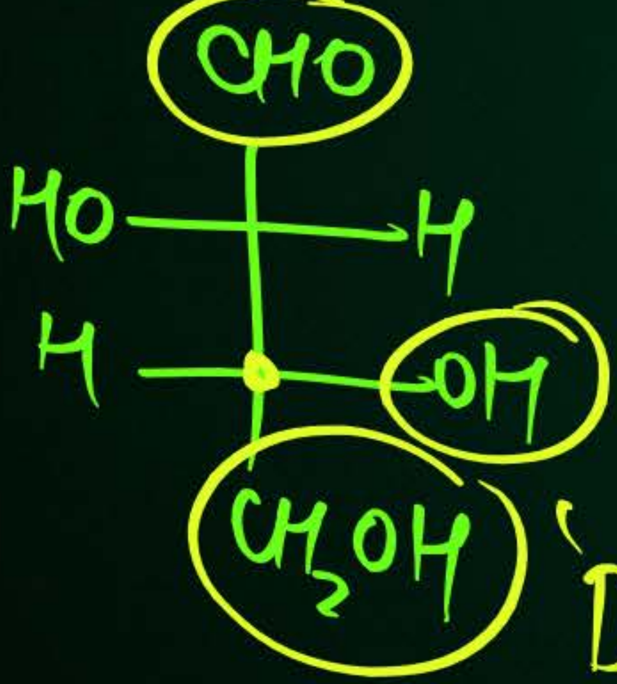
Q find 'D' or 'L' ?

①


CHO
H
2
OH
H
3
OH
CH2OH
4

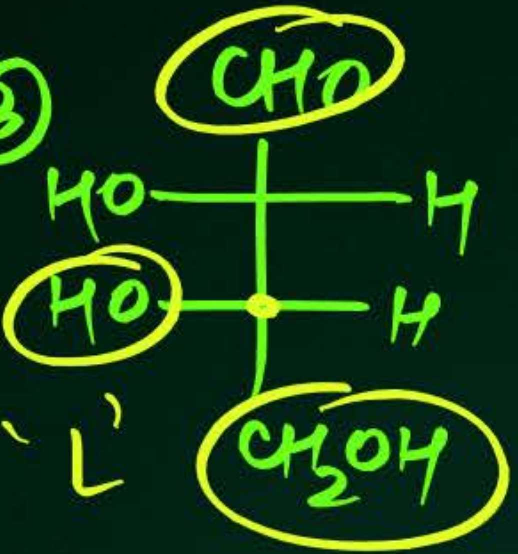
'D'

②


CHO
HO
H
H
OH
CH2OH

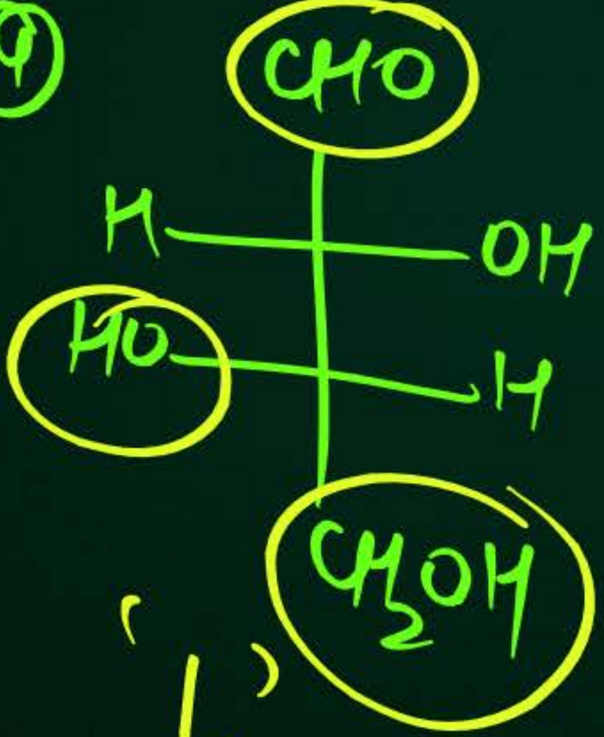
'D'

③


CHO
HO
H
HO
H
CH2OH

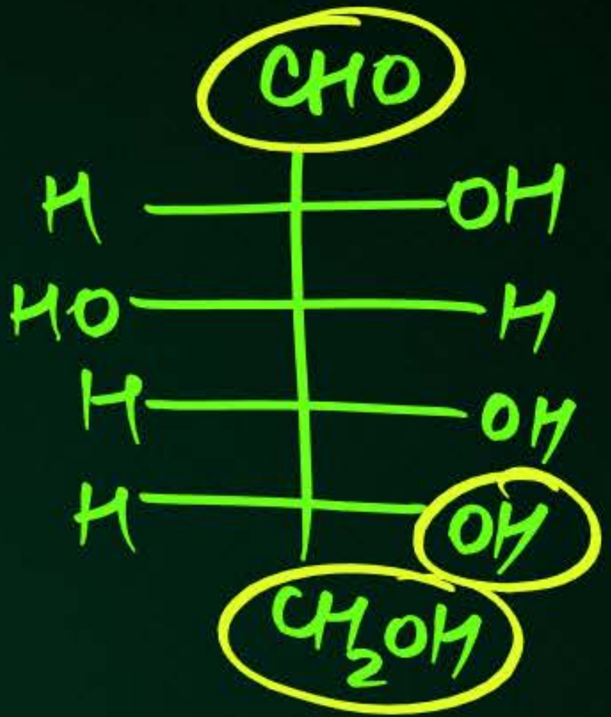
'L'

④


CHO
H
OH
HO
H
CH2OH

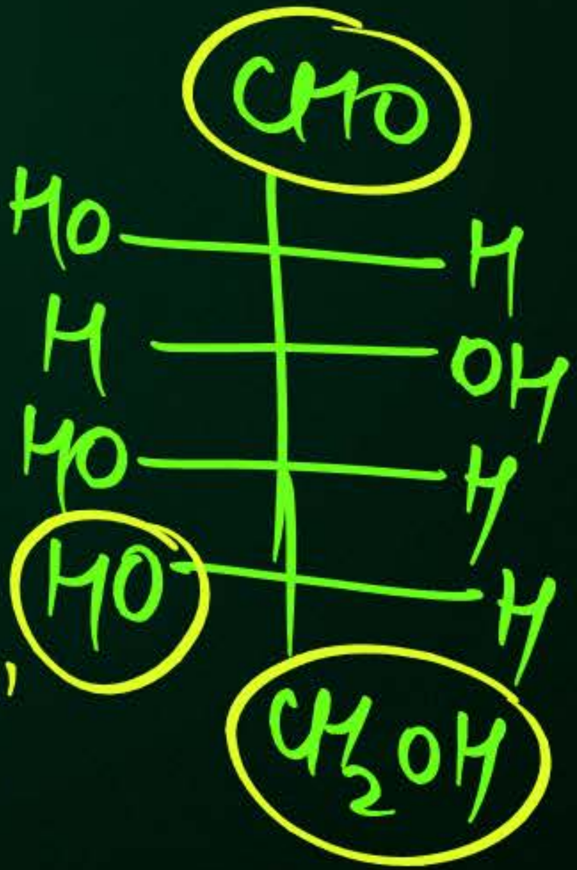
'L'

⑤


CHO
H
OH
HO
H
H
OH
H
OH
CH2OH

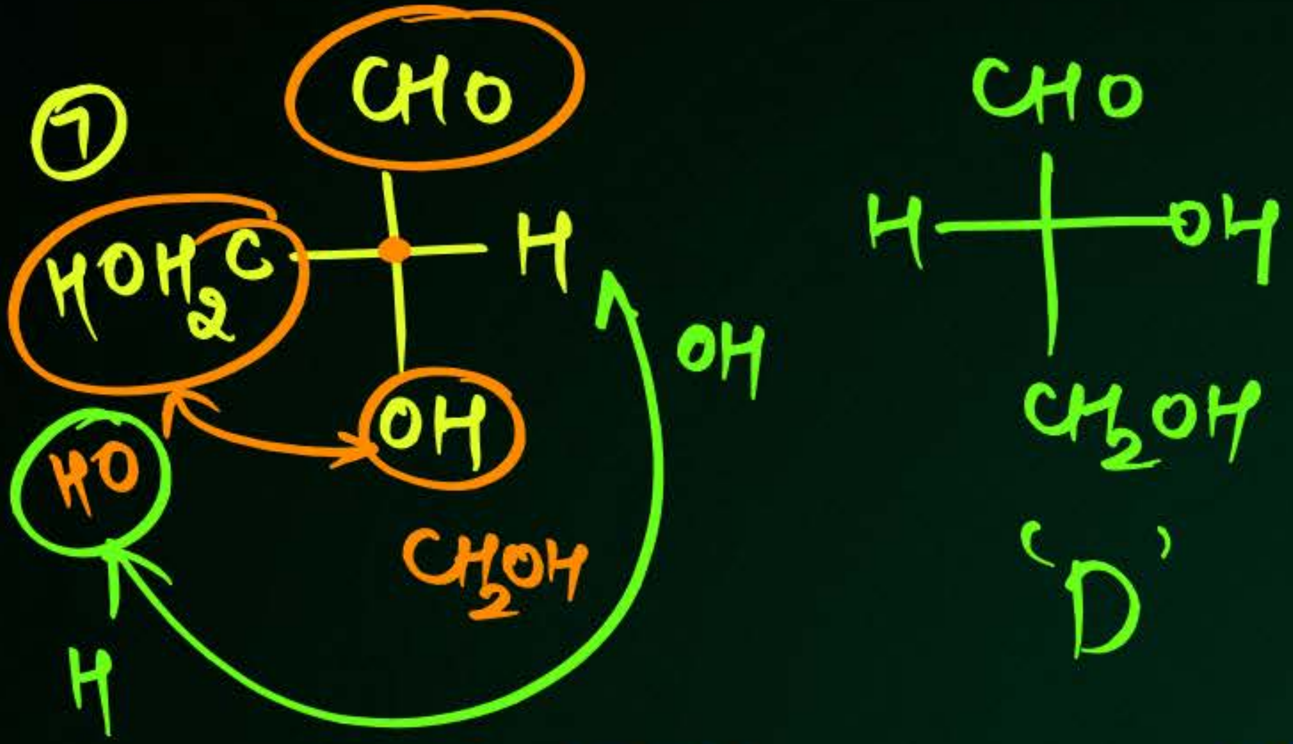
'D'

⑥

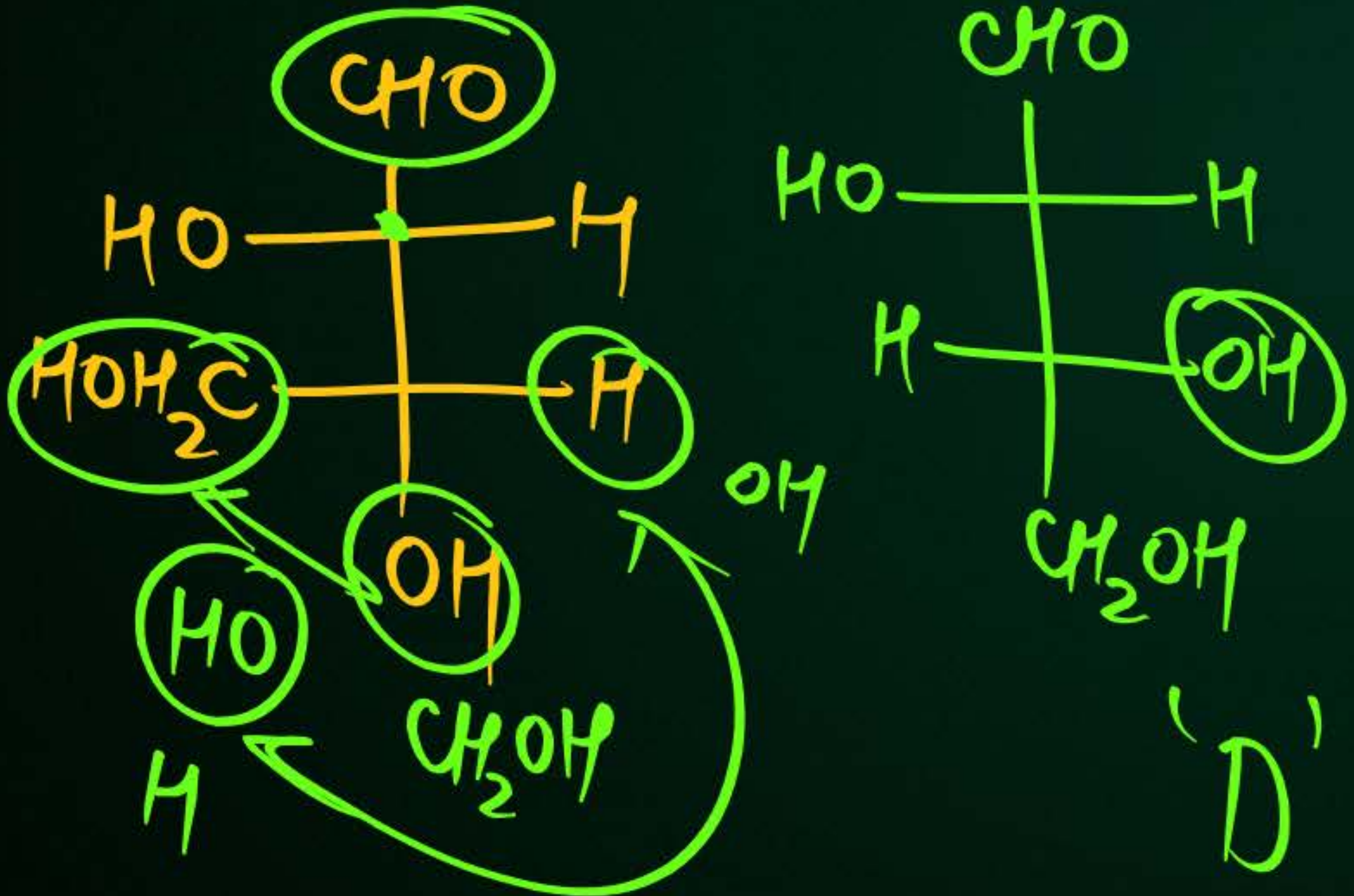

CHO
HO
H
H
OH
HO
H
HO
H
CH2OH

'L'

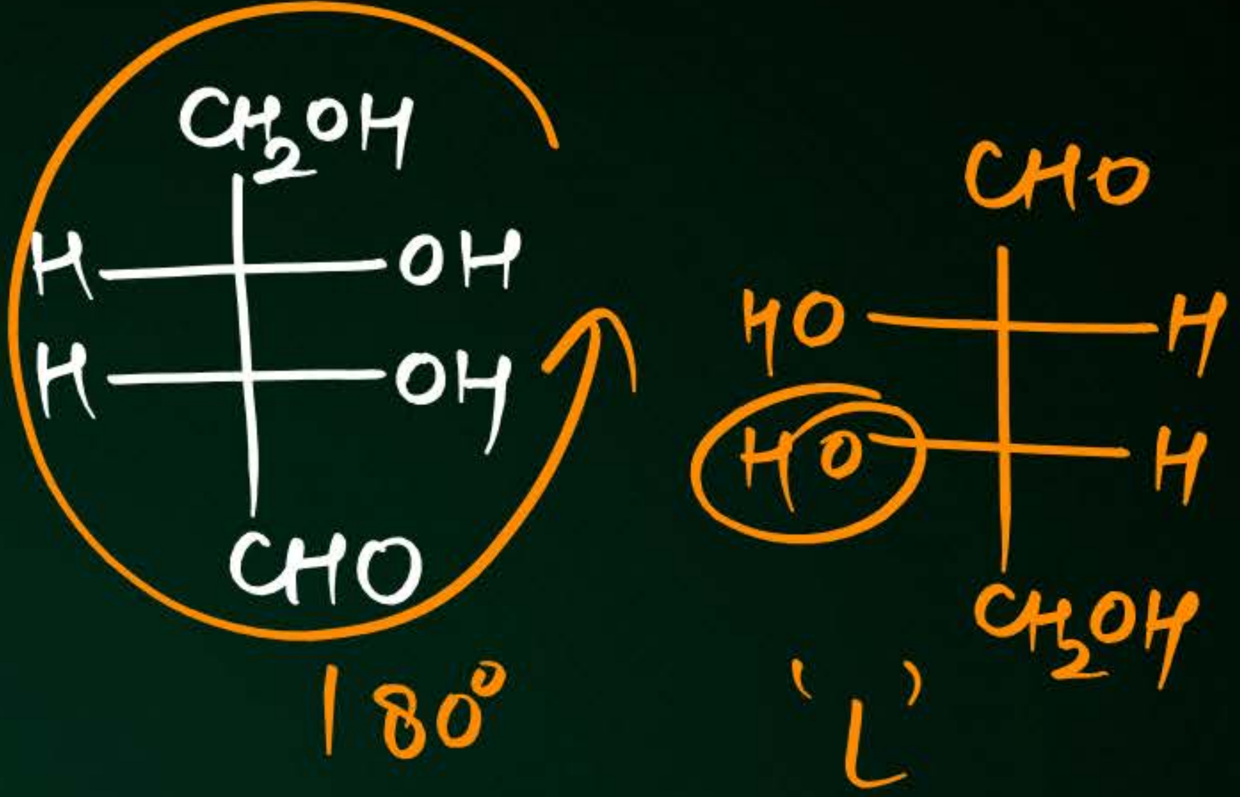
⑦


CHO
HOH₂C
H
OH
HO
H
CH₂OH
CHO
H
OH
CH₂OH
'D'

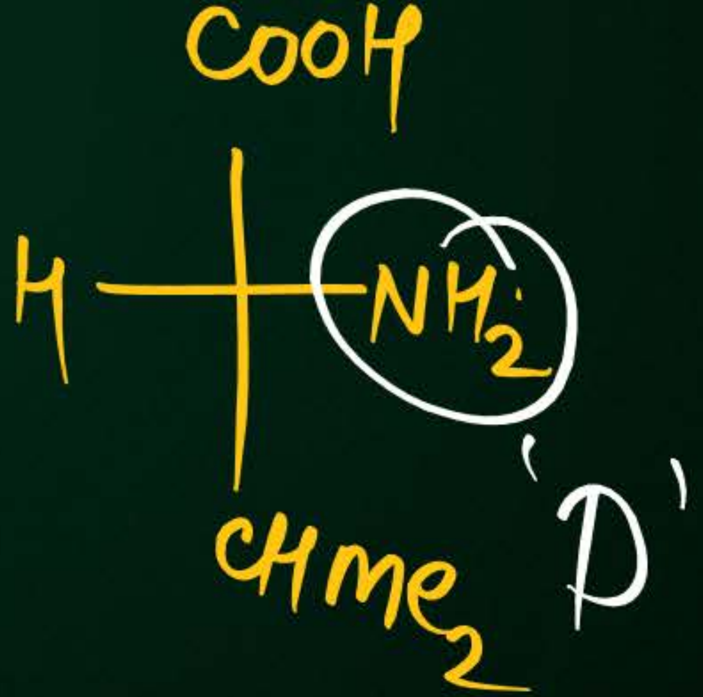
⑧


CHO
HO
H
HOH₂C
H
OH
OH
HO
H
CH₂OH
CHO
HO
H
H
OH
CH₂OH
'D'

⑨


CH₂OH
H
OH
H
OH
CHO
180°
CHO
HO
H
HO
H
CH₂OH
'L'

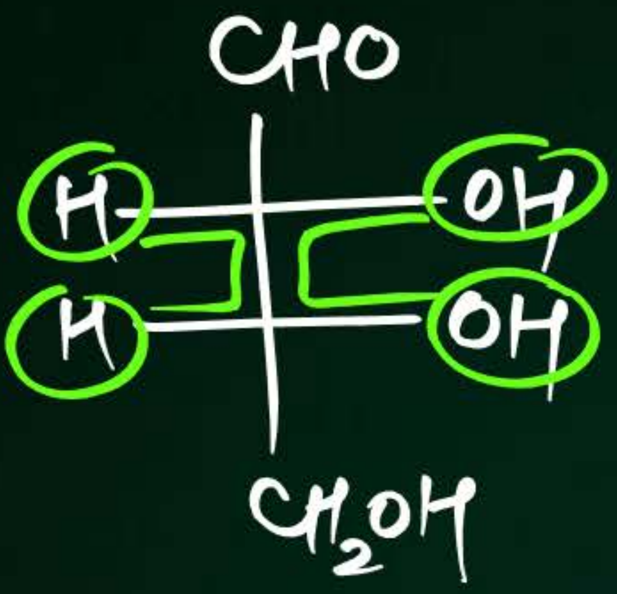
⑩


COOH
H
NH₂
CHMe₂
'D'

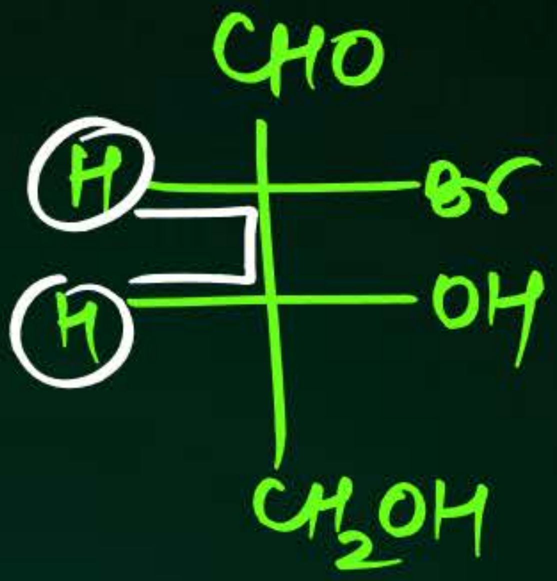
Erythro/Threo:

↓ same side

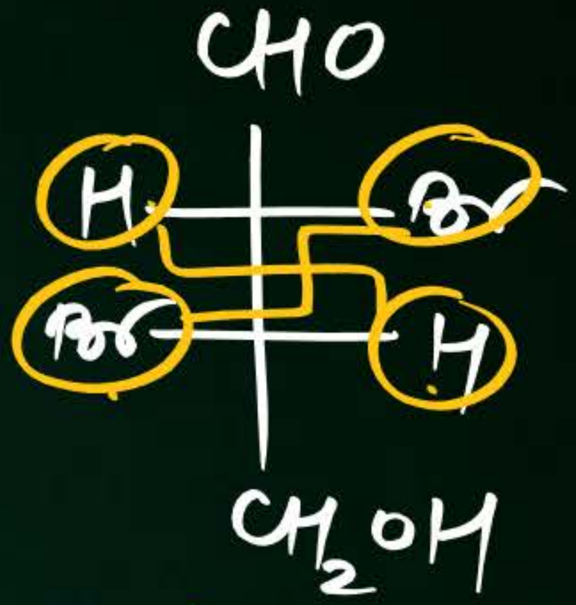
↓ opp side


CHO
H
OH
H
OH
CH_2OH

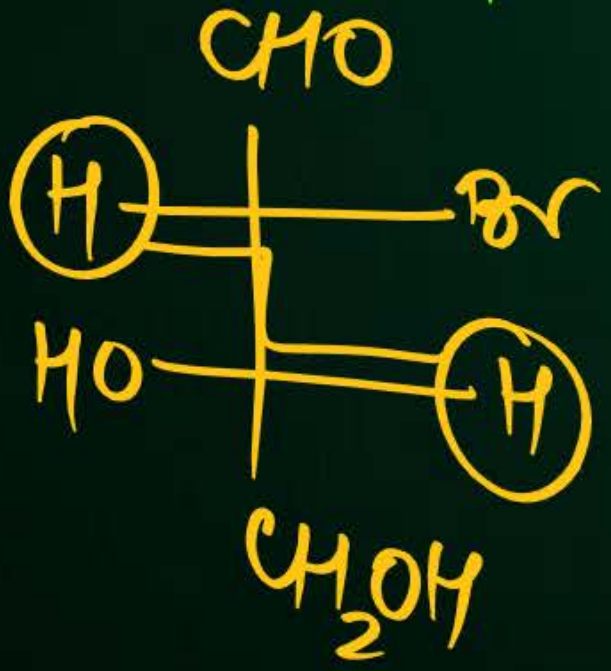
Erythro


CHO
H
Br
H
OH
CH_2OH

Erythro


CHO
H
Br
Br
H
CH_2OH

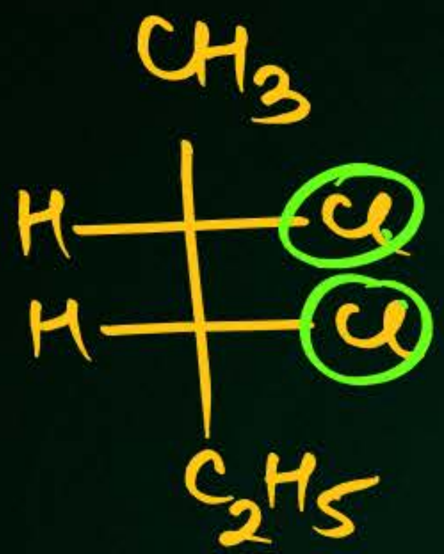
Threo


CHO
H
Br
HO
H
CH_2OH

Threo

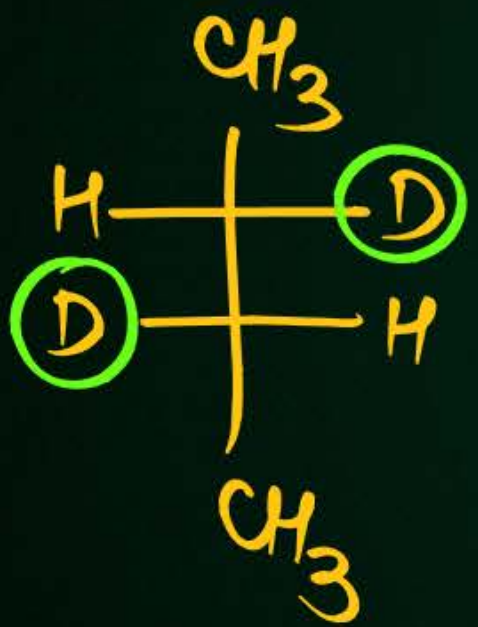
Q/

1)


CH3
H
Cl
H
Cl
C2H5

E

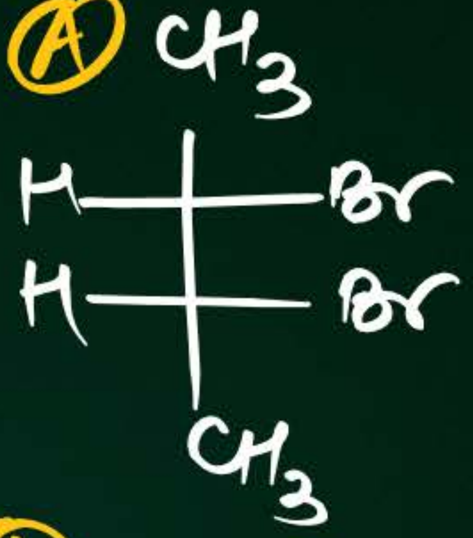
2)


CH3
H
D
D
H
CH3

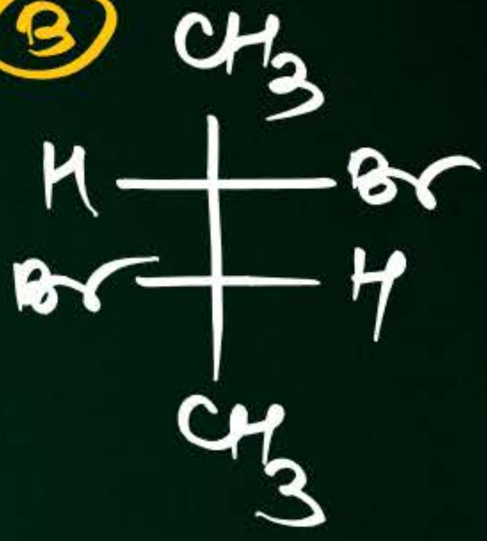
T

E & T of same M.F are dia.

Ⓐ


CH3
H
Br
H
Br
CH3

Ⓑ


CH3
H
Br
Br
H
CH3

Ⓐ → Ery

Ⓑ → Threo

Ⓐ & Ⓑ are diastereo

Epimers & Anomers

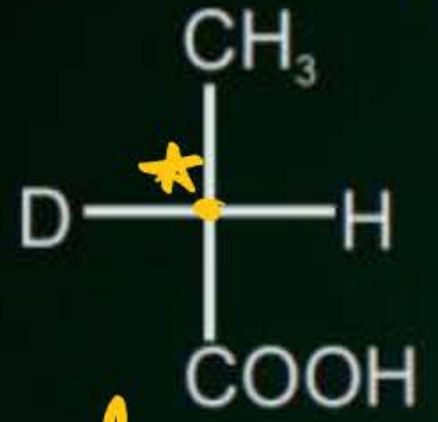
Biomolecule
main karenge

QUESTION

O·A ↑ OIA ↑

Identify which compound is resolvable & Non-resolvable?

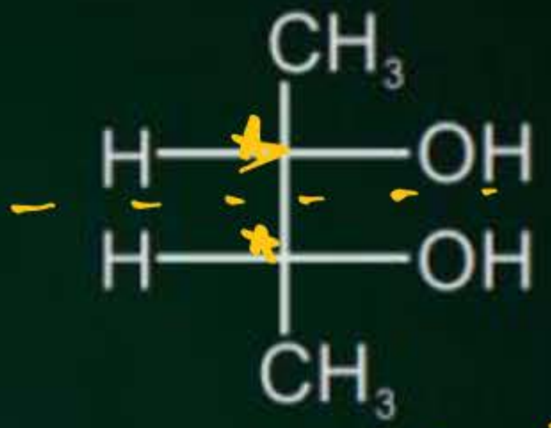
A



always OA

resolvable

B


CH3
H
OH
H
OH
CH3

meso(✓)

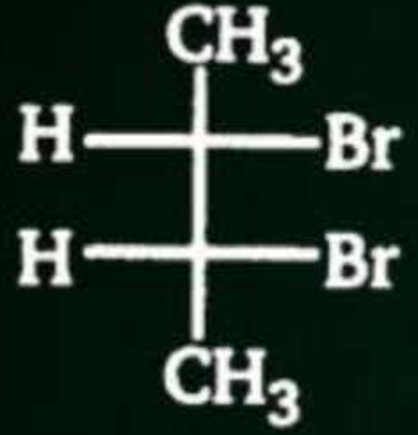
OIA

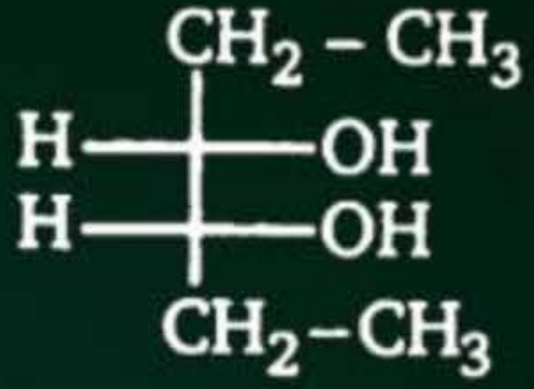
Non resolvable

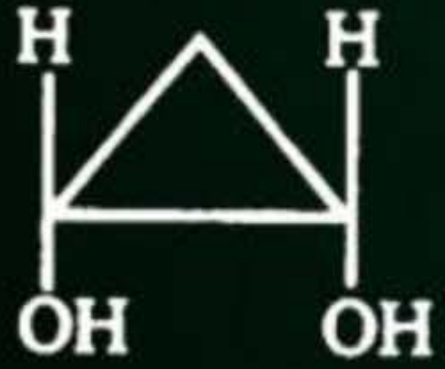
Home Work

QUESTION 01

Which of the following is a meso compound?

(A) 
CH3
H
Br
H
Br
CH3

(B) 
CH2 – CH3
H
OH
H
OH
CH2–CH3

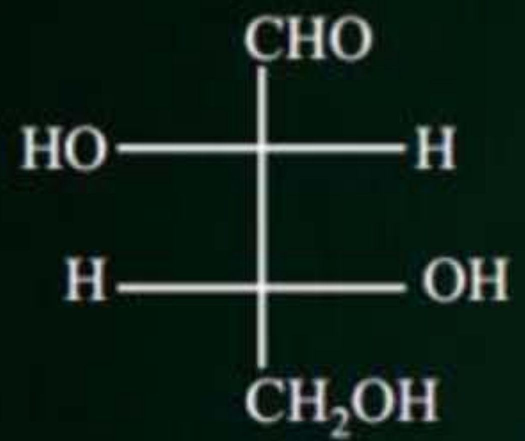
(C) 

(D) All of these

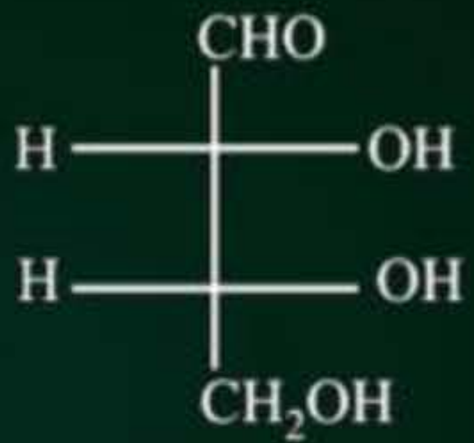
QUESTION 02

Which among the following compound has (L) configuration?

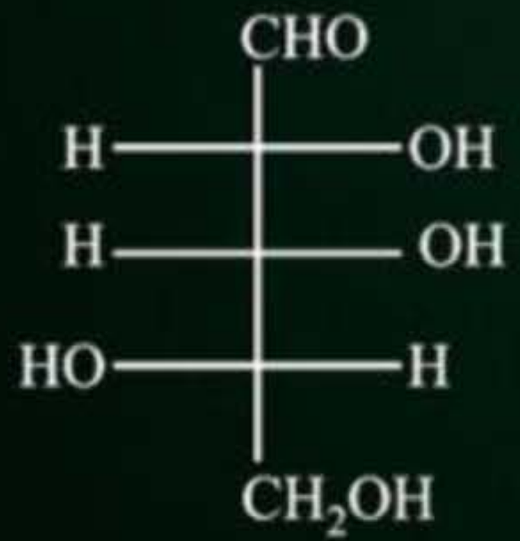
A


CHO
HO
H
H
OH
CH₂OH

B


CHO
H
OH
H
OH
CH₂OH

C


CHO
H
OH
H
OH
HO
H
CH₂OH

D NOT

QUESTION 03

The separation of a racemic mixture into pure enantiomers is termed as:

Ⓐ Racemization

Ⓑ Isomerization

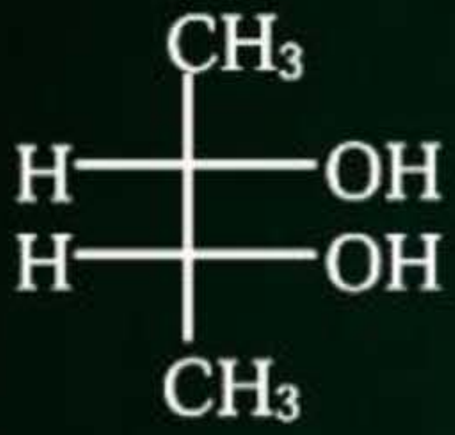
Ⓒ Resolution

Ⓓ Equilibration

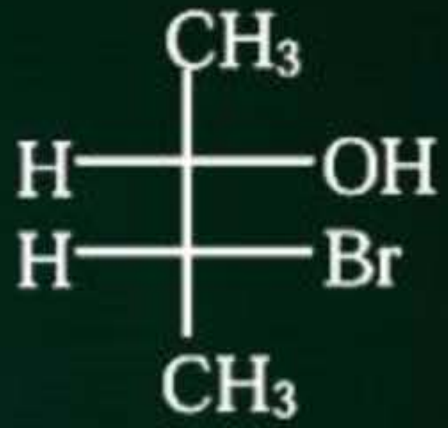
QUESTION 04

Which of the following structures represents a threo-stereoisomer?

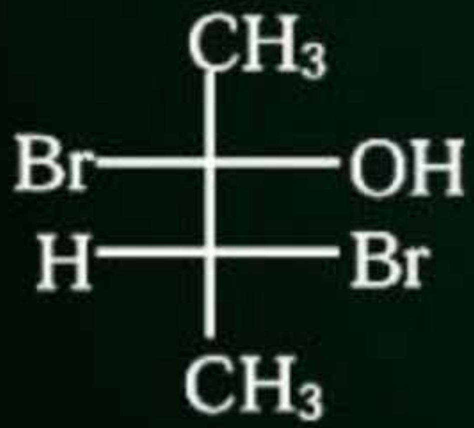
A


CH$_3$
H
OH
H
OH
CH$_3$

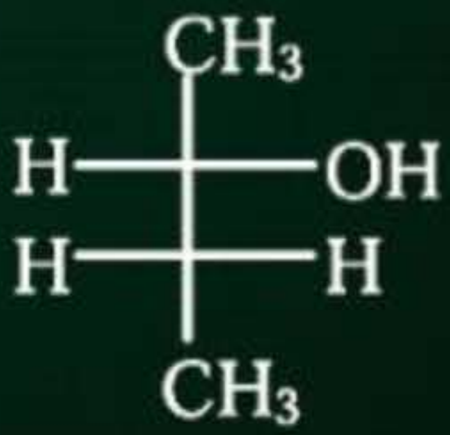
B


CH$_3$
H
OH
H
Br
CH$_3$

C


CH$_3$
Br
OH
H
Br
CH$_3$

D


CH$_3$
H
OH
H
H
CH$_3$

QUESTION 05

Which of the following statements is not correct D-(+) glyceraldehyde?

- **A** The symbol D indicates the dextrorotatory natures of the compound.
- **B** The sign (+) indicates the dextrorotatory nature of the compound.
- **C** The symbol D indicates that hydrogen atom lies left to the chiral centre in the Fischer projection diagram.
- **D** The symbol D indicates that hydrogen atom lies left to the chiral centre in the Fischer projection diagram.

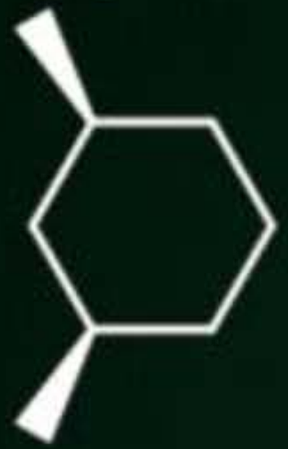
QUESTION 06

Which of the following statements for a meso compound is incorrect ?

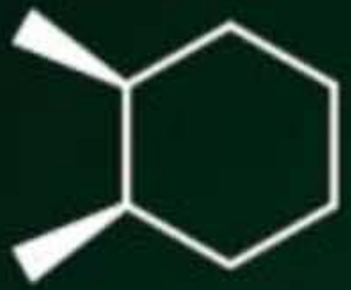
- A The meso compound has either a plane or a point of symmetry.
- B The meso compound has at least one pair of similar stereocenters.
- C The meso compound is achiral.
- D The meso compound is formed when equal amounts of two enantiomers are mixed.

QUESTION 07

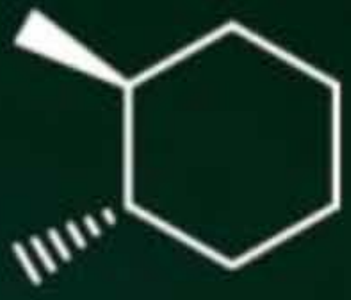
The molecule(s) that exist as meso structure(s)



(K)



(L)



(M)

A Only M

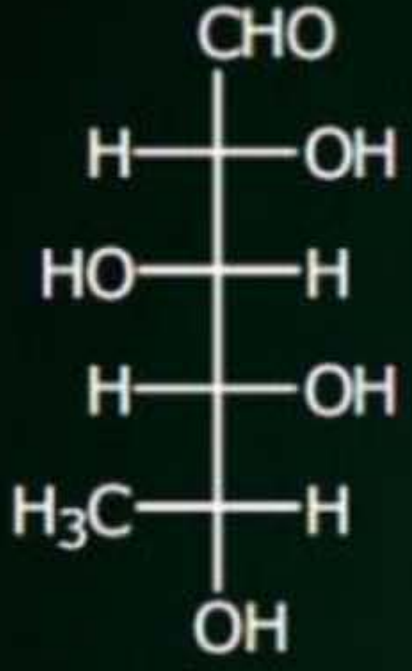
B Both K and L

C Only L

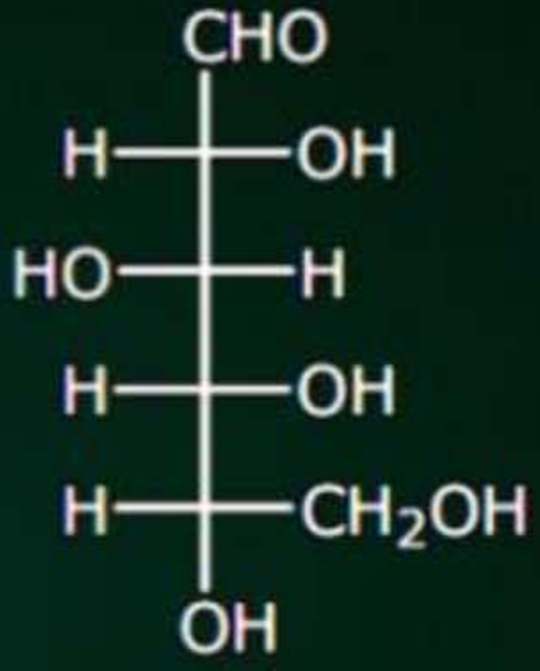
D Only K

QUESTION 08 Which of the following are L sugars.

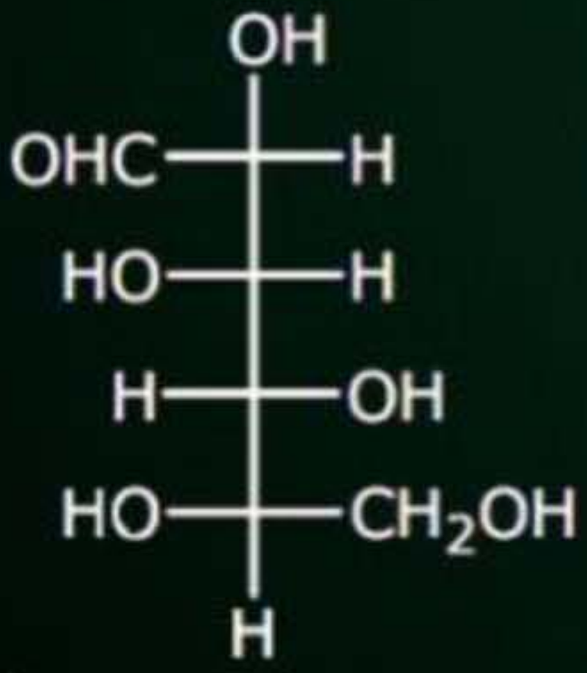
(A)


CHO
H
OH
HO
H
H
OH
H_3C
H
OH

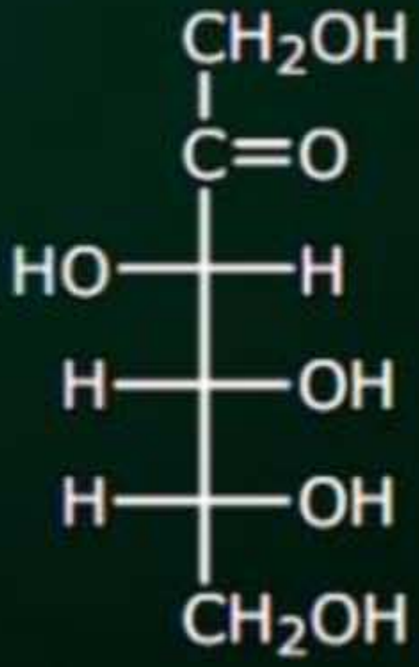
(B)


CHO
H
OH
HO
H
H
OH
H
CH_2OH
OH

(C)


OH
OHC
H
HO
H
H
OH
HO
CH_2OH
H

(D)


CH_2OH
C=O
HO
H
H
OH
H
OH
CH_2OH

QUESTION 09

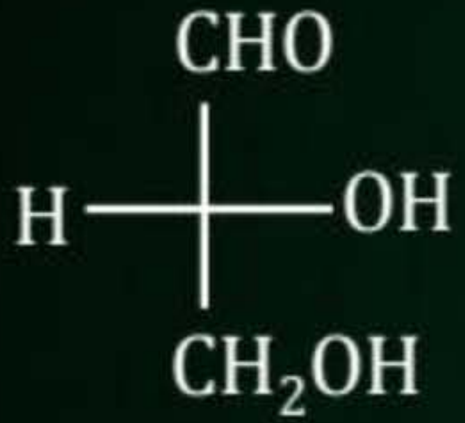
Which of the following compounds can be resolved?

- (A) cis-1,3-dimethylcyclohexane
- (B) 1, 1-dimethylcyclohexane
- (C) cis-1, 4-dimethylcyclohexane
- (D) cis-1-ethyl-3-methylcyclohexane

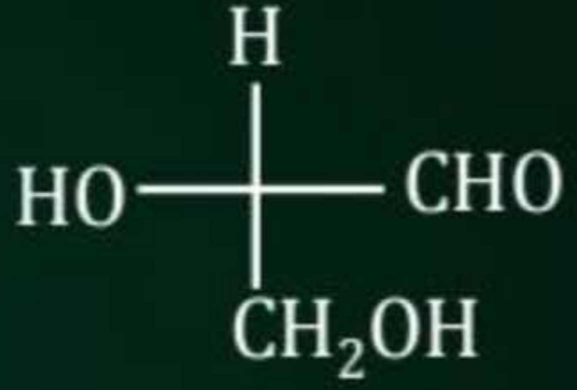
QUESTION 10

Which is the correct structure of D-glyceraldehyde?

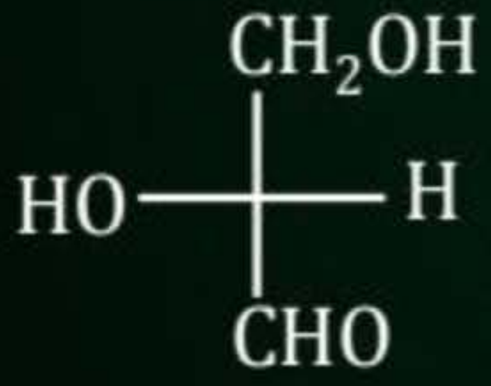
A


CHO
H
OH
CH_2OH

B


H
HO
CHO
CH_2OH

C


CH_2OH
HO
H
CHO

D All of these

ANSWER KEY

1. D
2. C
3. C
4. C
5. A
6. D
7. B
8. B
9. D
10. D

Home Work From PW Module (Yakeen NEET)

Prarambh: Q 102

Prabal: Q 23, 27

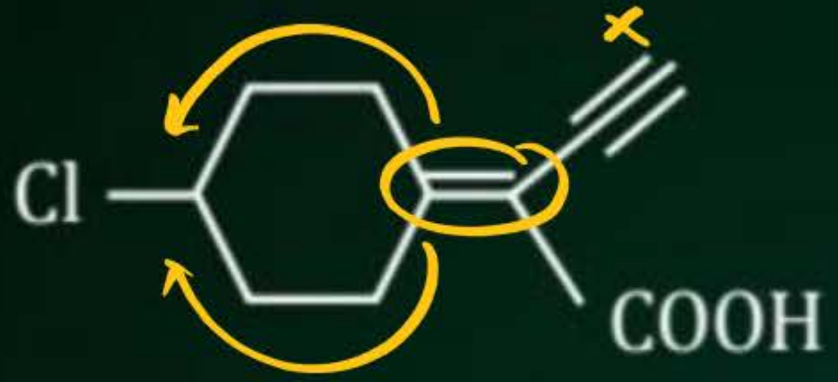
Parikshit: Q 32

Home Work

Discussion of L-06

QUESTION ①

What are the correct designations for the structure below?



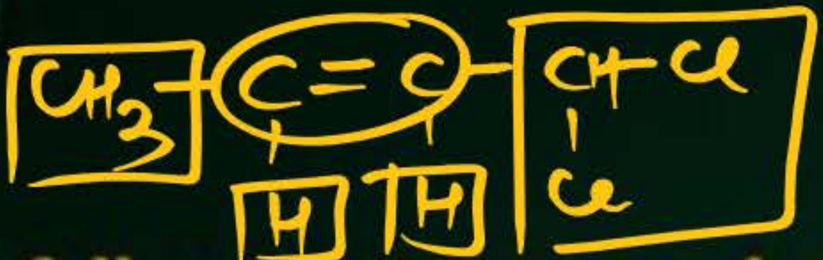
A E, E

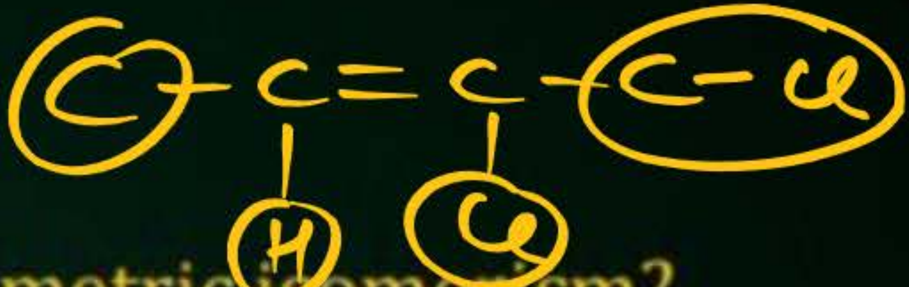
B Z, E

C E, Z

[✓ **D** No stereoisomerism is possible]

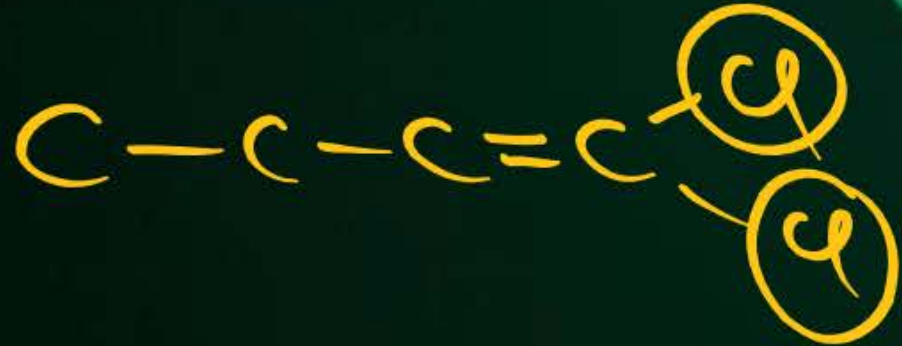
QUESTION 02

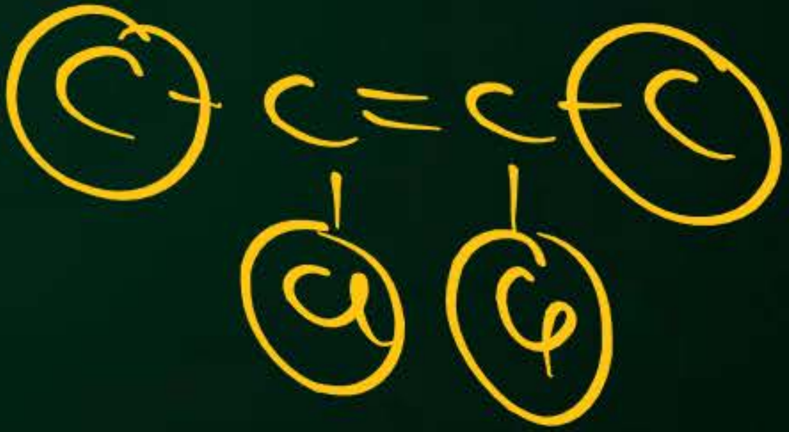

CH3
C=C
CH-Cl
H
H
Cl



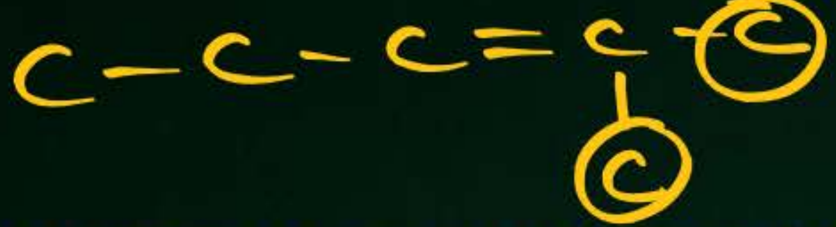
Which of the following compounds does not exhibit geometric isomerism?

- (A) 1,1-Dichloro-2-butene
- (B) 1,2-Dichloro-2-butene
- [✓ (C) 1,1-Dichloro-1-butene]
- (D) 2,3-Dichloro-2-butene.





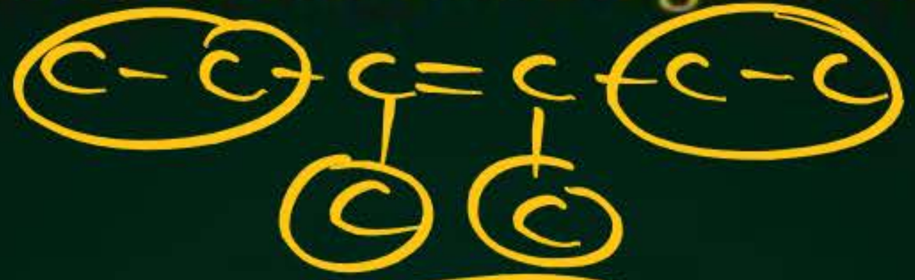
QUESTION 03



$$\mathrm{C-C-C=\underset{\underset{\textcircled{C}}{|}}{C}-\textcircled{C}}$$

Which of the following compounds could exhibit geometrical isomerism?

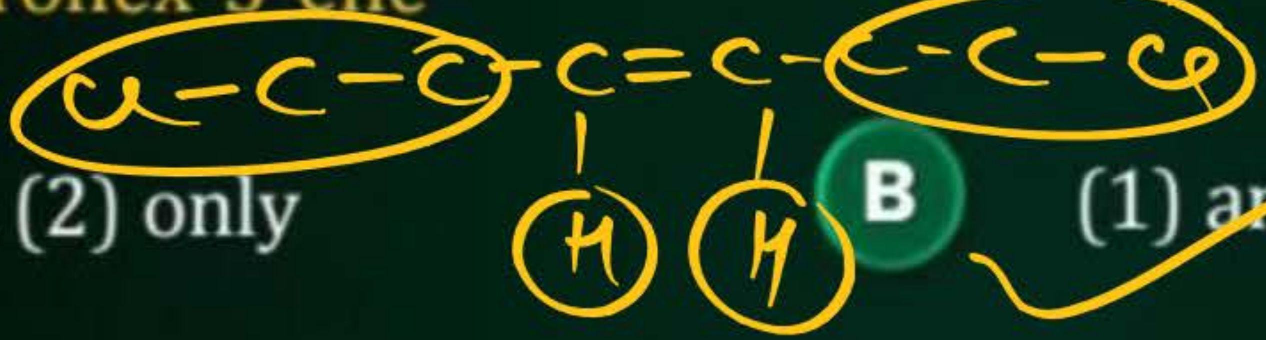
[✓ (1)] 3, 4-dimethylhex-3-ene



$$\mathrm{\textcircled{C-C}-\underset{\underset{\textcircled{C}}{|}}{C}=\underset{\underset{\textcircled{C}}{|}}{C}-\textcircled{C-C}}$$

(2) 2-methylpent-2-ene ×

[✓ (3)] 1, 6-dichlorohex-3-ene



$$\mathrm{\textcircled{Cl-C-C}-\underset{\underset{\textcircled{H}}{|}}{C}=\underset{\underset{\textcircled{H}}{|}}{C}-\textcircled{C-C-Cl}}$$

A (1) and (2) only

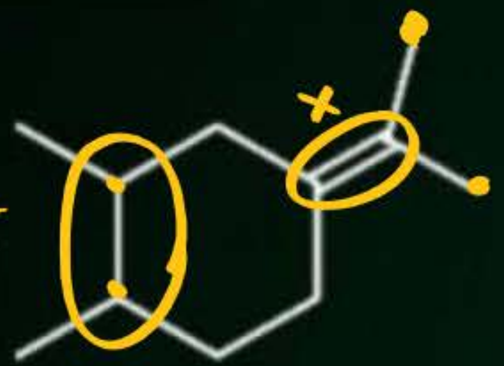
[✓ B] (1) and (3) only

C (2) and (3) only

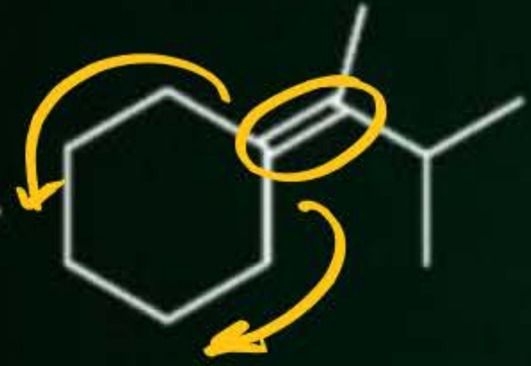
D (1), (2) and (3)

QUESTION ④

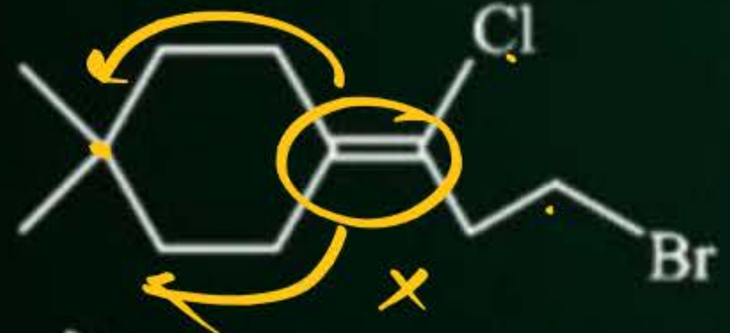
A ⇒ ✓


✓

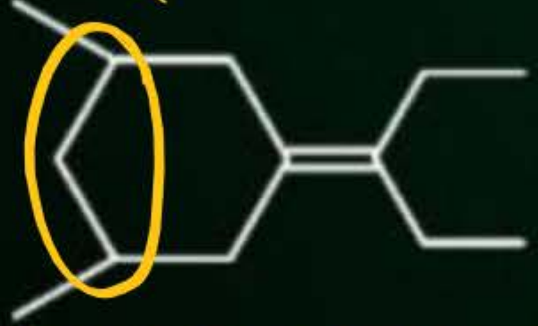
B ⇒ ×



C ⇒



D ⇒ ✓



Which of the following compounds can show Geometrical isomerism?

Ⓐ A, B, D

Ⓑ B, C

[✓ Ⓒ A, D]

Ⓓ C, D

QUESTION 05

Which of the following cannot exist in *syn* and *anti* form?

A $Ph - N = N - OH$

B $Ph - N = N - Ph$

C $Ph - CH = N - OH$

[✓ D] $Ph_2C = N - OH$

QUESTION 06

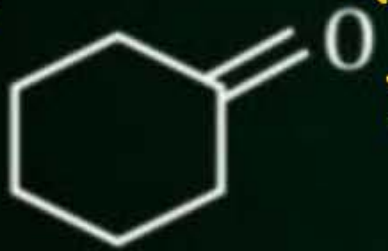
Which of the following compounds will not exhibit geometrical isomerism ?

A $CH_3-CH=CH-COOH$

B $Br-CH=CH-Br$

C $C_6H_5-CH=N-OH$

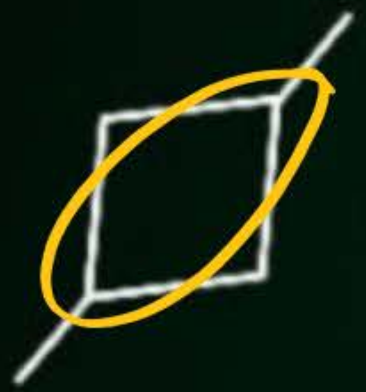
[✓ D]



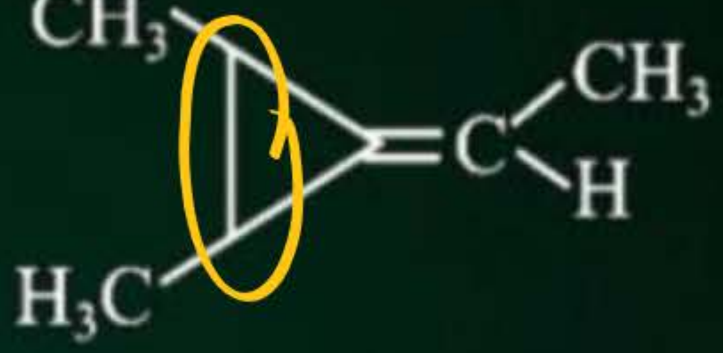
QUESTION 07

Geometrical isomerism is not shown by?

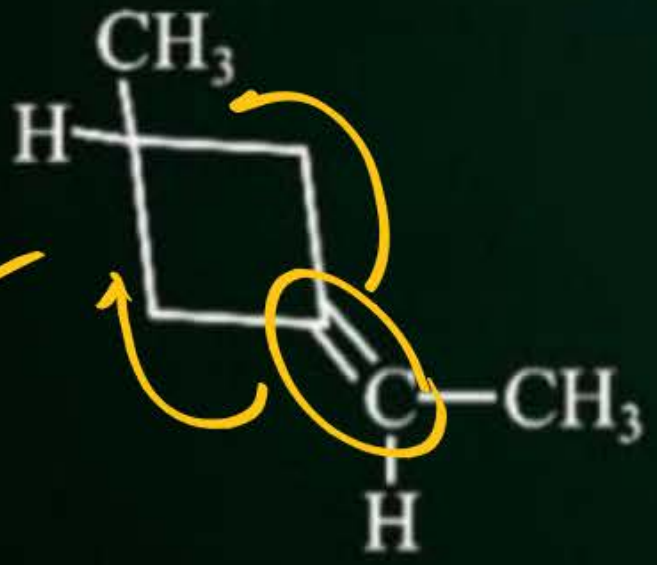
(A)



(B)


CH$_3$
H$_3$C
CH$_3$
C
H

(C)

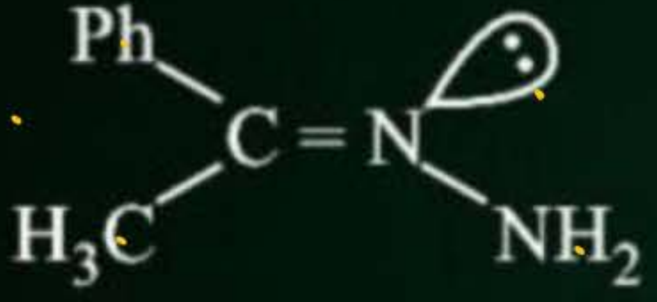


(D) Ph—CH=CH—CH$_3$

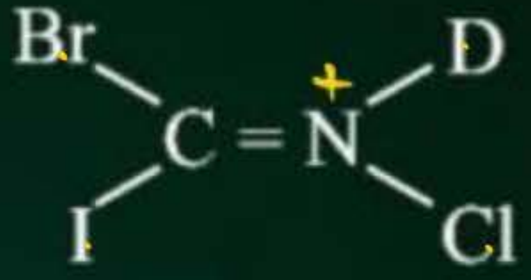
QUESTION 08

Which of the following will not show geometrical isomerism?

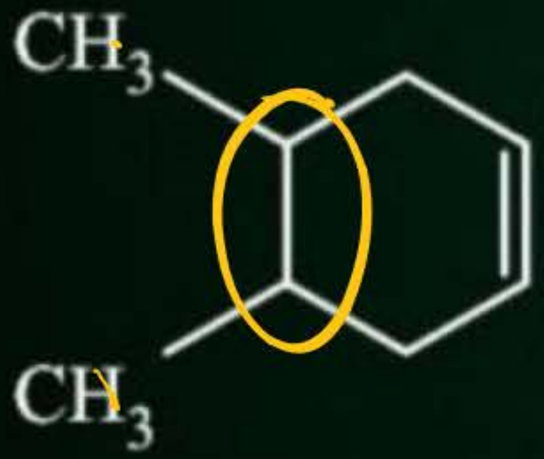
(A)


Ph
C
N
H3C
NH2

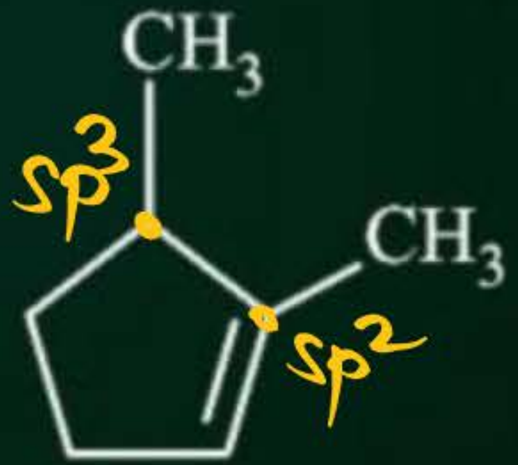
(B)



(C)



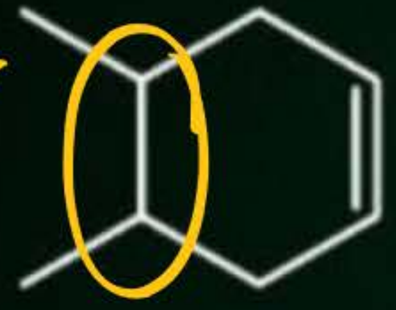
(D)


CH3
sp3
CH3
sp2

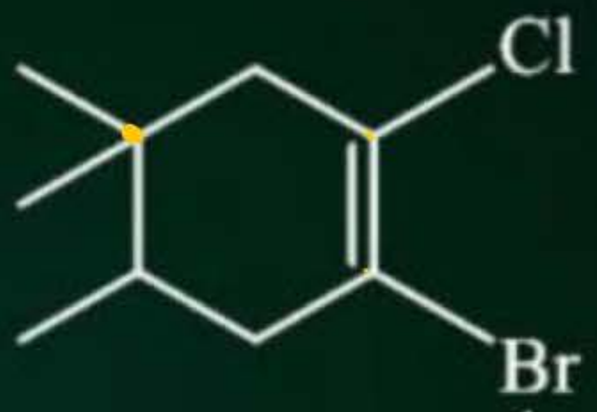
QUESTION 09

Which of the following compounds will show Geometrical isomerism?

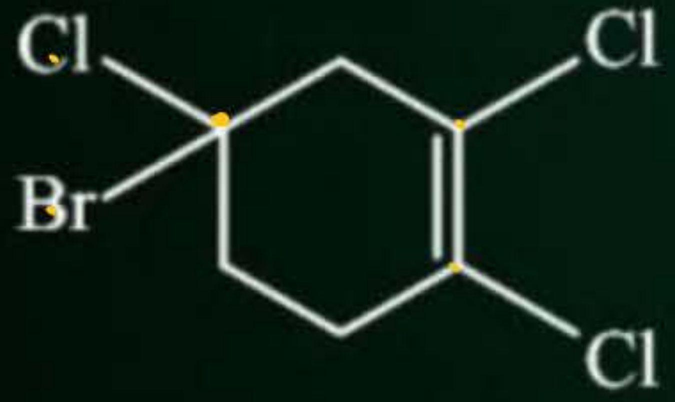
A ✓



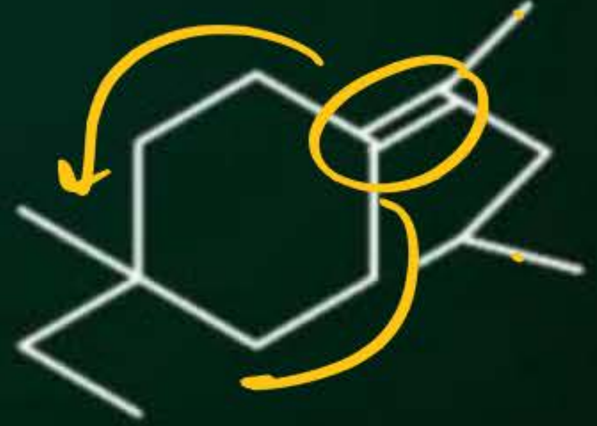
B



C ×



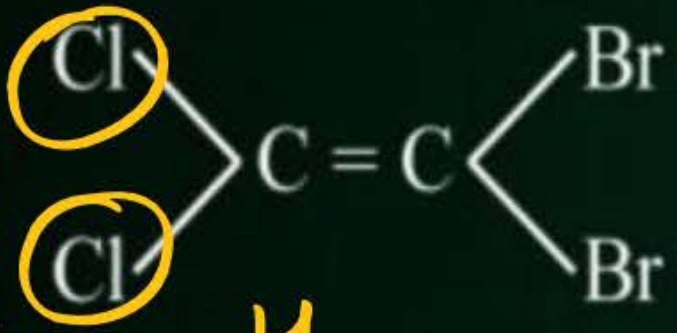
D

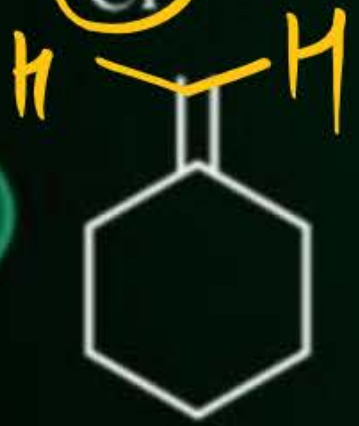


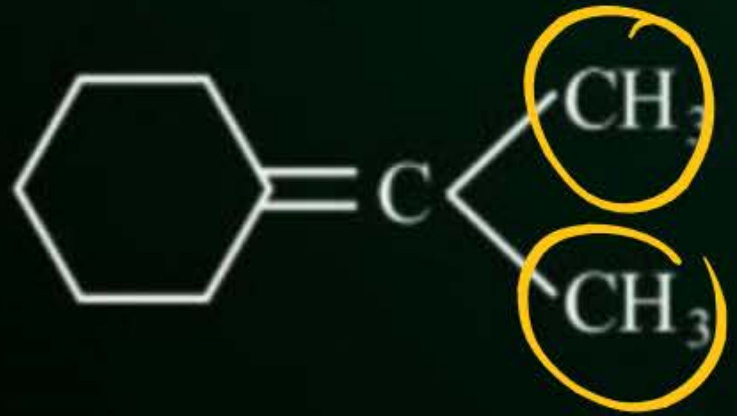
QUESTION 10

Which of the following compound show cis and trans isomerism?

[✓ A] $Cl - CH = CH - Cl$

B

Cl
Cl
C = C
Br
Br

C


D


ANSWER KEY

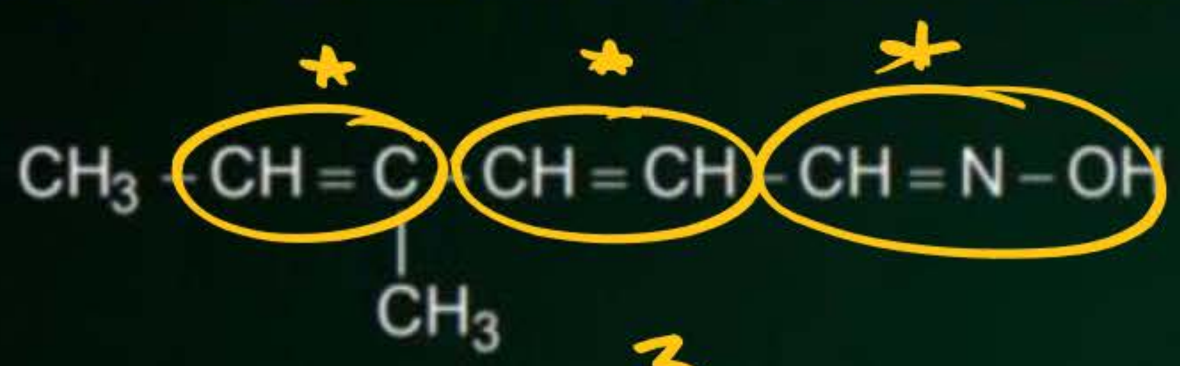
1. D
2. C
3. B
4. C
5. D
6. D
7. C
8. D
9. A
10. A

Home Work

Discussion of L-07

QUESTION 01

Find the number of geometrical isomers in:



$$CH_3-\overset{*}{CH=\underset{CH_3}{C}}-\overset{*}{CH=CH}-\overset{*}{CH=N-OH}$$

$2^3 = 8$

Ⓐ 2

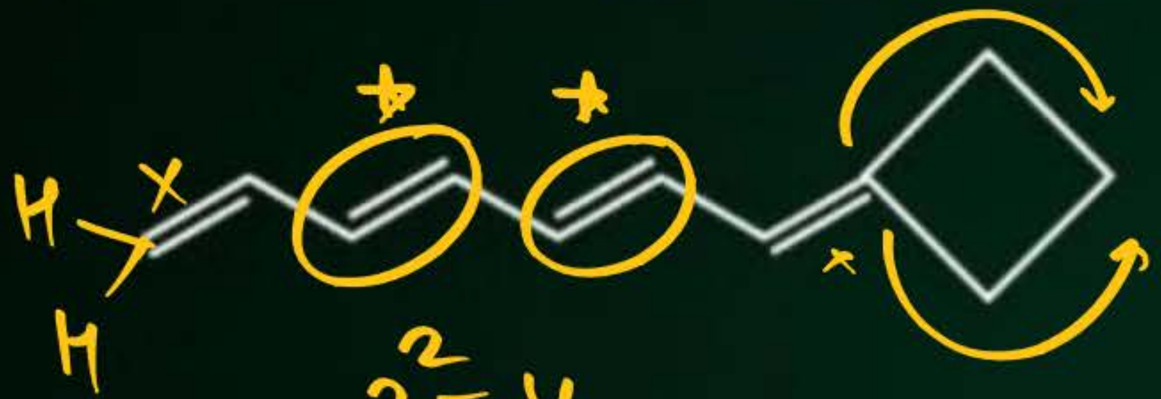
Ⓑ 4

Ⓒ [✓ 8]

Ⓓ 16

QUESTION 02

Total number of geometrical isomer of following compound.



$2^2 = 4$

A 2

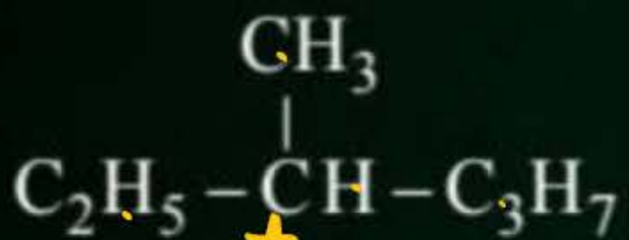
[✓ **B**] 4

C 8

D 16

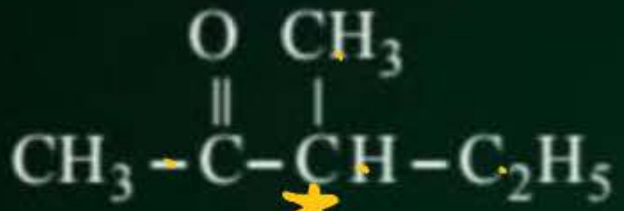
QUESTION 03

Among the following four structures I to IV:



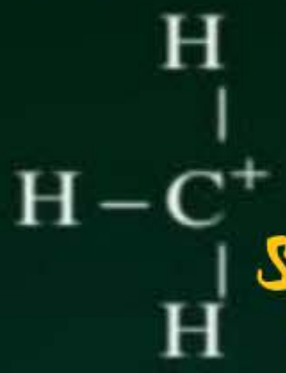
$C_2H_5-\underset{\star}{\overset{\overset{CH_3}{|}}{C}}H-C_3H_7$

(I)



$CH_3-\overset{\overset{O}{\|}}{C}-\underset{\star}{\overset{\overset{CH_3}{|}}{C}}H-C_2H_5$

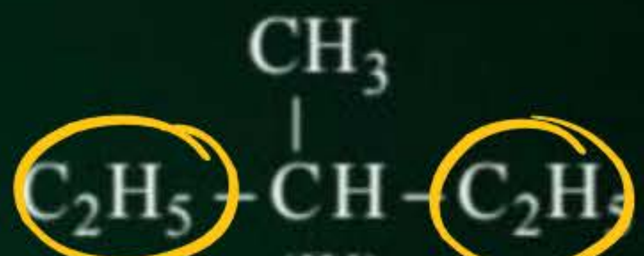
(II)



$H-\underset{\underset{H}{|}}{\overset{\overset{H}{|}}{C^+}}$

sp^2

(III)



$C_2H_5-\overset{\overset{CH_3}{|}}{C}H-C_2H_5$

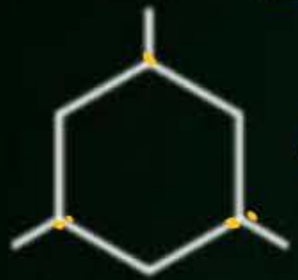
(IV)

- **A** all four have chiral carbons.
- [✓ **B**] only (I) and (II) are chiral carbons.
- **C** only (III) is a chiral carbons.
- **D** only (II) and (IV) are chiral carbons.

QUESTION 04

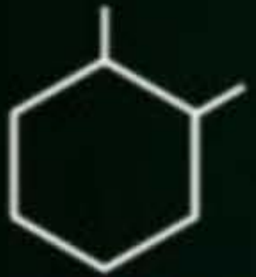
Find total number of Geometrical isomerism of following compounds.

$CH_3-CH=CH-CH=N-OH$ 2^2 4 has x geometrical isomers ④



All dark
1 dark
y = 2

has y geometrical isomers



z = 2

has z geometrical isomers

What is the value of x + y + z ?

(A) 16

(B) 8 ✓

(C) 4

(D) 10

QUESTION 05

The number of geometrical isomers in case of a compound with the structure

$\boxed{CH_3}-\underset{*}{CH = CH}-\underset{*}{CH = CH}-\boxed{C_2H_5}$ is:

$2^2 = 4$

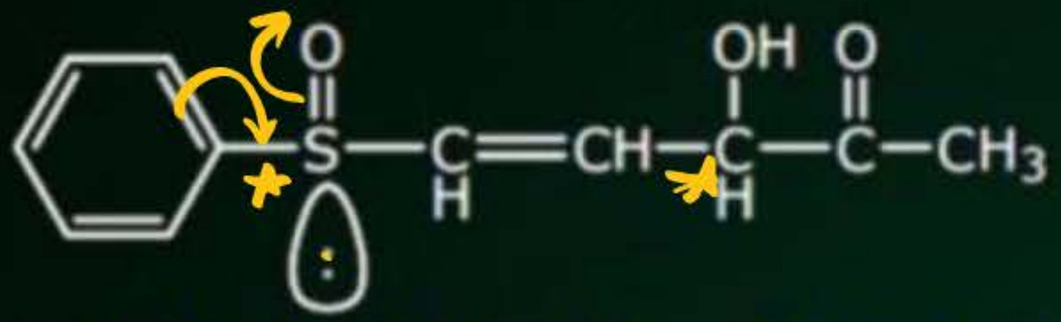
[✓ A] 4

(B) 3

(C) 2

(D) 5

QUESTION 06



Number of chiral centers are:

A 1

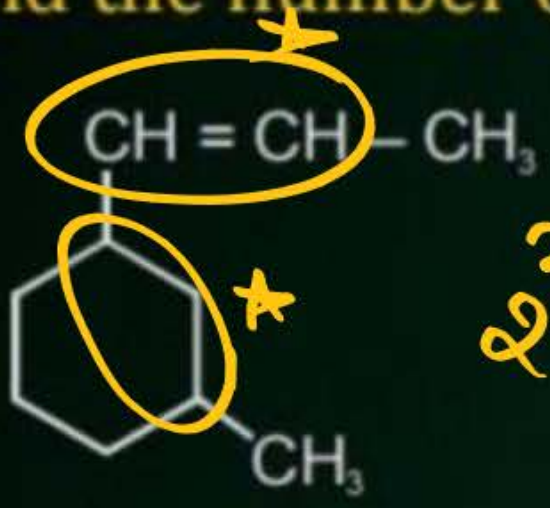
[✓ B] 2

C 3

D 4

QUESTION 07

Find the number of geometrical isomers in:


CH = CH – CH$_3$
CH$_3$
*
*

$2^2 = 4$

A 2

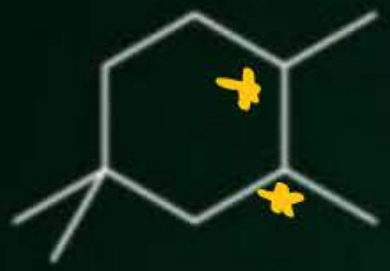
[✓ B 4]

C 8

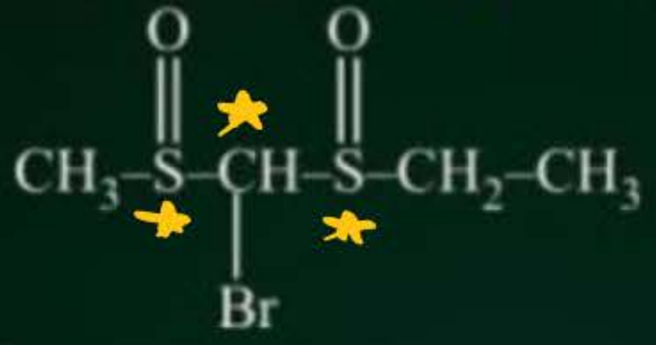
D 16

QUESTION 08

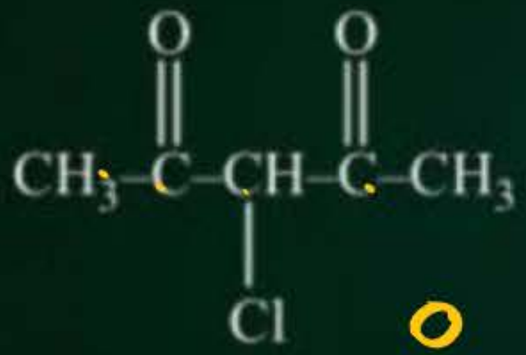
The total number of chiral center in compounds are respectively;



,



$$CH_3-\overset{\overset{O}{\|}}{S}-\underset{Br}{\underset{|}{CH}}-\overset{\overset{O}{\|}}{S}-CH_2-CH_3$$



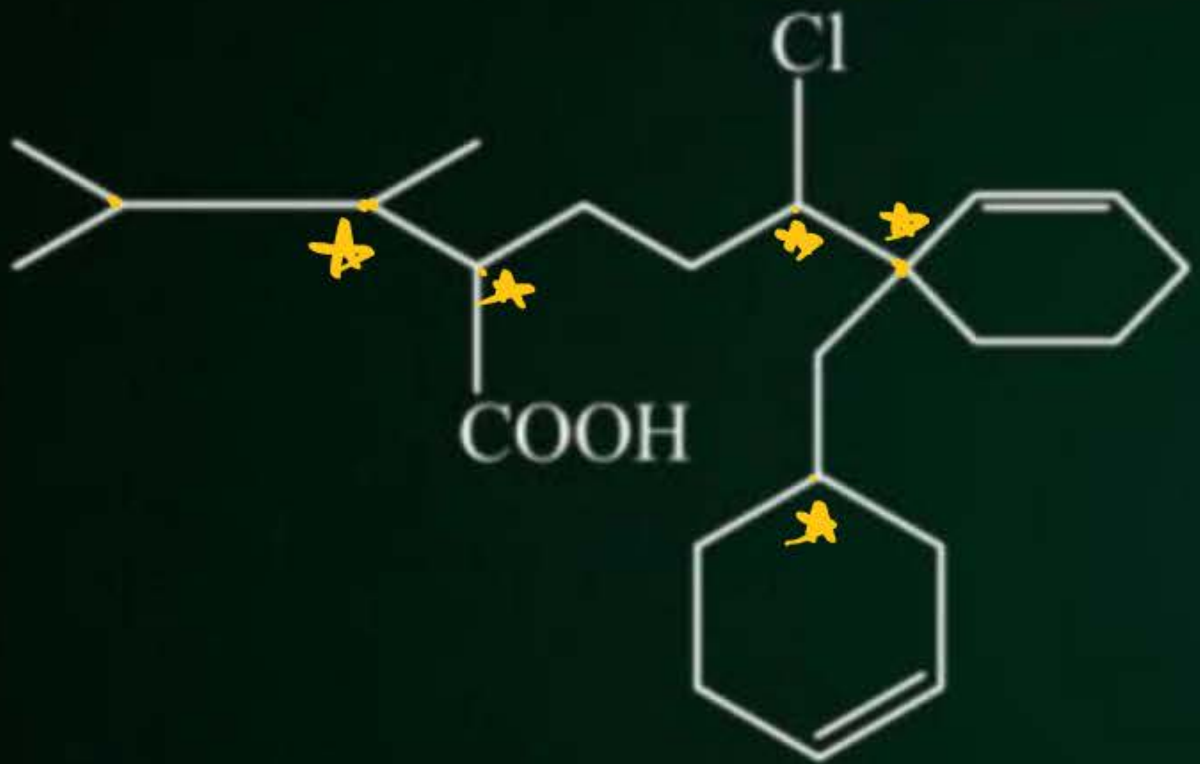
$$CH_3-\overset{\overset{O}{\|}}{C}-\underset{Cl}{\underset{|}{CH}}-\overset{\overset{O}{\|}}{C}-CH_3$$

0

- A 2, 1, 1
- B 2, 1, 0
- C 2, 3, 3
- [✓ D] 2, 3, 0

QUESTION 09

The no. of chiral carbons in given compound is:



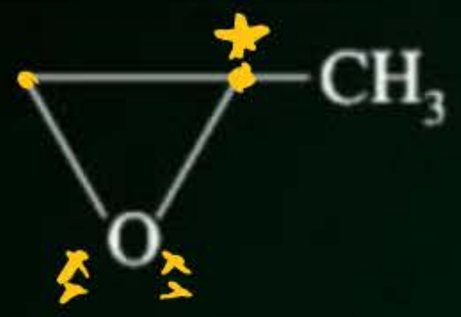
A 3

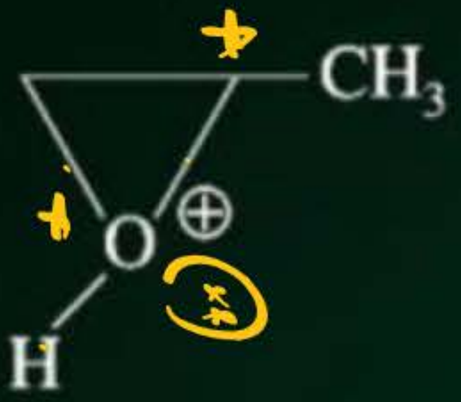
B 4

[✓ **C** 5]

D 6

QUESTION 10





Number of chiral center present in above compounds are:

A 1, 1

B [✓ 1, 2]

C 2, 1

D 2, 3

ANSWER KEY

1. C
2. B
3. B
4. B
5. A
6. B
7. B
8. D
9. C
10. B

Home Work

Discussion of L-08

QUESTION 01

Assertion: Optical isomerism is based on the symmetry of a molecule.
Reason: A molecule which has no plane of symmetry is described as chiral. ×

cos check

A Both Assertion and Reason are correct and Reason is the correct explanation for Assertion.

B Both Assertion and Reason are correct but Reason is not the correct explanation for Assertion.

[✓ C Assertion is correct but Reason is incorrect.]

D Both Assertion and Reason are incorrect.

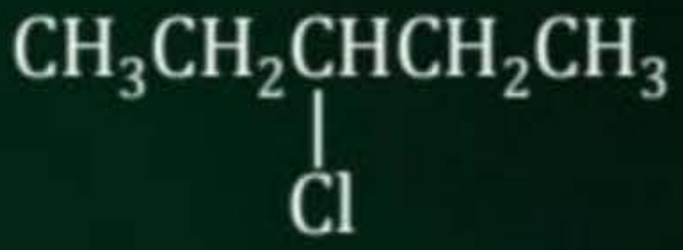
QUESTION 02

OA

Which of the following is a chiral molecule?

A $ClCH_2CH_2CH_2CH_2CH_3$ ✗

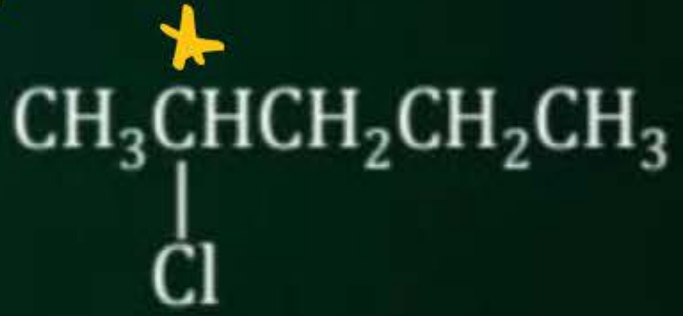
B



$CH_3CH_2\underset{Cl}{\underset{|}{C}}HCH_2CH_3$

C $ClCH=CHCH_2CH_2CH_3$ ✗

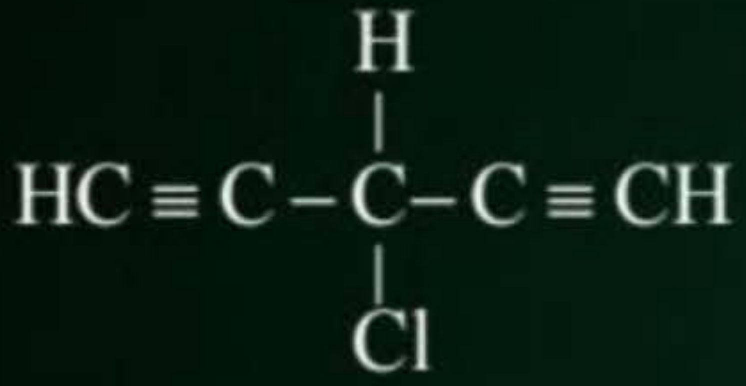
✓ **D**

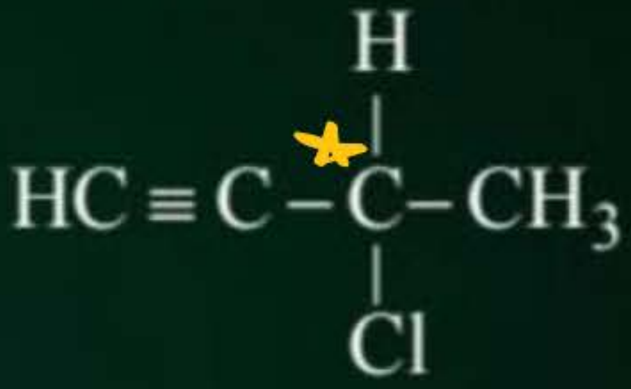


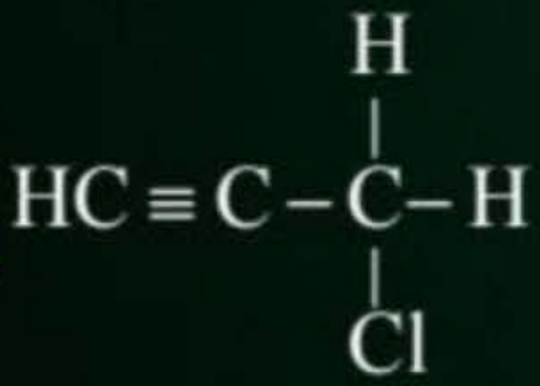
$CH_3\overset{*}{\underset{Cl}{\underset{|}{C}}}HCH_2CH_2CH_3$

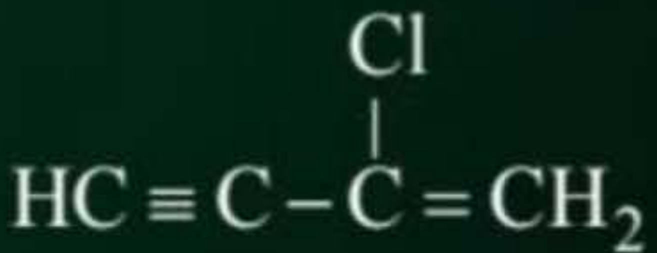
QUESTION 03

Which of the following is most likely to show optical isomerism?

A ✗

$$HC\equiv C-\overset{\overset{H}{|}}{\underset{\underset{Cl}{|}}{C}}-C\equiv CH$$

✓ B

$$HC\equiv C-{}^{*}\overset{\overset{H}{|}}{\underset{\underset{Cl}{|}}{C}}-CH_3$$

C ✗

$$HC\equiv C-\overset{\overset{H}{|}}{\underset{\underset{Cl}{|}}{C}}-H$$

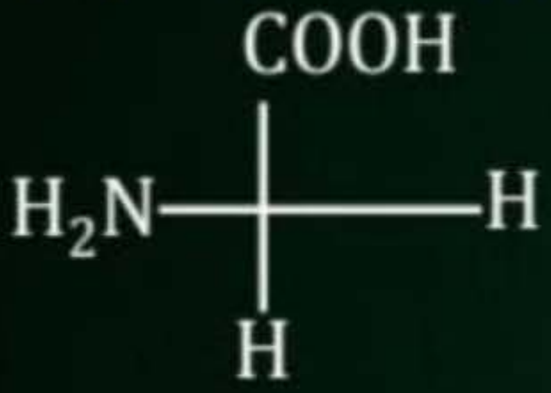
D ✗

$$HC\equiv C-\overset{\overset{Cl}{|}}{C}=CH_2$$

QUESTION 04

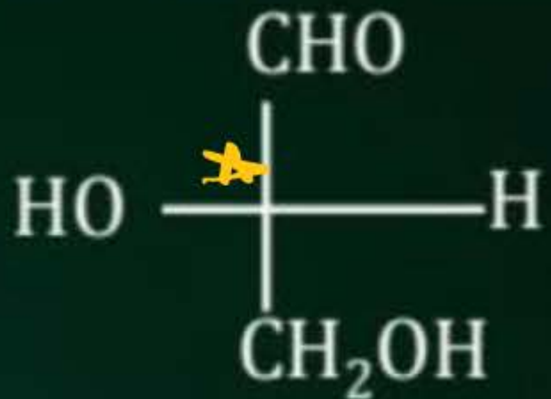
OA

Which of the following molecules is expected to rotate the plane of polarised light?

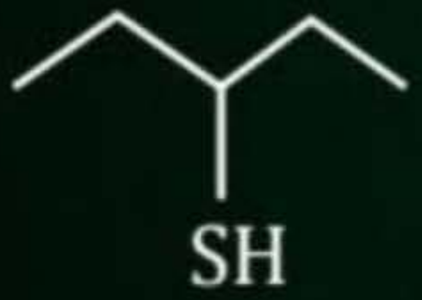
(A) ✗



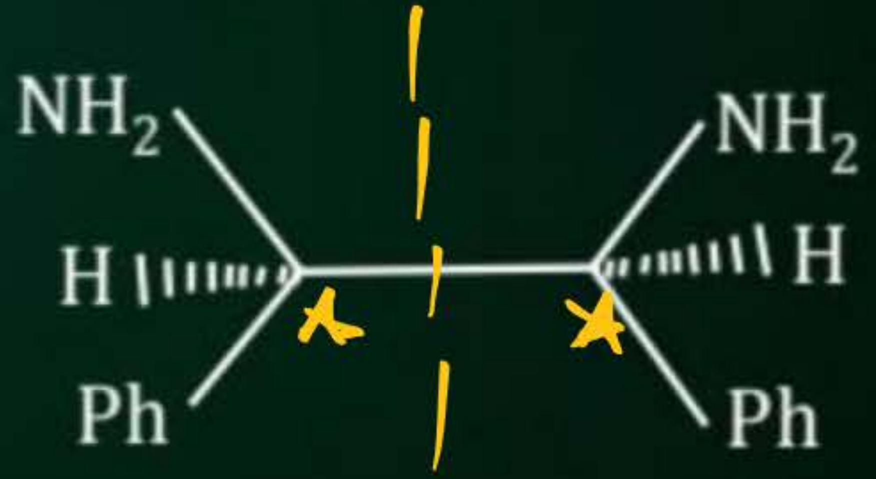
(B) ✓


CHO
HO
H
CH_2OH

(C) ✗



(D)

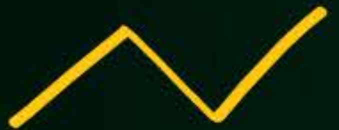

NH_2
H
Ph
NH_2
H
Ph

Pos(✓)

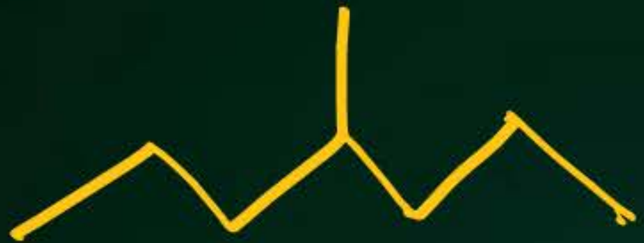
QUESTION 05

Which of the following optically active?

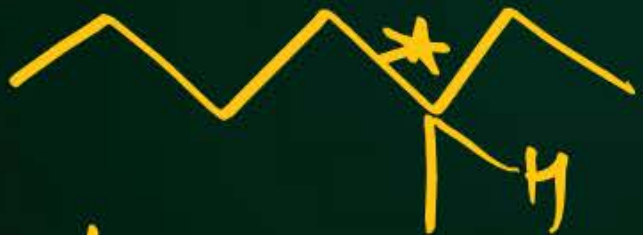
Ⓐ ✗ Butane



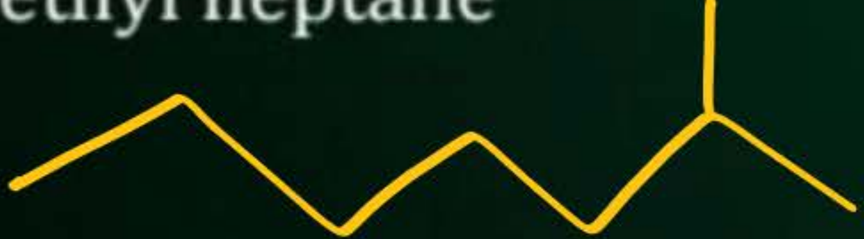
Ⓑ ✗ 4-Methyl heptane



Ⓒ ✓ 3-Methyl heptane



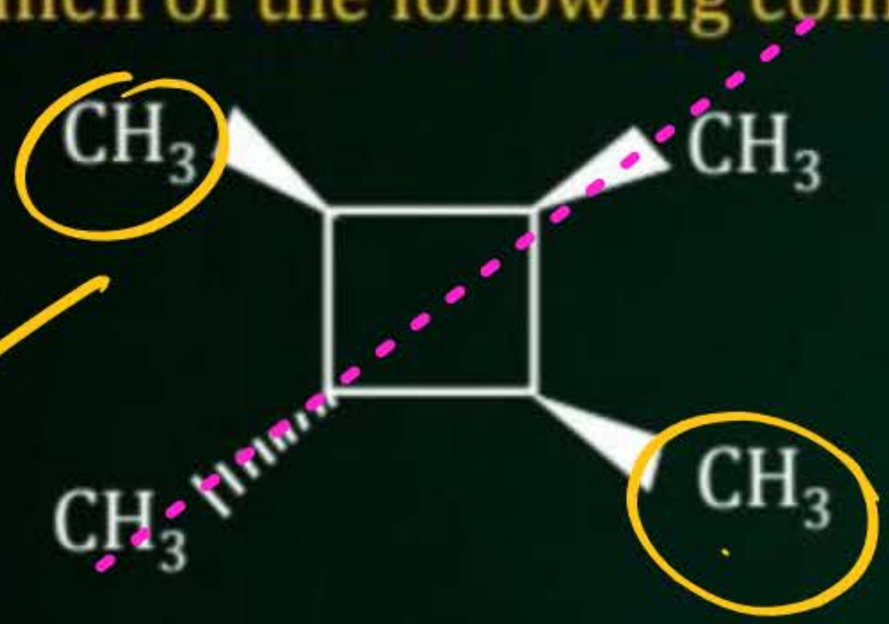
Ⓓ 2-Methyl heptane



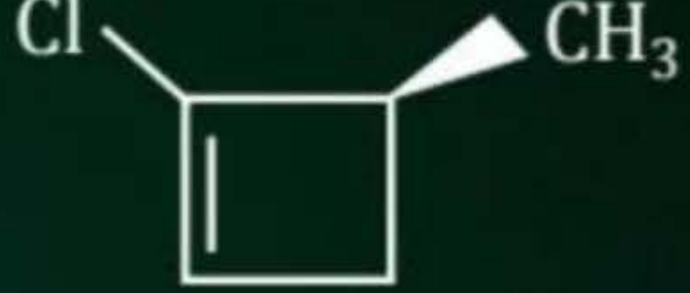
QUESTION 06

In which of the following compound have plane of symmetry?

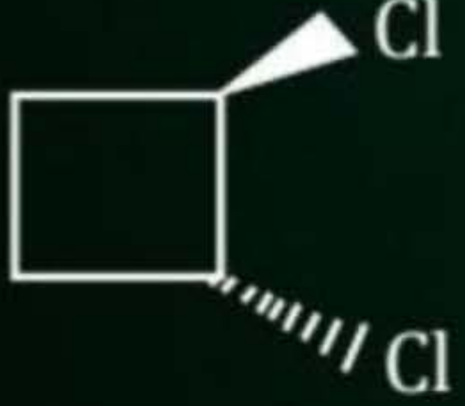
A


CH_3
CH_3
CH_3
CH_3

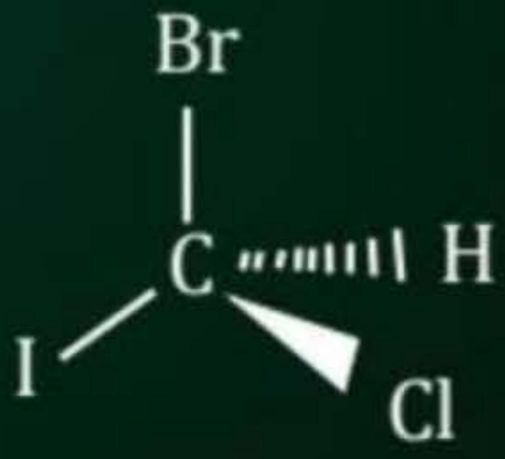
B



C



D



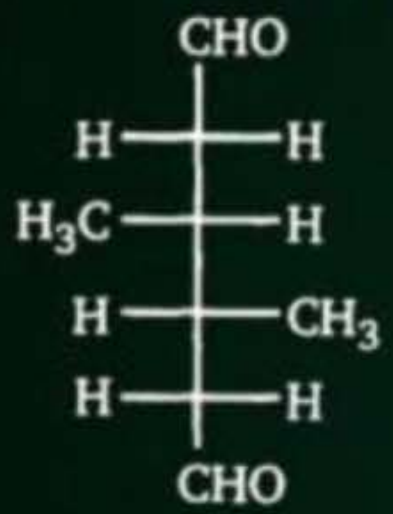
QUESTION 07

Which of the following statements best describes the stereochemical relationships of compound I, II and III shown below ?

POS ✗

OA

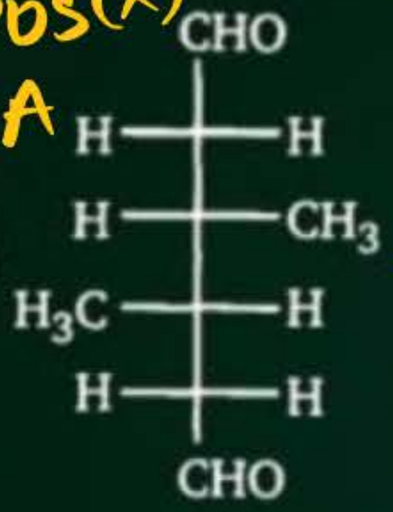
(I)



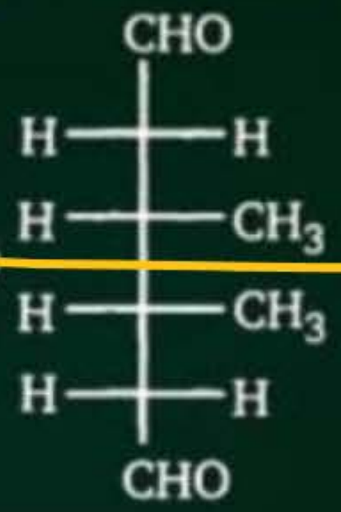
POS(✗)

OA

(II)



~~(III)~~



POS(✓)

OIA

(A) All compounds are chiral

(B) Only I is chiral

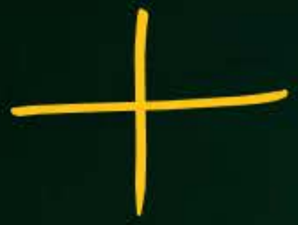
[✓ (C)] I and II are chiral

(D) None of these

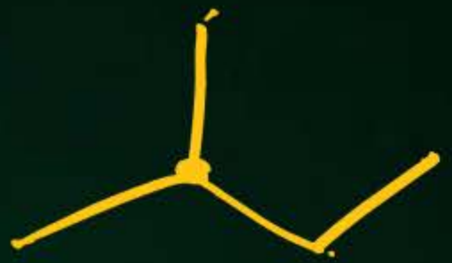
QUESTION 08

Which of the following will exhibit chirality?

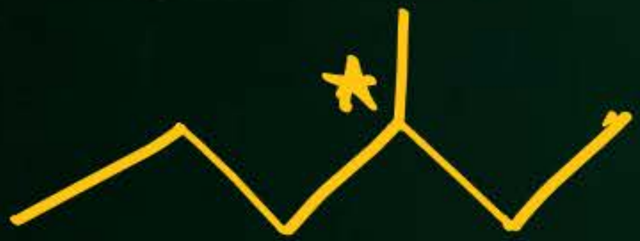
A Neopentane



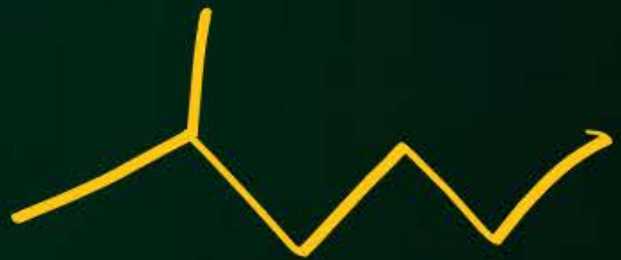
B Isopentane



[✓ **C**] 3-Methylhexane

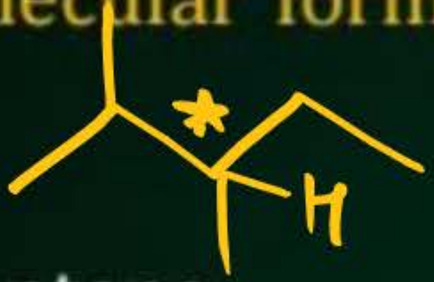


D 2-Methylhexane



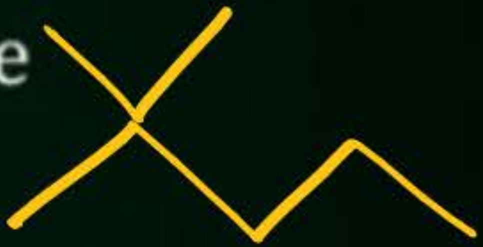
QUESTION 09

A compound with molecular formula C_7H_{16} shows optical isomerism. The compound will be:



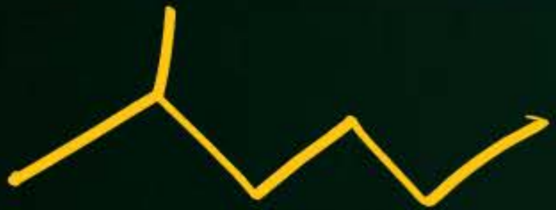
[✓ A] 2, 3-dimethyl pentane

✗ B 2, 2-dimethyl pentane



C 2-methyl hexane

✗



D none of the above

QUESTION 10

Which of the following compounds is expected to be optically active?

- **A** ✗ $(CH_3)_2CHCHO$
- **B** ✗ $CH_3CH_2CH_2CHO$
- [✓ **C**] $CH_3CH_2\overset{*}{C}H(Br)CHO$
- **D** ✗ $CH_3CH_2CBr_2CHO$

ANSWER KEY

1. C
2. D
3. B
4. B
5. C
6. A
7. C
8. C
9. A
10. C

Thank you."

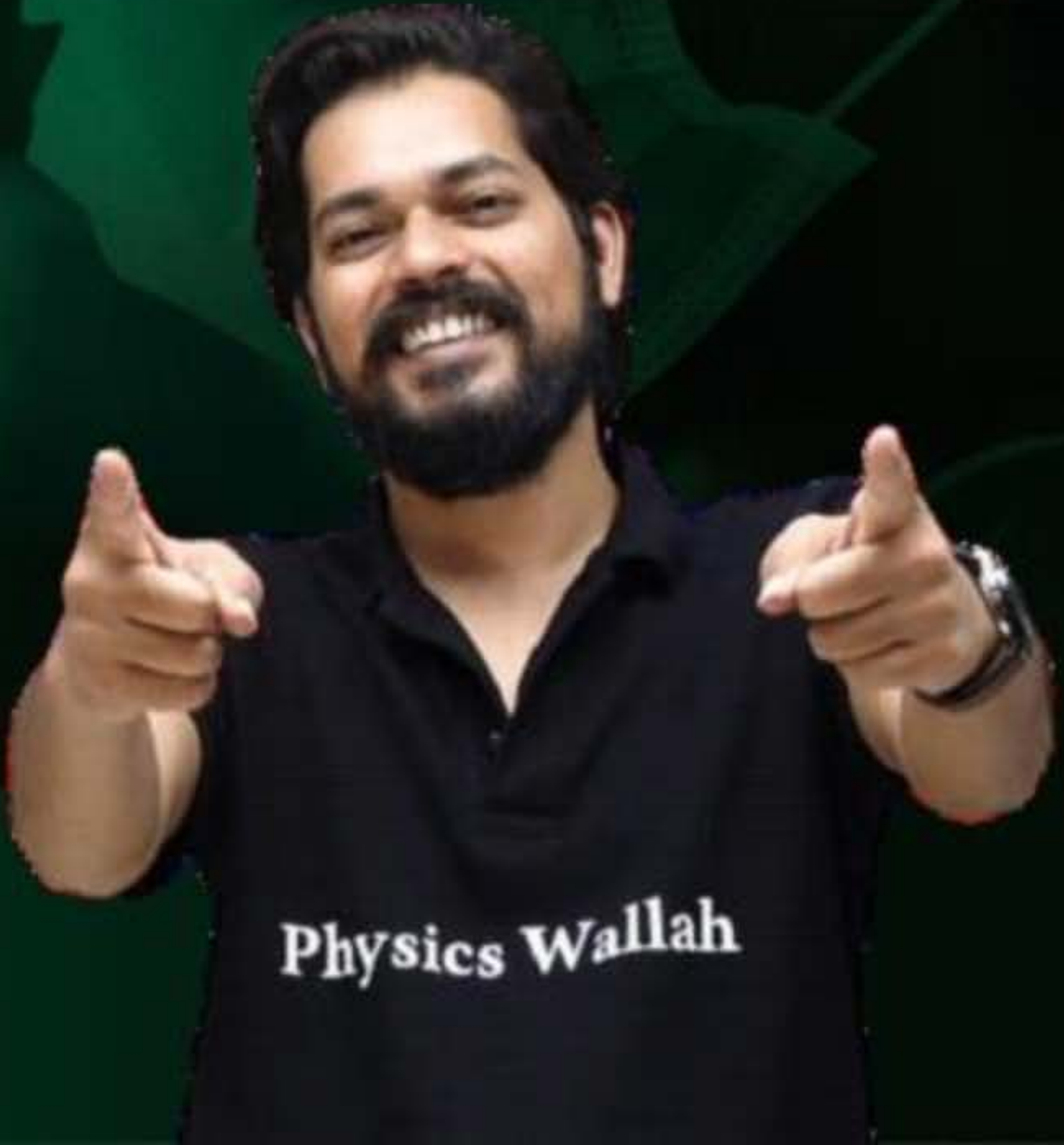
YAKEEN 2.0

FOR NEET 2025

Lecture- 11 **Organic Chemistry**

Some Basic Principles and Techniques (ISOMERISM)

By- Pankaj Sir(POPU MAMA)


Physics Wallah

Topics *to be covered*

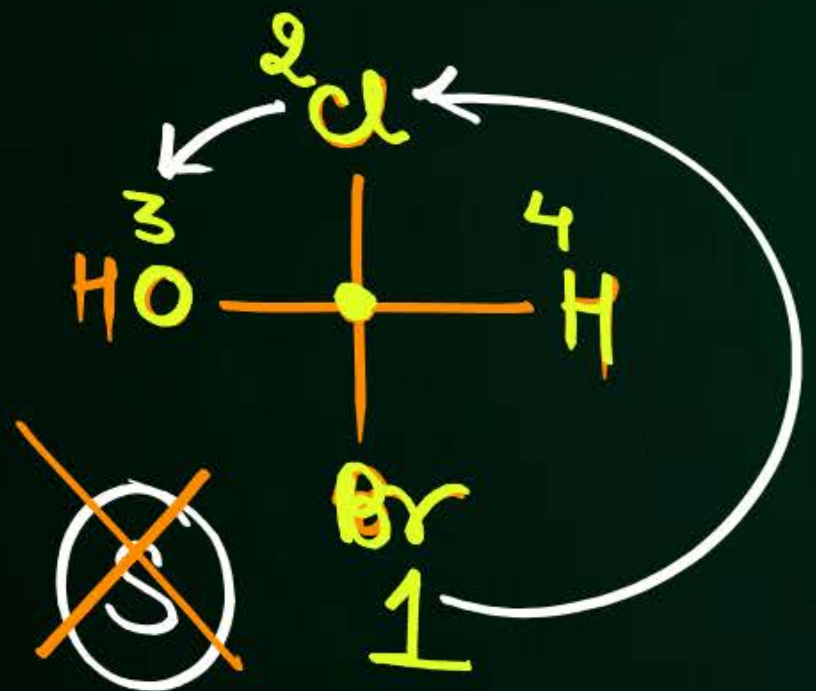
1. R/S Configuration, Pseudo chiral centers
2. No. of Optical Isomers & Stereoisomers / optical rotation
3. Practice

R/S Configuration (C.I.P rule)

Case 01: In Fischer Projection Formula

R → Rectus (C.W)

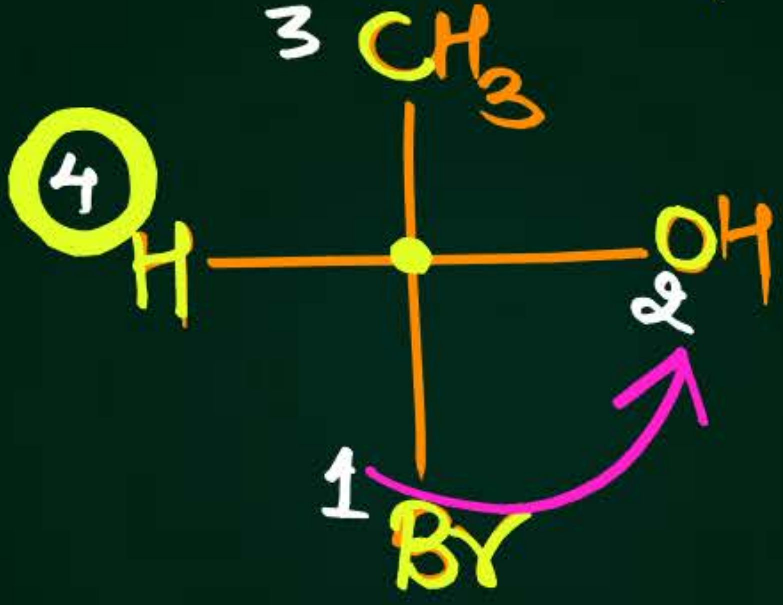
S → Sinister (A.C.W)



2 Cl
3 HO
4 H
Br 1
~~S~~

R

if ④ is on horizontal position then flip the answer.

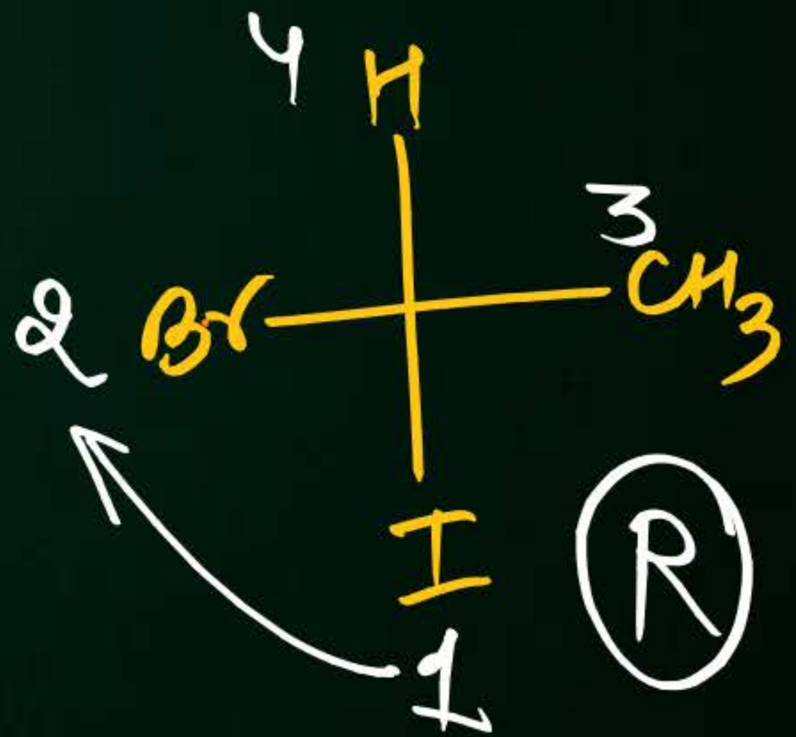


3 CH3
④ H
OH 2
1 Br

~~S~~ R

(1 → 2) shortest

(2 → 3) shortest



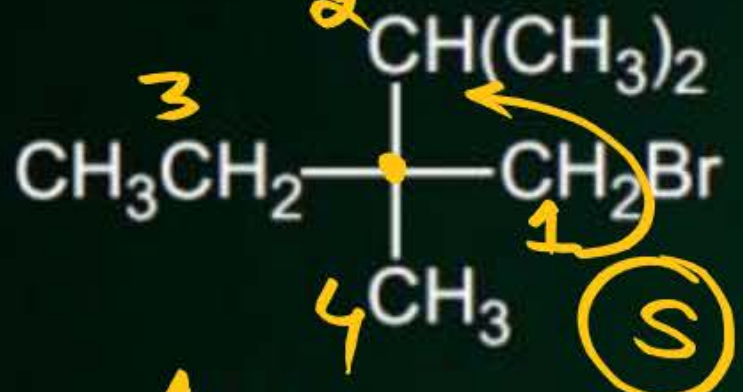
4 H
2 Br
3 CH3
I 1

Ⓡ

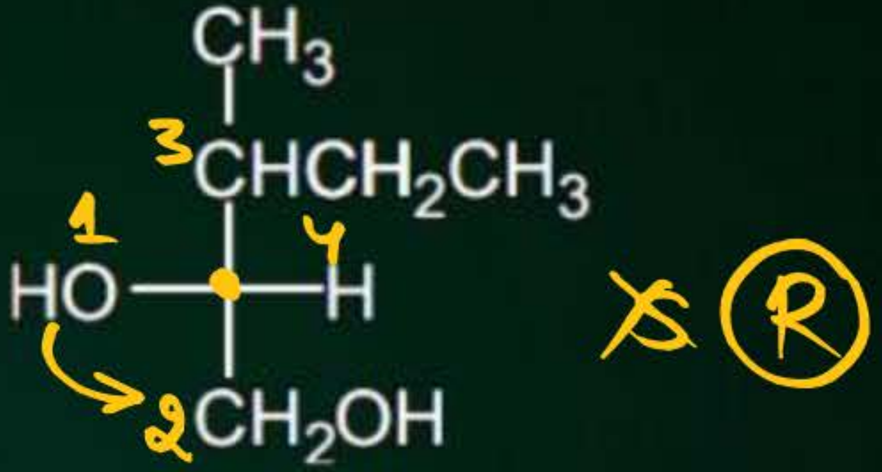
QUESTION

Indicate whether each of the following structures has the *R* configuration or the *S* configuration.

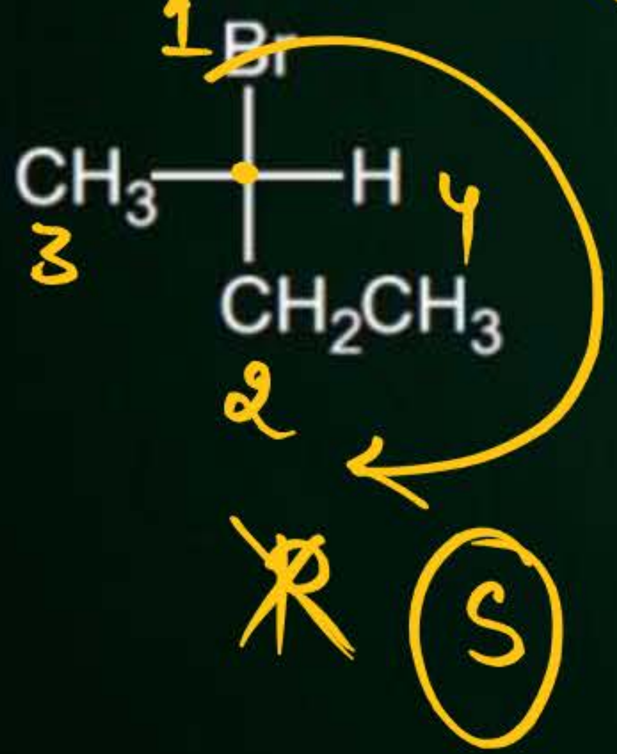
A


2 CH(CH$_3$)$_2$
3
CH$_3$CH$_2$
CH$_2$Br
1
4 CH$_3$
S

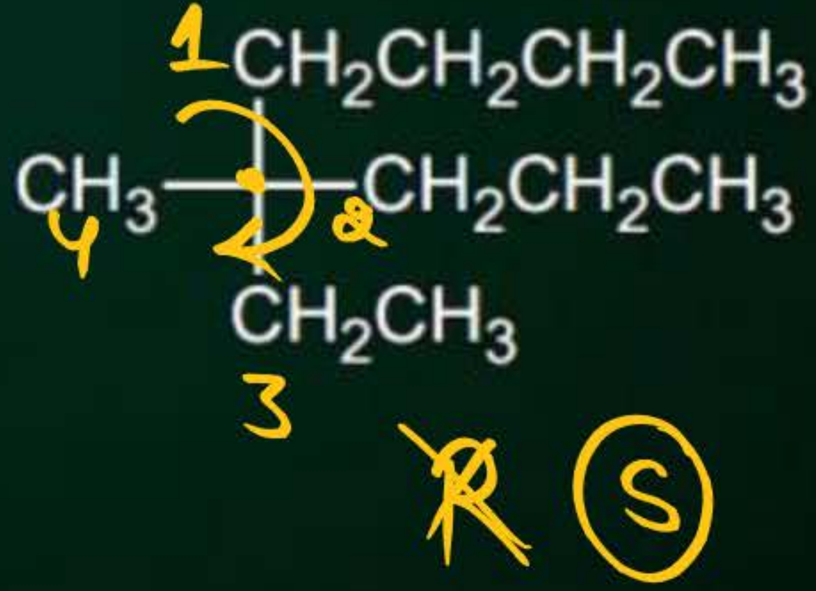
B


CH$_3$
3 CHCH$_2$CH$_3$
1
HO
4
H
2 CH$_2$OH
~~S~~ R

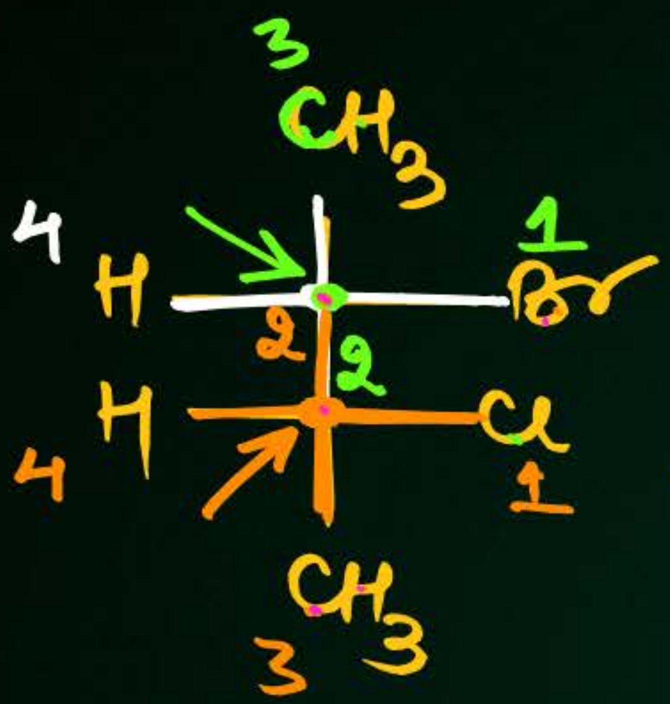
C


1 Br
CH$_3$
3
H
4
CH$_2$CH$_3$
2
~~R~~ S

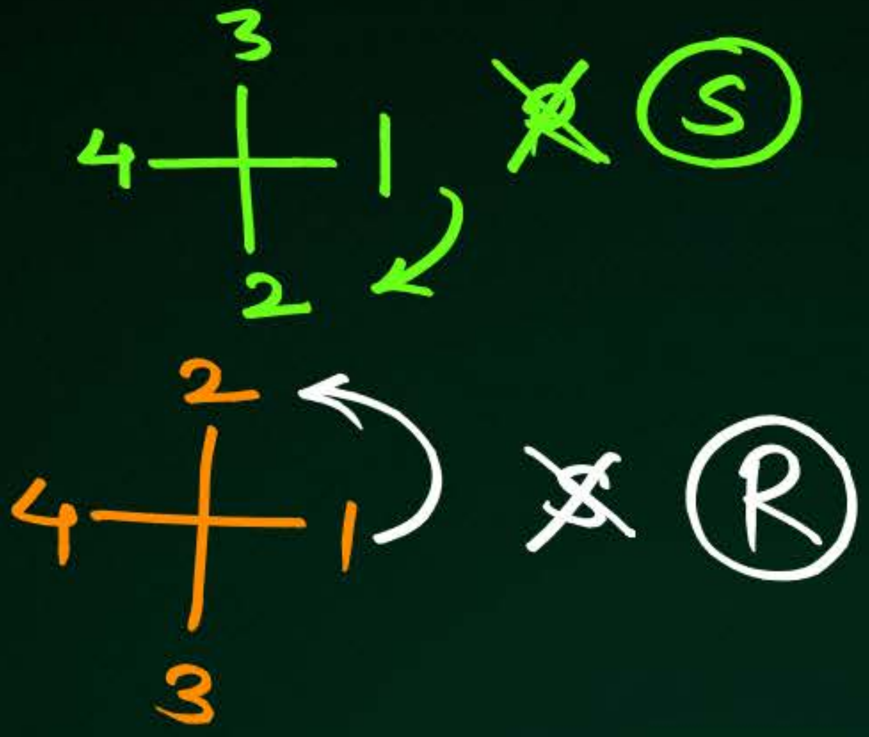
D


1 CH$_2$CH$_2$CH$_2$CH$_3$
CH$_3$
4
2
CH$_2$CH$_2$CH$_3$
CH$_2$CH$_3$
3
~~R~~ S

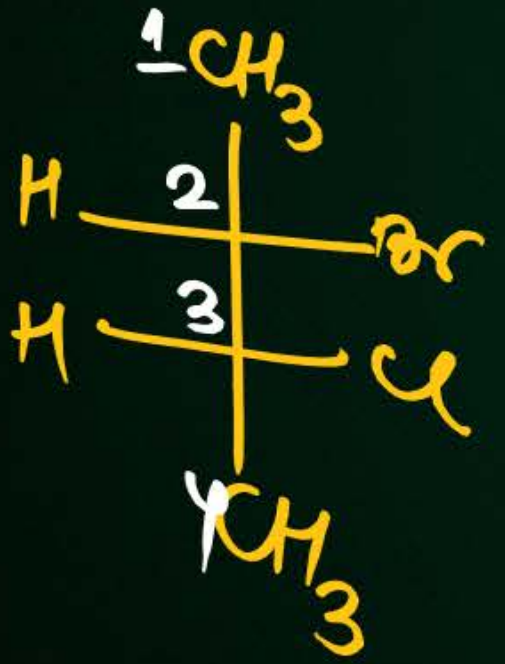
Q/



3
CH3
4
H
1
Br
2
2
4
H
Cl
1
CH3
3



3
4
1
2
~~R~~
S
2
4
1
3
~~S~~
R



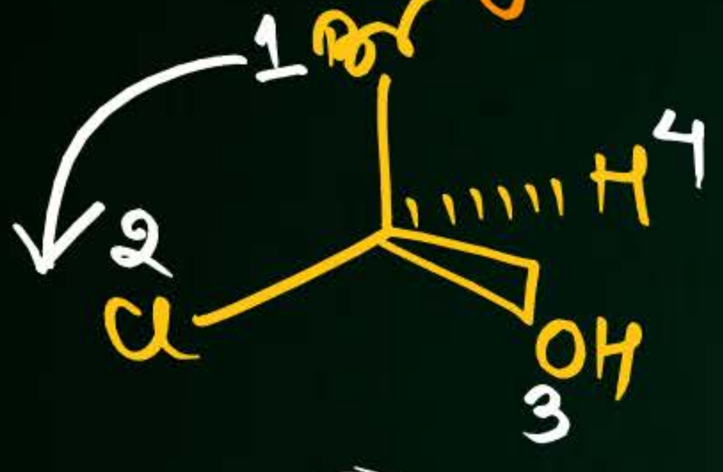
1
CH3
H
2
Br
H
3
Cl
4
CH3

IUPAC name

2S-Bromo-3R-Chloro butane

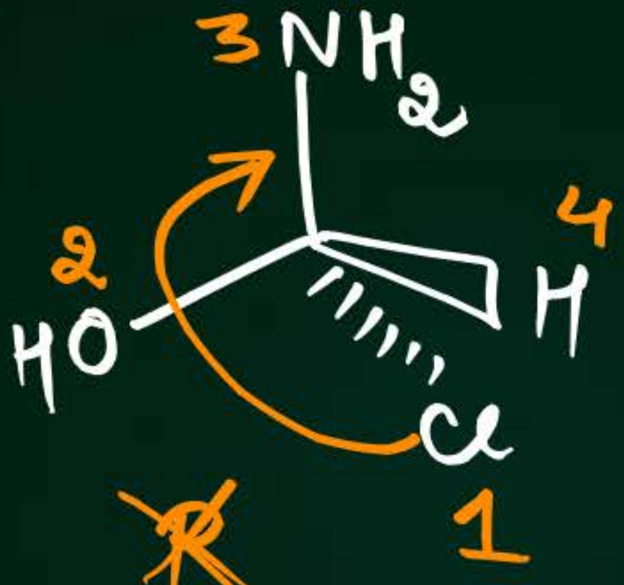
Case 02: In Solid dash wedge

① if ④ is on dash
No change in answer


1 Br
2 Cl
3 OH
H 4

Ⓢ

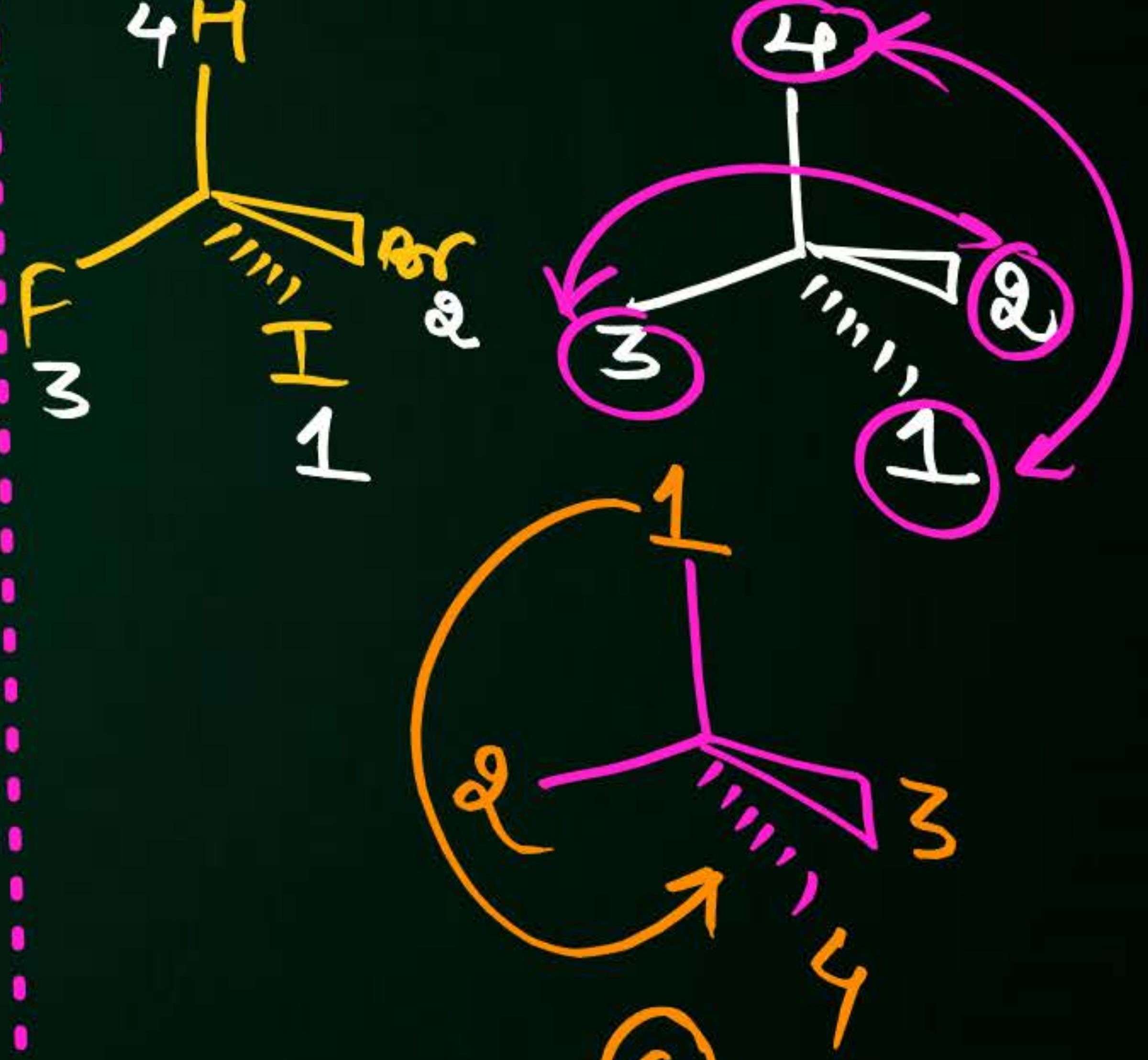
② if ④ is on solid
flip the answer


3 NH2
2 HO
H 4
Cl 1

~~R~~

S

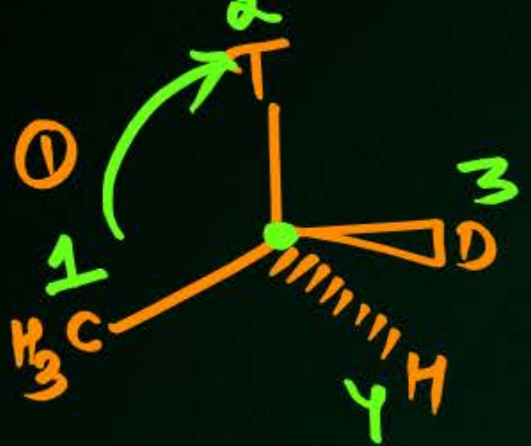
③ if ④ is on line
then make even no. of interchanges & convert
Case ③ ⟶ Case ①


4 H
F 3
I 1
Br 2
4
2
3
1
1
2
3
4

Ⓢ

Q/

①

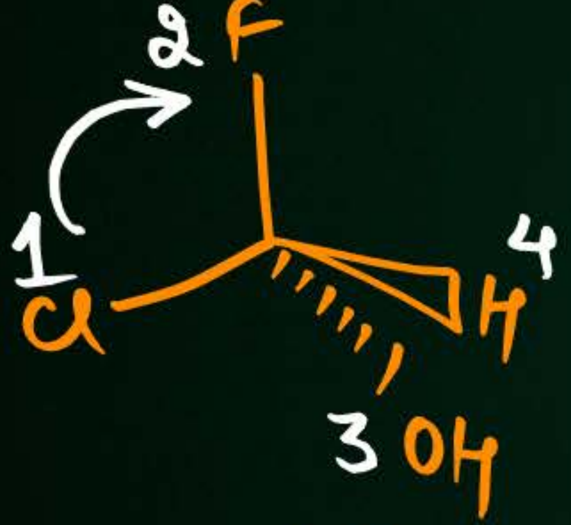


2
T
①
1
H_3C
3
D
4
H

Ⓡ

(R, S, S)

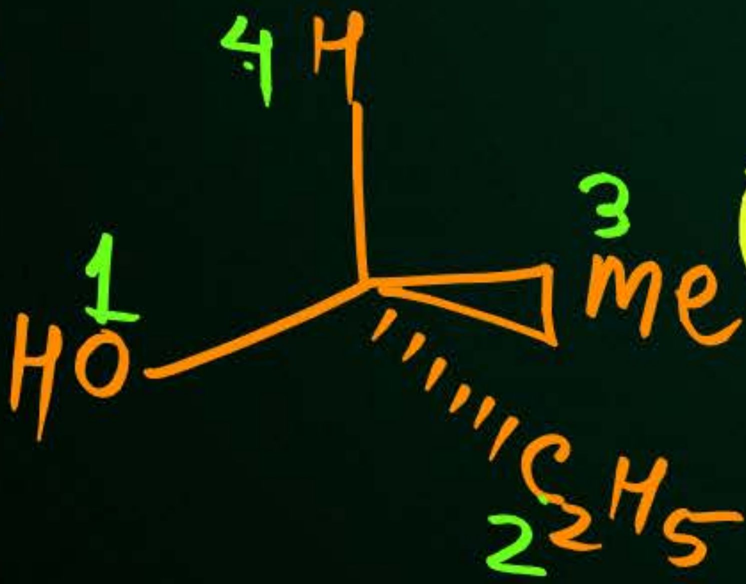
②



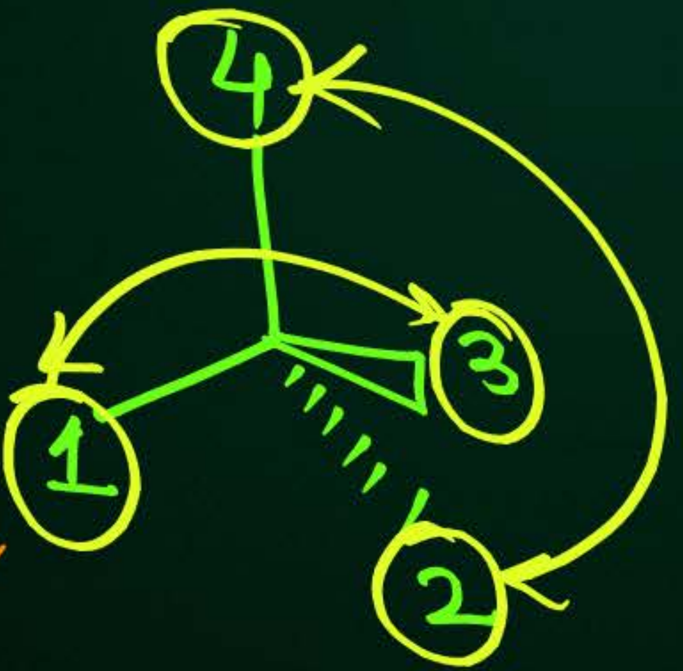
2
F
1
Cl
4
H
3
OH

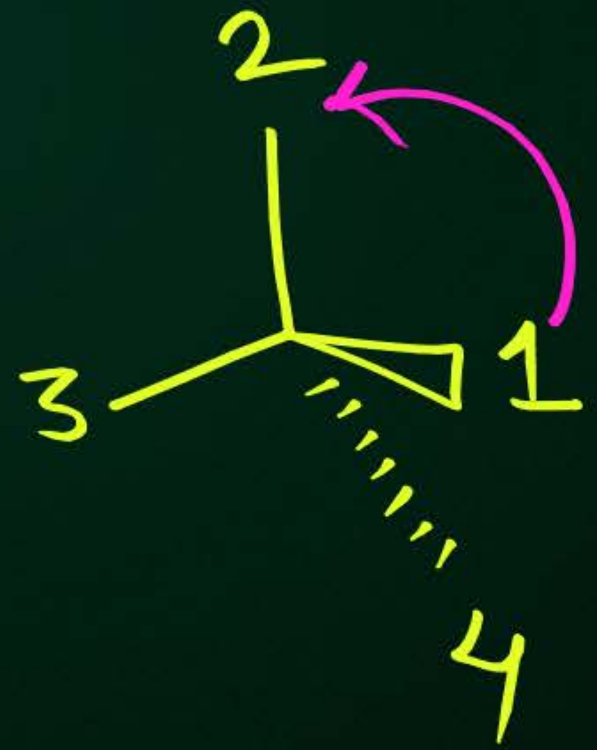
Ⓢ

③



4
H
1
HO
3
me
2
C_2H_5

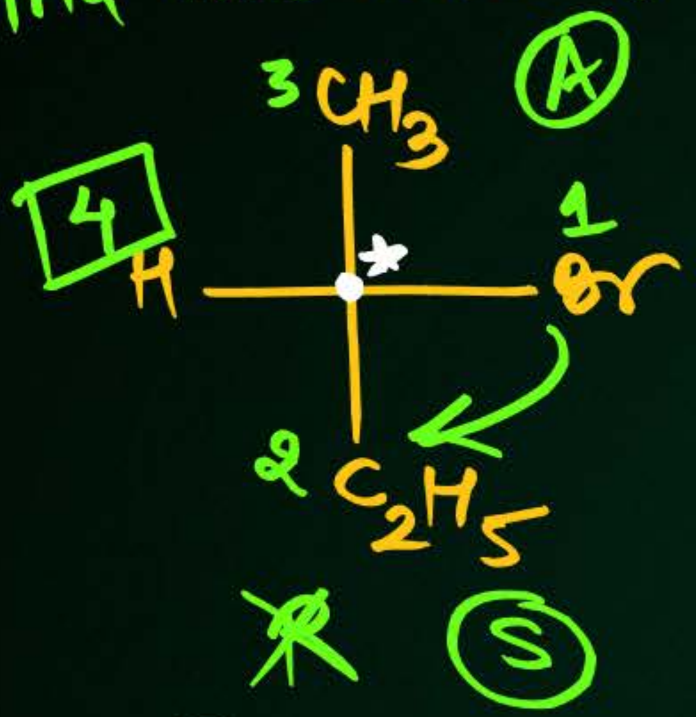




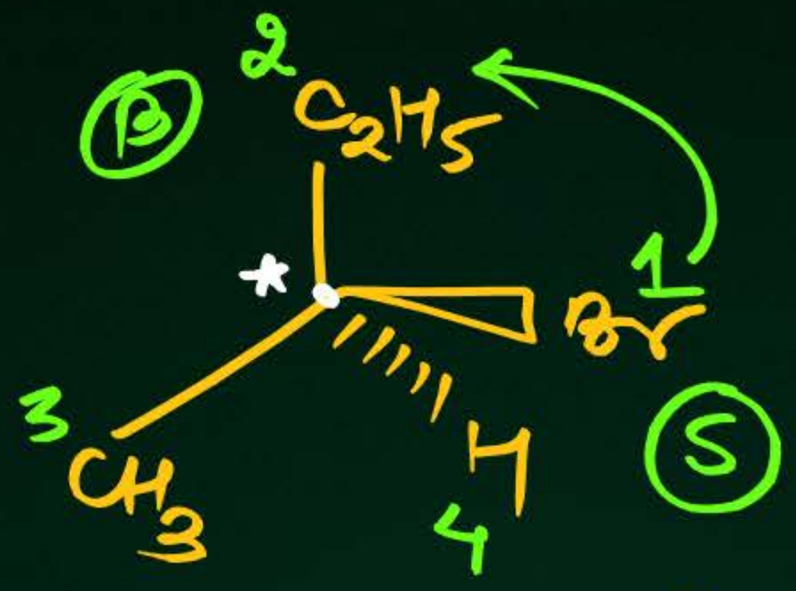
Ⓢ

Q. find the relation ?

①



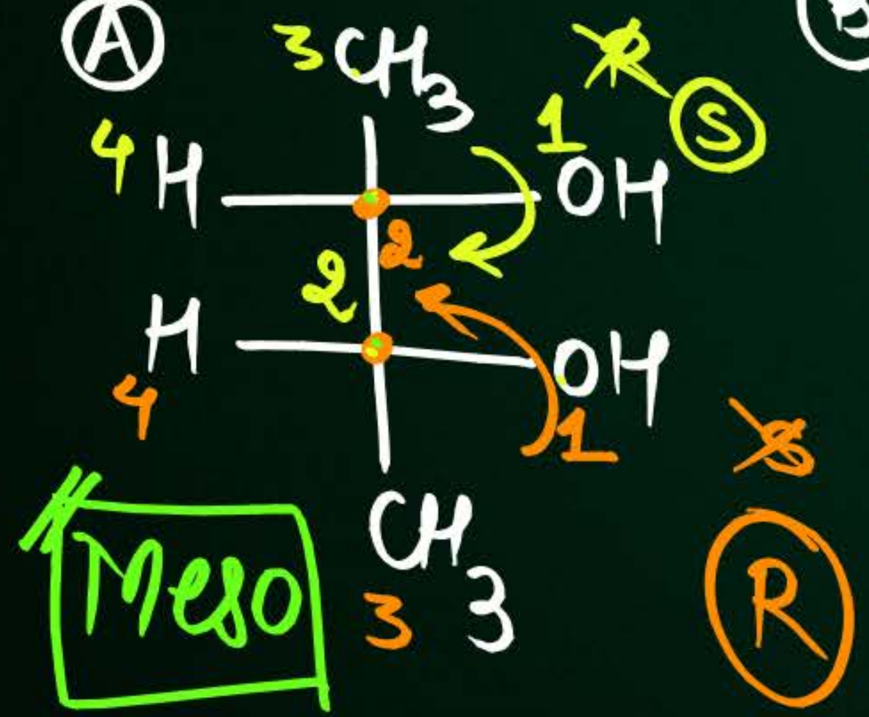
(A)
3 CH3
4 H
1 Br
2 C2H5
*
R
S



(B)
2 C2H5
1 Br
3 CH3
H 4
*
S

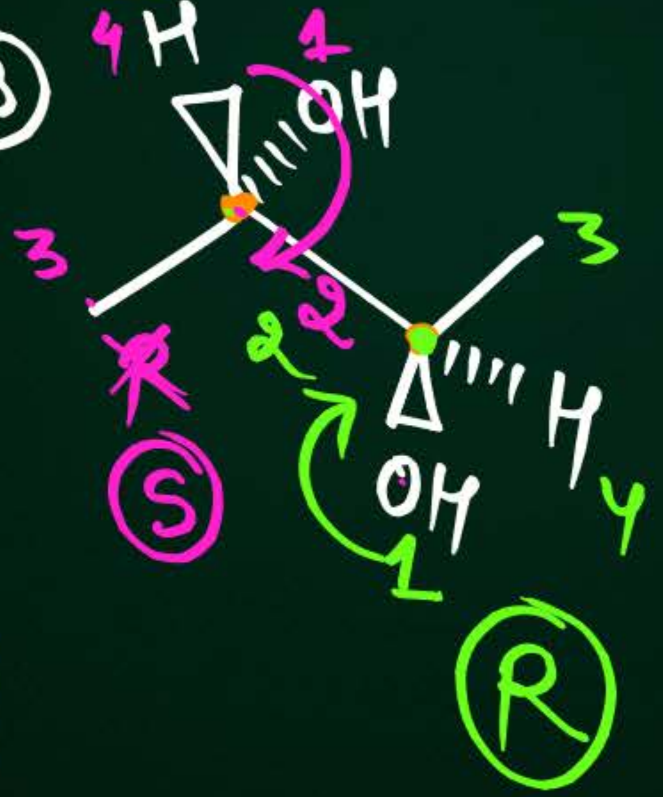
(A) & (B) are identical

②



(A)
3 CH3
4 H
1 OH
2
2
H
4
OH
1
CH3
3 3
R
S
S
R
Meso

(B)



4 H
1 OH
3
2
3
2 2
H 4
OH
1
R
S
R

1 chiral car

Config same - I

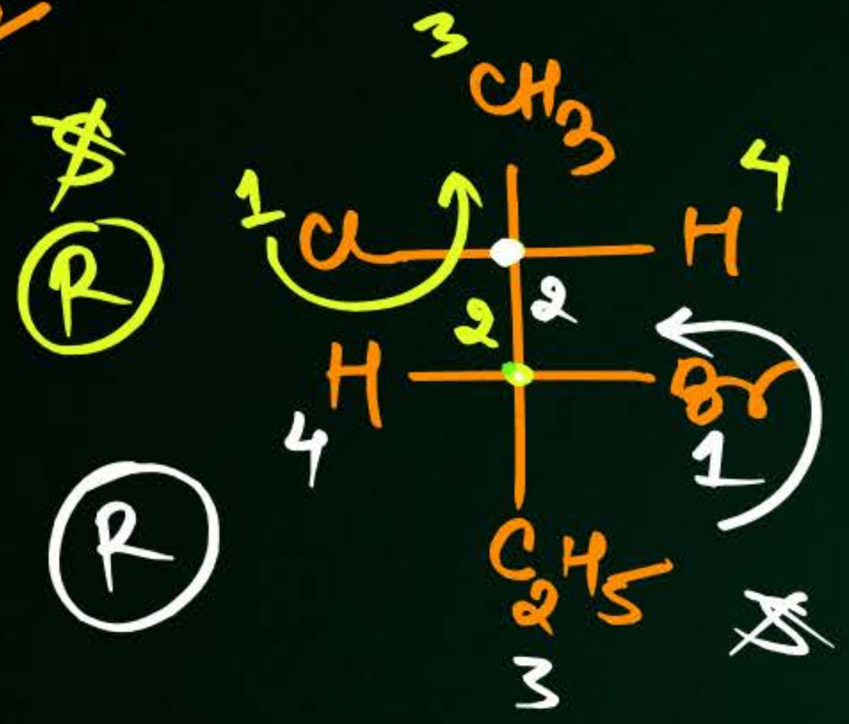
" opp - E

Same config ÷ I

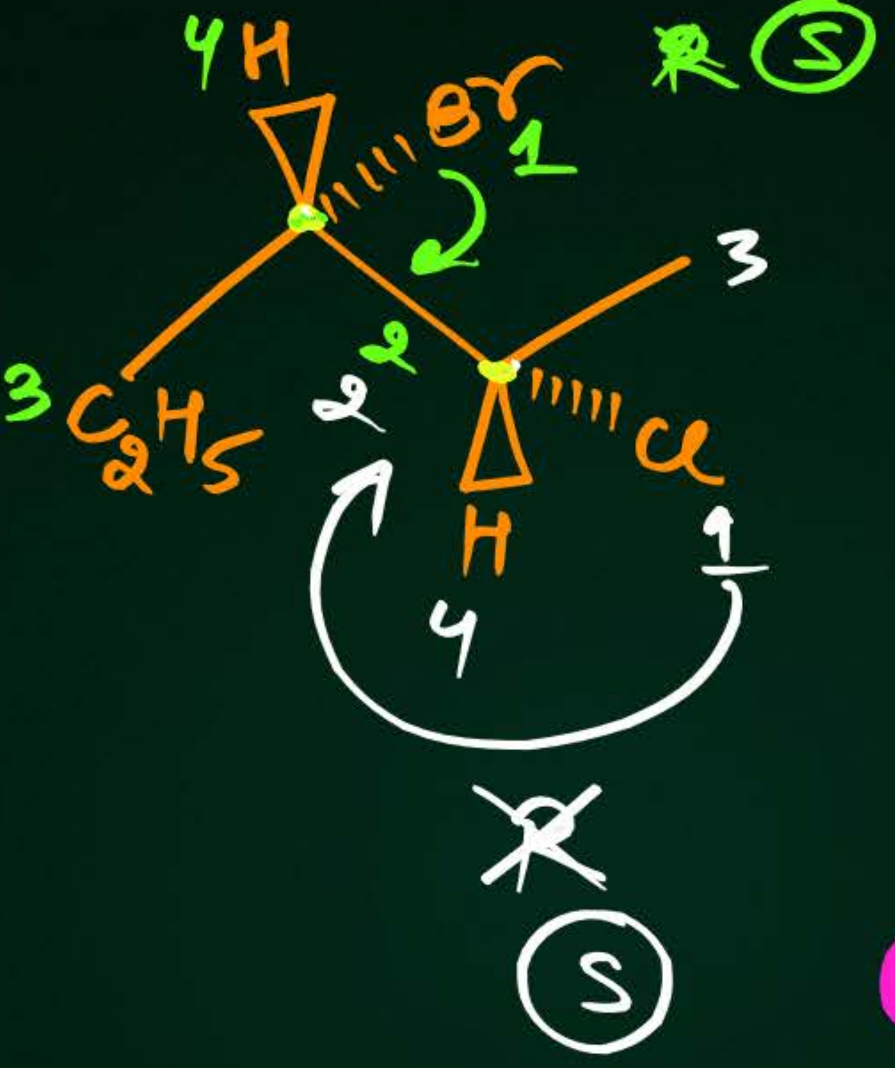
Dono chiral 'c' ke config change ÷ Enantiomer

Ek ka same & ek ka change toh ÷ Dias

Q/



S
R
R
3 CH3
1 Cl
H 4
2
2
4 H
Br 1
C2H5
3
S



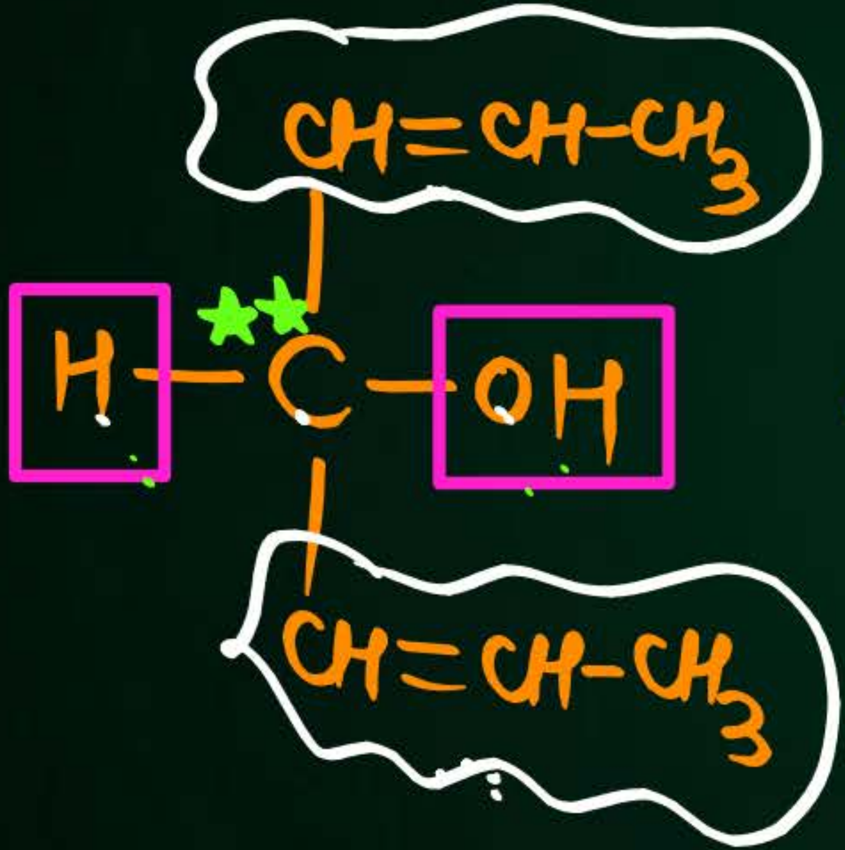
4 H
Br 1
R S
3
3 C2H5
2
2
2
Cl
H
1
4
R
S

R | S
R | S

E

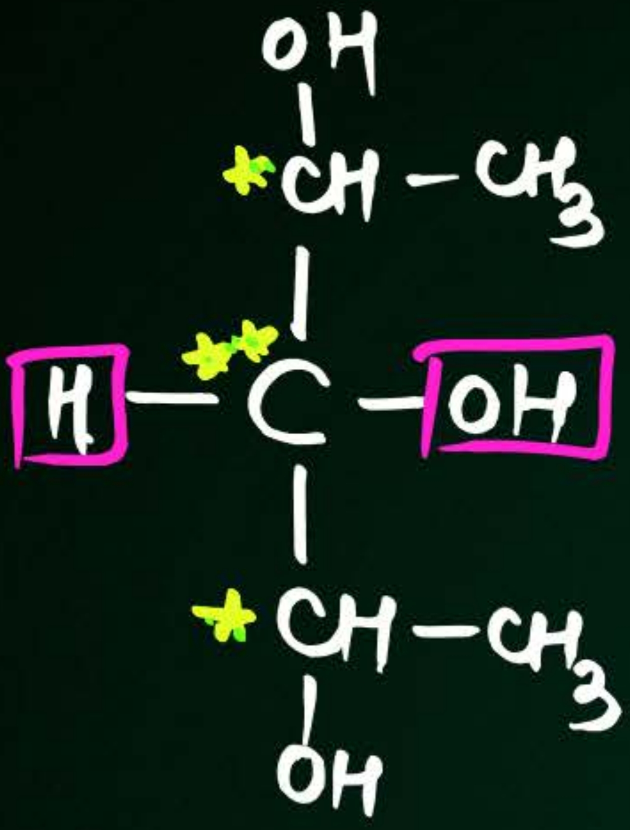
Pseudo chiral centers

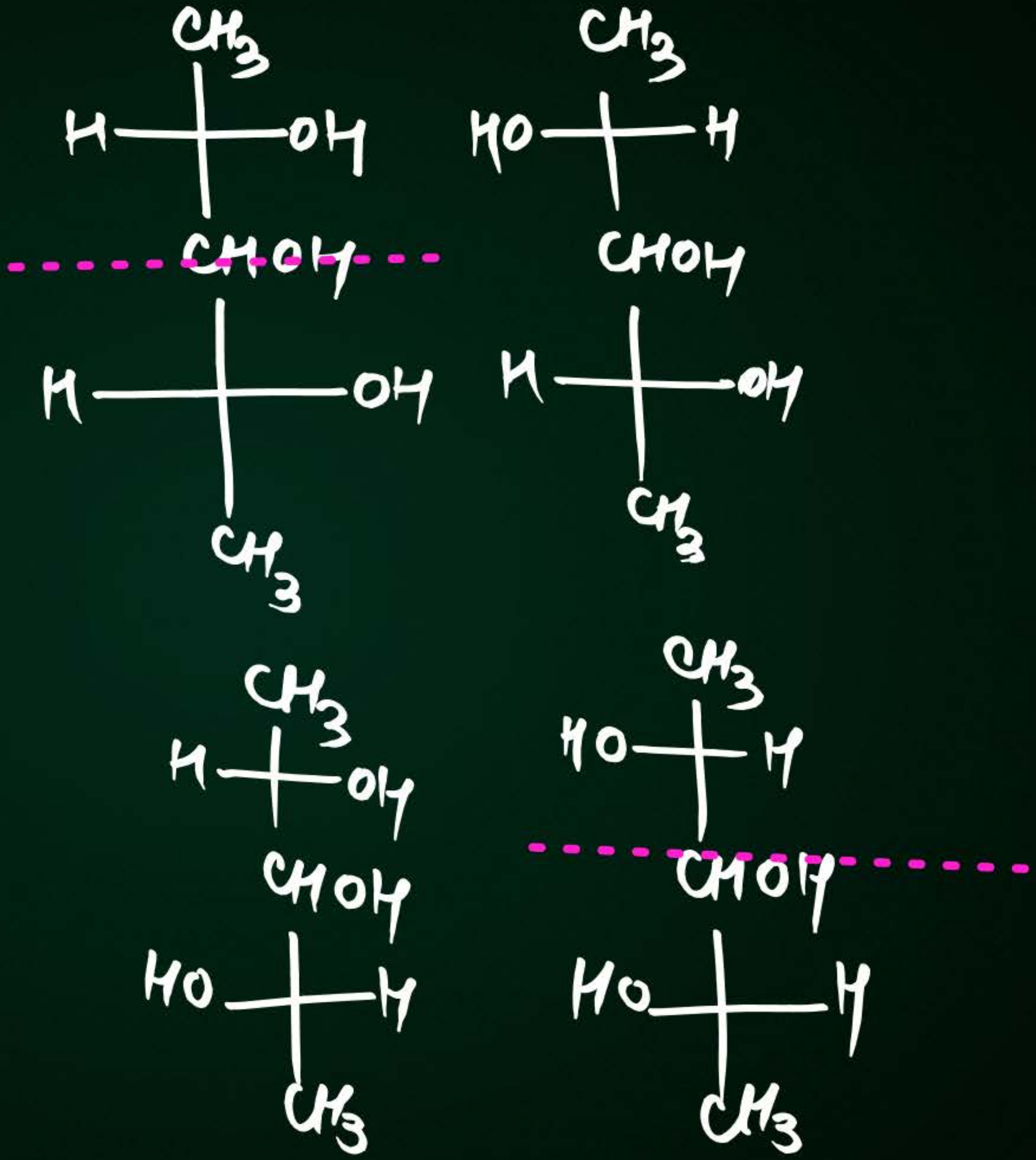
1. Two different group must be present
2. Other two groups have same MF but exhibiting GI or have chiral centers



$H-\overset{\overset{CH=CH-CH_3}{|}}{\underset{\underset{CH=CH-CH_3}{|}}{\overset{**}{C}}}-OH$

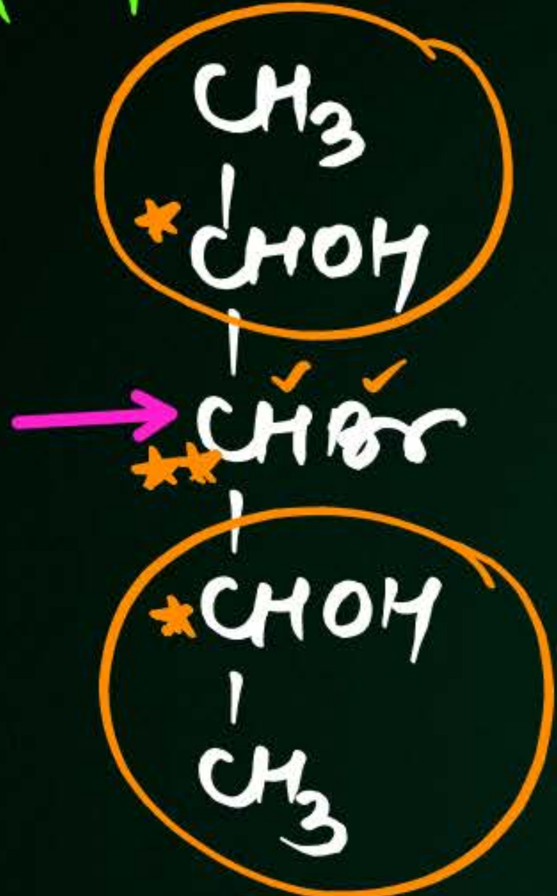
cis	cis	Trans	Trans
Achiral	chiral	chiral	Achiral
cis	Trans	cis	Trans


OH
*CH – CH3
H – C – OH
*CH – CH3
OH


CH3
H — OH
CHOH
H — OH
CH3
CH3
HO — H
CHOH
H — OH
CH3
CH3
H — OH
CHOH
HO — H
CH3
CH3
HO — H
CHOH
HO — H
CH3

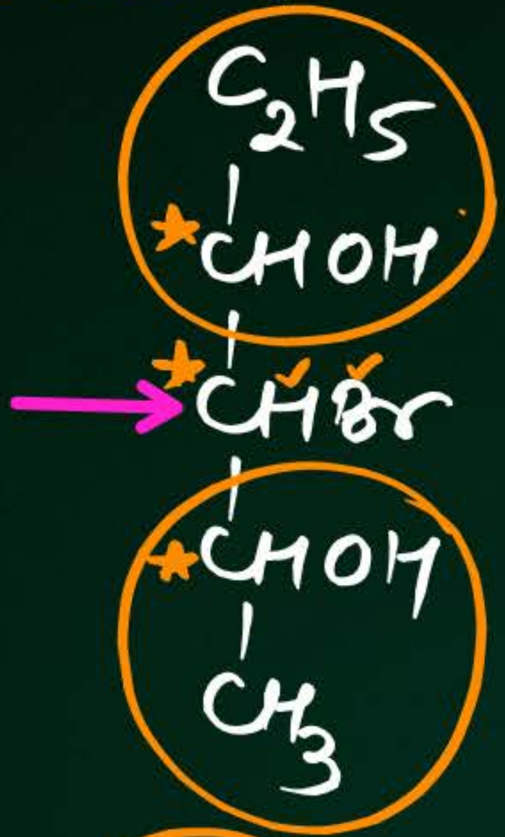
Q find Pseudo chiral carbon ?

① ✓



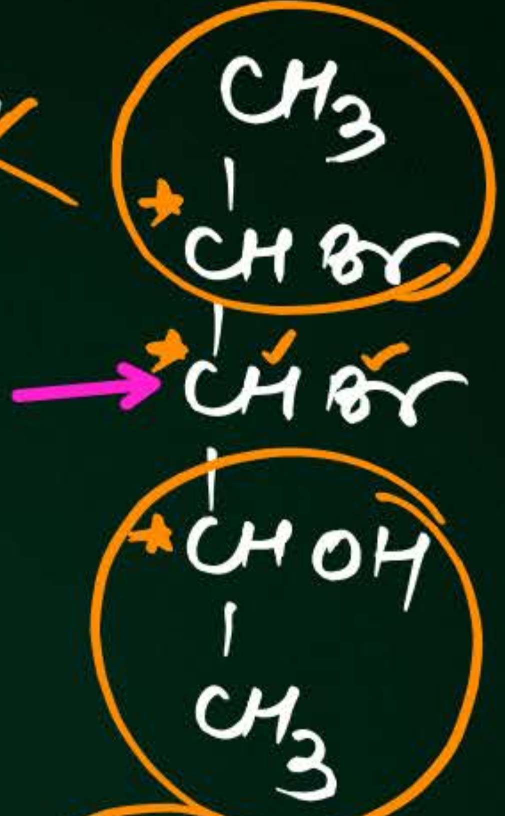
$CH_3-CH(OH)-CH(Br)-CH(OH)-CH_3$

② ✗



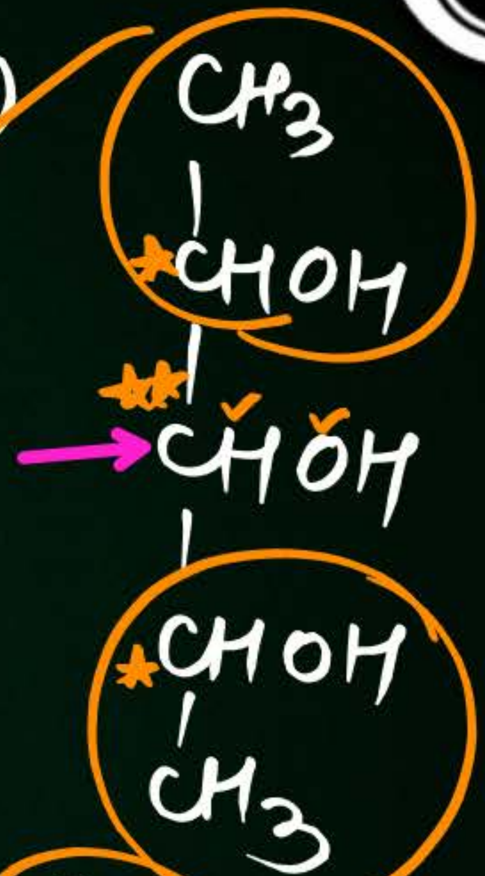
$C_2H_5-CH(OH)-CH(Br)-CH(OH)-CH_3$

③ ✗



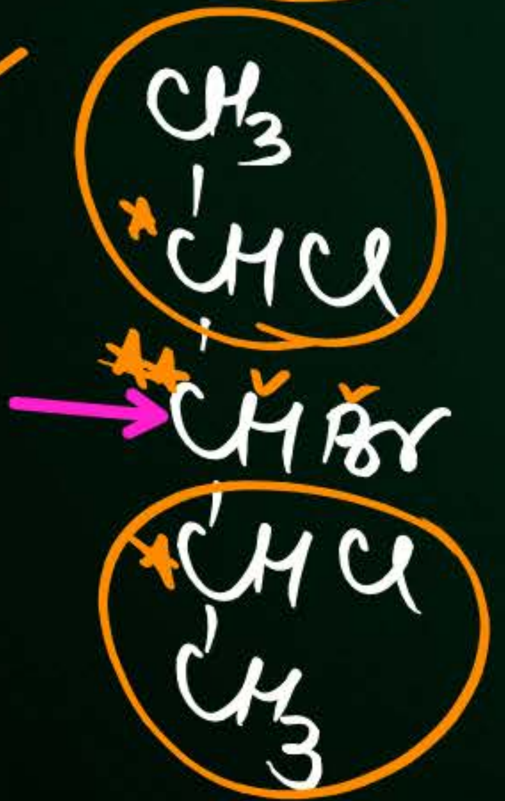
$CH_3-CH(Br)-CH(Br)-CH(OH)-CH_3$

④ ✓



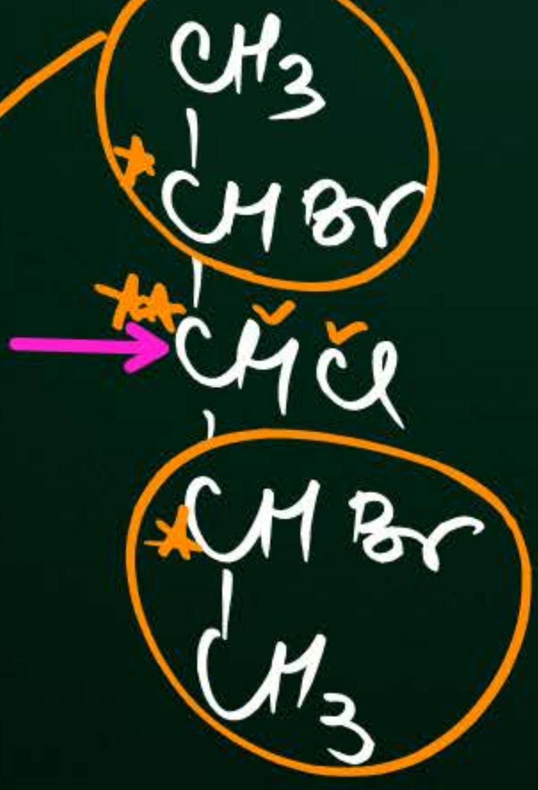
$CH_3-CH(OH)-CH(OH)-CH(OH)-CH_3$

⑤ ✓



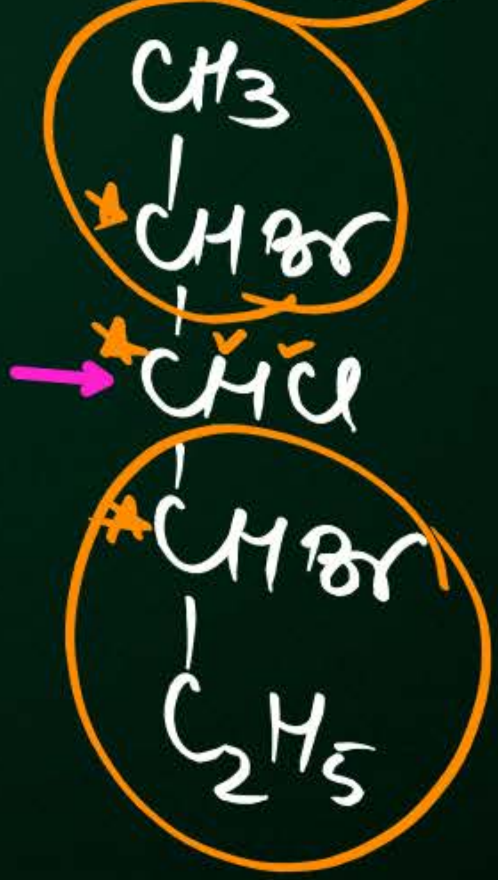
$CH_3-CH(Cl)-CH(Br)-CH(Cl)-CH_3$

⑥ ✓



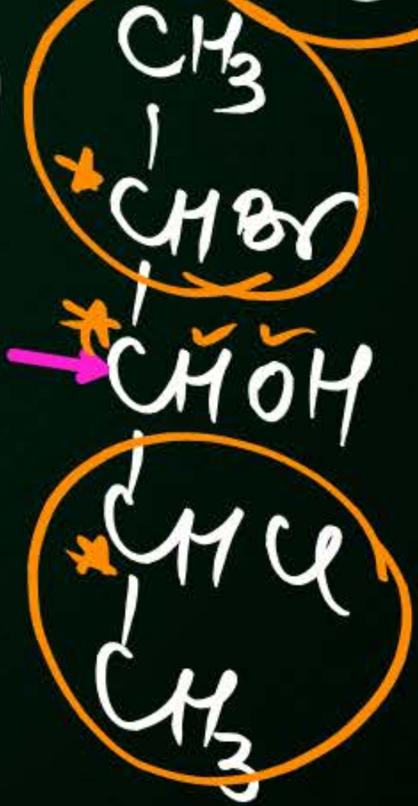
$CH_3-CH(Br)-CH(Cl)-CH(Br)-CH_3$

⑦ ✗



$CH_3-CH(Br)-CH(Cl)-CH(Br)-C_2H_5$

⑧ ✗



$CH_3-CH(Br)-CH(OH)-CH(Cl)-CH_3$

Calculation of Optical Isomers:

Case 1. If molecule is unsymmetrical.

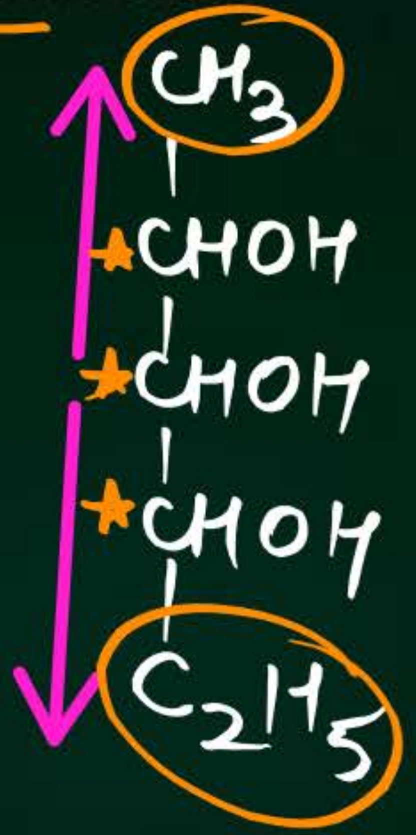
Total O.I $= 2^n$

O.A $= 2^n$

meso $= 0$

RM $= \frac{O.A}{2}$

n = no. of chiral centers


CH₃
*CHOH
*CHOH
*CHOH
C₂H₅

$\boxed{n = 3}$

Total O.I $= 2^n = 2^3 = 8$

O.A $= 8$

meso $= 0$

RM $= \frac{8}{2} = 4$

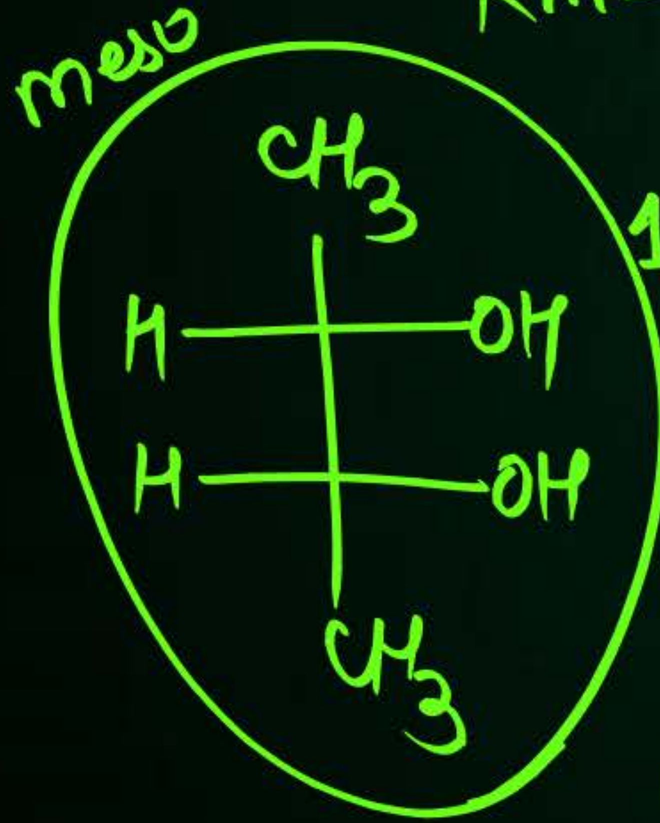
Case 2. If molecule is symmetrical (n = even)

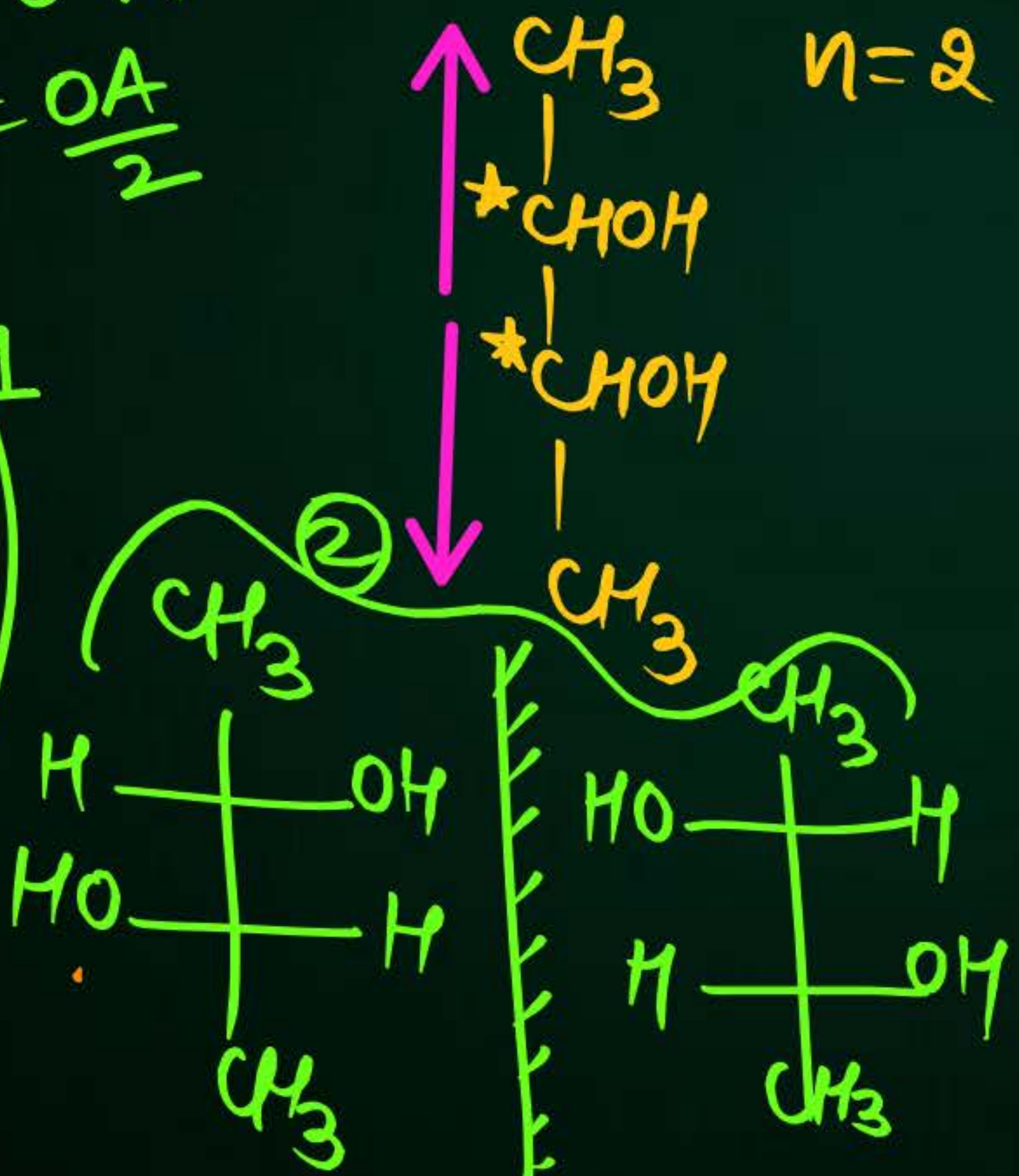
$$\text{Total O·I} = 2^{n-1} + 2^{\frac{n}{2}-1}$$

O·A

meso

$$RM = \frac{OA}{2}$$


meso
1
CH3
H
OH
H
OH
CH3


CH3
*CHOH
*CHOH
CH3
②
CH3
H
OH
HO
H
CH3
CH3
HO
H
H
OH
CH3

n = 2

$$\text{Total O·I} = 2^{2-1} + 2^{\frac{2}{2}-1}$$

$$= 2^{1} + 2^{0}$$

$$= 2 + 1 = \boxed{3}$$

OA

meso

$$RM = \frac{2}{2} = 1$$

Case 3. If molecule is symmetrical (n = odd)

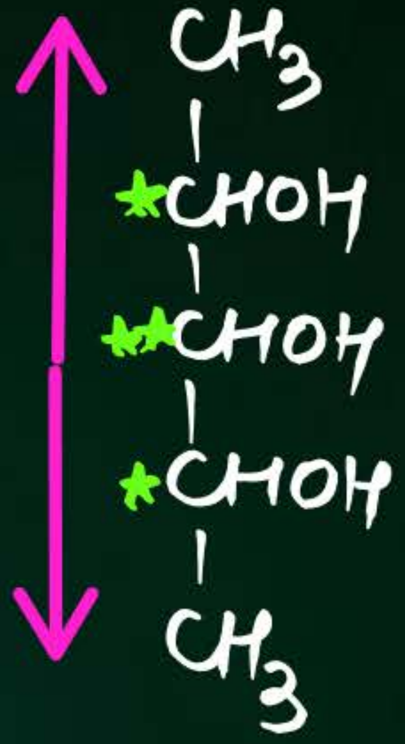
Total O·I = 2^{n-1}

meso = $2^{\left(\frac{n-1}{2}\right)}$

O·I = O·A + Meso

O·A = O·I − meso

RM = $\frac{OA}{2}$



$CH_3-\overset{*}{C}HOH-\overset{**}{C}HOH-\overset{*}{C}HOH-CH_3$

n = 3

Total O·I = $2^{3-1} = 2^{2} = 4$

Meso = $2^{\frac{3-1}{2}} = 2^{1} = 2$

O·A = 4 − 2 = 2

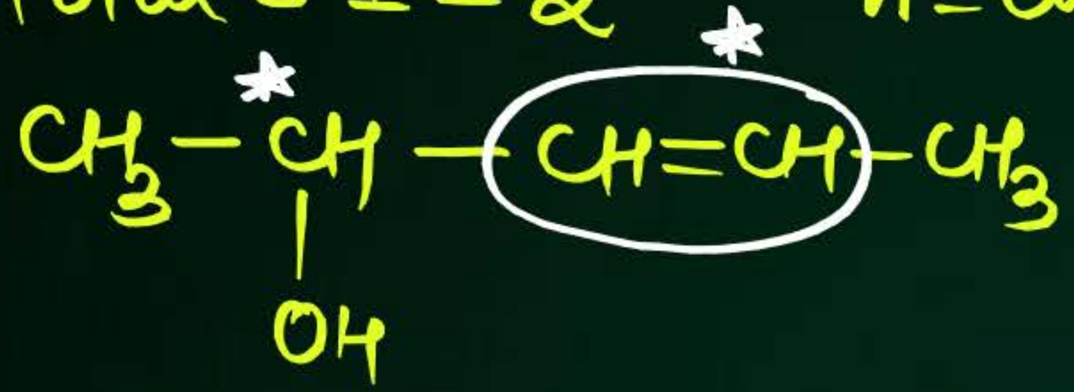
RM = $\frac{2}{2} = 1$

Calculation of Stereoisomers: (GI + O·I)

Case 1. If molecule is unsymmetrical.

Total S·I = 2^n n = chiral cent + stereogenic area (double bond wale)

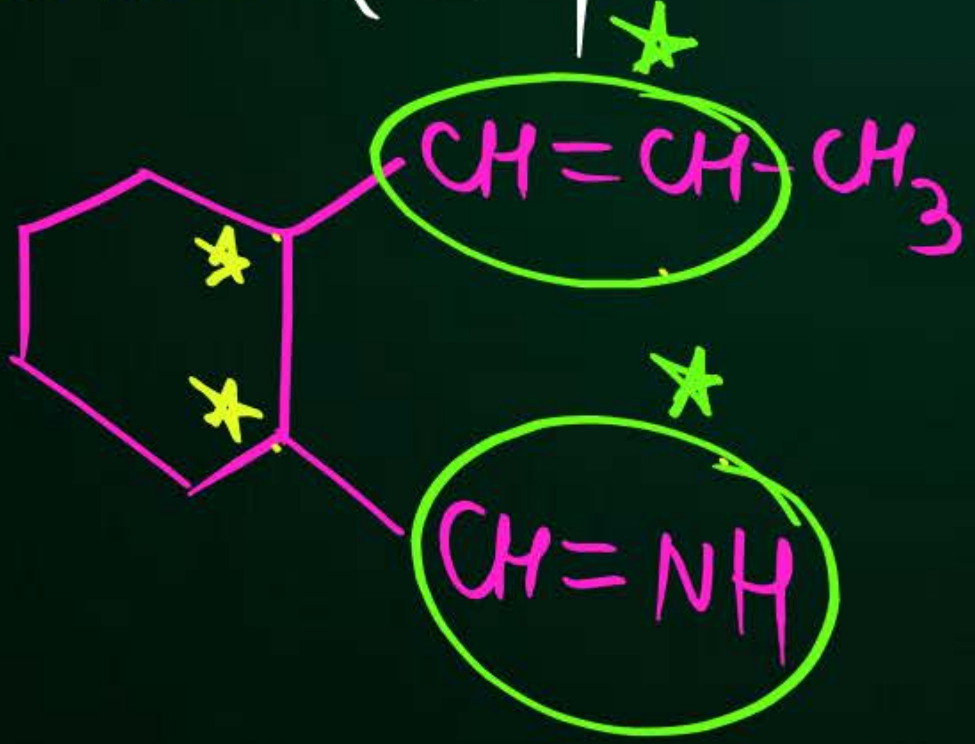
Q



$CH_3-\overset{*}{C}H(OH)-\overset{*}{CH=CH}-CH_3$

Total S·I = $2^2 = 4$

Q



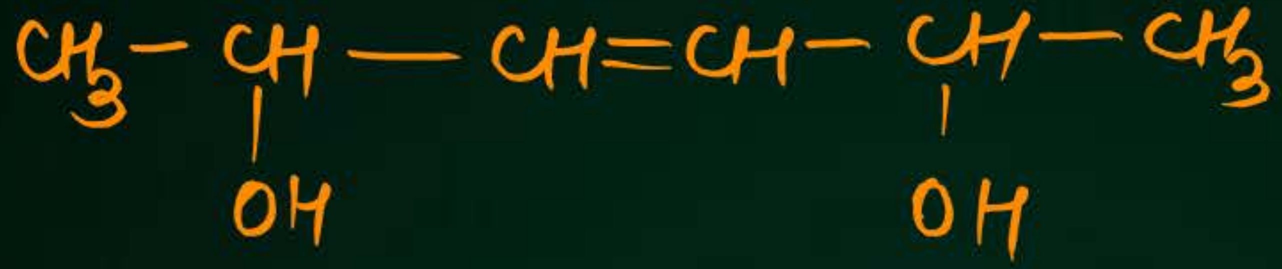
n = 4

$2^4 = 16$

Calculation of Stereoisomers: (Not in syllabus)

Case 2. If molecule is symmetrical.

NO formula



$CH_3-\underset{OH}{\underset{|}{CH}}-CH=CH-\underset{OH}{\underset{|}{CH}}-CH_3$

Ans ÷ ⑥

① R cis R

① ← R cis S
S cis R

① S cis S

③

① R Trans R

① ← R Trans S
S Trans R

① S Trans S

③

Optical rotation

Polarimeter

exp

$$\boxed{\alpha = \frac{\theta}{C \cdot l}}$$

α = specific rotation

θ = observed rotation

C = concn of organic soln $\left(\frac{gm}{mL}\right)$

l = length (dm)

Q

$\theta = +25^\circ$

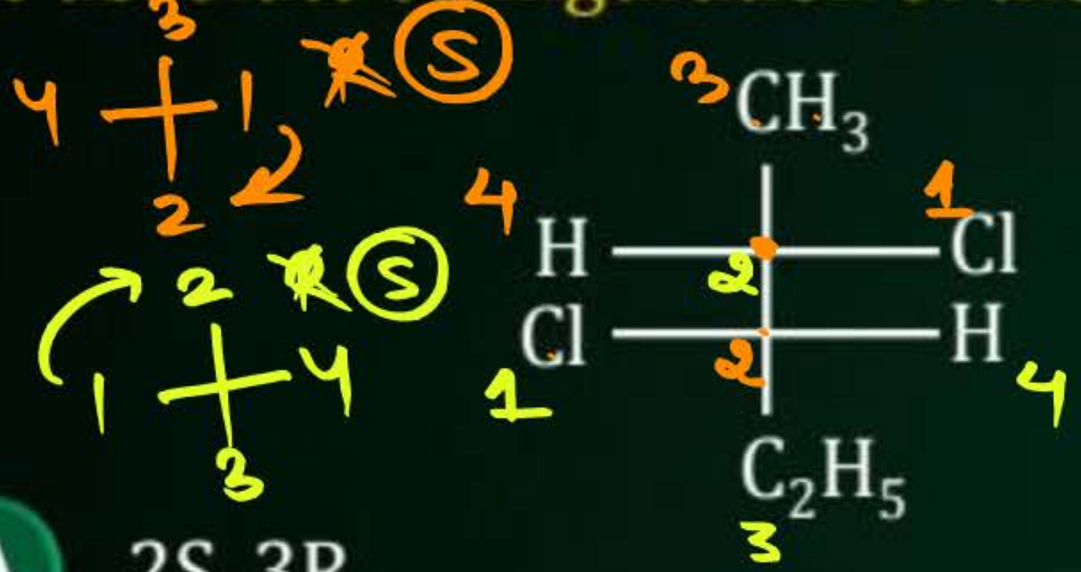
$C = 5$ gm/mL

$l = 1$ dm

$$\alpha = \frac{25}{5 \times 1} = 5$$

QUESTION (AIIMS 2003)

The absolute configuration of the following:



3
4
1
2
S
2
S
1
4
3
3 CH$_3$
4 H
1 Cl
Cl 1
H 4
2
2
C$_2$H$_5$ 3

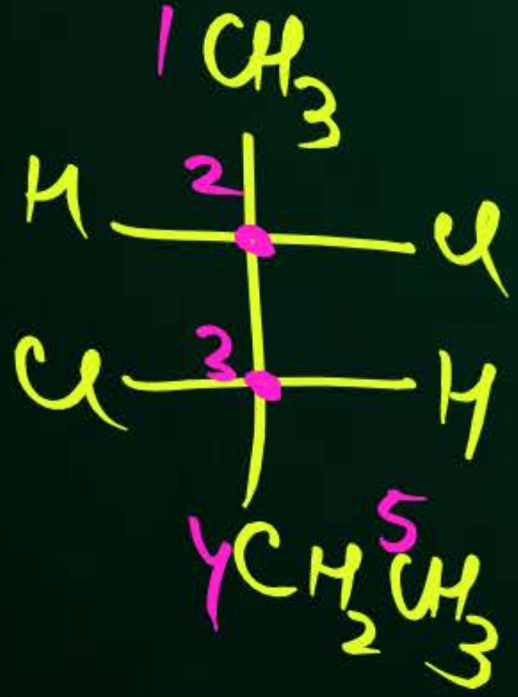
is:

A 2S, 3R

[✓ B] 2S, 3S

C 2R, 3S

D 2R, 3R



1 CH$_3$
H
2
Cl
Cl
3
H
5
4 CH$_2$CH$_3$

QUESTION

The correct decreasing priority of groups $\overset{1}{-NO_2}$, $\overset{3}{-C\equiv N}$, $\overset{2}{-NH_2}$ and $\overset{4}{-CH_2NH_2}$ in absolute configuration R/S of a compound is:

[✓ A] $\underline{N}O_2 > \underline{N}H_2 > \underline{C} \equiv N > \underline{C}H_2NH_2$

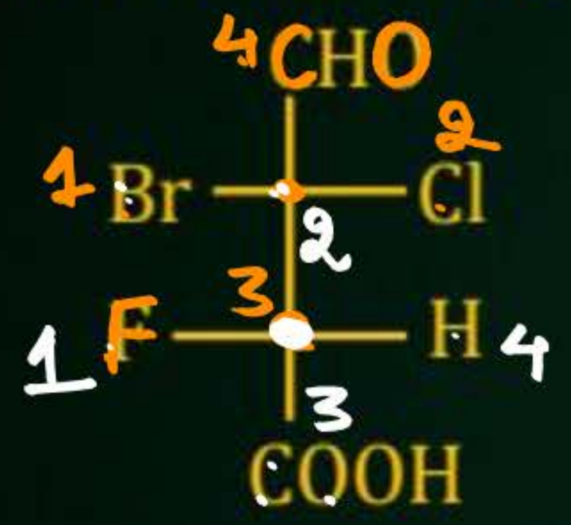
B $NO_2 > C \equiv N > NH_2 > CH_2NH_2$

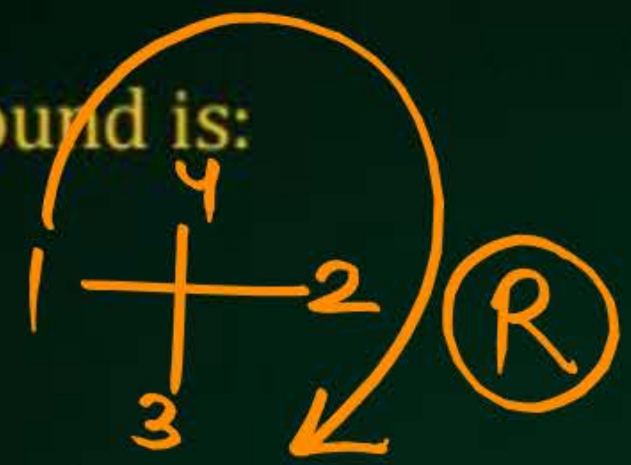
C $NH_2 > NO_2 > C \equiv N > CH_2NH_2$

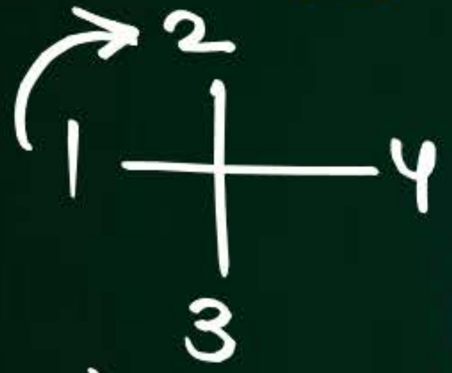
D $NH_2 > NO_2 > CH_2NH_2 > C \equiv N$

QUESTION

Configuration of compound is:


4 CHO
1 Br
2 Cl
2
3
1 F
H 4
3
COOH





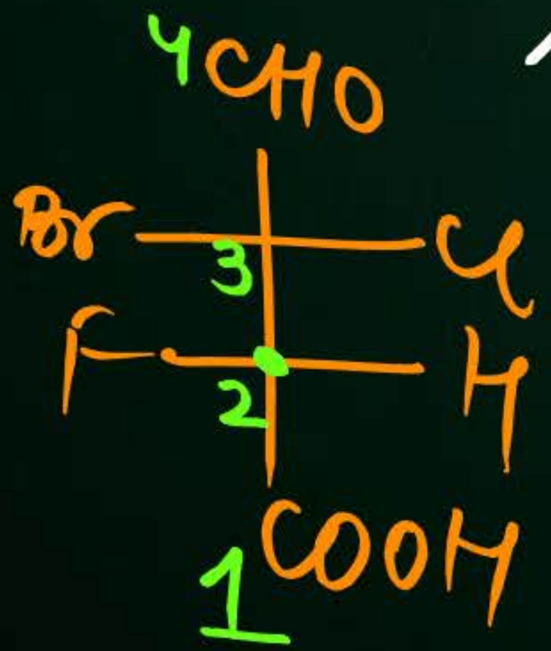
~~R~~ (S)

(A) 2S, 3S

(B) 2R, 3S

(C) 2R, 3R

[✓ D] 2S, 3R


4 CHO
Br
Cl
3
F
2
H
1 COOH

(2-S)(3-R)

QUESTION (AIIMS 1997)

The number of $\overset{\text{optically Active}}{\underbrace{\text{enantiomers}}_{\text{O.A}}}$ of the compound $\underbrace{CH_3\overset{*}{C}HBr\,\overset{*}{C}HBr\,COOH}_{\text{Unsym}}$ is:

Total O.I $= 2^2 = 4$

OA $= 4$

- **A** 2
- **B** 3
- **C** 4 ✓
- **D** 6

QUESTION

A compound contains two dissimilar asymmetric carbon atoms. The number of stereoisomers is:

Unsymm

$n = 2$

Total S.I $= 2^2 = 4$

A 2

B 3

[✓ **C** 4]

D 1

QUESTION

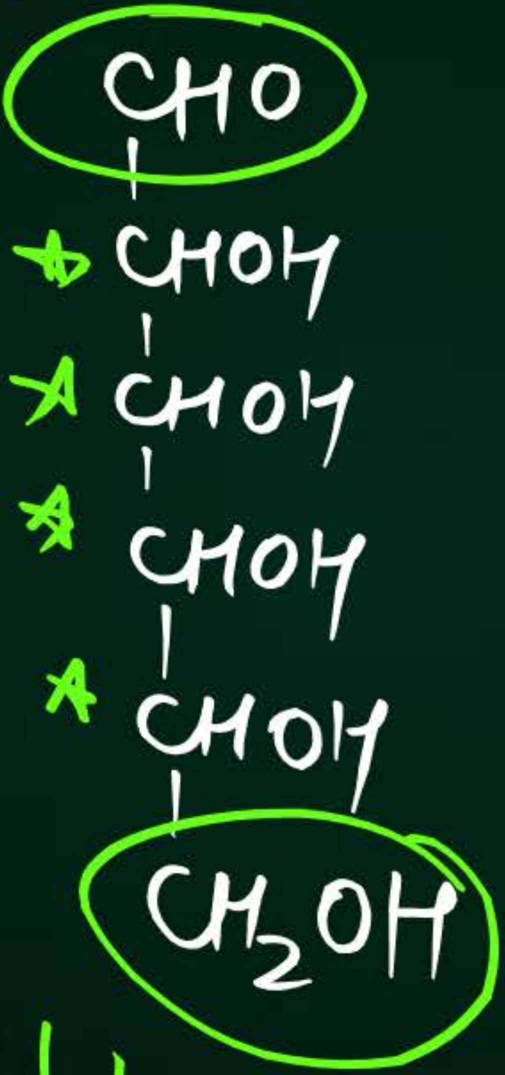
Glucose has how many optical isomers?

A 8

B 12

[✓ C] 16

D Cannot be predicted



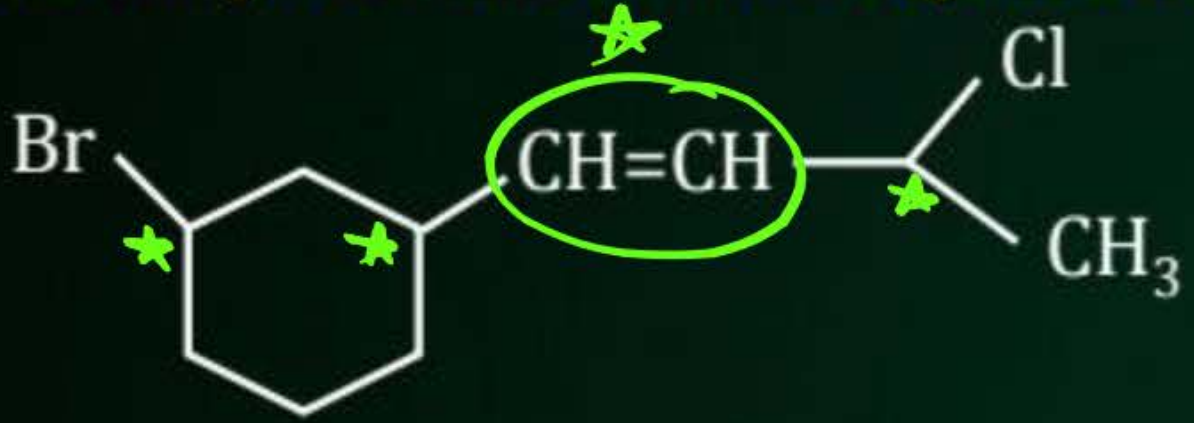
$$\begin{array}{c} CHO \\ | \\ {}^{*}CHOH \\ | \\ {}^{*}CHOH \\ | \\ {}^{*}CHOH \\ | \\ {}^{*}CHOH \\ | \\ CH_2OH \end{array}$$

Unsym

Total O.I $= 2^4 = 16$

QUESTION

How many stereoisomer are possible for the following molecule?


Br
CH=CH
Cl
CH_3

Total S.I $= 2^n = 2^4 = 16$

A 4

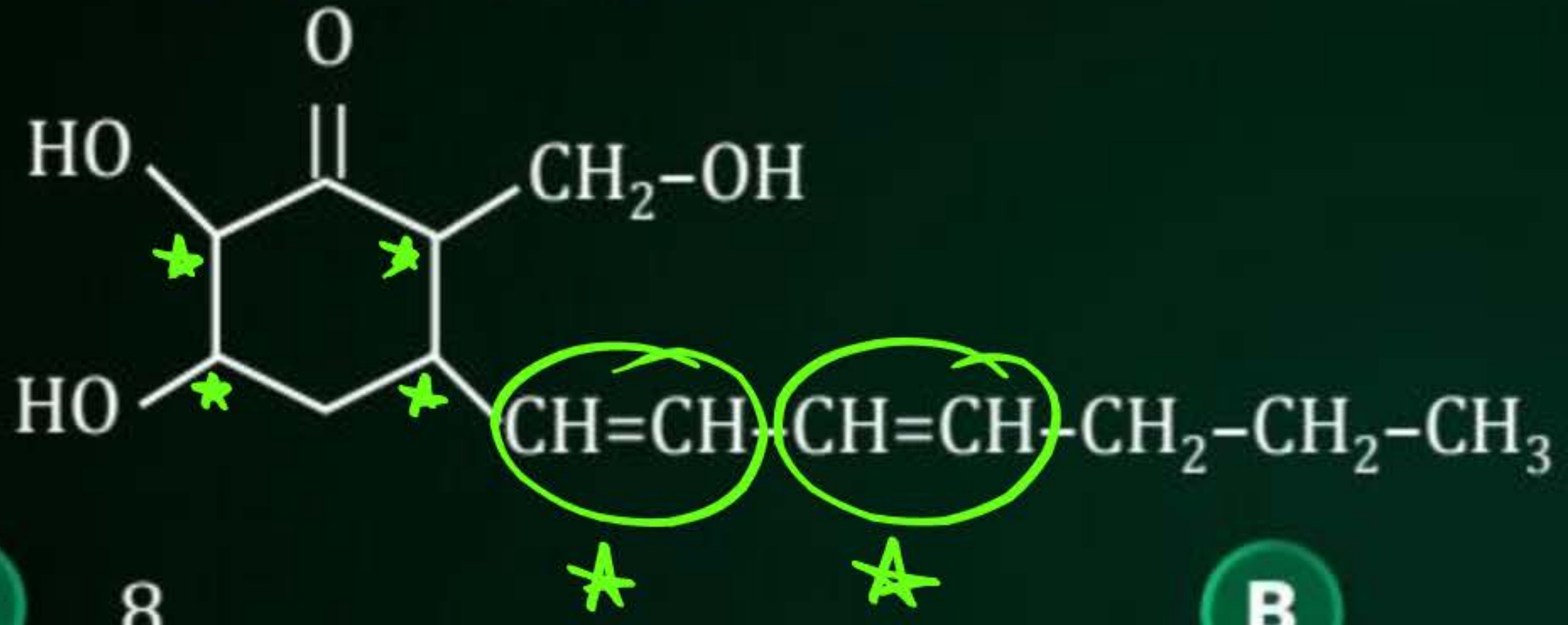
B 8

C [✓ 16]

D 32

QUESTION

How many stereoisomer may have this natural occuring compound.



Total S.I $= 2^n$

$= 2^6$

$= 64$

A 8

B 16

C 64 ✓

D 128

QUESTION

How many stereoisomers of $(CH_3)_2CH\overset{*}{CH=CH}CH_2\overset{*}{C}H(OH)CH_2Br$ are possible?

A 2

B 3

C 4 ✓

D 5

Total S.I $= 2^n$

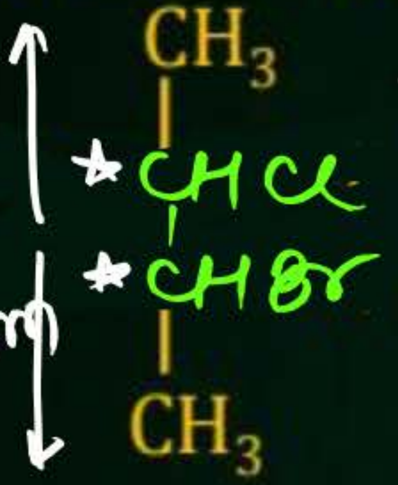
$= 2^2 = 4$

QUESTION

~~Geo~~ opti ✓

Calculate total number of stereoisomers of the following compounds.

(1)



$CH_3-CHCl-CHBr-CH_3$

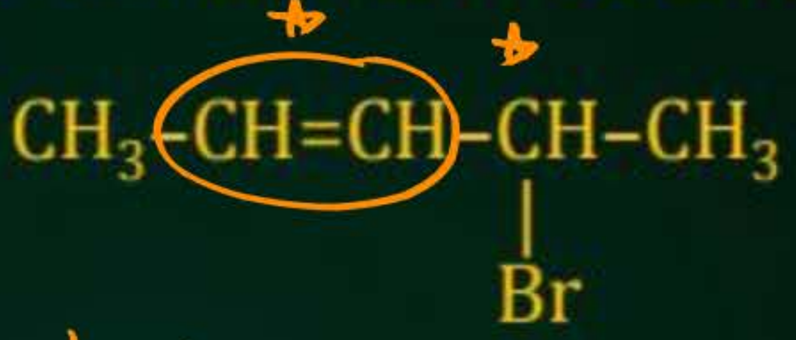
Unsymm

Total O.I = 2^n

or

S.I = $2^2 = 4$

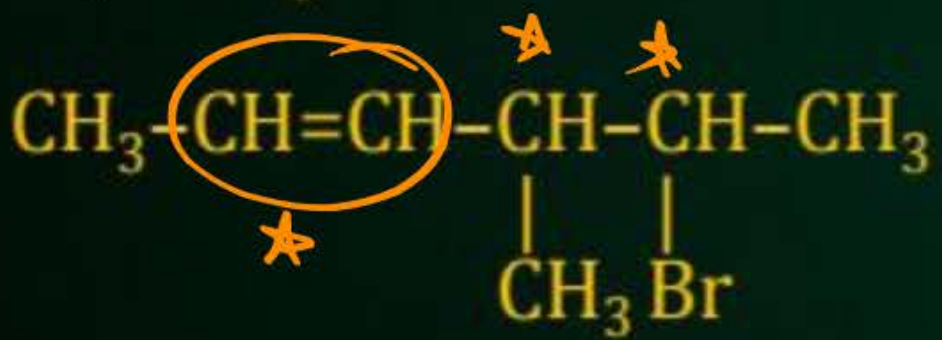
(2)



$CH_3-CH=CH-CH(Br)-CH_3$

Total S.I = $2^2 = 4$

(3)



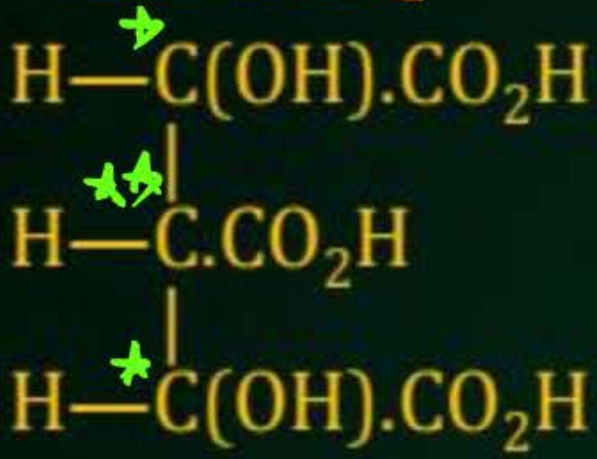
$CH_3-CH=CH-CH(CH_3)-CH(Br)-CH_3$

Total S.I = $2^3 = 8$

QUESTION

optical isomers

How many stereoisomers can exist for the following acid



$$\begin{array}{l} H-\overset{*}{C}(OH).CO_2H \\ \quad\;| \\ H-\overset{**}{C}.CO_2H \\ \quad\;| \\ H-\overset{*}{C}(OH).CO_2H \end{array}$$

$n=3$

Total O.I $= 2^{3-1} = 4$

Ⓐ two

[✓ Ⓑ four]

Ⓒ eight

Ⓓ sixteen

QUESTION

The number of optical isomers of $\underline{CH_3}\underset{*}{C}H(OH)\underset{*}{C}H(OH)\underline{CHO}$ is:

Unsymm

- (A) 0
- (B) 2
- (C) 3
- [✓ (D) 4]

Total O.I $= 2^2$

$= 4$

QUESTION

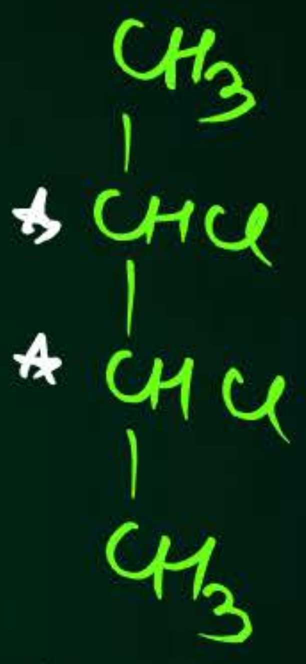
The number of optically active isomers observed in 2, 3-dichlorobutane is:

A 0

[✓ **B** 2]

C 3

D 4



$$\begin{array}{l} CH_3 \\ | \\ ^{*}CHCl \\ | \\ ^{*}CHCl \\ | \\ CH_3 \end{array}$$

Symm

$$\text{Total OI} = 2^{2-1} + 2^{\frac{2}{2}-1}$$

$$= 2^1 + 2^0$$

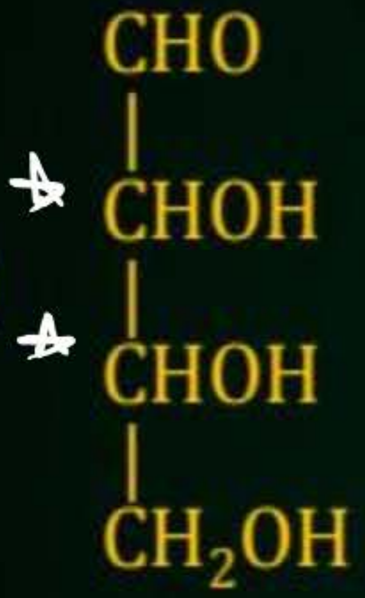
$$= \underbrace{2}_{\text{OA}} + \underbrace{1}_{\text{meso}}$$

QUESTION

OI ✓

Calculate the total number of stereoisomers in the following compounds.

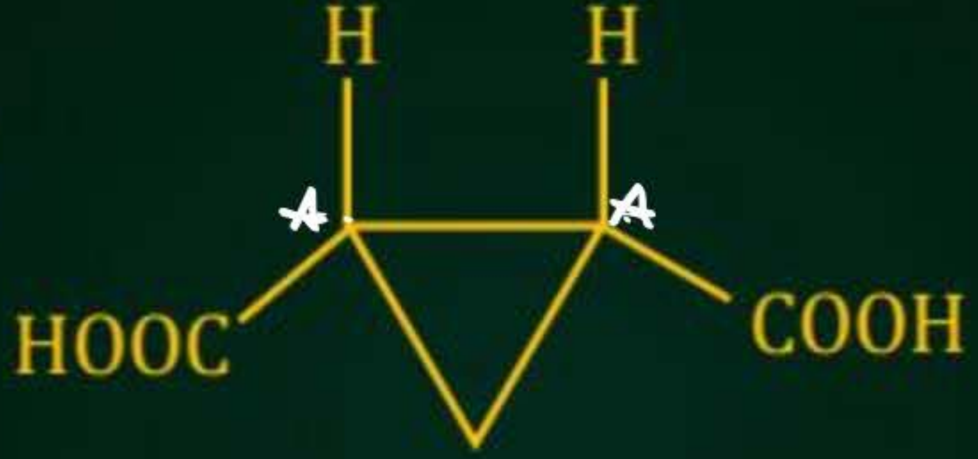
(I)


CHO
CHOH
CHOH
CH_2OH

Unsym

$2^2 = 4$

(II)

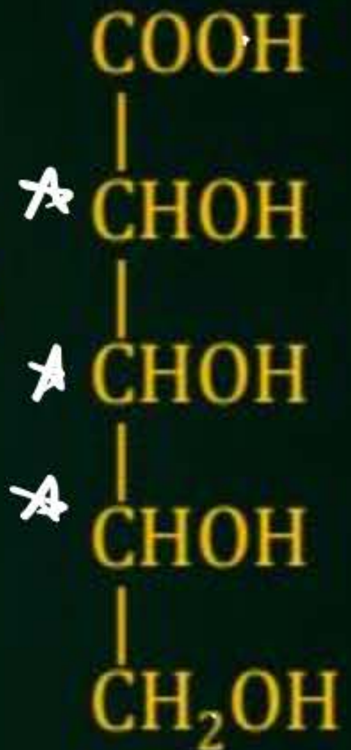

H
H
HOOC
COOH

sym

Total = 2 + 1 = 3

OI

(III)


COOH
CHOH
CHOH
CHOH
CH_2OH

Unsym

$2^3 = 8$

QUESTION

OI ✓

How many stereoisomers of the following molecule are possible?

$HOOC.CH = C = CH.COOH$ $\quad 2^1 = 2$

Allene cummulative double bond

[✓ A] two optical isomers

B two geometrical isomers

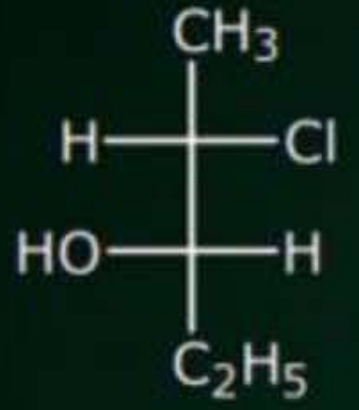
C two optical and two geometrical isomers

D None

Home Work

QUESTION 01

The compound with the below configuration is called:



(A) (2S, 3S)-2-chloro-3-hydroxypentane

(B) (2S, 3R)-2-chloro-3-hydroxypentane

(C) (2R, 3R)-2-chloro-3-hydroxypentane

(D) (2R, 3S)-2-chloro-3-hydroxypentane

QUESTION 02

Applying the sequence rule, which of the following priority arrangements is correct in determining the R/S configuration of:

A $-C_6H_5 > -CH=CH_2 > -CHO > -COOH$

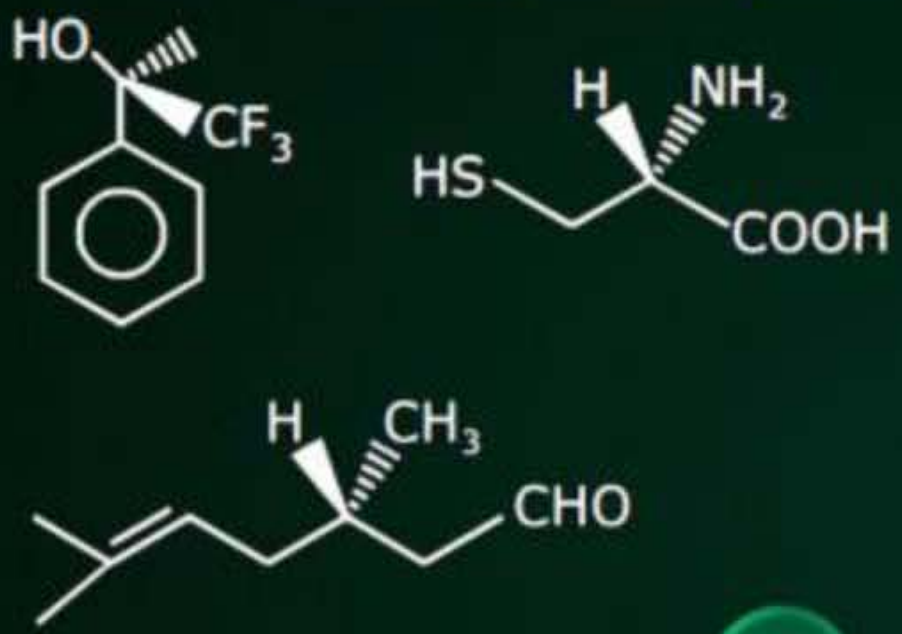
B $-COOH > -CH=CH_2 > -CHO > -C_6H_5$

C $-COOH > -CHO > -C_6H_5 > -CH=CH_2$

D $-COOH > -C_6H_5 > -CHO > -CH=CH_2$

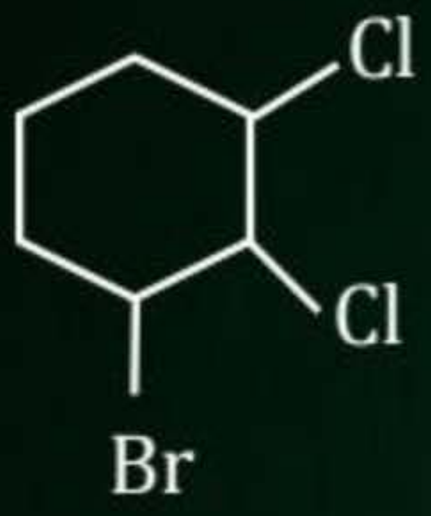
QUESTION 03

The R/S configuration of these compounds are respectively:


HO
CF_3
H
NH_2
HS
COOH
H
CH_3
CHO

- (A) R, R, S
- (B) R, S, R
- (C) R, S, S
- (D) S, S, S

QUESTION 04



Stereoisomers of given compound is:

(A) 4

(B) 6

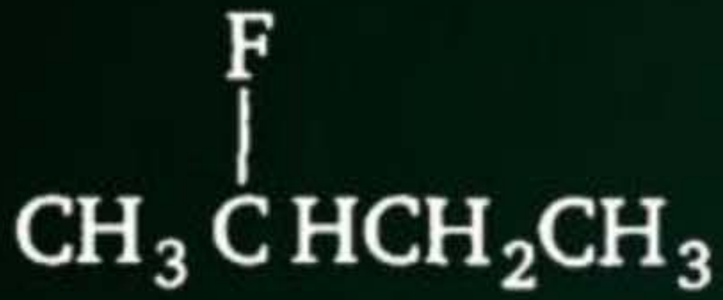
(C) 8

(D) 2

QUESTION 05

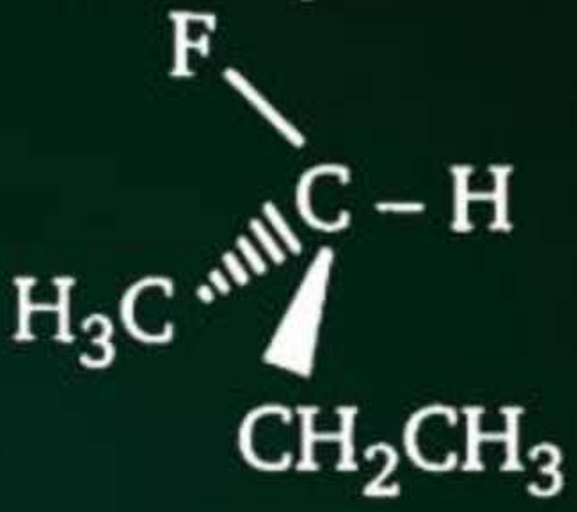
The structure of (*S*)-2-fluorobutane is best represented by:

Ⓐ



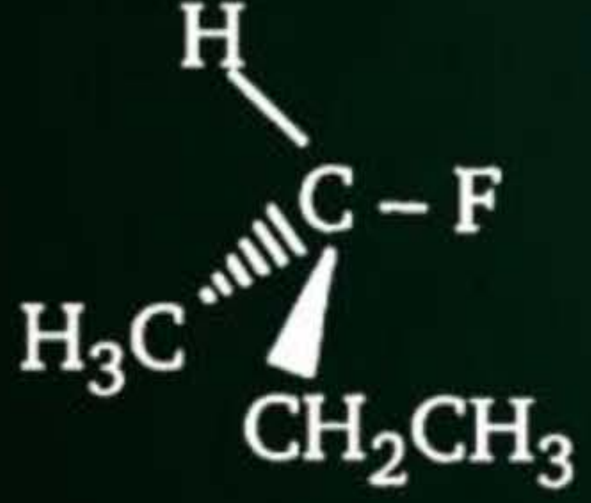
$\mathrm{CH_3\overset{\overset{\large F}{|}}{C}HCH_2CH_3}$

Ⓑ



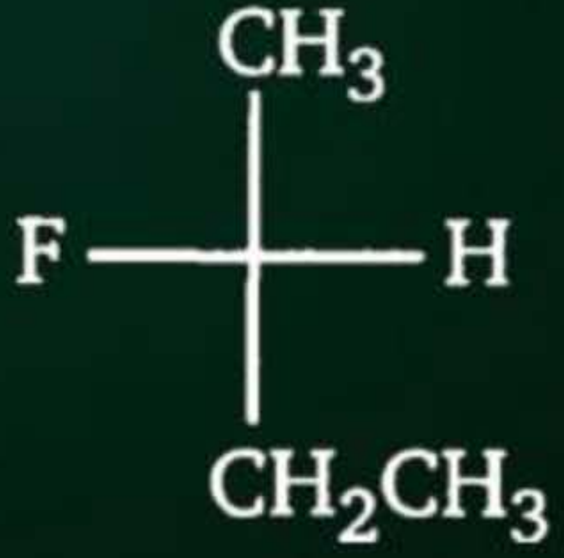
F
C – H
H3C
CH2CH3

Ⓒ



H
C – F
H3C
CH2CH3

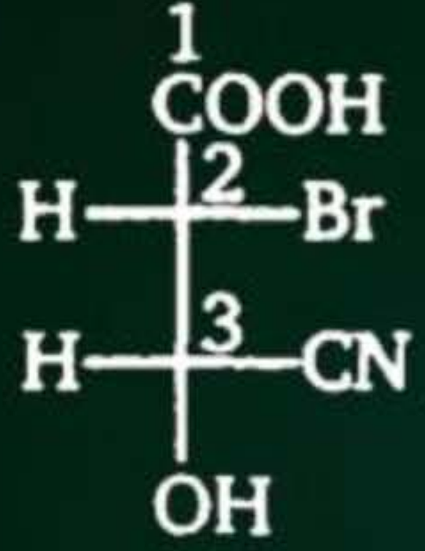
Ⓓ



CH3
F
H
CH2CH3

QUESTION 06

The absolute configurations of the two centers in the following molecule are:


1
COOH
H
2
Br
H
3
CN
OH

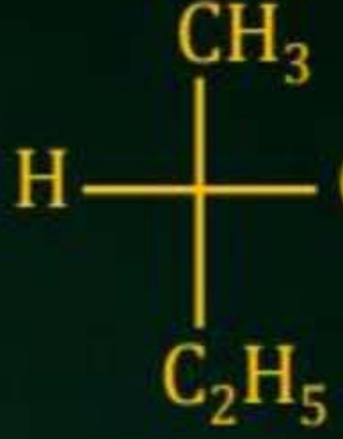
A 2(R), 3(S)

B 2(R), 3(R)

C 2(S), 3(S)

D 2(S), 3(R)

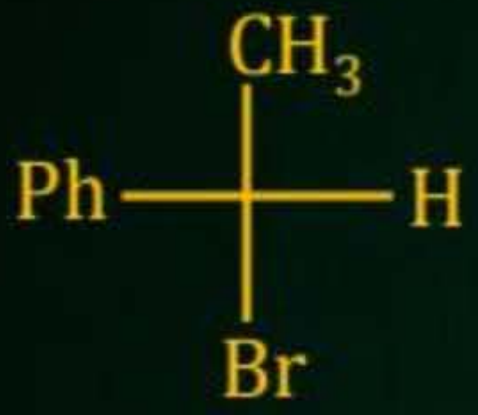
QUESTION 07

Which of the following operations on the Fischer formula  $\begin{array}{ccc} & CH_3 & \\ H & - & OH \\ & C_2H_5 & \end{array}$ does not change its absolute configuration?

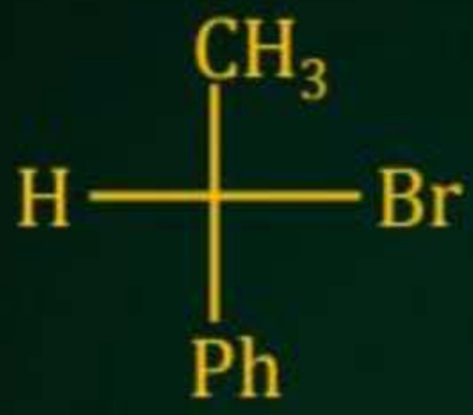
- (A) Exchanging groups across the horizontal bond.
- (B) Exchanging groups across the vertical bond.
- (C) Exchanging groups across the horizontal bond and also across the vertical bond.
- (D) Exchanging a vertical and horizontal group.

QUESTION 08

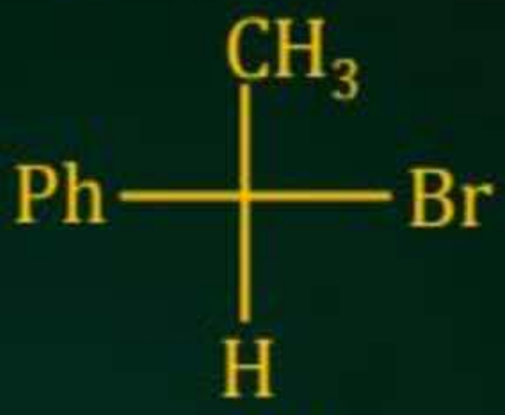
The pair of enantiomers among the following compound is:



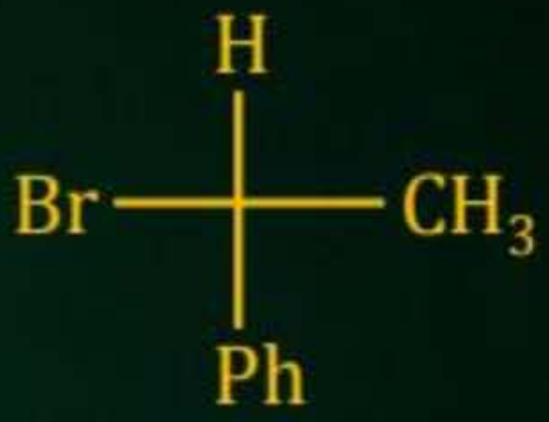
I



II



III



IV

(A) I and IV

(B) II and IV

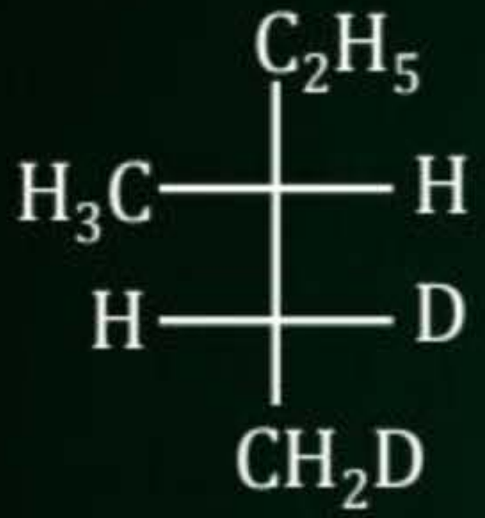
(C) II and III

(D) I and II

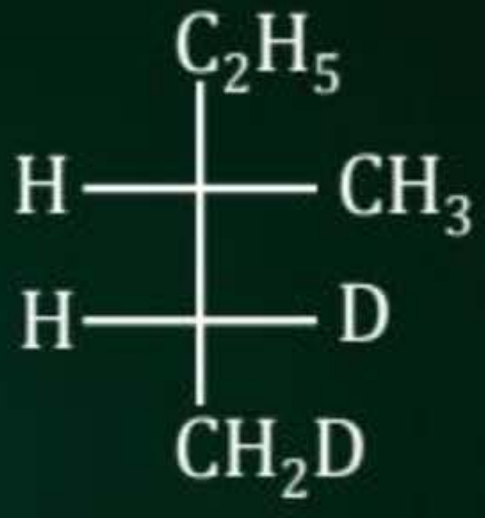
QUESTION 09

The structure of (2R, 3R) $C_2H_5CH(CH_3)CH(D)CH_2D$ is:

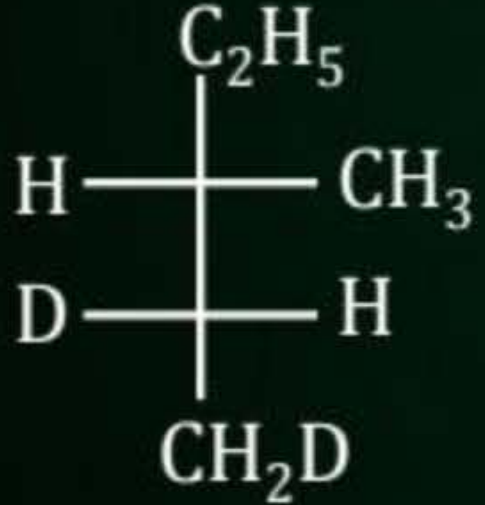
A


C_2H_5
H_3C
H
H
D
CH_2D

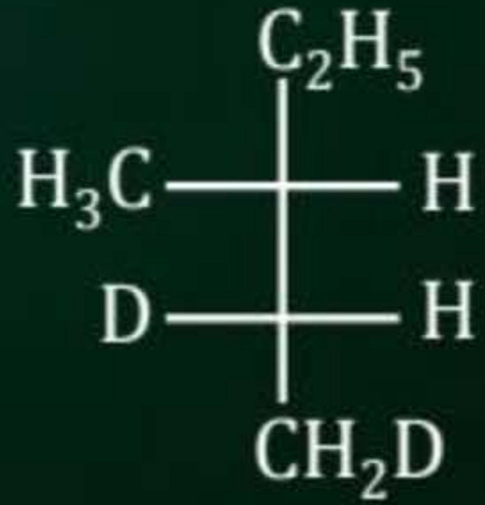
B


C_2H_5
H
CH_3
H
D
CH_2D

C

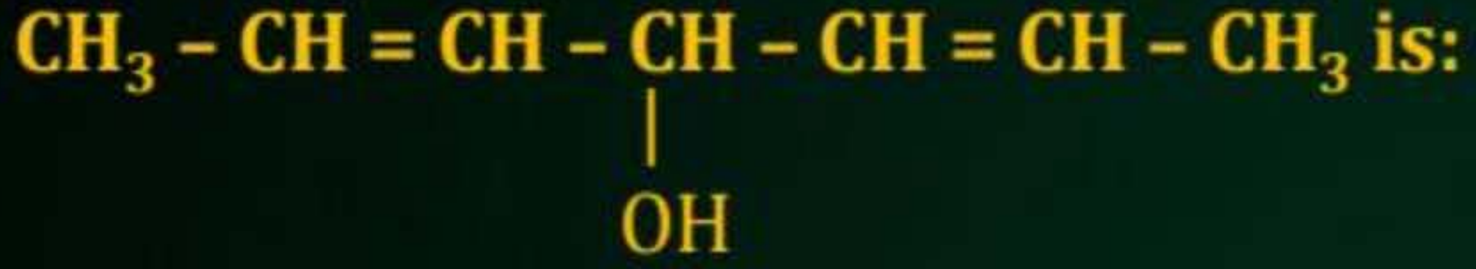

C_2H_5
H
CH_3
D
H
CH_2D

D


C_2H_5
H_3C
H
D
H
CH_2D

QUESTION 10

Total number of stereoisomers of the compound



$$CH_3-CH=CH-\underset{\displaystyle OH}{\underset{|}{CH}}-CH=CH-CH_3 \text{ is:}$$

A 2

B 3

C 4

D 8

ANSWER KEY

1. A
2. C
3. A
4. C
5. C
6. A
7. C
8. C
9. A
10. C

Home Work From PW Module (Yakeen NEET)

Prarambh: Q 114, 115

Prabal: Q 16, 24

Parikshit: Q 31, 34, 35

Thank you!!

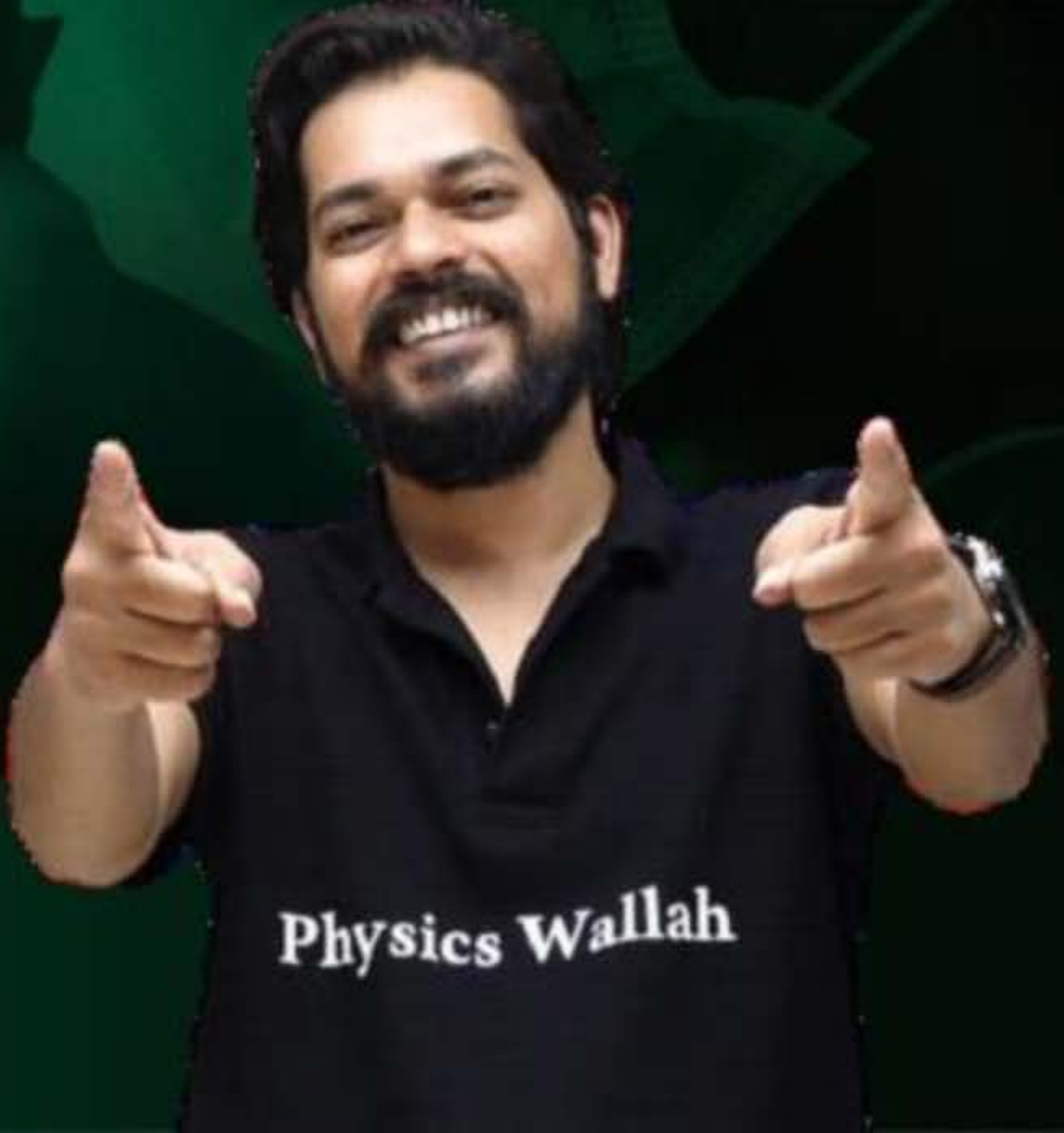
YAKEEN 2.0

FOR NEET 2025

Lecture- 12 **Organic Chemistry**

Some Basic Principles and Techniques (ISOMERISM)

By- Pankaj Sir(POPU MAMA)


Physics Wallah

Topics *to be covered*

1. Conformers ✓
2. Optical Rotation Practice ✓
3. Practice

QUESTION

$$\left(\alpha = \frac{\theta}{C \cdot l}\right)$$

If solution of a compound ($\underbrace{30\text{g}/100\text{mL}}_{C}$ of solution) has measured rotation of $\underset{\theta}{+15^\circ}$ in a $\underset{l}{2}$ dm log sample tube. The specific rotation of this compound is:

A +50°

B +25° ✓

C +15°

D +7.5°

$$\alpha = \frac{\cancel{15}}{\cancel{2}\left(\frac{\cancel{30}}{100}\right) \times 2} = \frac{100}{4} = 25$$

QUESTION $c = \frac{gm}{mL}$ $\boxed{\frac{w}{V}}$

$200\,mL \xrightarrow{\times 5} 1000\,mL$

✓ When an optically active compound is placed in a $\underset{}{\overset{l}{\underline{\text{10 dm tube}}}}$ is present $\overset{w}{\underline{\text{20 g}}}$ in a $\underline{\text{200 ml}}$ solution rotates the PPL by $\underset{\theta}{}$ 30°. Calculate the angle of rotation and specific angle of rotation if above solution is $\underline{\text{diluted to 1 liter.}}$

1000mL

A 16° and 36°

B 6° and 30° ✓

C 3° and 30°

D 6° and 36°

$$\alpha = \frac{\theta}{c \cdot l}$$

$$\alpha = \left(\frac{30}{\frac{2\cancel{0}}{2\cancel{0}\cancel{0}} \times 1\cancel{0}}\right) = 30$$

$\alpha \Rightarrow$ independent

$$\alpha = \frac{\theta_{new}}{C_{new}\, l}$$

$$30 = \frac{\theta_{new}}{\frac{2\cancel{0}}{10\cancel{0}\cancel{0}} \times 1\cancel{0}}$$

$30 = 5\theta_{new}$ ^{5} $\theta_{new} = 6$

QUESTION

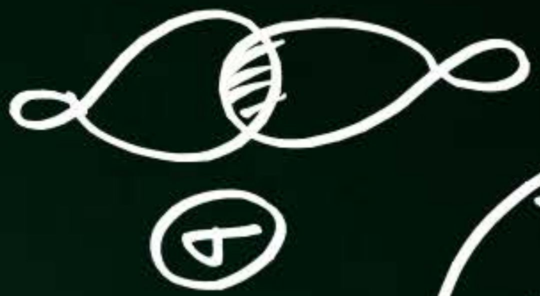
A sample containing a single enantiomer of fluoxetine (Prozac) is placed in a polarimeter. The observed rotation is 9.06° clockwise. The sample was made by dissolving 1.24 g of fluoxetine in a solution with a total volume of 2.62 mL. The light source was a sodium D line and the temperature was 25°C. The length of the sample tube was 1.25 dm, calculate specific rotation.

$\theta = +9.06$ $w = 1.24\,gm$ $V = 2.62\,mL$

$l = 1.25\,dm$

$$\alpha = \frac{9.06}{\frac{1.24}{2.62} \times 1.25}$$

Conformational Isomerism



restricted

π

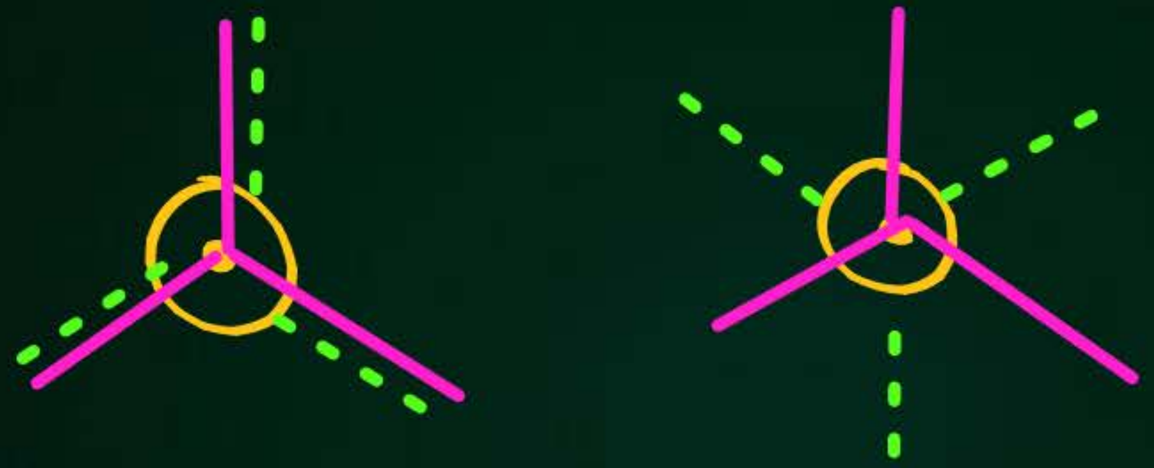
Ring

biphenyl

1. Arises due to free rotation around C–C sigma bond.
2. There are infinite conformers.
3. The energy for rotation (Rotational Energy) around sigma bond is available at room temperature.
4. Total conformer of methane is zero. CH_4
5. Also known as Rotamers.
6. Conformers are not true isomers.
7. Interconvertible.

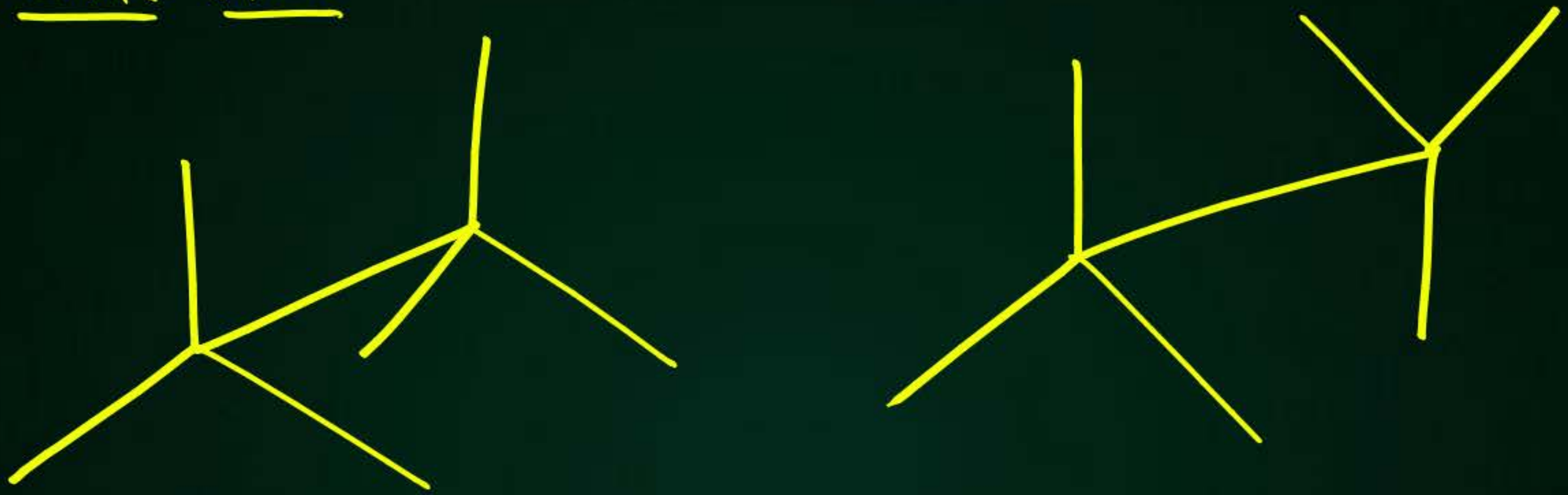
Newmann projection formula

(Front view)



Sawhorse Formula

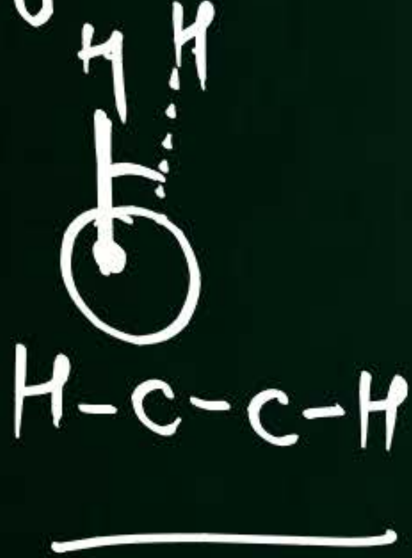
Side view

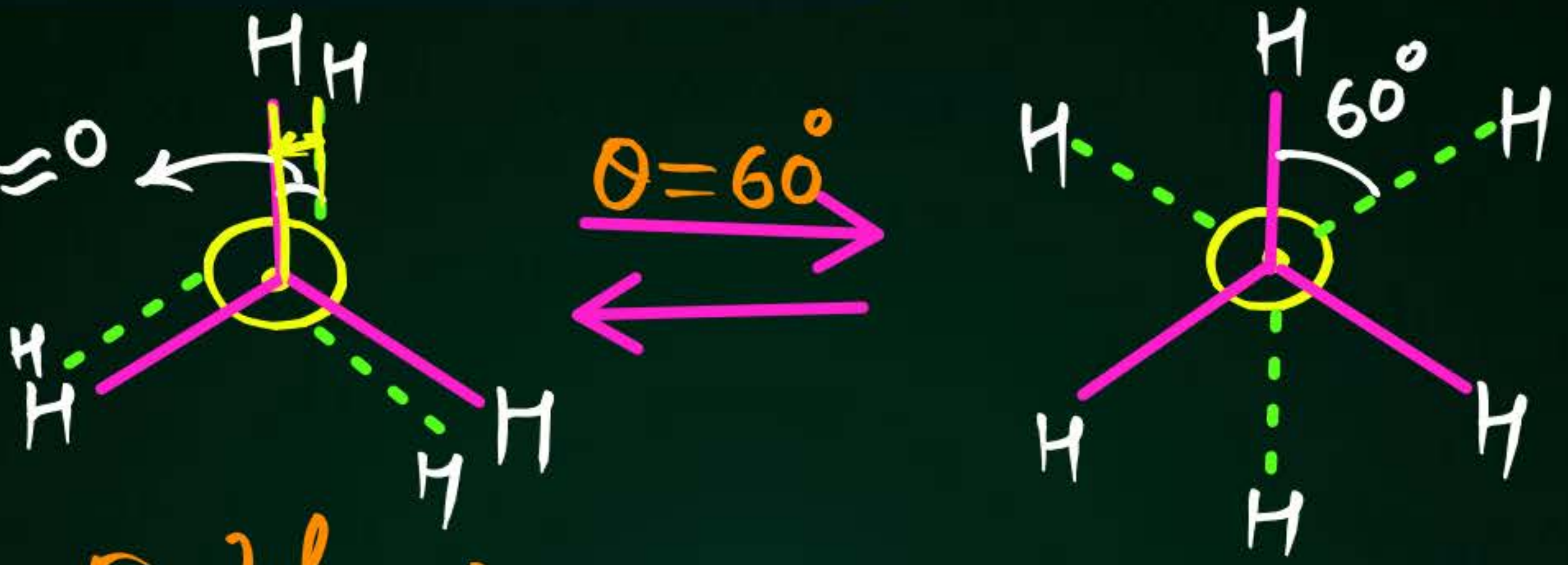


Conformation Isomerism in Ethane

$\overset{1}{CH_3}-\overset{2}{CH_3}$

$\theta = 0$ → Dihedral angle




H
H
H
H
H
H
H
H
θ = 60°
H
60°
H
H
H
H
H

Eclipsed form

More repulsion

Less stable

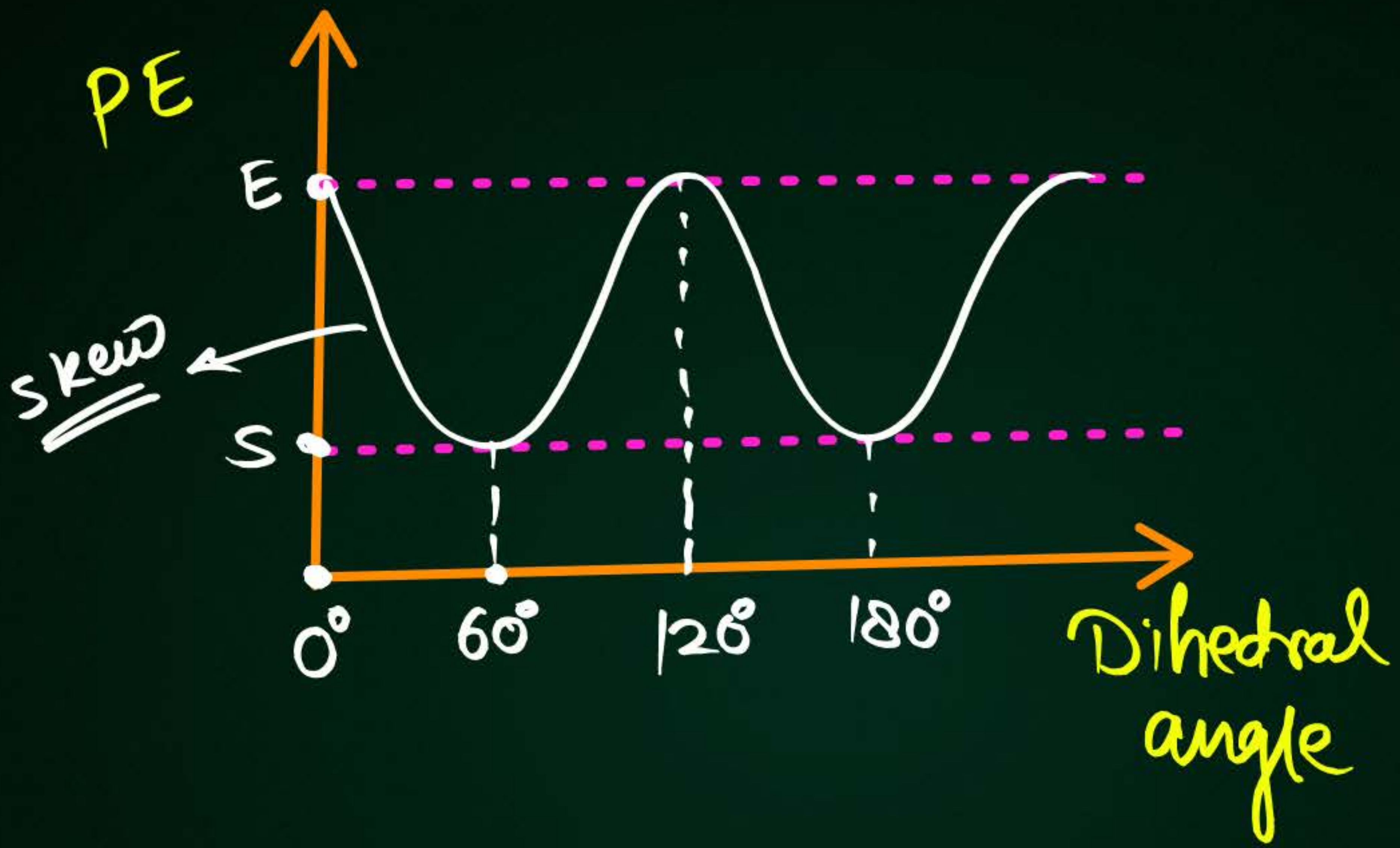
Staggered form

Less repulsion

More stable

All confor. other than Ec & st are known as Skew form

Energy profile dia.

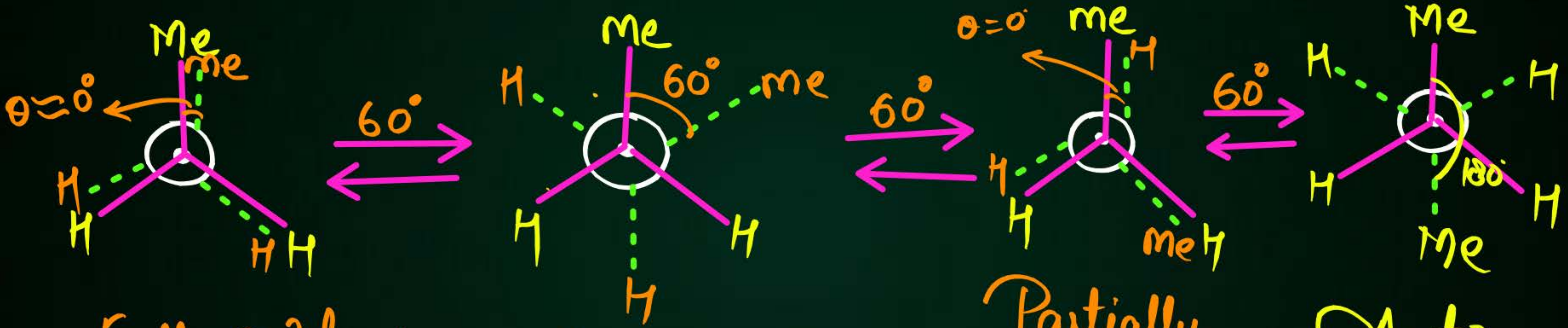


Conf of propane Same as Ethane

★ Most imp: ★

Conformation Isomerism in Butane

$CH_3-\overset{1}{CH_2}-\overset{2}{CH_2}-CH_3$


Me
me
θ=0°
H
H
H H
60°
Me
H
60°
me
H
H
H
60°
θ=0°
me
H
H
H
me H
60°
Me
H
H
H
180°
H
Me

Fully Eclipsed

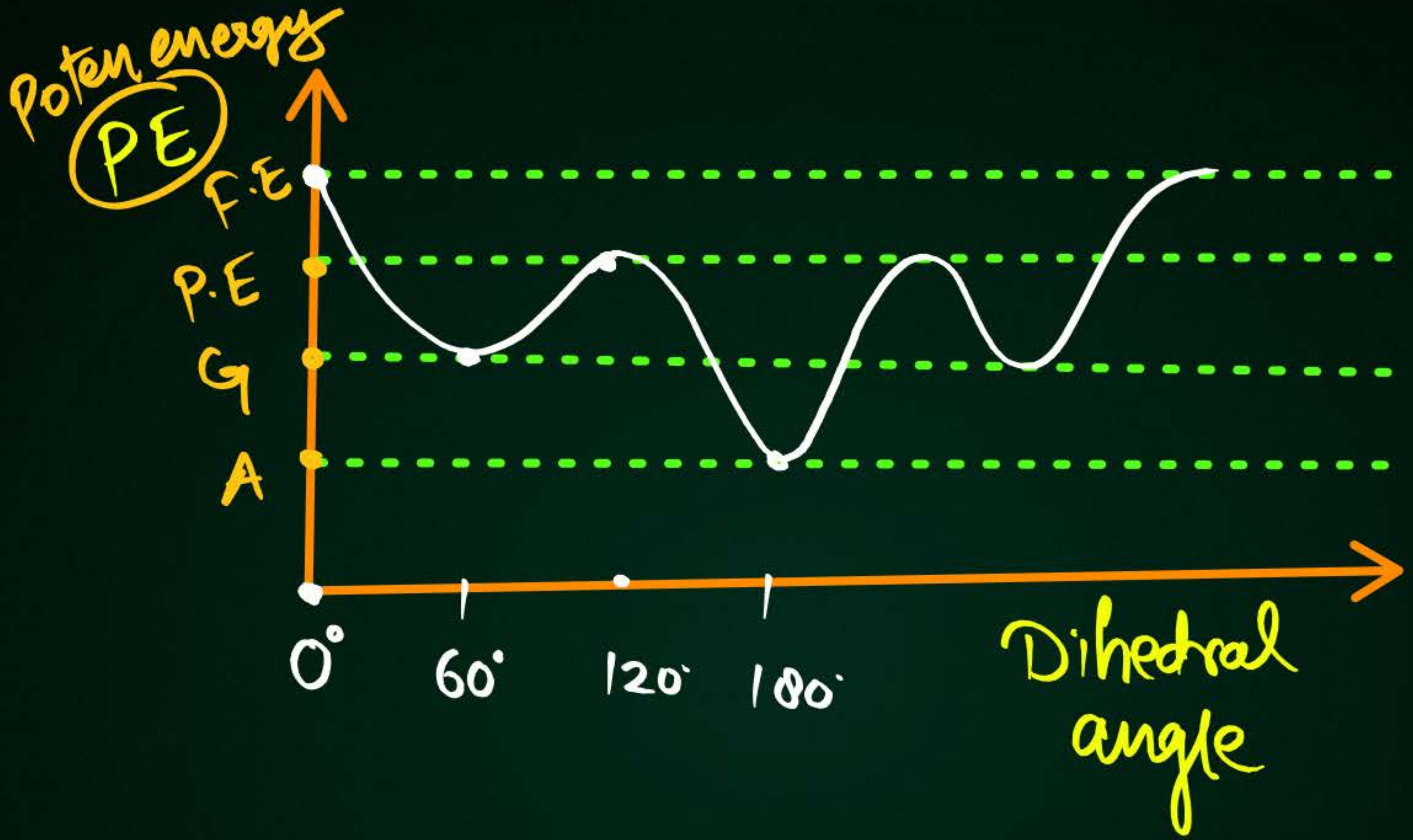
Gauche

Partially Eclipsed

Anti

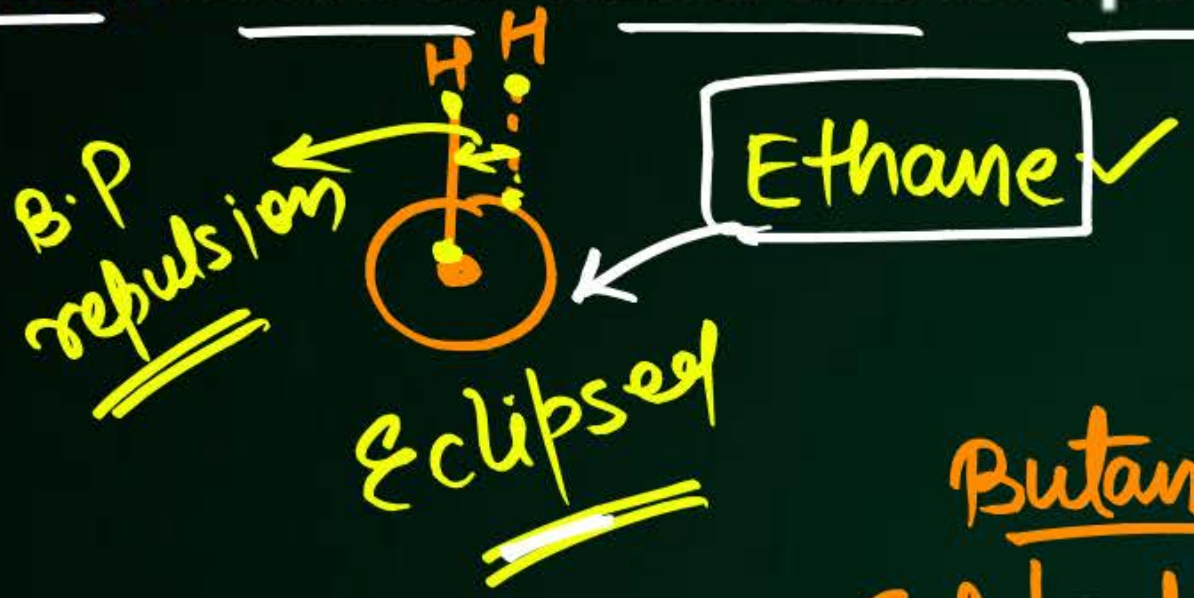
Stability $\underbrace{\text{Anti} > \text{Gauche}}_{\text{Staggered}} > \overbrace{\text{partially Eclipsed} > \text{fully Eclipsed}}^{\text{Eclipsed}}$

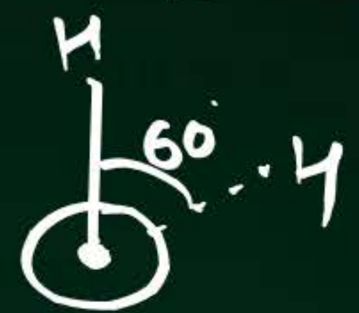
Energy profile dia.



Strain (Destabilization):

Torsional: The strain arises due to repulsion b/w bond pair electrons.





Minimum
or
no torsional strain

Butane ✓

Eclipsed ✓

Staggerd

Minimum
or
no torsional strain

Vander Waal: The strain arises due to repulsion of front & back atoms or group due to steric factor (bulkiness).

Ethane No vanderwaal strain

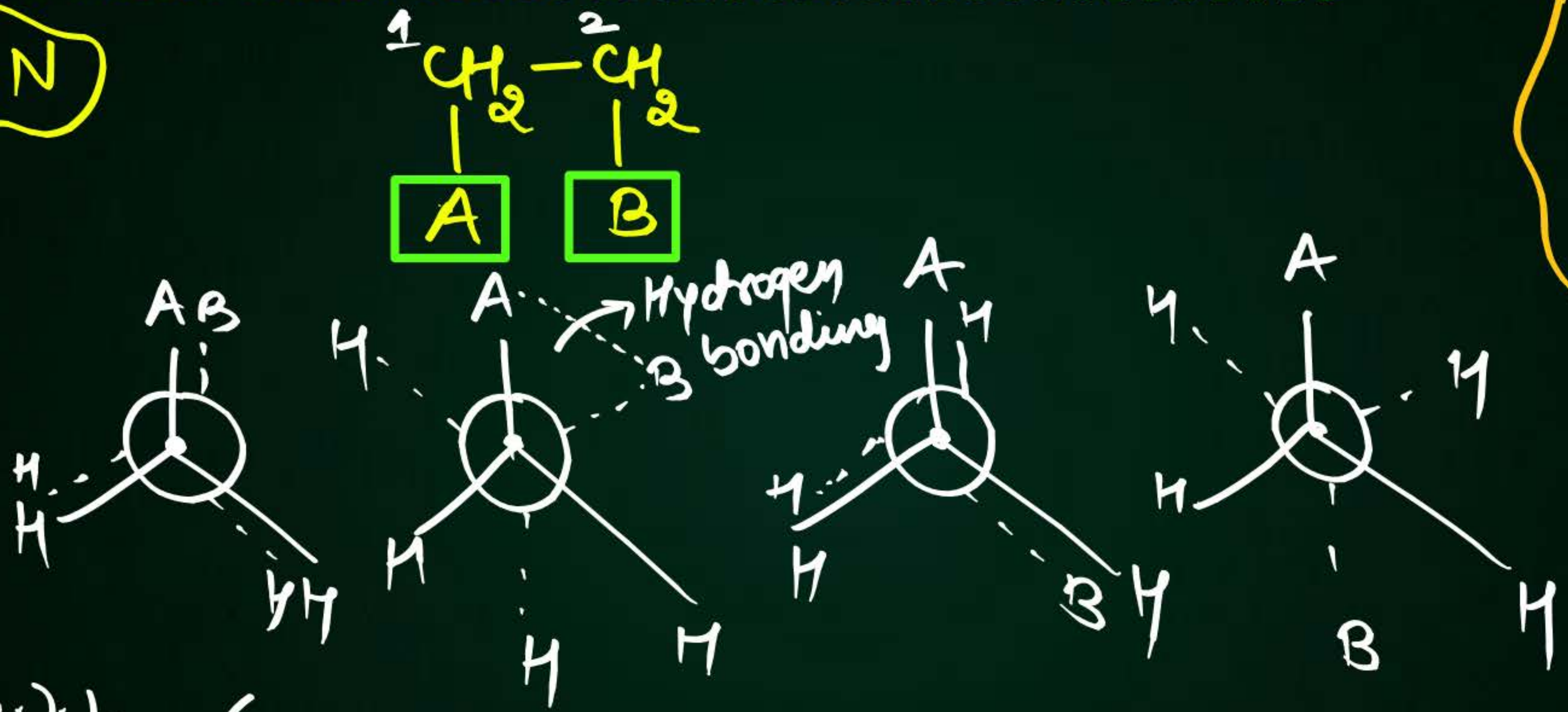
Butane yes " " is present

	T·S	V·S
Ethane	✓	✗
Butane	✓	✓

Gauche Effect:

Gauche is more stable than anti when Hydrogen bonding is present

F, O, N

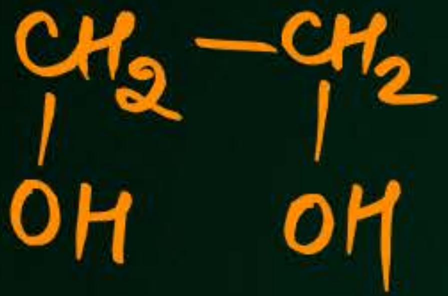


1
2
CH_2-CH_2
A
B
Hydrogen bonding
A
B
H
H
H
H
H
H
H
A
H
H
H
H
A
H
H
H
H
B
H
A
H
H
H
B
H

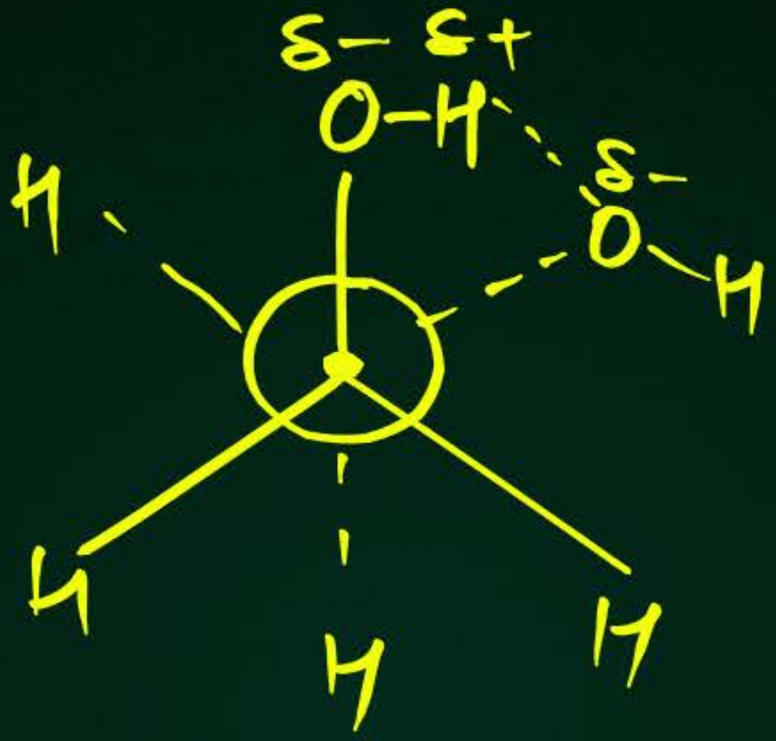
A	B
OH	OH
NH_2	NH_2
OH	F
OH	NH_2
NH_2	F

Stability (G > A > PE > FE)

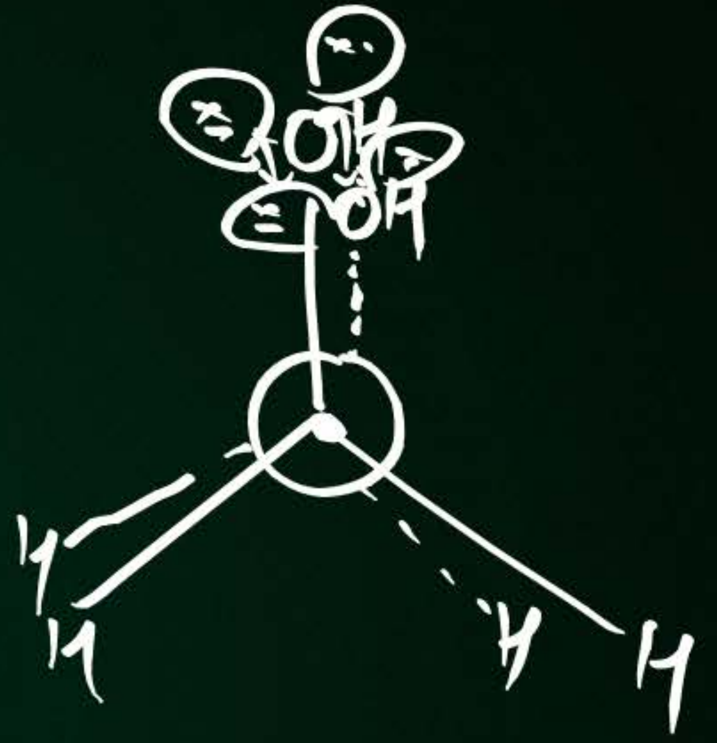
Q Draw most stable conformer of ethylene glycol



CH_2-CH_2 with OH on each carbon ($HO-CH_2-CH_2-OH$)


δ− δ+
O–H
δ−
O–H
H
H
H
H
H

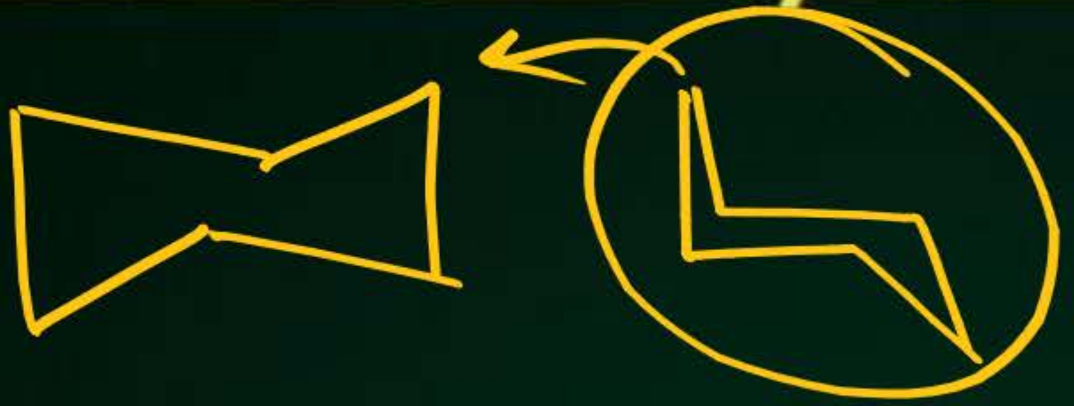
Gauche



Jyada kareebi acchi nahi hai

Conformation Isomerism in Cyclohexane

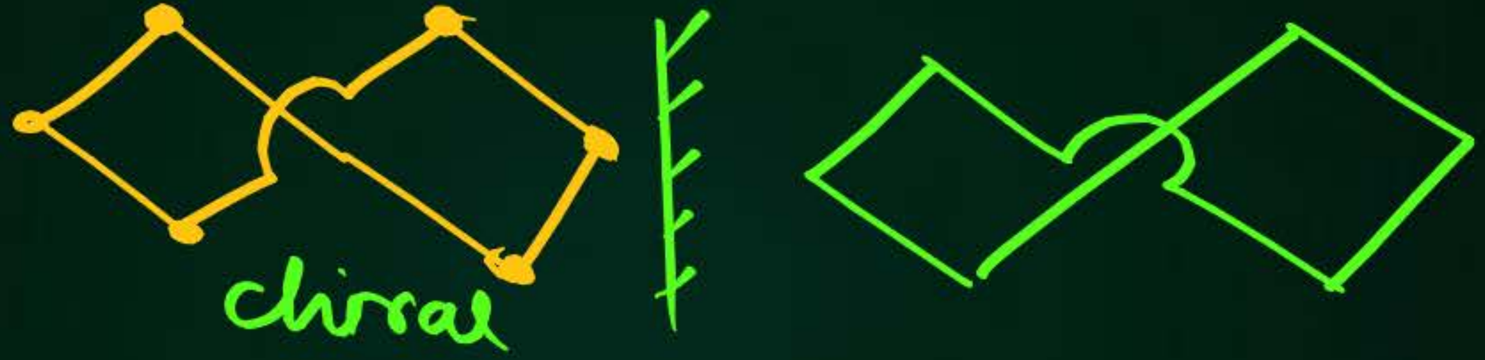
① Chair



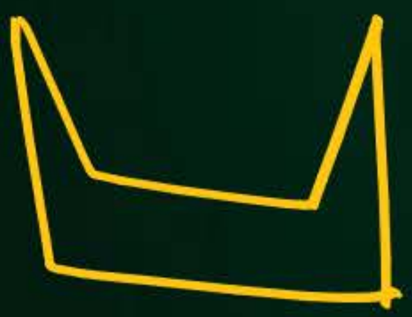
Stability

C > T.B > B > H.C

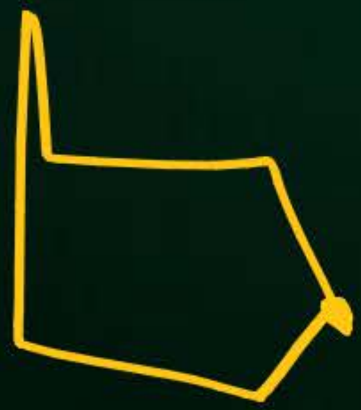
② Twist boat



③ Boat



④ Half chair



QUESTION

Select the correct statements.

- (A) Eclipsed and staggered ethanes give different products on reaction with chlorine in presence of light. ✗
- (B) The conformational isomers can be isolated at room temperature. ✗
- [✓ (C)] Torsional strain in ethane is minimum at dihedral angles 60°, 180° and 300°.
- (D) Steric strain is minimum in staggered gauche from of *n*-butane.

V.W

QUESTION

Assertion: Conformers are impractical to separate. ✓

Reason: Conformers have negligibly small difference in their potential energy. ✓

[✓ Ⓐ Assertion is True, Reason is true: Reason is a correct explanation for assertion.]

Ⓑ Assertion is True, Reason is true: Reason is not a correct explanation for assertion.

Ⓒ Assertion is True, Reason is False.

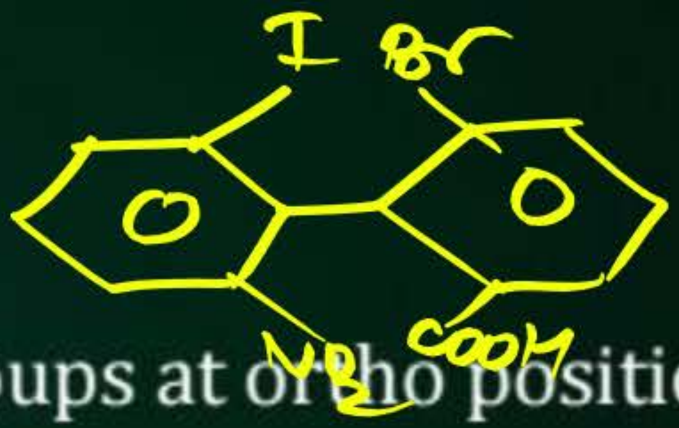
Ⓓ Assertion is False, Reason is true.

QUESTION

Free rotation about σ bond can be restricted by

A Formation of a π bond ✓

B Formation of a cycle ✓

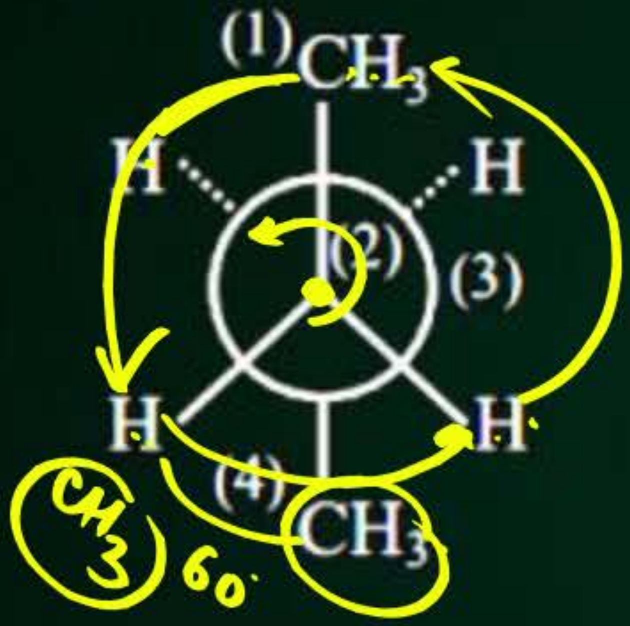


C Steric repulsion between the bulkier groups at ortho position in bi phenyl system. ✓

[✓ D] (A), (B) and (C)

QUESTION

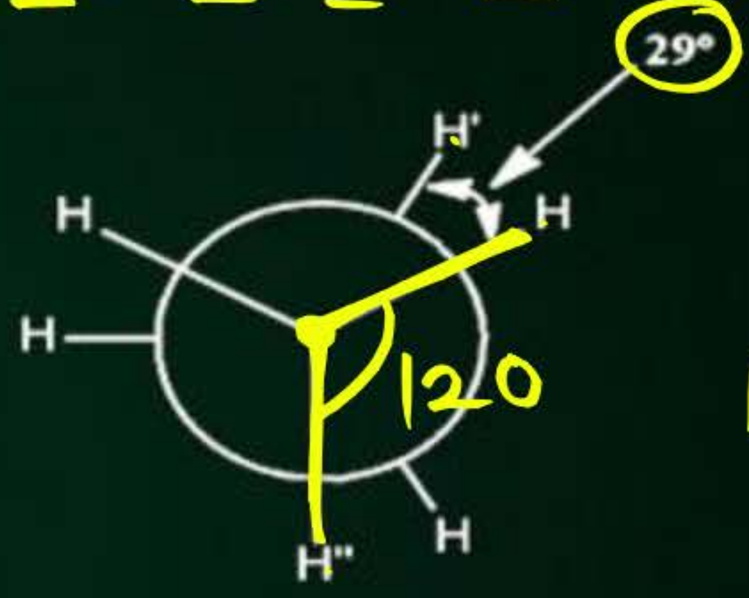
If C_2 in above compound is rotated by 120° angle in anticlockwise direction along C_2–C_3, which of the following form will be produced -



- A Partial eclipsed
- B Perfectly eclipsed
- C Staggered
- [✓ D] Gauche conformation

QUESTION

In the following skew conformation of ethane, H′ - C - C - H″ dihedral angle is:


29°
H'
H
H
H
H
H"
H
120

120+29
149

Ⓐ 58°

[✓ Ⓑ 149°]

Ⓒ 151°

Ⓓ 120°

QUESTION

The correct statement regarding the comparison of staggered and eclipsed conformations of ethane is:

A ✗ The staggered conformation of ethane is less stable than staggered conformation because staggered conformation has torsional strain.

B ✗ The eclipsed conformation of ethane is more stable than staggered conformation because eclipsed conformation has no torsional strain.

C ✗ The eclipsed conformation of ethane is more stable than staggered conformation even though the eclipsed conformation has torsional strain.

[✓ D] The staggered conformation of ethane is more stable than eclipsed conformation because staggered conformation has no torsional strain.

QUESTION

With respect to the conformers of ethane, which of the following statements is true?

A Bond angle remains same but bond length changes.

B Bond angles changes but bond length remains same.

C Both bond angle and bond length change.

[✓ D Both bond angles and bond length remain same.]

QUESTION

Among the three conformations of [redacted] Butane, the order of stability follows the sequence

A Eclipsed > gauche > staggered

B Eclipsed > staggered > gauche

[✓ C] $\underbrace{\text{Staggered}}_{\text{Anti}}$ > gauche > eclipsed

D Gauche > staggered > eclipsed

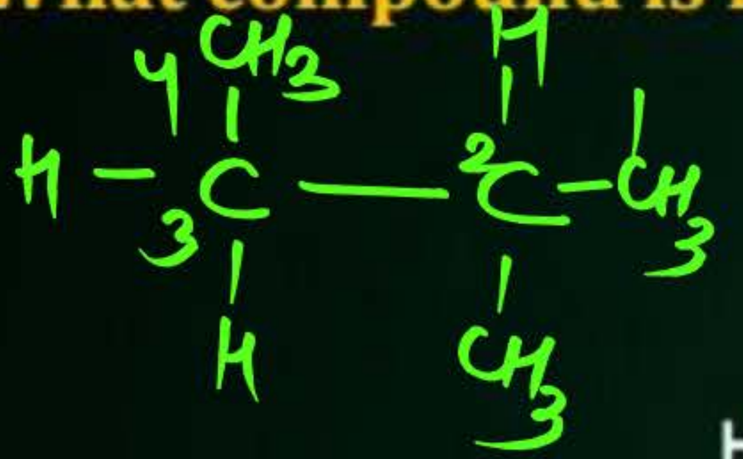
QUESTION

The incorrect statement regarding conformations of ethane is:

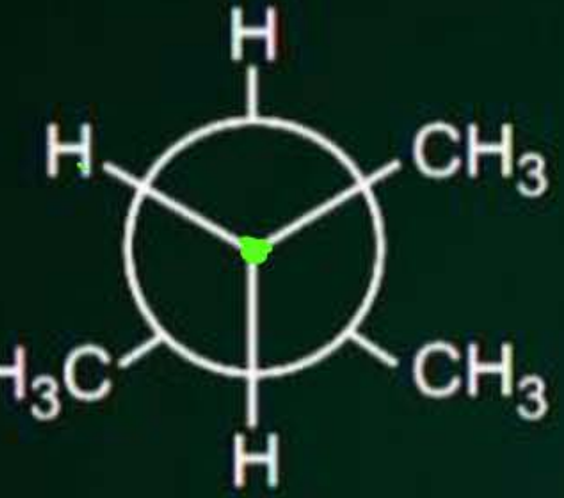
- A The conformations of ethane are inter-convertiable to one-another.
- B The dihedral angle in staggered conformation is 60°.
- [✓ C] Eclipsed conformation is the most stable conformation.
- D Ethane has infinite number of conformations.

QUESTION

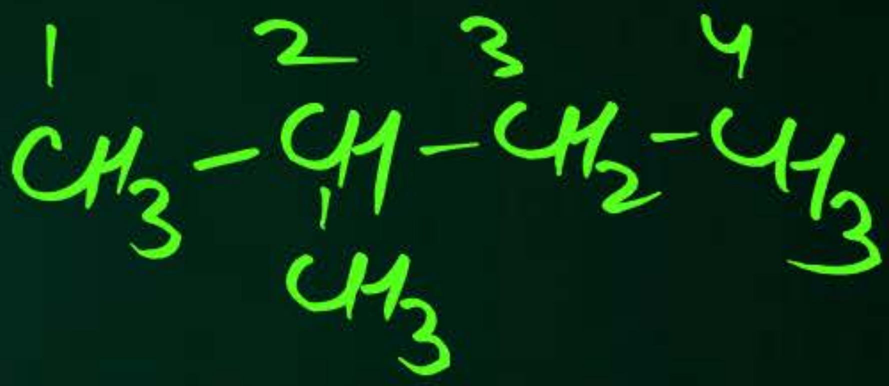
What compound is represented by the Newman projection shown?



4
CH_3
H
H
3
C
2
C
CH_3
H
CH_3



H
H
CH_3
H_3C
CH_3
H



$$\overset{1}{CH_3}-\underset{CH_3}{\overset{2}{CH}}-\overset{3}{CH_2}-\overset{4}{CH_3}$$

Ⓐ $CH_3CH_2CH_3$

[✓ Ⓑ] $(CH_3)_2CHCH_2CH_3$

Ⓒ $CH_3CH(CH_3)_2$

Ⓓ $CH_3CH_2CH_2CH(CH_3)_2$

QUESTION

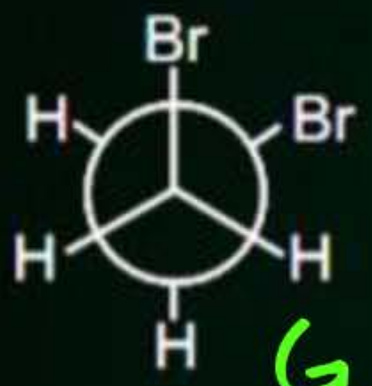
Stability A>G>P>FE

Energy A<G<P<FE

Rank the following conformations in order of increasing energy

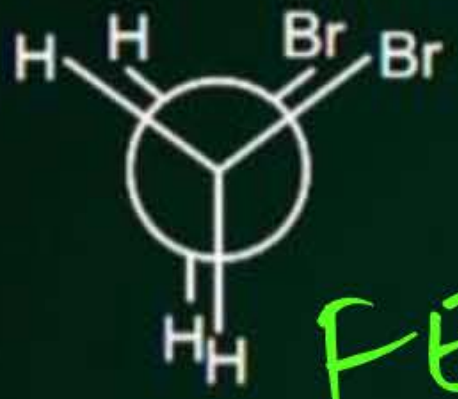
IV<I<III<II

(I)



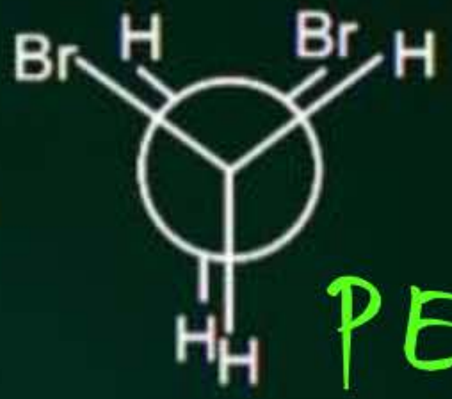
G

(II)



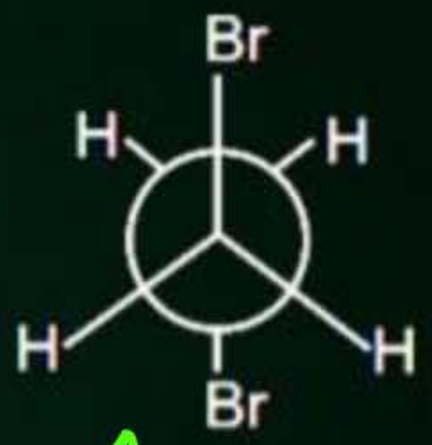
FE

(III)



PE

(IV)

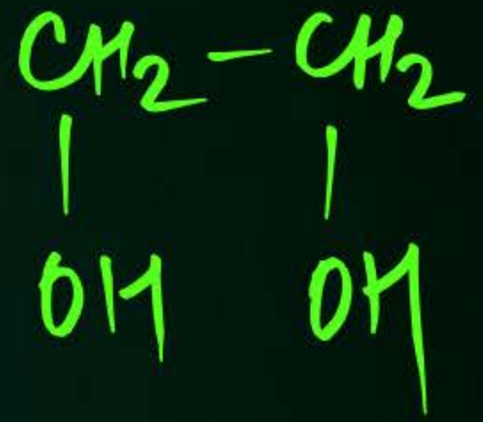


A

- A ✓ IV < I < III < II
- B III < II < IV < I
- C II < III < I < IV
- D IV < III < II < I

QUESTION

The correct stability order for conformation of ethylene glycol is:



$$\underset{OH}{CH_2}-\underset{OH}{CH_2}$$

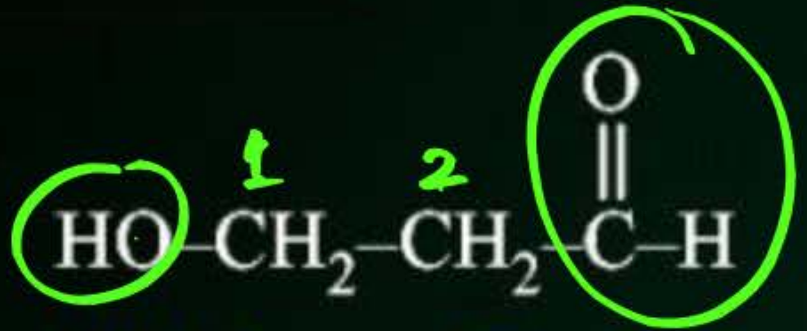
(A) Anti > Gauche > Partially Eclipsed > Eclipsed

[✓ (B)] Gauche > Anti > Partially Eclipsed > Fully Eclipsed

(C) Eclipsed > Partially Eclipsed > Gauche > Eclipsed

(D) Partially Eclipsed > Eclipsed > Gauche > Anti

QUESTION

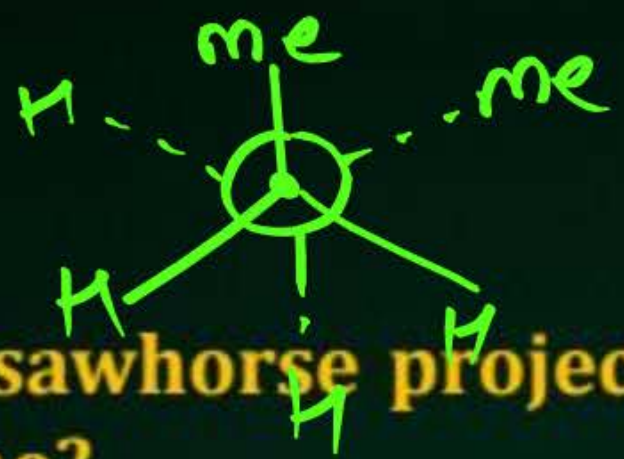


$$HO-CH_2-CH_2-\overset{\overset{O}{\|}}{C}-H$$

Which conformer of above compound is most stable (Consider conformer across (C_2–C_3))?

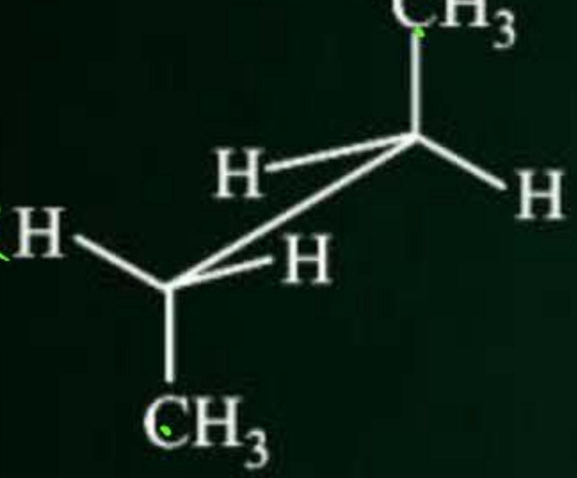
- (A) Staggered
- [✓ (B)] Gauche
- (C) Full eclipsed
- (D) Partially eclipsed

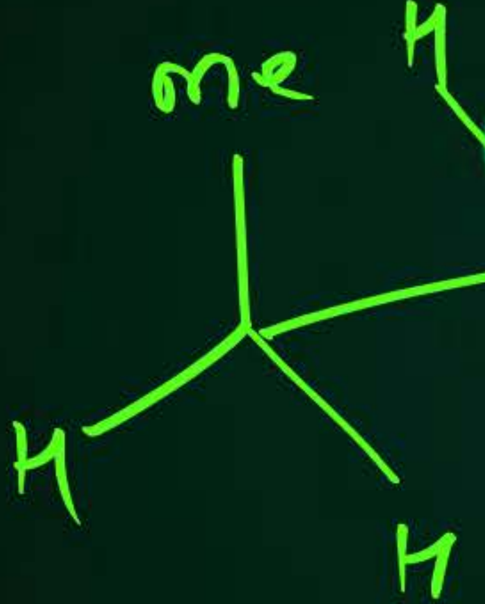
QUESTION



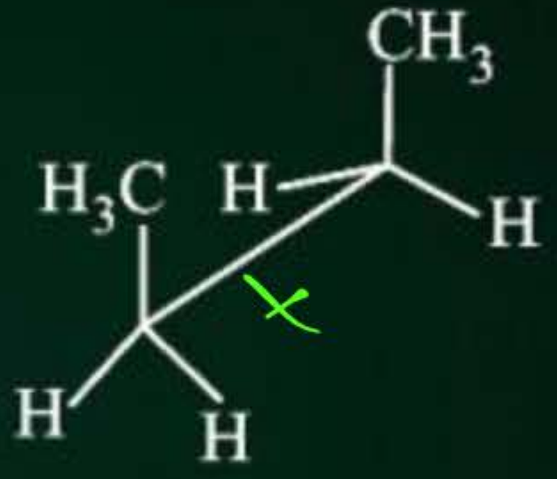
Which of the following sawhorse projection formulae represents the gauche conformation of n-butane?

A

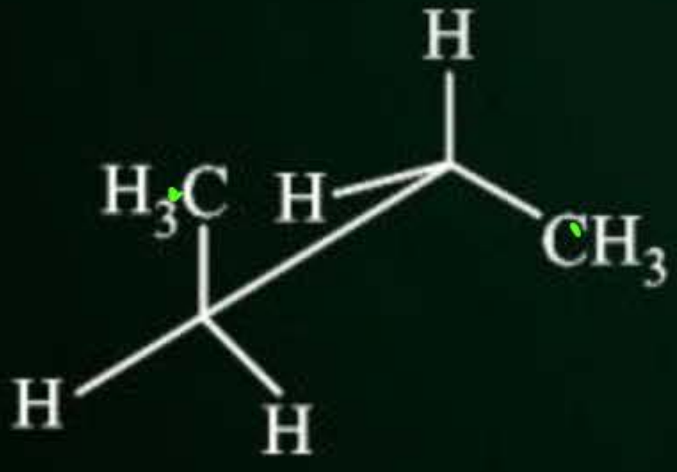

CH$_3$
H
H
H
H
CH$_3$



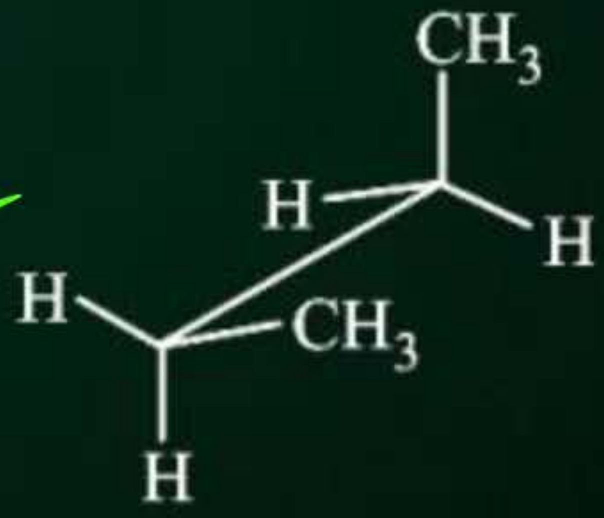
B


CH$_3$
H$_3$C
H
H
H
H

C


H
H$_3$C
H
CH$_3$
H
H

[✓ **D**]

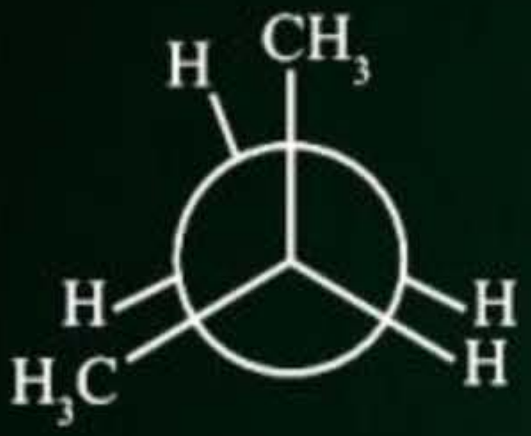

CH$_3$
H
H
H
CH$_3$
H

QUESTION

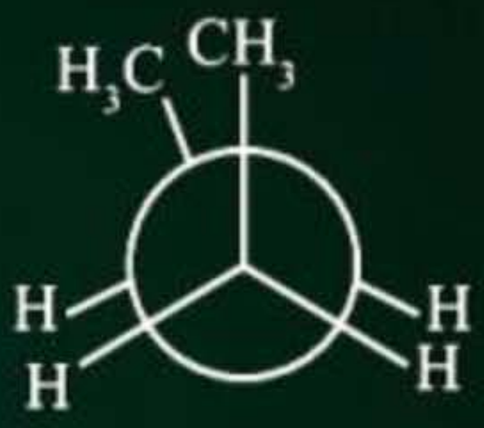
Which is the lowest energy conformation of butane?

most stable

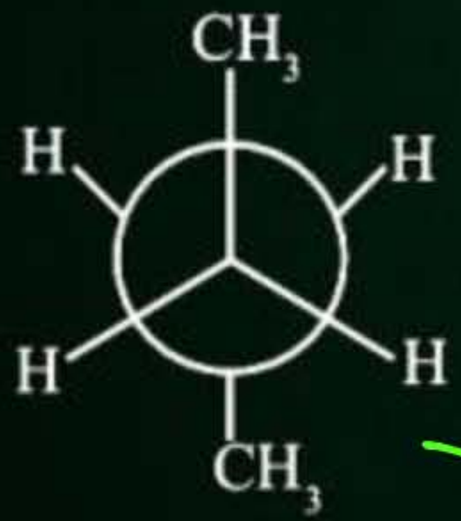
A


H
CH_3
H
H_3C
H
H

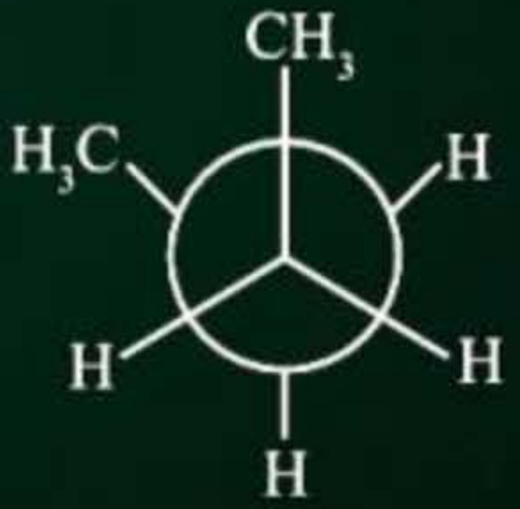
B


H_3C
CH_3
H
H
H
H

[✓ **C**]


CH_3
H
H
H
H
CH_3

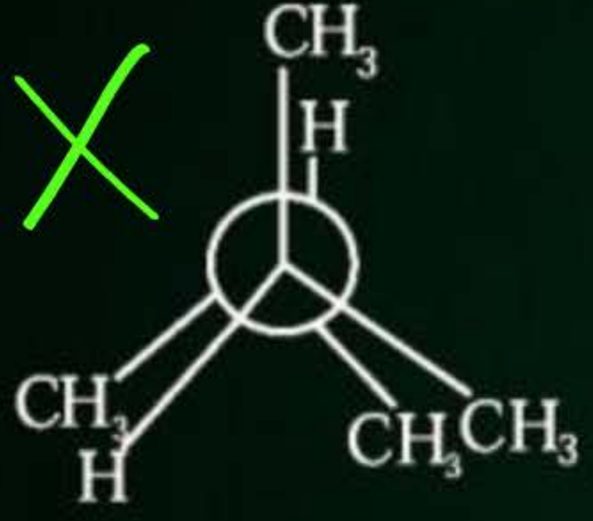
D


CH_3
H_3C
H
H
H
H

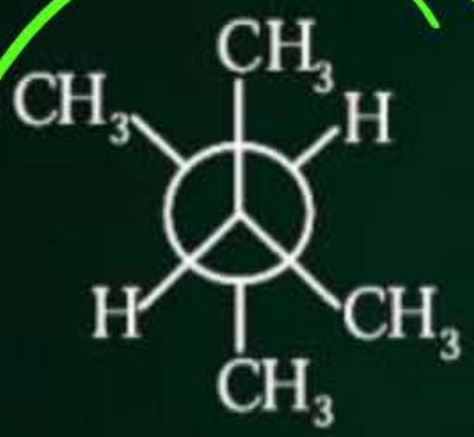
QUESTION

stability max

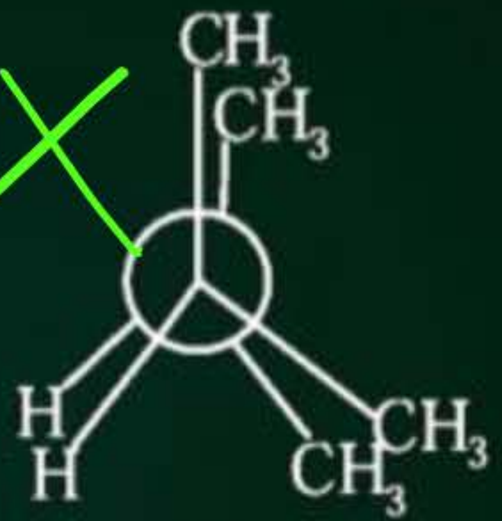
Which of the following has minimum torsional strain and minimum Vander waal strain?


CH_3
H
CH_3
H
CH_3
CH_3

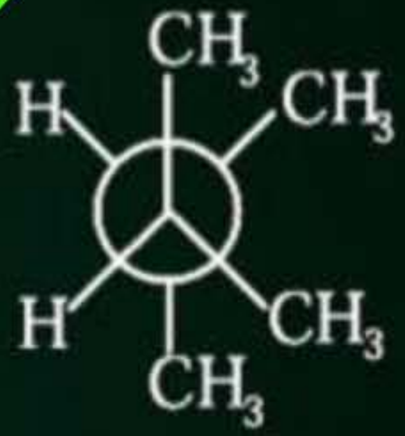
I


CH_3
CH_3
H
H
CH_3
CH_3

II


CH_3
CH_3
H
H
CH_3
CH_3

III


CH_3
H
CH_3
H
CH_3
CH_3

IV

A I

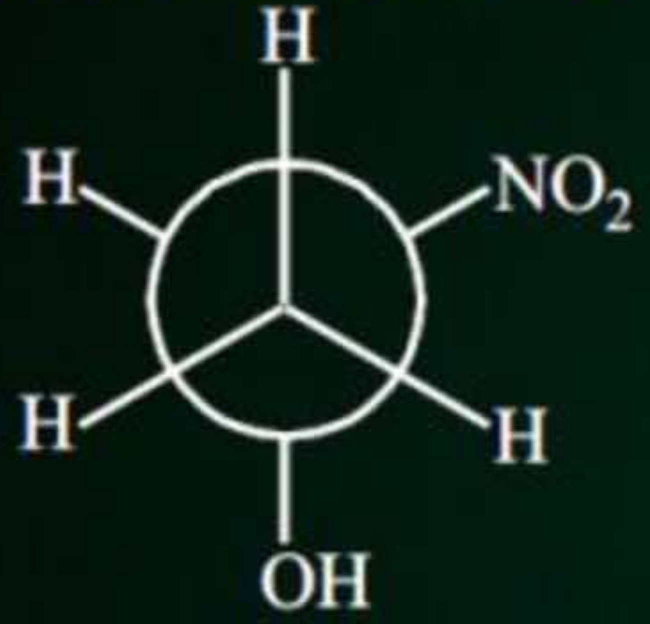
[✓ **B**] II

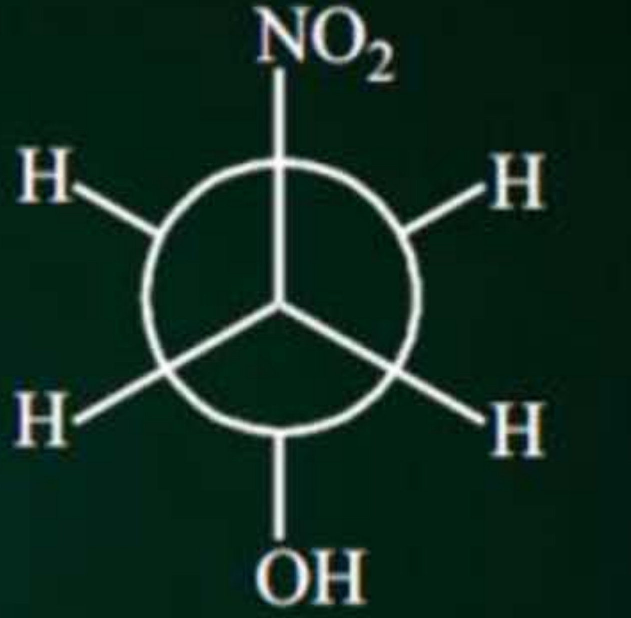
C III

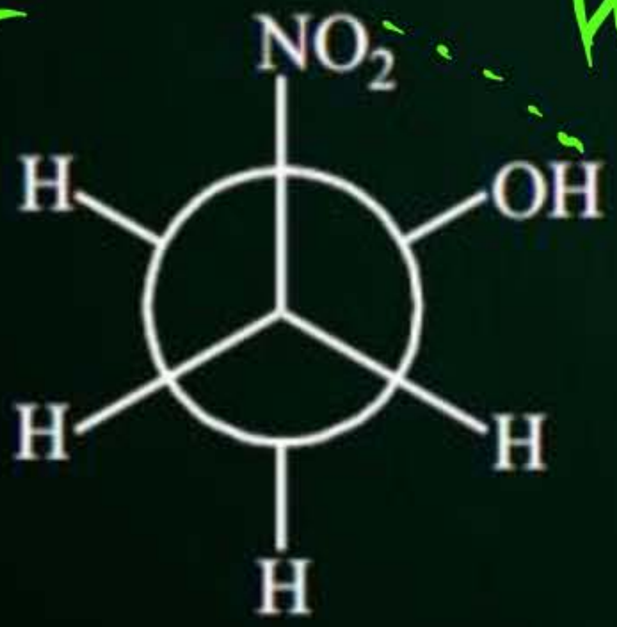
D IV

QUESTION

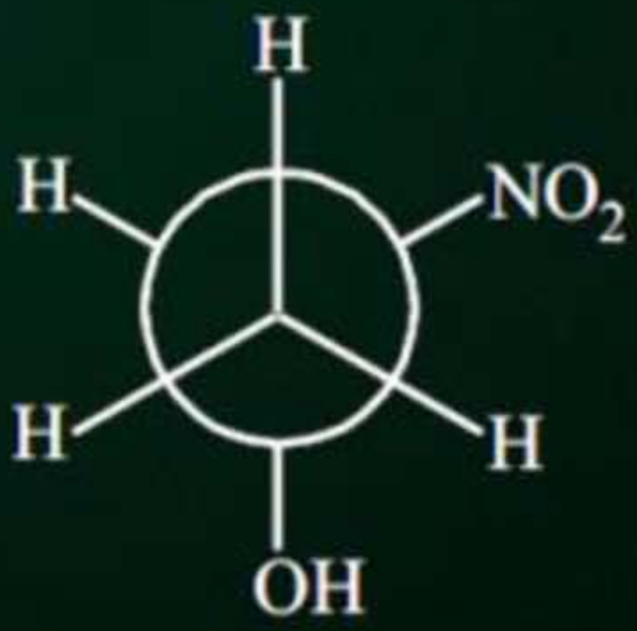
The most stable form of 2-nitro ethanol is:

A


B


[✓ C]


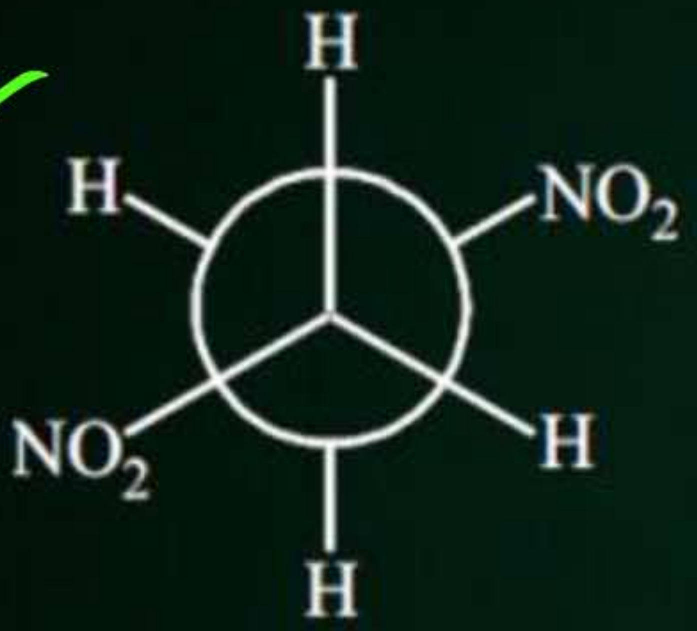
Hydrogen bonding

D


QUESTION

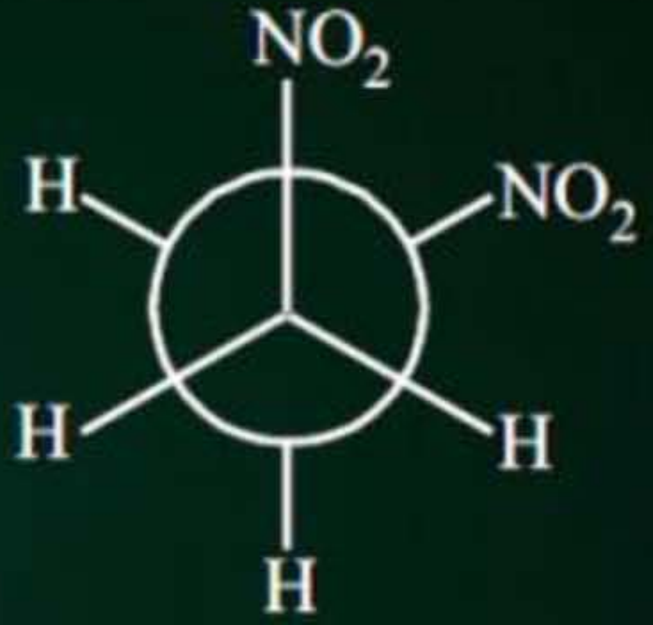
The most stable form of 1, 2-Di nitro ethane is:

[✓ A]

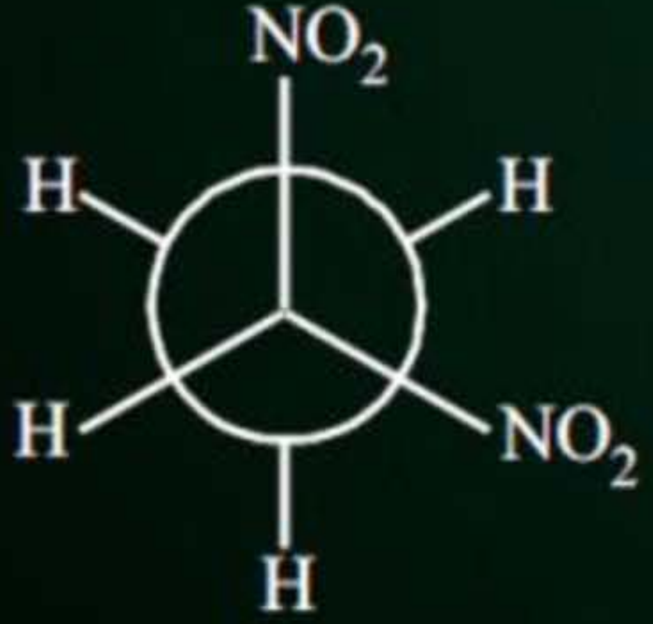

H
H
NO$_2$
NO$_2$
H
H

Anti

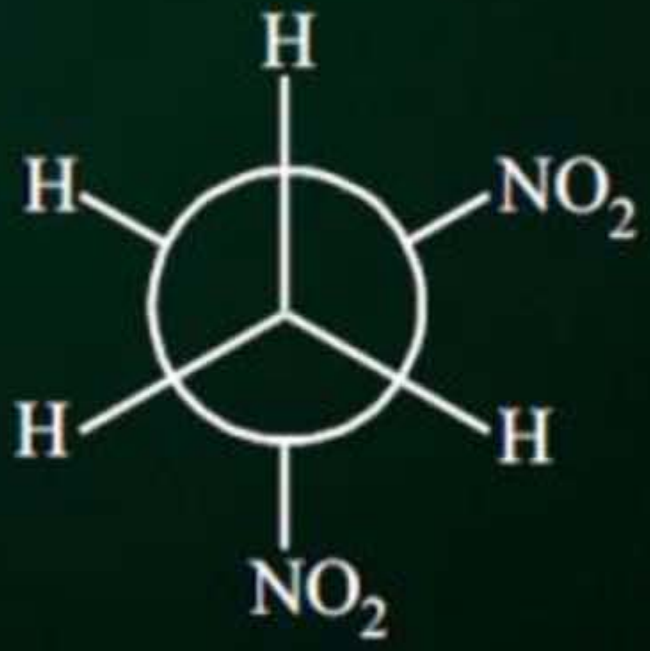
B


NO$_2$
H
NO$_2$
H
H
H

C


NO$_2$
H
H
H
NO$_2$
H

D


H
H
NO$_2$
H
H
NO$_2$

QUESTION

The most stable conformation of ethane–1, 2-diol is:

Ⓐ anti

Ⓑ [✓ gauche]

Ⓒ partially eclipsed

Ⓓ fully eclipse

Home Work

QUESTION 01

Assertion: Staggered conformation of ethane is most stable while eclipsed conformation is least stable.

Reason: Staggered form has the least torsional strain and the eclipsed form has the maximum torsional strain.

- **A** Assertion is True, Reason is true: Reason is a correct explanation for assertion.
- **B** Assertion is True, Reason is true: Reason is not a correct explanation for assertion.
- **C** Assertion is True, Reason is False.
- **D** Assertion is False, Reason is true.

QUESTION 02

Which conformer of cyclohexane is chiral?

- A Chair
- B Boat
- C Twisted boat
- D None of these

QUESTION 03

Most stable form of cyclohexane is:

Ⓐ Boat

Ⓑ Chair

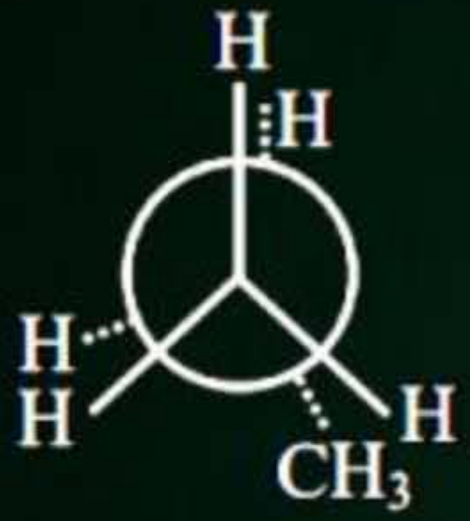
Ⓒ Skew

Ⓓ Eclipsed

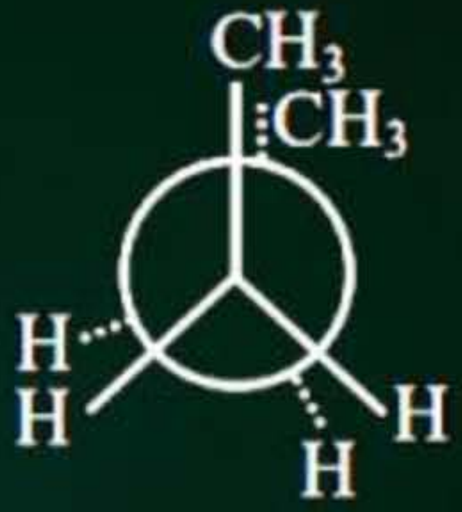
QUESTION 04

Which one of the following has maximum torsional strain?

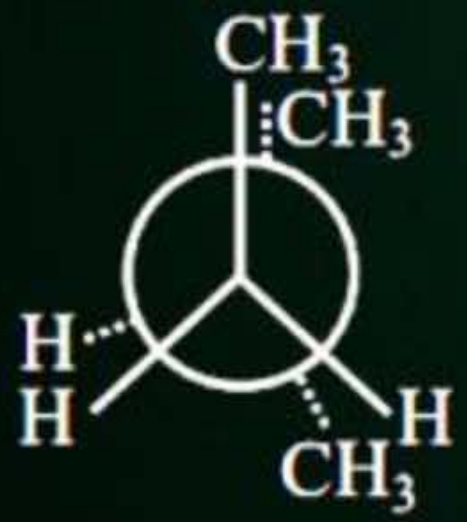
A



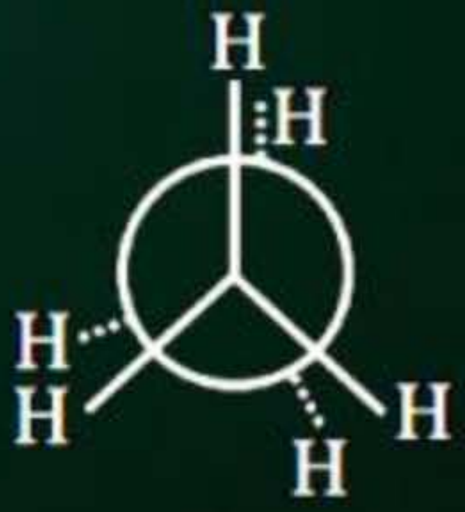
B


CH3
CH3
H
H
H
H

C

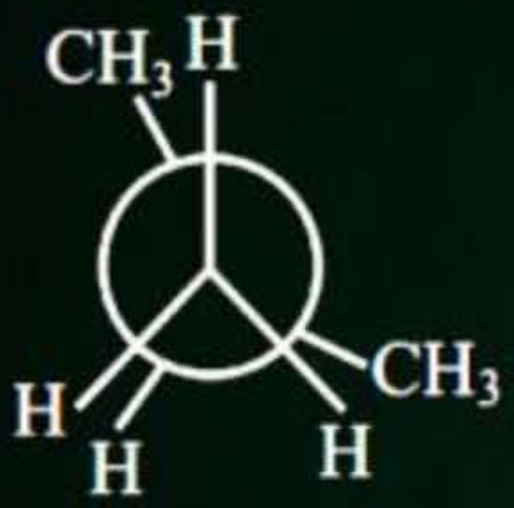

CH3
CH3
H
H
H
CH3

D



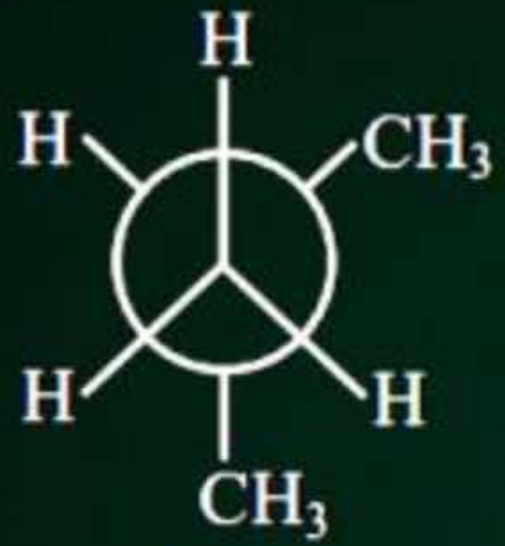
QUESTION 05

What are the type of isomers in following pairs


CH₃
H
CH₃
H
H
H

I

and


H
H
CH₃
H
H
CH₃

II

A Conformers

B Position

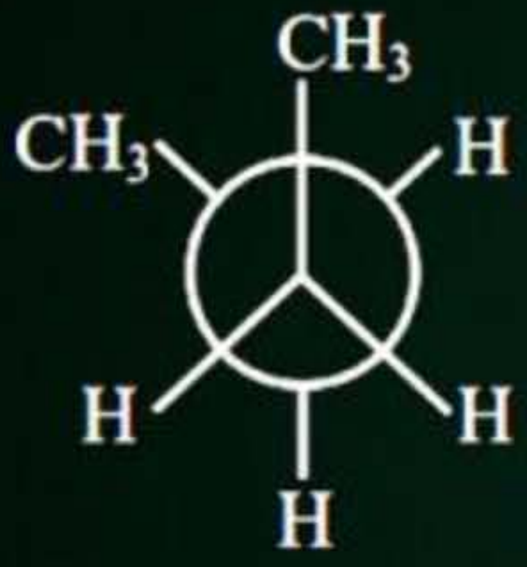
C Optical

D Geometrical

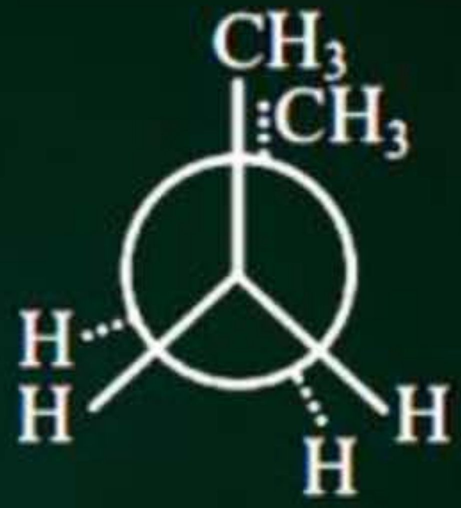
QUESTION 06

Which one of the following has minimum energy?

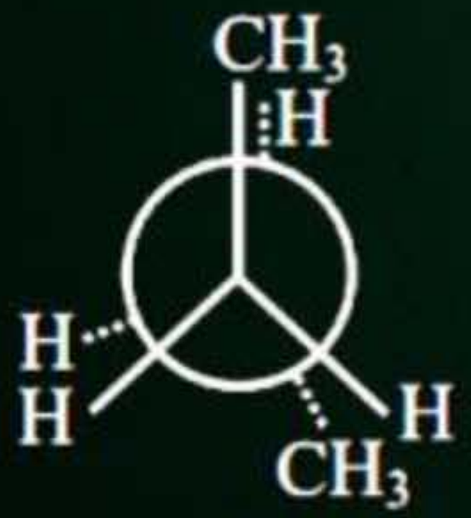
A


CH3
CH3
H
H
H
H

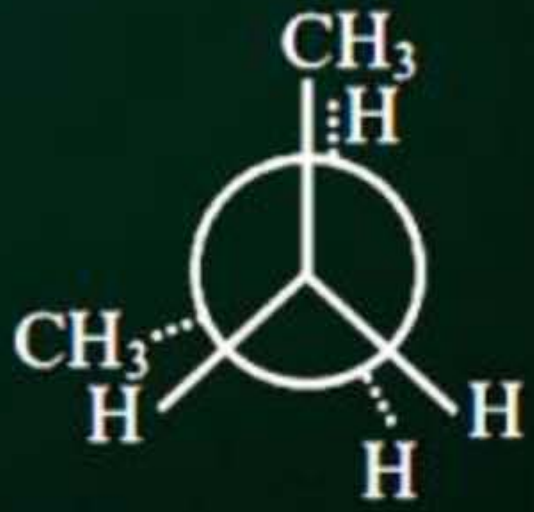
B


CH3
CH3
H
H
H
H

C


CH3
H
H
H
H
CH3

D


CH3
H
CH3
H
H
H

QUESTION 07

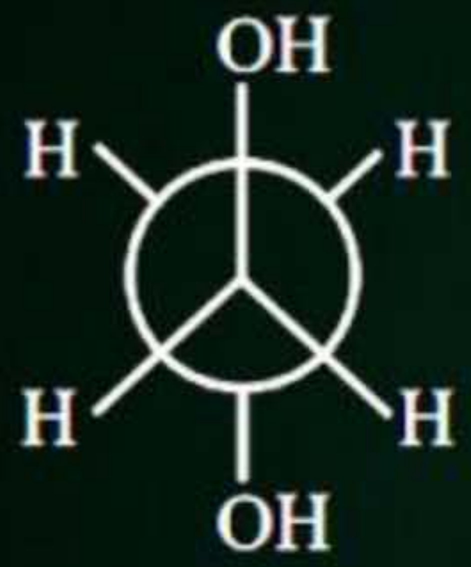
How many conformation does ethane have?

- (A) 1
- (B) 2
- (C) 3
- (D) Infinite

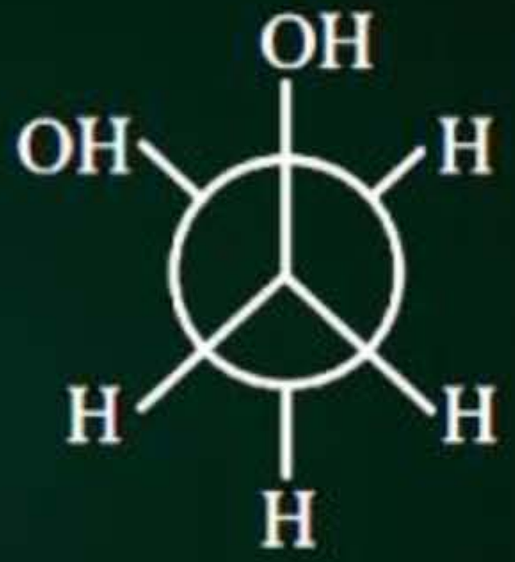
QUESTION 08

Most stable conformation of Ethylene glycol is:

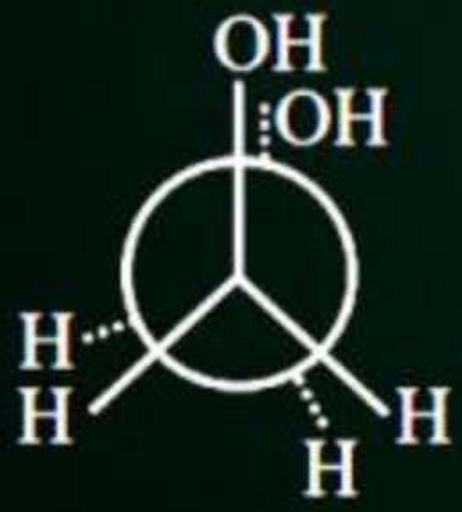
A



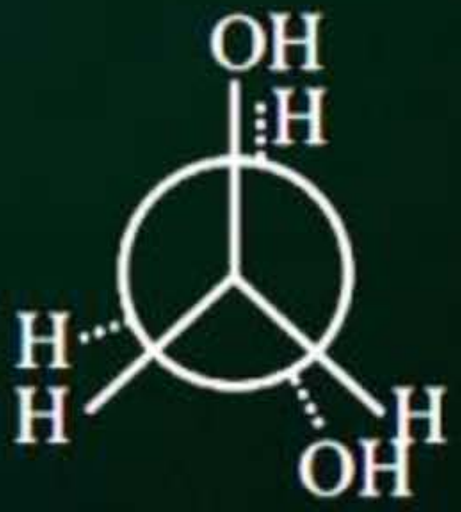
B



C

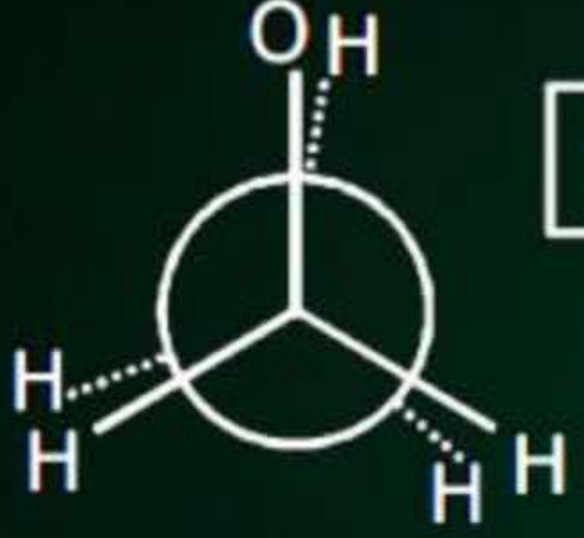


D



QUESTION 09

Following eclipsed form of propane is repeated after rotation of



$\boxed{\text{O}=-\text{CH}_3}$

Ⓐ 45°

Ⓑ 90°

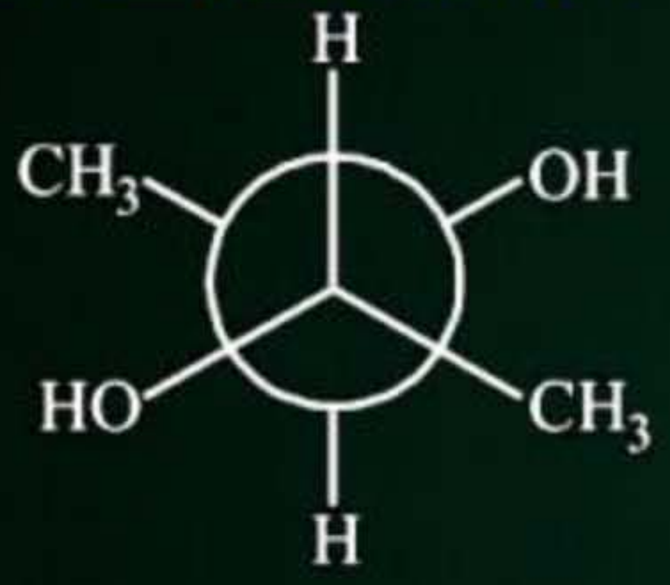
Ⓒ 120°

Ⓓ 180°

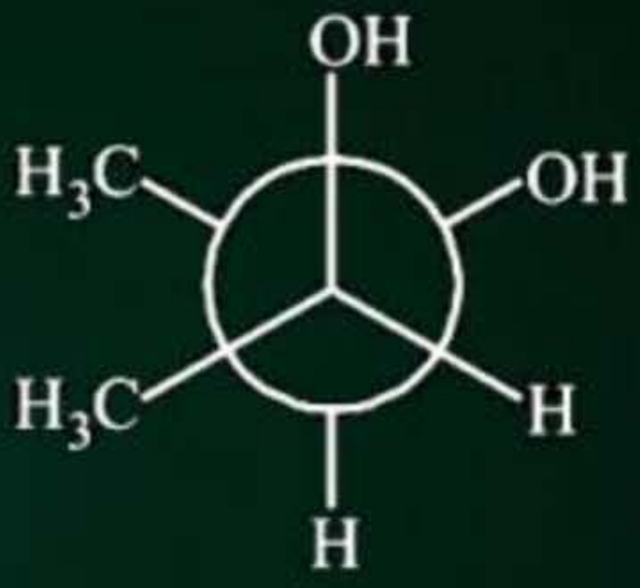
QUESTION 10

Which is highly stable?

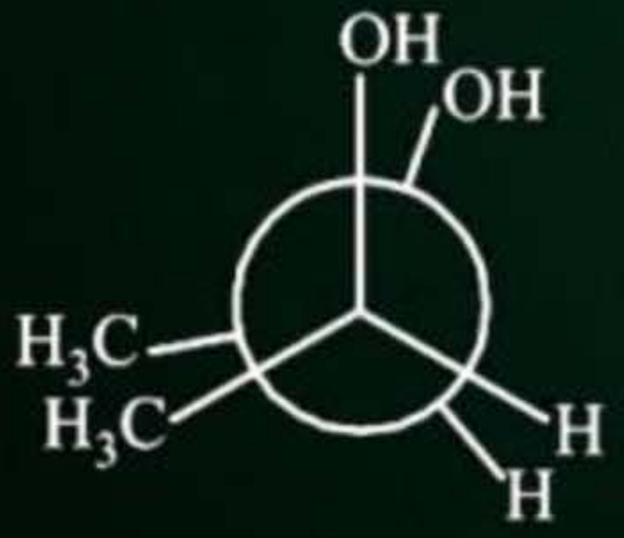
A


H
CH_3
OH
HO
CH_3
H

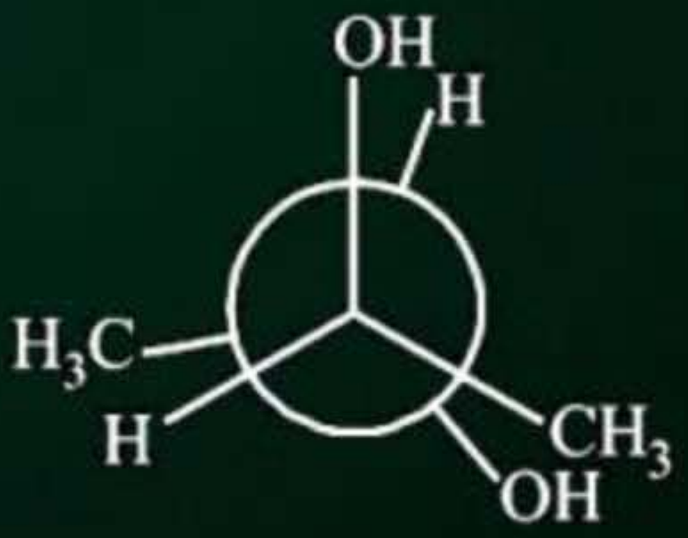
B


OH
H_3C
OH
H_3C
H
H

C


OH
OH
H_3C
H_3C
H
H

D


OH
H
H_3C
H
CH_3
OH

ANSWER KEY

1. A
2. C
3. B
4. C
5. A
6. A
7. D
8. B
9. C
10. B

Home Work From PW Module (Yakeen NEET)

Prarambh: Q 63, 75, 116, 118

Thank you!!

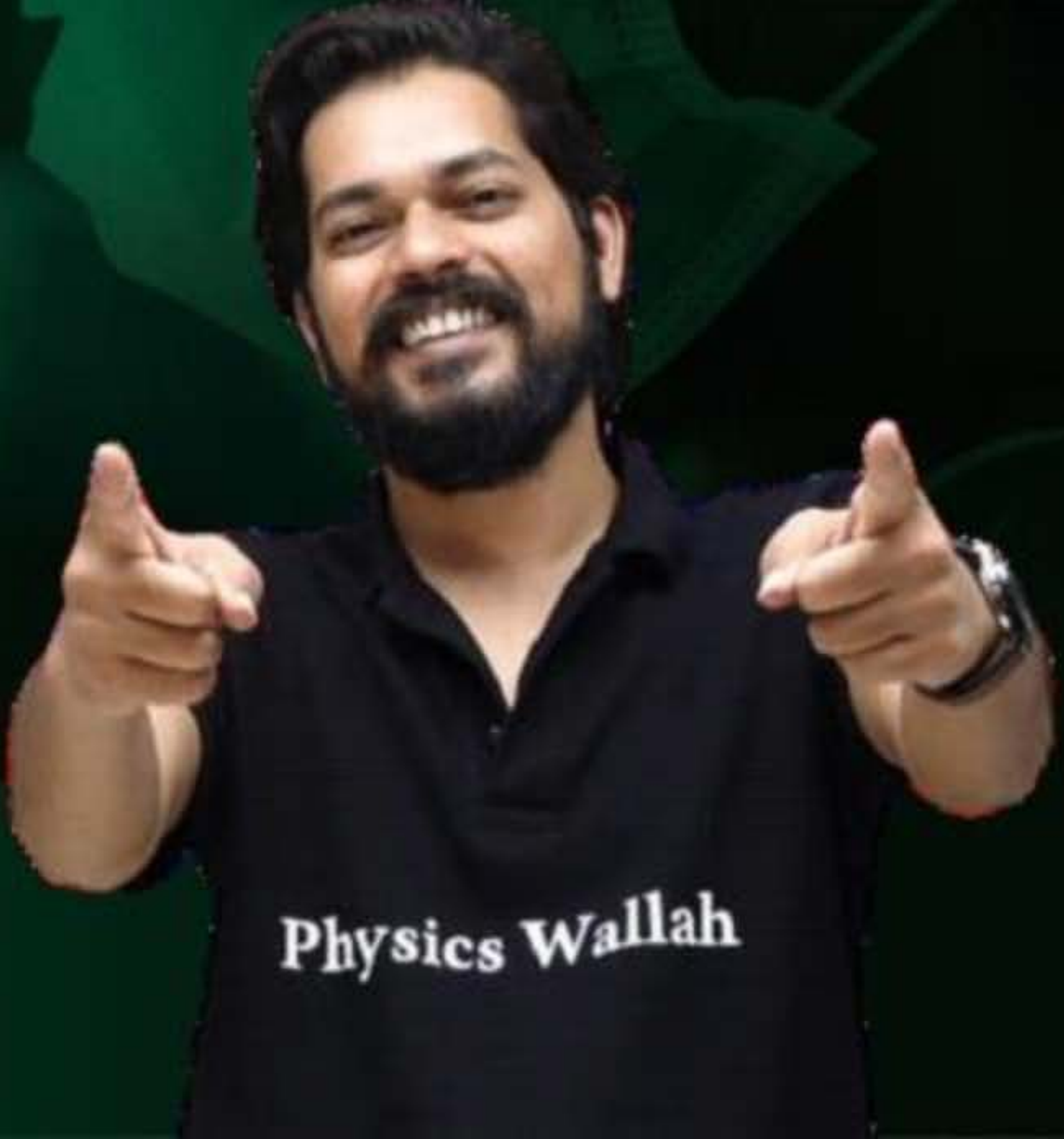
YAKEEN 2.0

FOR NEET 2025

Lecture- 13 Organic Chemistry

Some Basic Principles and Techniques
(ISOMERISM)

By- Pankaj Sir(POPU MAMA)


Physics Wallah

Topics *to be covered*

1. NEET/AIPMT & JEE Mains PYQs Discussion
2. Practice

NEET PYQs

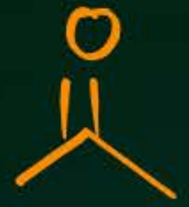
QUESTION (NEET 2021)

$C-C-O-C$
$C-O-C-C$ same

The compound which shows metamerism is:

A ✗ C_3H_8O $DU=(3+1)-\left(\frac{8}{2}\right)=0$

B ✗ C_3H_6O $DU=(3+1)-\frac{6}{2}=1$



$C=C-O-C$
$C-O-C=C$ } same

C ✓ $\underline{\underline{C_4H_{10}O}}$

D C_5H_{12}

$C-C-C-O-C$
$C-C-O-C-C$

$C-\underset{\underset{C}{|}}{C}-O-C$
} 3

QUESTION (NEET 2017)

With respect to the conformers of ethane, which of the following statements is true?

A Bond angle changes but bond length remains same

B Both bond angle and bond length change

[✓ C] Both bond angles and bond length remains same

D Bond angle remains same but bond length changes

QUESTION (NEET 2016)

The correct statement regarding the comparison of staggered and eclipsed conformation of ethane, is:-

A ✗ The staggered conformation of ethane is less stable than eclipsed conformation, because staggered conformation has torsional strain.

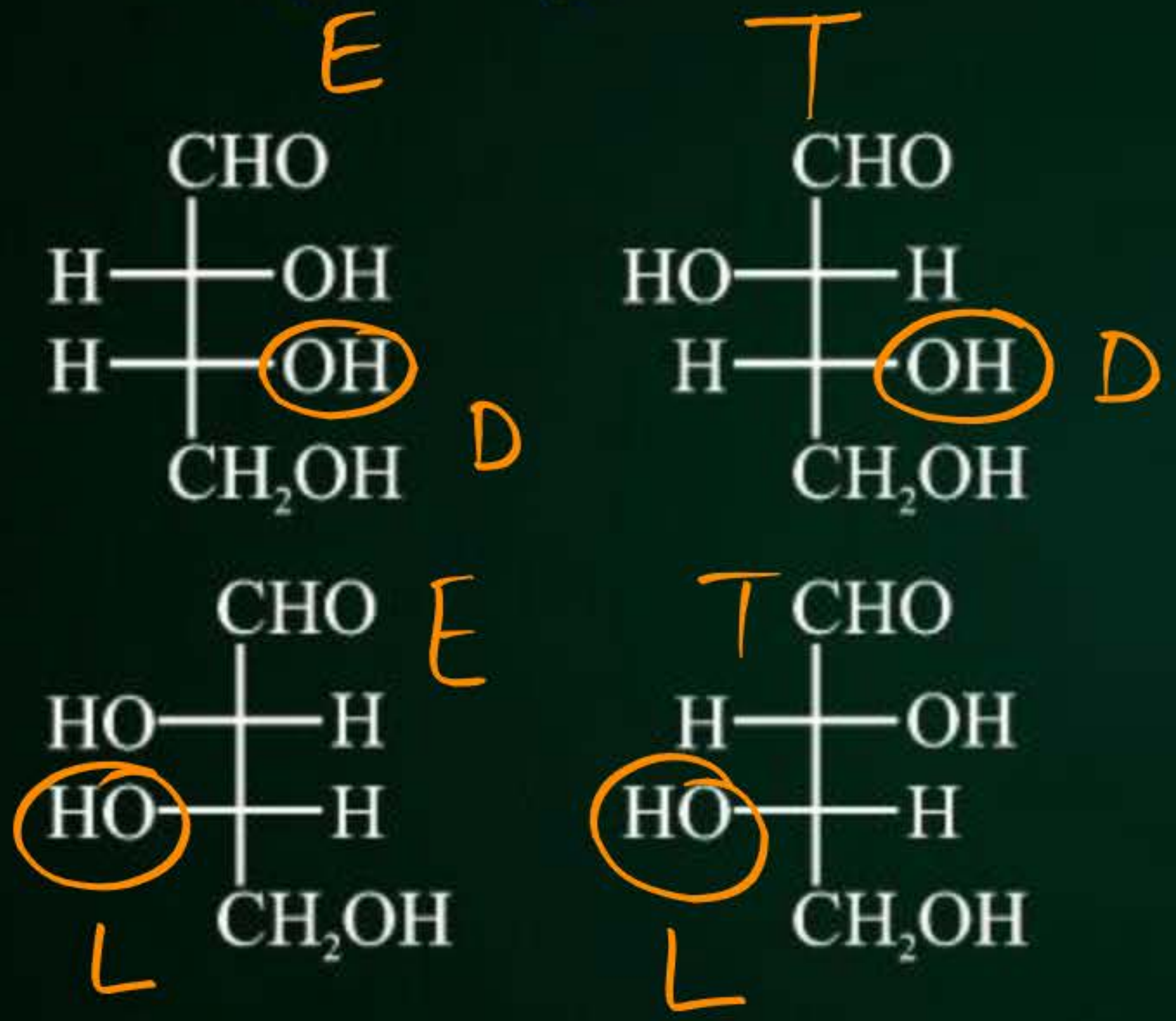
B ✗ The eclipsed conformation of ethane is more stable than staggered conformation, because eclipsed conformation has no torsional strain.

C ✗ The eclipsed conformation of ethane is more stable than staggered conformation even through the eclipsed conformation has torsional strain.

[✓ D] The staggered conformation of ethane is more stable than eclipsed conformation, because staggered conformation has no torsional strain.

QUESTION (NEET 2016)

The correct corresponding order of names of four aldoses with configuration given below:


E
T
CHO
H
OH
H
OH
D
CH₂OH
CHO
HO
H
H
OH
D
CH₂OH
CHO
E
HO
H
HO
H
CH₂OH
L
T
CHO
H
OH
HO
H
CH₂OH
L

A L-erythrose, L-threose, L-erythrose, D-threose

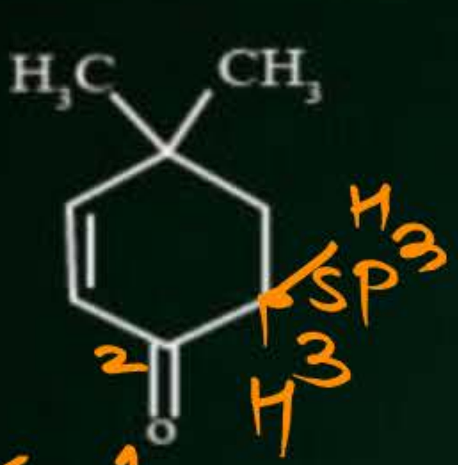
B D-threose, D-erythrose, L-threose, L-erythrose

C L-erythrose, L-threose, D-erythrose, D-threose

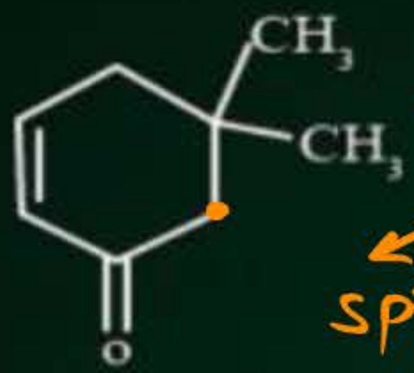
[✓ D] D-erythrose, D-threose, L-erythrose, L-threose

QUESTION (NEET 2015)

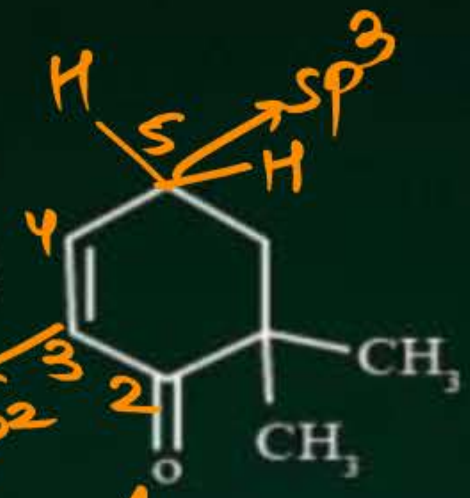
Given,


H$_3$C
CH$_3$
H
sp3
2
H3
1

✓ 1 (I)



(II) ✓


H
5
sp3
H
4
3
sp2
2
CH$_3$
CH$_3$
1

(III)

Which of the given compounds can exhibit tautomerism?

A I and III

B II and III

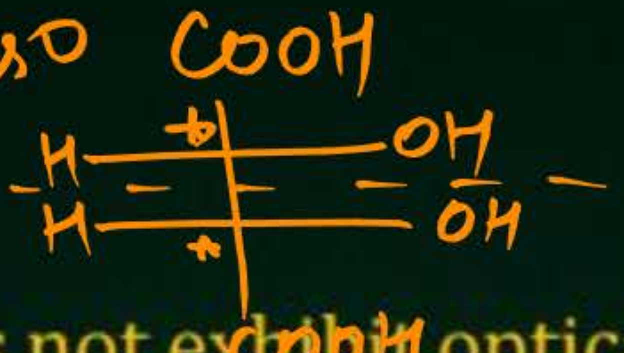
[✓ **C** I, II and III]

D I and II

QUESTION (AIPMT 2012)

meso

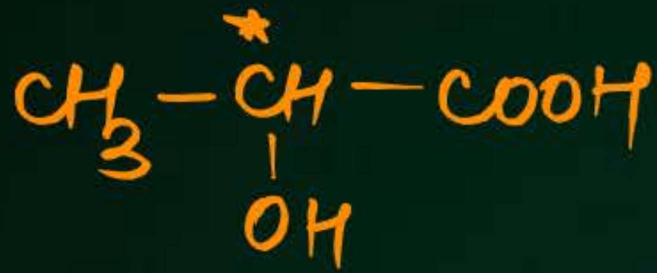
OIA



Which of the following acids does not exhibit optical isomerism?

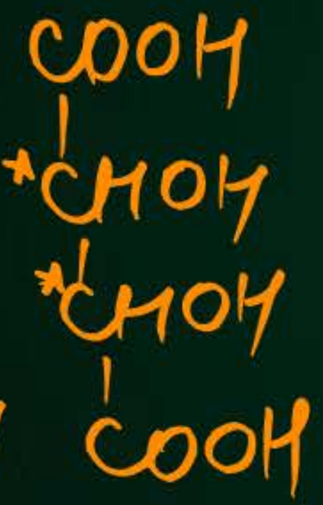
A Lactic acid

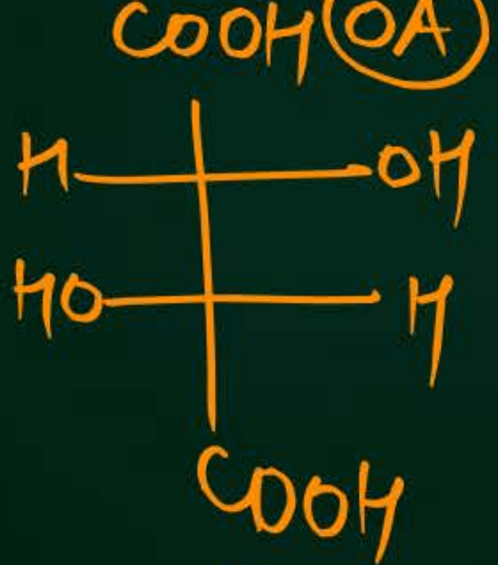
OA



$CH_3-\overset{*}{C}H(OH)-COOH$

B Tartaric acid

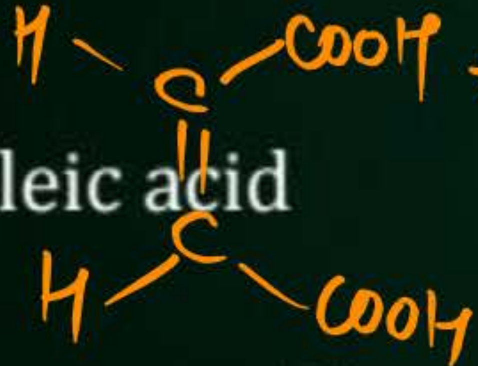




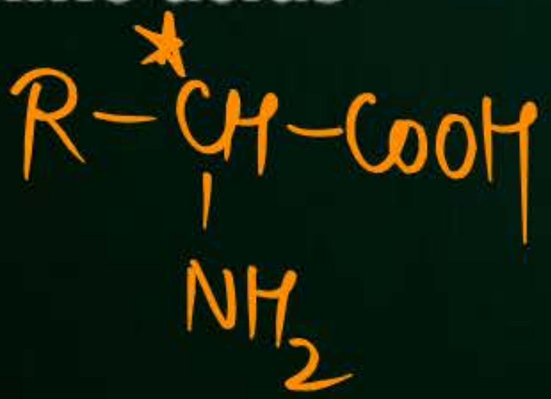
OA

pos(x)

[✓ **C**] Maleic acid



D α-amino acids

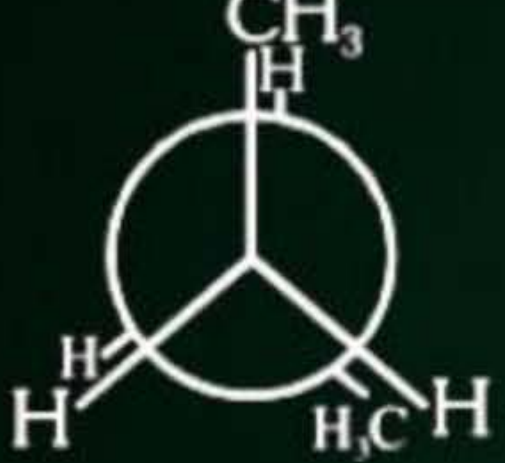


$R-\overset{*}{C}H(NH_2)-COOH$

QUESTION (AIPMT 2010)

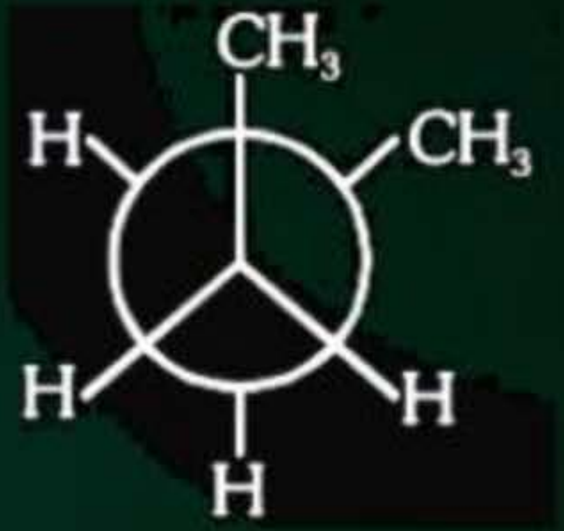
In the following the most stable conformation of n-butane is:

A



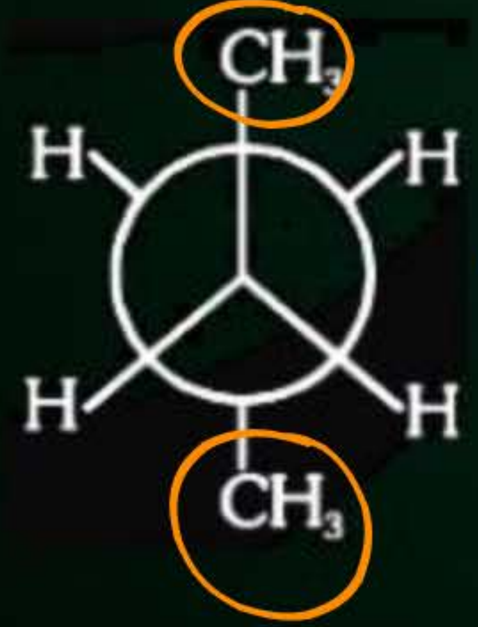
CH_3
H
H
H
H_3C
H

B



CH_3
H
CH_3
H
H
H

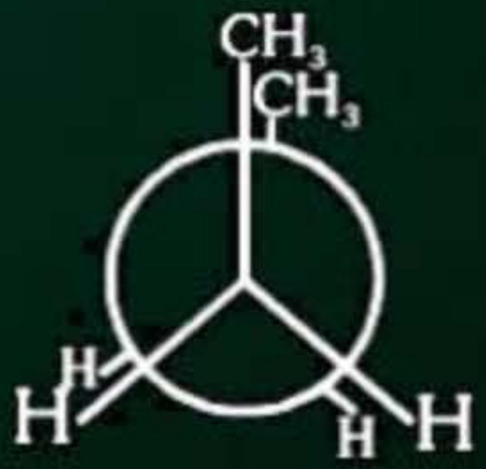
[✓ C]



CH_3
H
H
H
H
CH_3

Anti

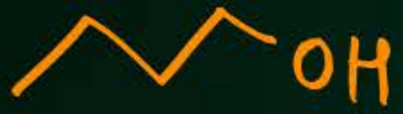
D

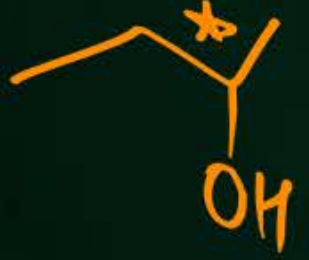


CH_3
CH_3
H
H
H
H

QUESTION (AIPMT 2009)

Which of the following compounds will exhibit cis-trans (geometrical) isomerism?

- (A) 1-Butanol 

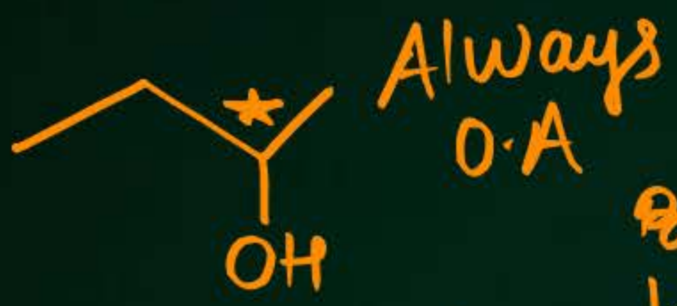
- [✓ (B)] 2-Butene $CH_3-CH=CH-CH_3$
- (C) 2-Butanol 

- (D) 2-Butyne $CH_3-C\equiv C-CH_3$

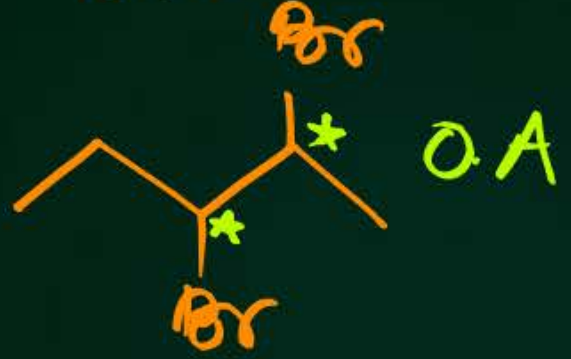
QUESTION (AIPMT 2006)

Which of the following is not chiral?

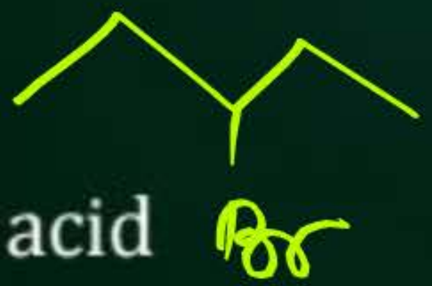
(A) 2–Butanol


*
OH
Always
O.A

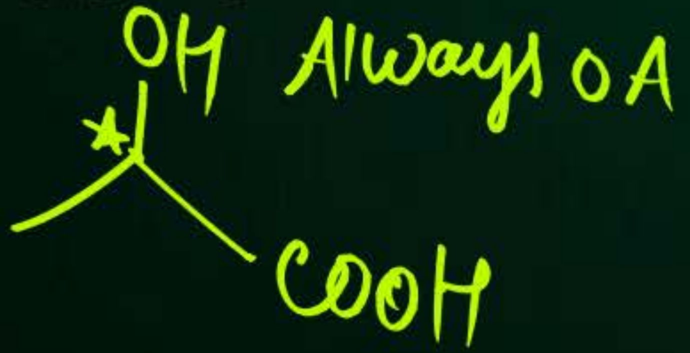
(B) 2, 3–Dibromo pentane



[✓ C] 3–Bromo pentane



(D) 2–Hydroxy propanoic acid


OH
*
Always O A
COOH

QUESTION (AIPMT 2005)

Which one of the following pairs represents stereoisomerism?

Ⓐ Structural isomerism and Geometrical isomerism

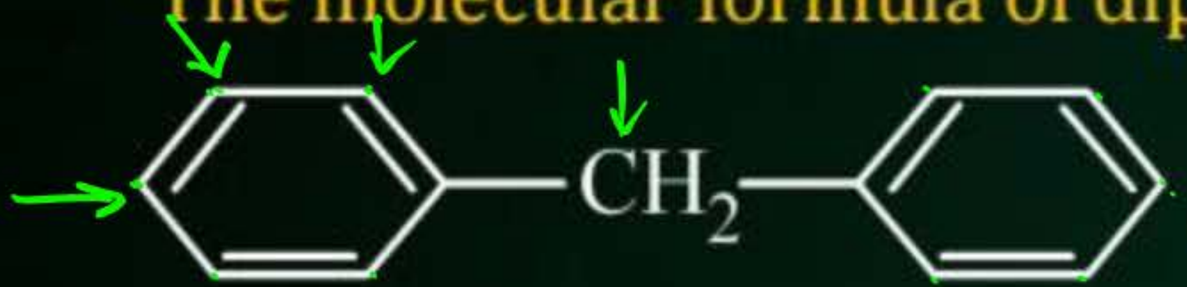
[✓ Ⓑ] Optical isomerism and Geometrical isomerism

Ⓒ Chain isomerism and Rotational isomerism

Ⓓ Linkage isomerism and Geometrical isomerism

QUESTION (AIPMT 2004)

The molecular formula of diphenyl methane,



, is $C_{13}H_{12}$.

How many structural isomers are possible when one of the hydrogens is replaced by a chlorine atom?

[✓ (A)] 4

(B) 8

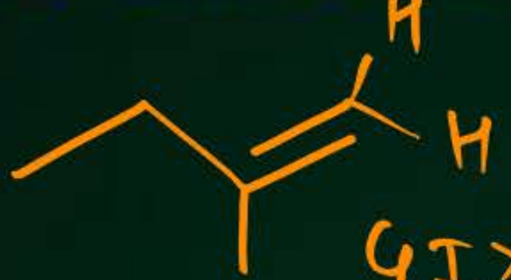
(C) 7

(D) 6

QUESTION (AIPMT 2002)

Which of the following compounds exhibits, stereoisomerism?

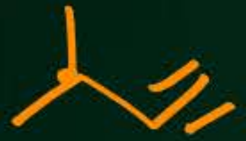
A 2-methylbutene-1



GI ×

OI ×

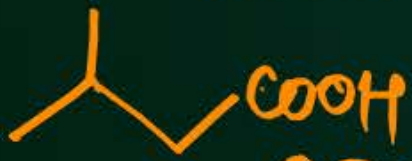
B 3-methylbutyne-l



GI ×

OI ×

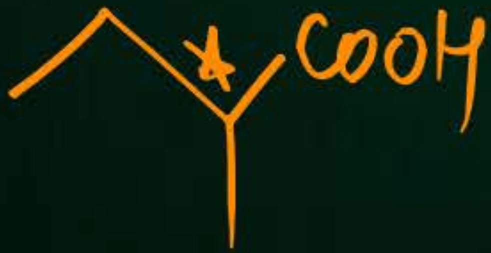
C 3-methylbutanoic acid



OI ×

GI ×

[✓ **D**] 2-methylbutanoic acid



OI ✓

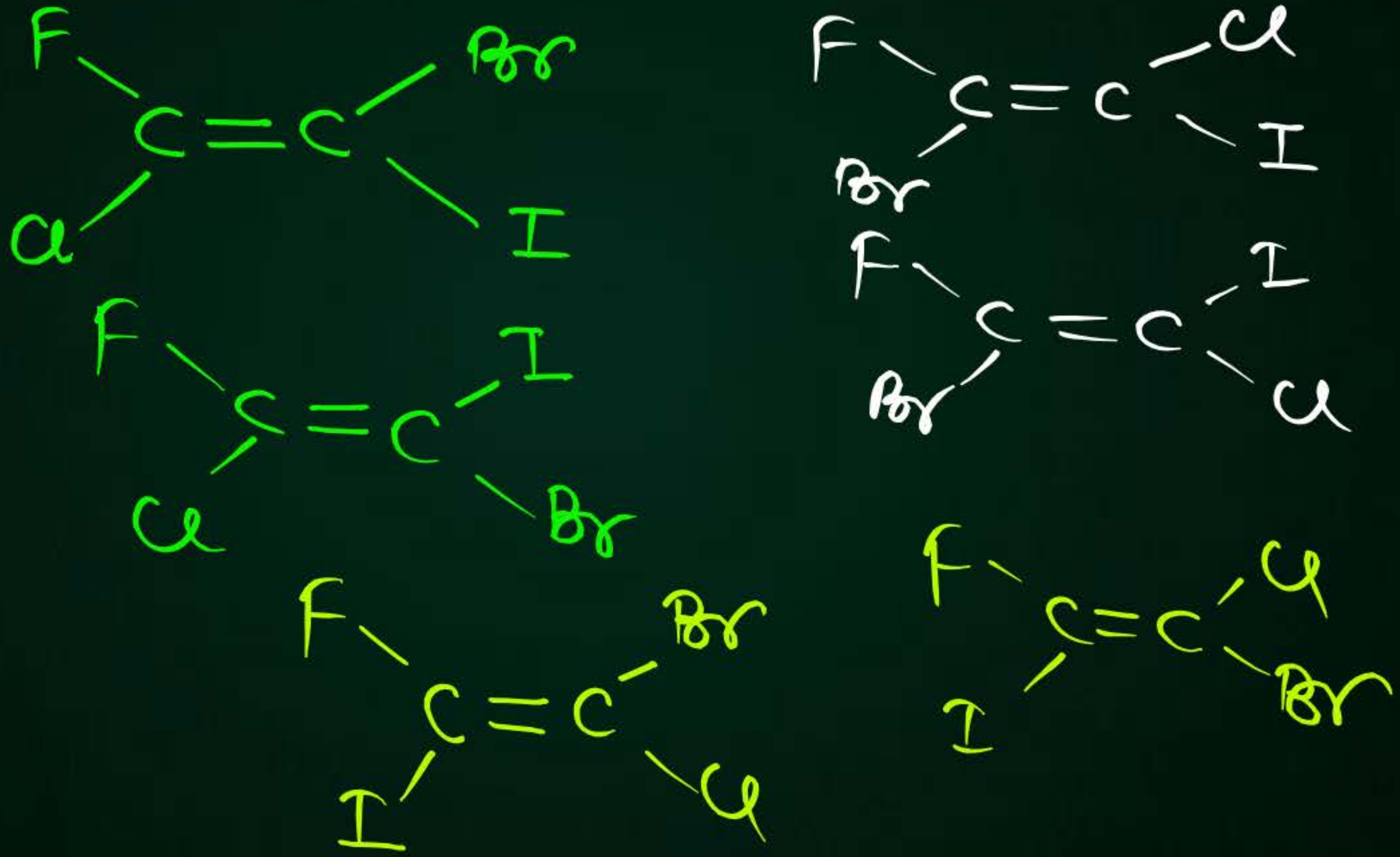
GI ×

QUESTION (AIPMT 2001)

$$DU = (2+1) - \left(\frac{4}{2}\right)$$
$$= 3 - 2 = 1$$

The number of isomers for the compound with molecular formula $C_2BrClFI$ is:

- **A** 3
- **B** 4
- **C** 5
- [✓ **D** 6]



F, Cl, C=C, Br, I
F, Br, C=C, Cl, I
F, Cl, C=C, I, Br
F, Br, C=C, I, Cl
F, I, C=C, Br, Cl
F, I, C=C, Cl, Br

QUESTION (AIPMT 2002)

Geometrical isomers are different in:

- (A) Position of functional group
- (B) Position of atoms
- [✓ (C)] Spatial arrangement of atoms
- (D) Length of carbon chain

QUESTION (AIPMT 1997)

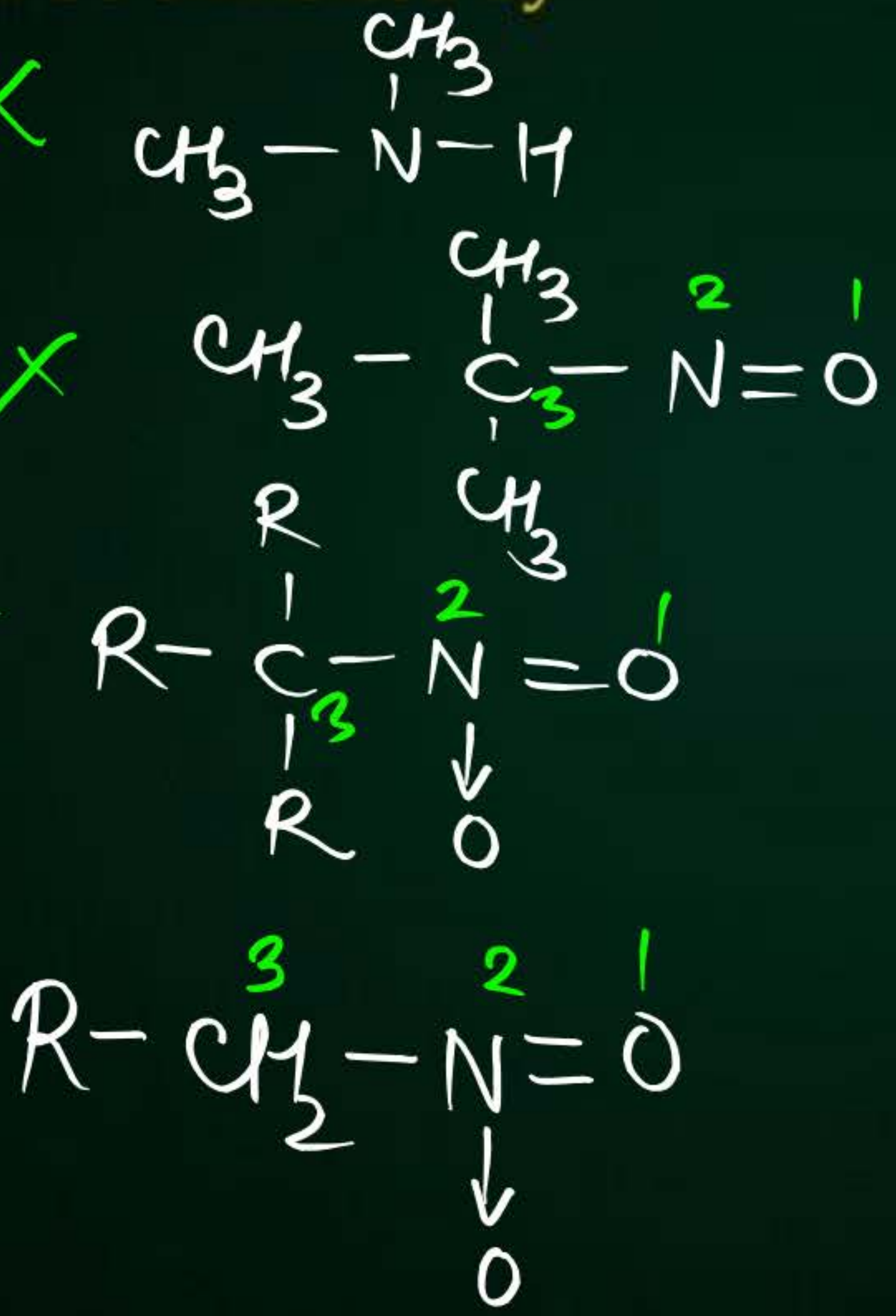
Tautomerism will be exhibited by

A $(CH_3)_2NH$ ✗

B $(CH_3)_3CNO$ ✗

C R_3CNO_2 ✗

D RCH_2NO_2 ✓



$CH_3-\overset{\overset{CH_3}{|}}{N}-H$

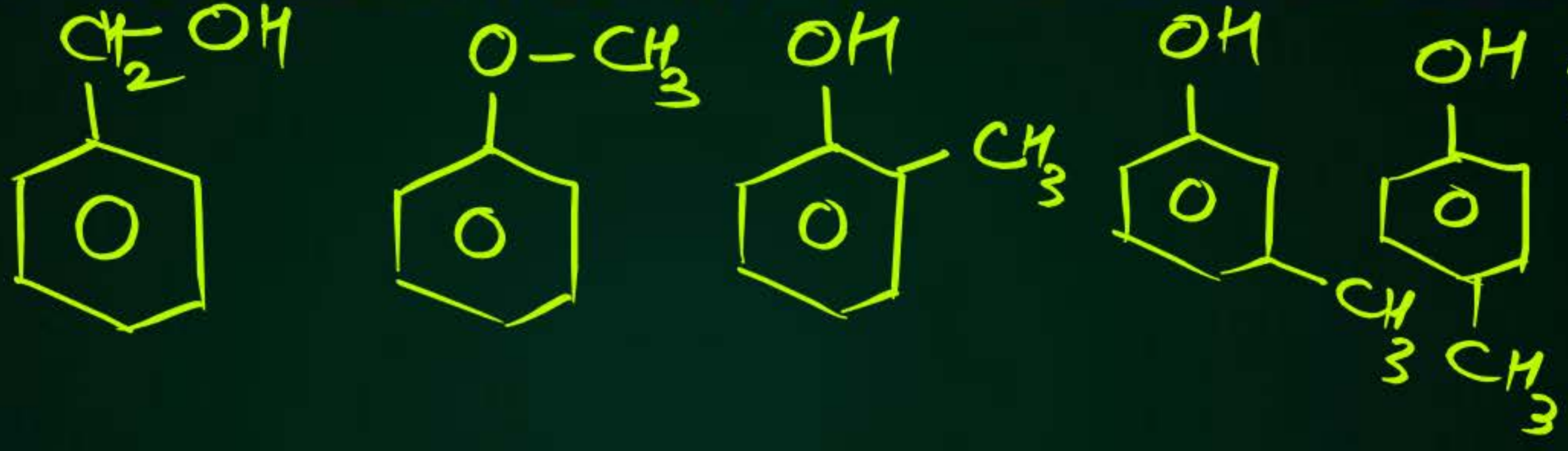
$CH_3-\underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C_3}}-\overset{2}{N}=\overset{1}{O}$

$R-\underset{\underset{R}{|}}{\overset{\overset{R}{|}}{C^3}}-\underset{\underset{O}{\downarrow}}{\overset{2}{N}}=\overset{1}{O}$

$R-\overset{3}{CH_2}-\underset{\underset{O}{\downarrow}}{\overset{2}{N}}=\overset{1}{O}$

QUESTION (AIPMT 1995)

The number of possible Benzenoid isomers of the compound with molecular formula C_7H_8O is:



CH_2OH
$O-CH_3$
OH
CH_3
OH
CH_3
OH
CH_3

$DU = (7+1) - \left(\frac{8+0-0}{2}\right)$

$= 8 - 4$

$= ④$

A 3

B 5

C 7

D 9

QUESTION (AIPMT 1991)

Isomers of a substance must have the same

Ⓐ Structural formula

Ⓑ Physical properties

Ⓒ Chemical properties

Ⓓ [✓ Molecular formula]

QUESTION (AIPMT 1989)

Which one of the following can exhibit cis-trans isomerism?

- A $CH_3 - CHCl - COOH$
- B $H - C \equiv C - Cl$
- [✓ C] $ClCH = CHCl$
- D $ClCH_2 - CH_2Cl$

QUESTION (AIPMT 1988)

How many chain isomers could be obtained from the alkane C_6H_{14}?

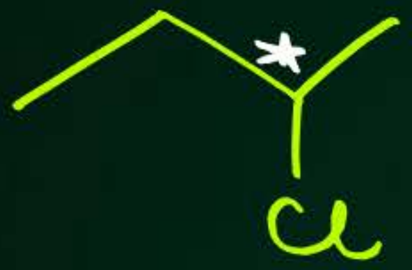
- (A) Four
- (B) [✓ Five]
- (C) Six
- (D) Seven

1 ✓
1 ✓
1 ✓
2 ✓
3 ✓
⑤
9
18
35
75 ✓

JEE Mains PYQs

QUESTION (JEE Mains 1st Feb 2024, Morning Shift)

Number of optical isomers possible for 2–chlorobutane ....



②

A) 1

B) 2

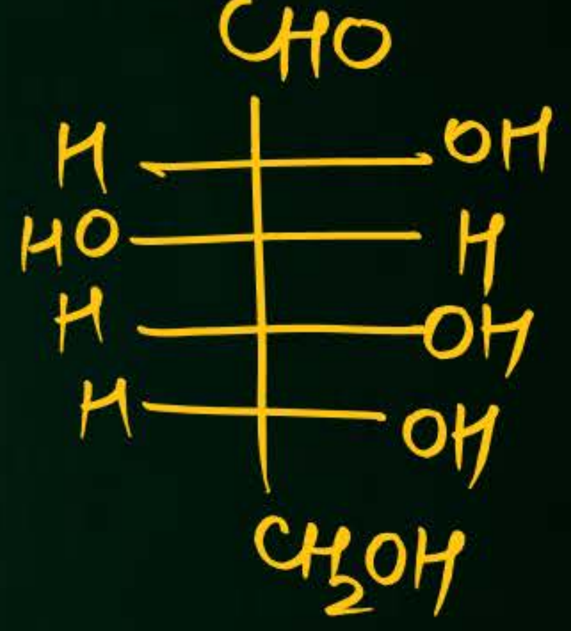
C) 3

D) 4

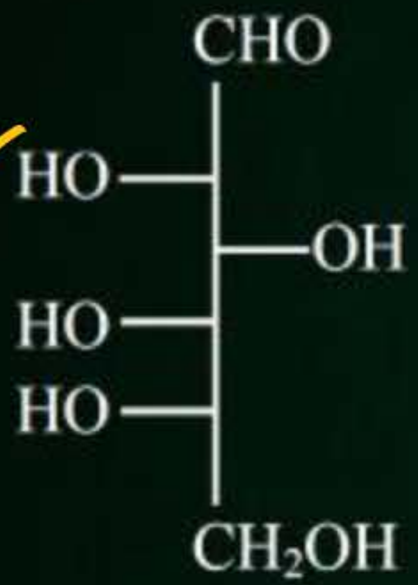
QUESTION (JEE Mains 4th April 2024, Evening Shift)

Which of the following is the correct structure of L-Glucose?

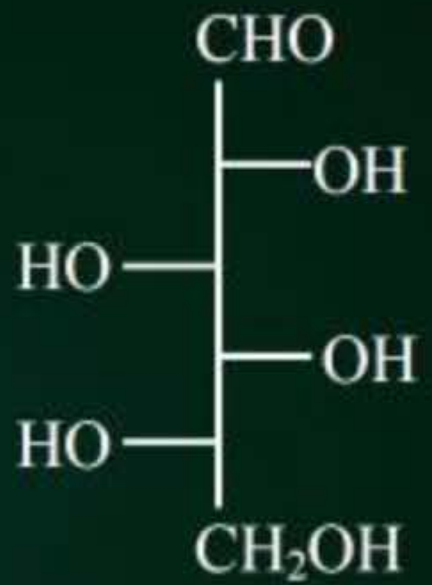
D-Glucose


CHO
H
OH
HO
H
H
OH
H
OH
CH₂OH

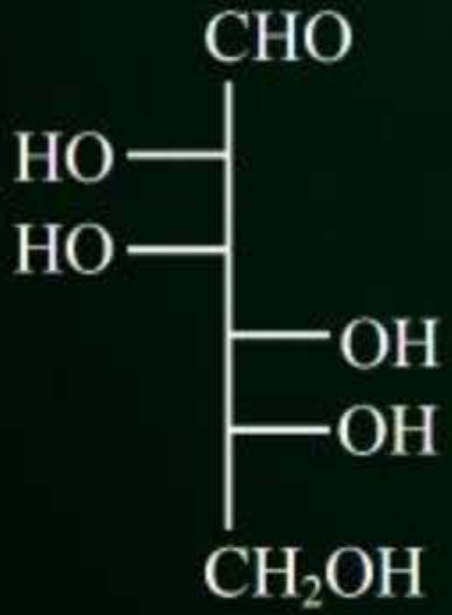
A ✓


CHO
HO
OH
HO
HO
CH₂OH

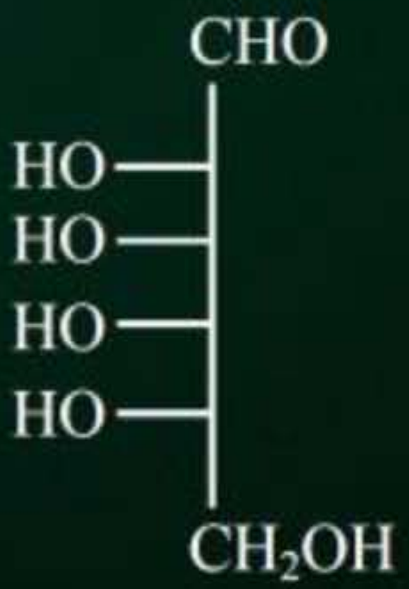
B ✗


CHO
OH
HO
OH
HO
CH₂OH

C ✗


CHO
HO
HO
OH
OH
CH₂OH

D


CHO
HO
HO
HO
HO
CH₂OH

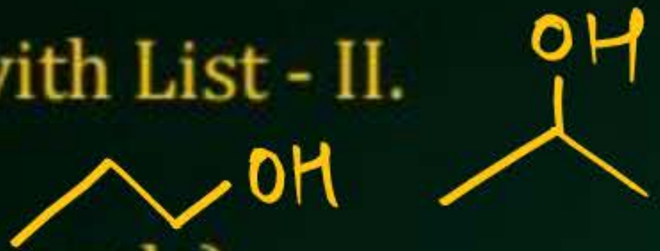
QUESTION (JEE Mains 4th April 2024, Morning Shift)

The number of different chain isomers for C_7H_{16} is ________.

A) 2
B) 3
C) 5
[✓ D) 9]

QUESTION (JEE Mains 5th April 2024, Evening Shift)

Match List - I with List - II.



List - I (Pair of Compounds)		List - II (Isomerism)
(A) n-propanol and Isopropanol III	(I)	Metamerism
(B) Methoxy propane and ethoxyethane	(II)	Chain Isomerism
(C) Propanone and propanal IV	(III)	Position Isomerism
(D) Neopentane and Isopentane	(IV)	Functional Isomerism

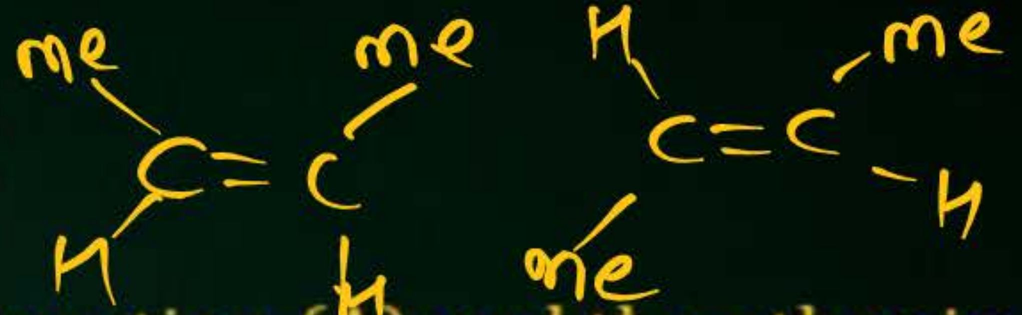
A ✗ (A)–(II), (B)–(I), (C)–(IV), (D)–(III)

B (A)–(III), (B)–(I), (C)–(II), (D)–(IV)

C ✗ (A)–(I), (B)–(III), (C)–(IV), (D)–(II)

✓ **D** (A)–(III), (B)–(I), (C)–(IV), (D)–(II)

QUESTION (JEE Mains 5th April 2024, Morning Shift)



Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).

Assertion (A): Cis form of alkene is found to be more polar than the trans form.

Reason (R): Dipole moment of trans isomer of 2-butene is zero.

$\mu \neq 0$ polar

In the light of the above statements, choose the correct answer from the options given below:

$\mu = 0$ non polar

A Both (A) and (R) are true but (R) is NOT the correct explanation of (A).

B (A) is true but (R) is false.

[✓ **C**] Both (A) and (R) are true and (R) is the correct explanation of (A).

D (A) is false but (R) is true.

QUESTION (JEE Mains 6th April 2024, Evening Shift)

The incorrect statement regarding the geometrical isomers of 2-butene is:

Restricted

A cis-2-butene and trans-2-butene are not interconvertible at room temperature.

[✓ B] cis-2-butene has less dipole moment than trans-2-butene.

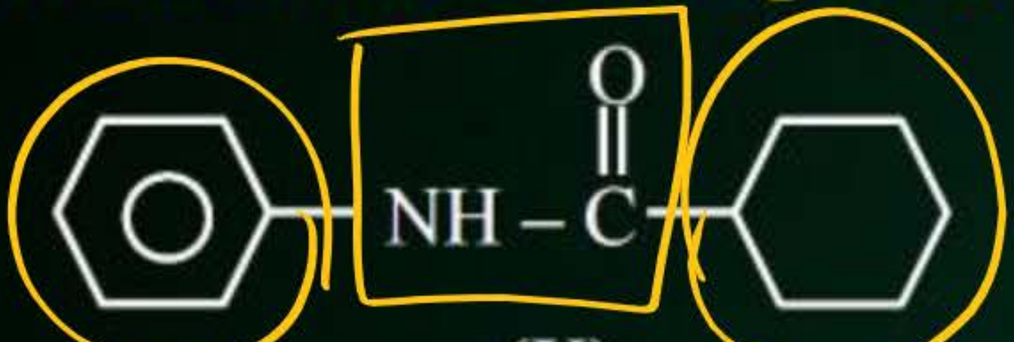
↳ $\mu = 0$

C trans-2-butene is more stable than cis-2-butene.

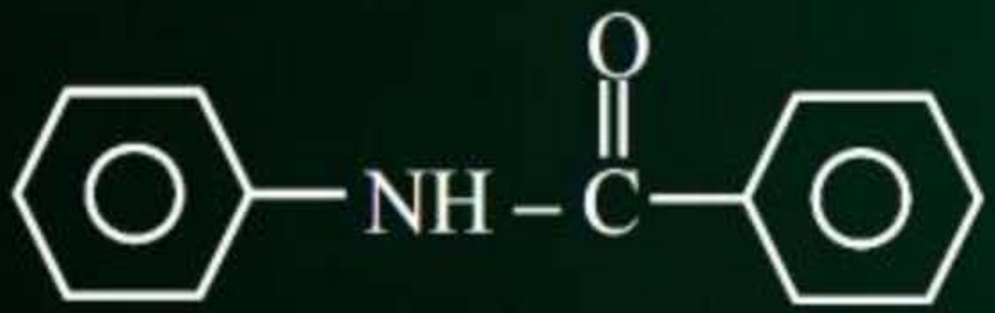
D cis-2-butene and trans-2-butene are stereoisomers.

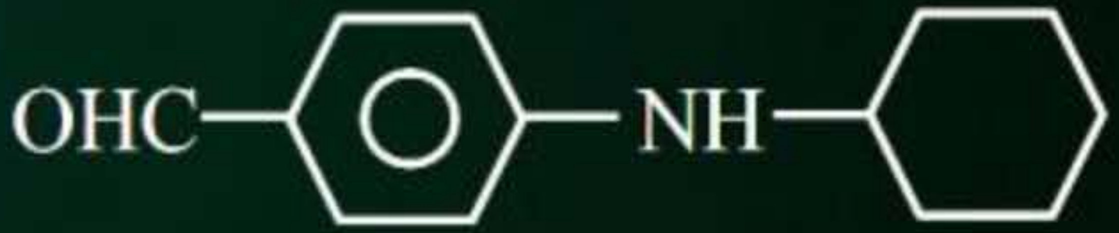
QUESTION (JEE Mains 6th April 2024, Morning Shift)

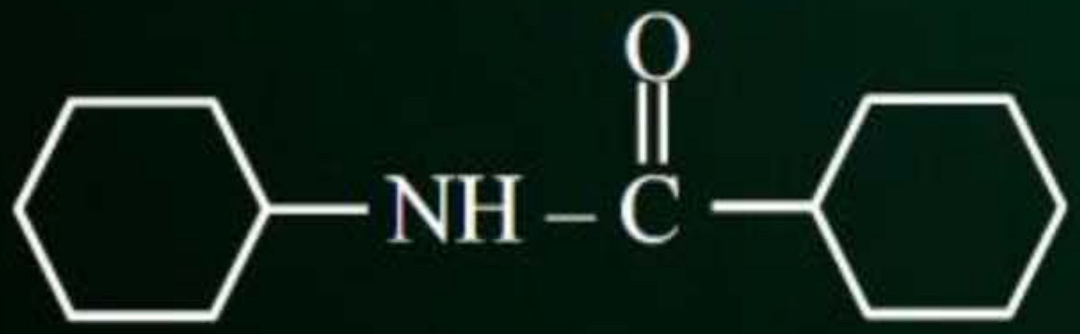
Which of the following is metamer of the given compound (X)?

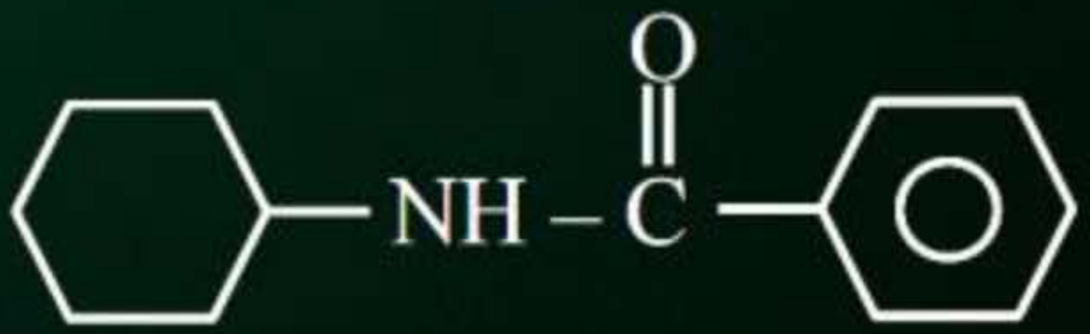


(X)

A 

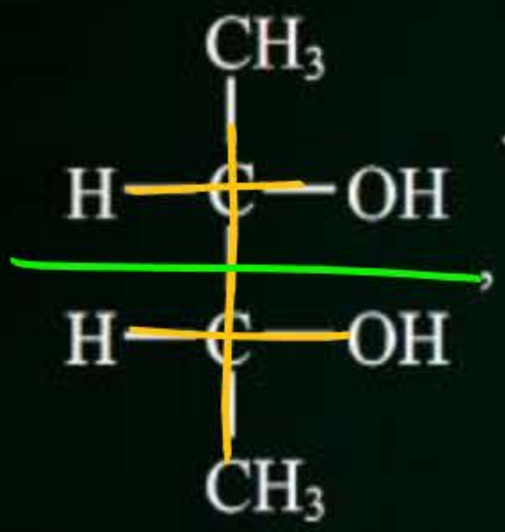
B 

C 

[✓ D] 

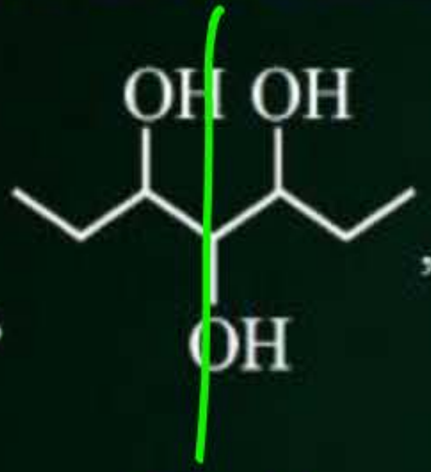
QUESTION (JEE Mains 8th April 2024, Evening Shift)

Total number of optically active compounds from the following is ______.



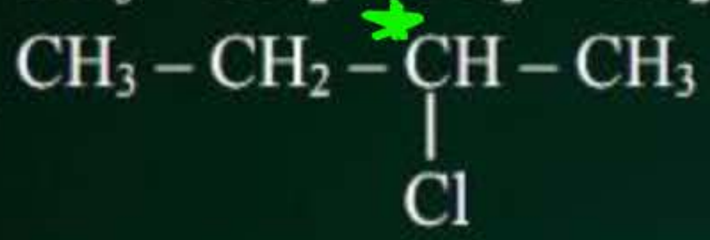
POS

OIA



OIA

$CH_3-CH_2-CH_2-CH_2-OH$,



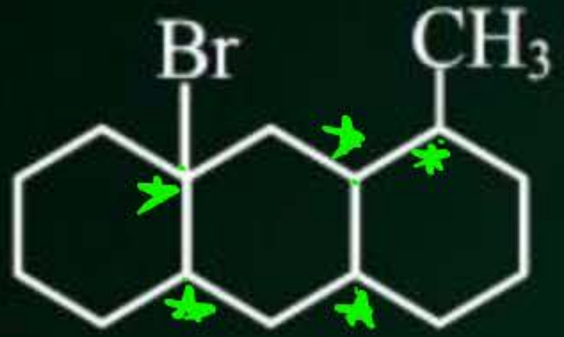
$CH_3-CH_2-\overset{*}{C}H(Cl)-CH_3$

$CH_3-CH_2-CH_2-CH_2-Cl$,

$(CH_3)_2CH-CH_2-CH_2-Cl$

QUESTION (JEE Mains 8th April 2024, Morning Shift)

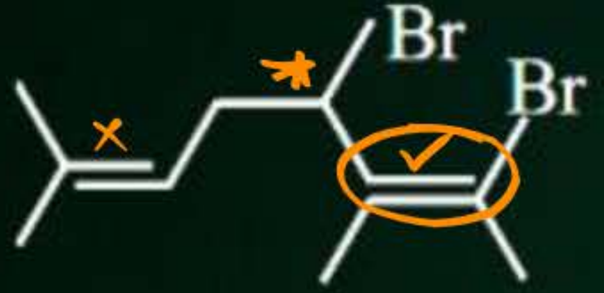
The number of optical isomers in following compound is: ____.



$2^5 = 32$

QUESTION (JEE Mains 9th April 2024, Evening Shift)

Total number of stereo isomers possible for the given structure:



$$2^n = 2^2 = 4$$

A 8

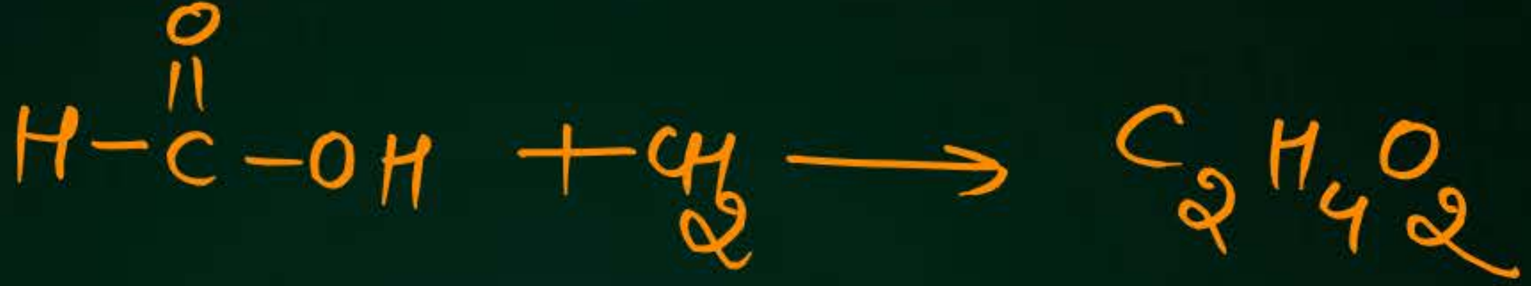
B 2

[✓ C 4]

D 3

QUESTION (JEE Mains 27th January 2024, Evening Shift)

The molecular formula of second homologue in the homologous series of mono carboxylic acids is ______.

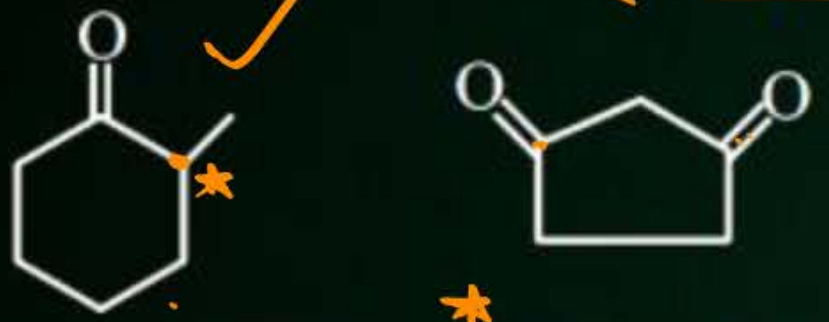


$$H-\overset{\overset{O}{\|}}{C}-OH + CH_2 \longrightarrow C_2H_4O_2$$

- **A** $C_3H_6O_2$
- [✓ **B**] $C_2H_4O_2$
- **C** CH_2O
- **D** $C_2H_2O_2$

QUESTION (JEE Mains 27th January 2024, Evening Shift)

Total number of compounds with Chiral carbon atoms from following is ______.

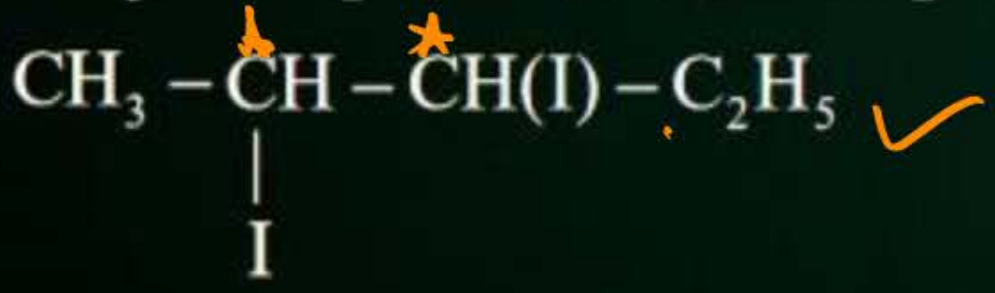


$CH_3-CH_2-\overset{*}{C}H(NO_2)-COOH$ ✓

$CH_3-CH_2-CHBr-CH_2-CH_3$

$CH_3-\overset{*}{C}H(I)-CH_2-NO_2$ ✓

$CH_3-CH_2-\overset{*}{C}H(OH)-CH_2OH$ ✓

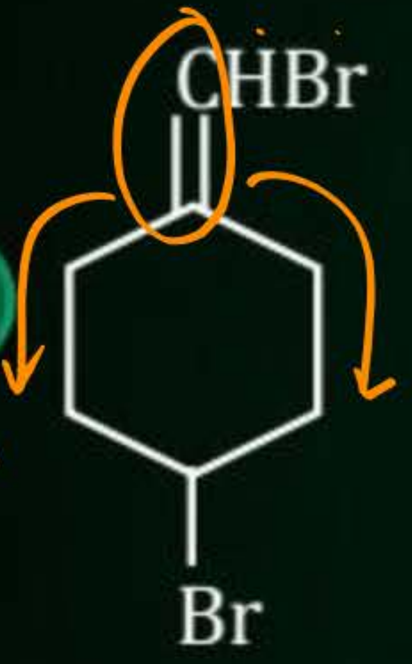


$CH_3-\underset{I}{\overset{*}{C}H}-\overset{*}{C}H(I)-C_2H_5$ ✓

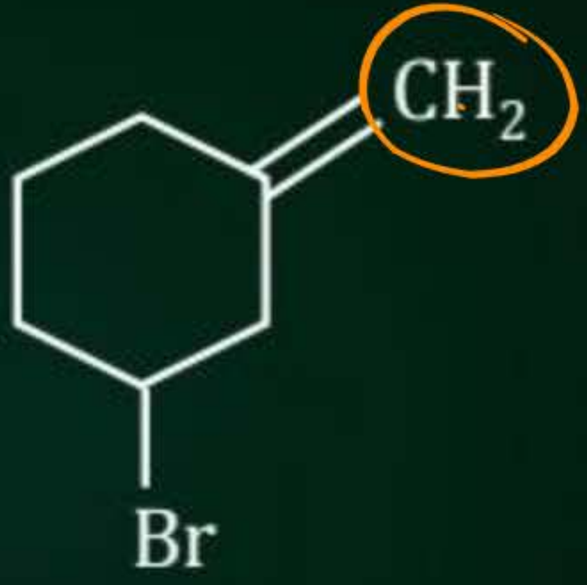
QUESTION (JEE Mains 29th January 2024, Evening Shift)

Which one of the following will show geometrical isomerism?

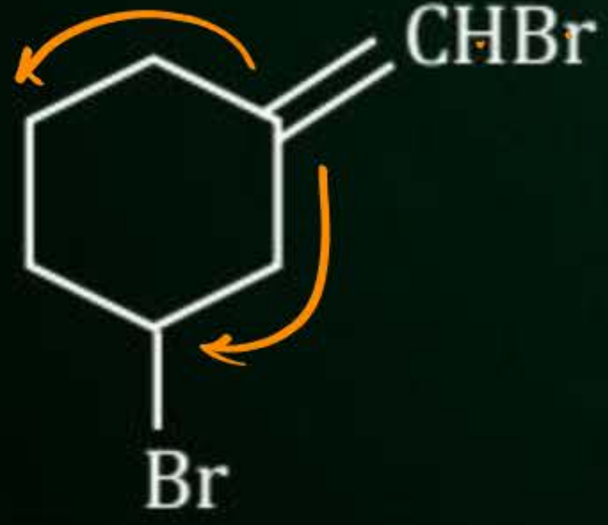
A



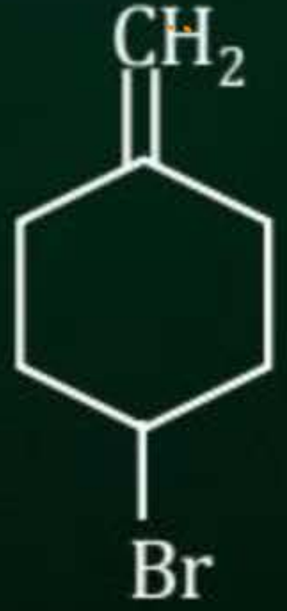
B



C

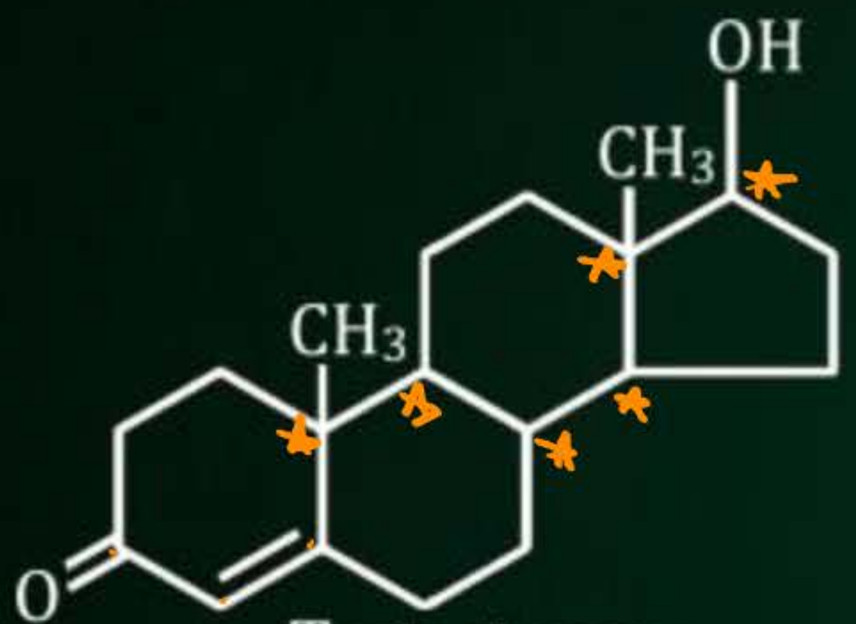


D



QUESTION [January Shift 1 JEE Mains 2023]

Testosterone, which is a steroidal hormone has the following structure.



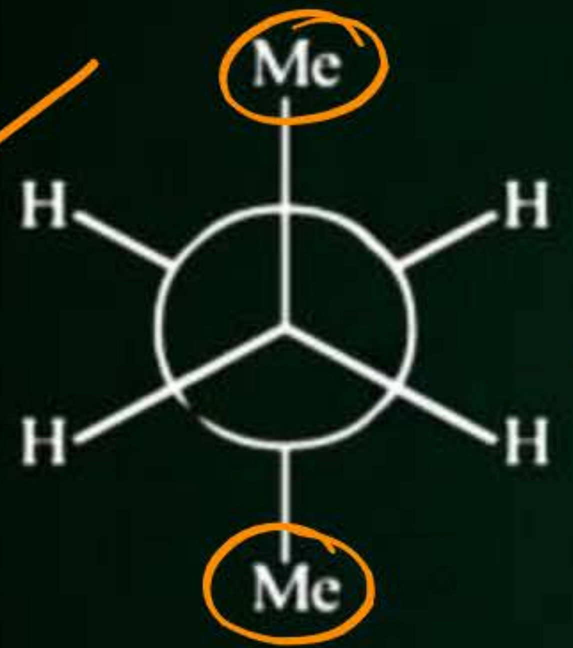
Testosterone

The total number of asymmetric carbon atom/s in testosterone is:

QUESTION [January Shift 1 JEE Mains 2023]

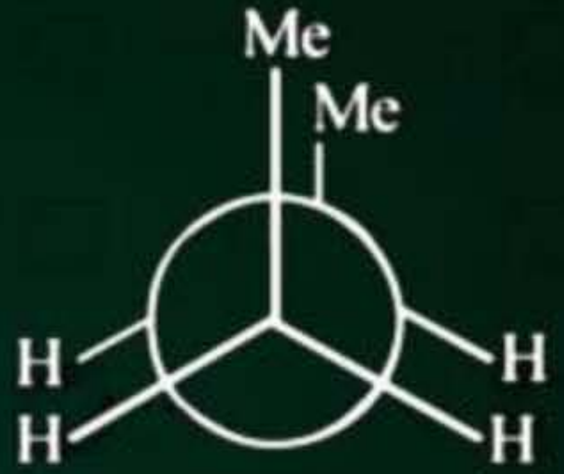
Which of the following conformations will be the most stable?

A

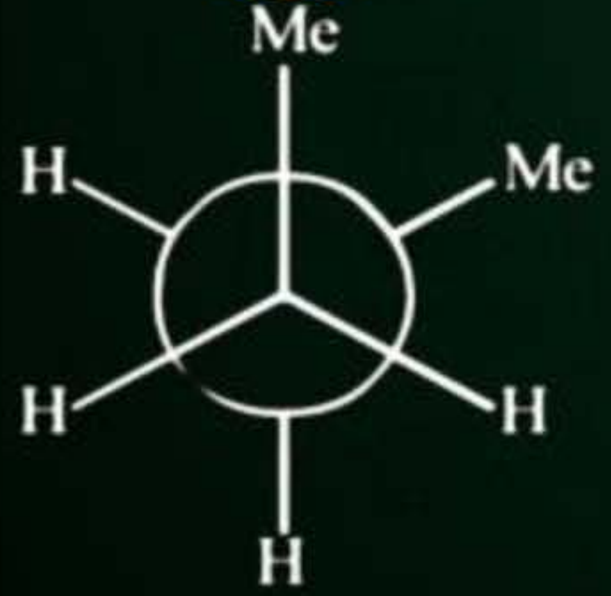


Anti

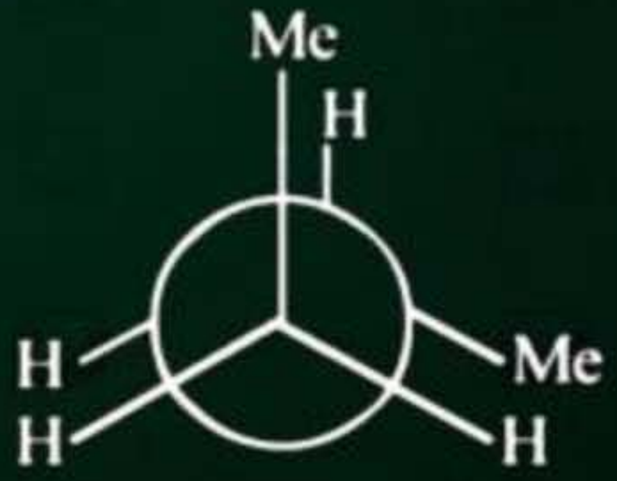
B



C

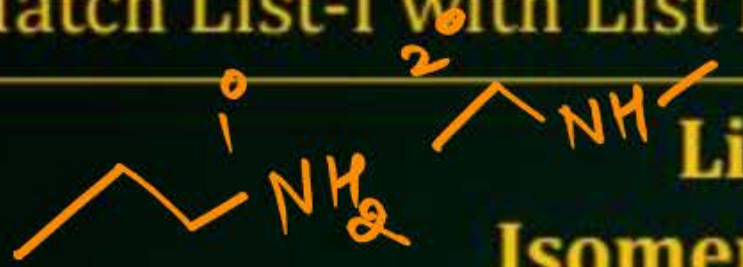


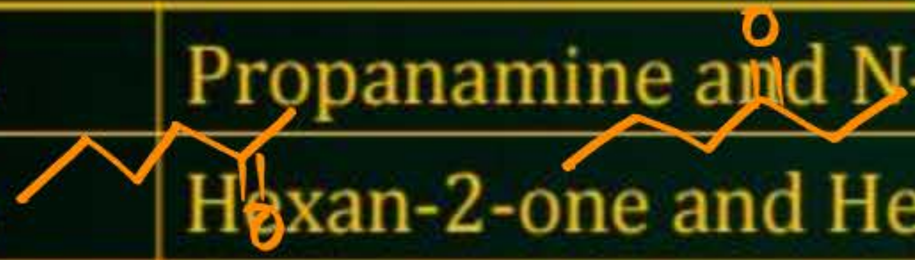
D



QUESTION [January Shift 2 JEE Mains 2023]

Match List-I with List II.





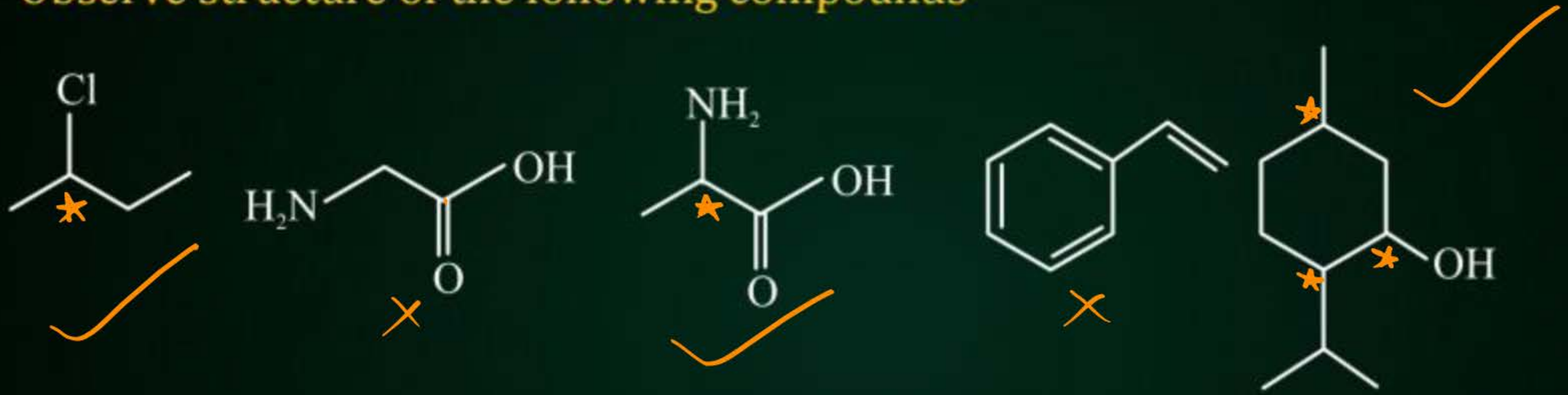
	List-I Isomeric pairs		List-II Type of isomers
A.	Propanamine and N-Methylethanamine III	I.	Metamers
B.	Hexan-2-one and Hexan-3-one I	II.	Positional isomers
C.	Ethanamide and Hydroxyethanimine	III.	Functional isomers
D.	o-nitrophenol and p-nitrophenol	IV.	Tautomers

Choose the correct answer from the options given below:

- A A-III, B-IV, C-I, D-II
- B A-IV, B-III, C-I, D-II
- C A-II, B-III, C-I, D-IV
- [✓ D] A-III, B-I, C-IV, C-II

QUESTION [29 Jan, JEE Mains 2022]

Observe structure of the following compounds

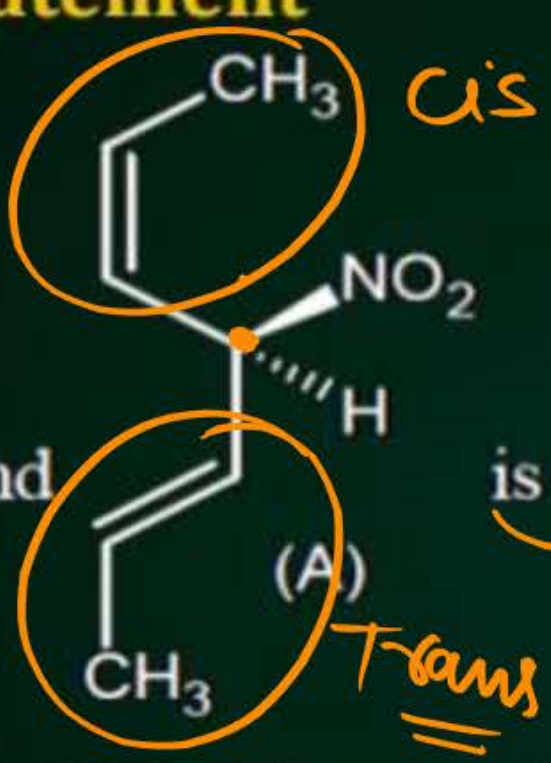

Cl
H_2N
OH
O
NH_2
OH
O
OH

The total number of structures/compounds which possess asymmetric atoms is ______.

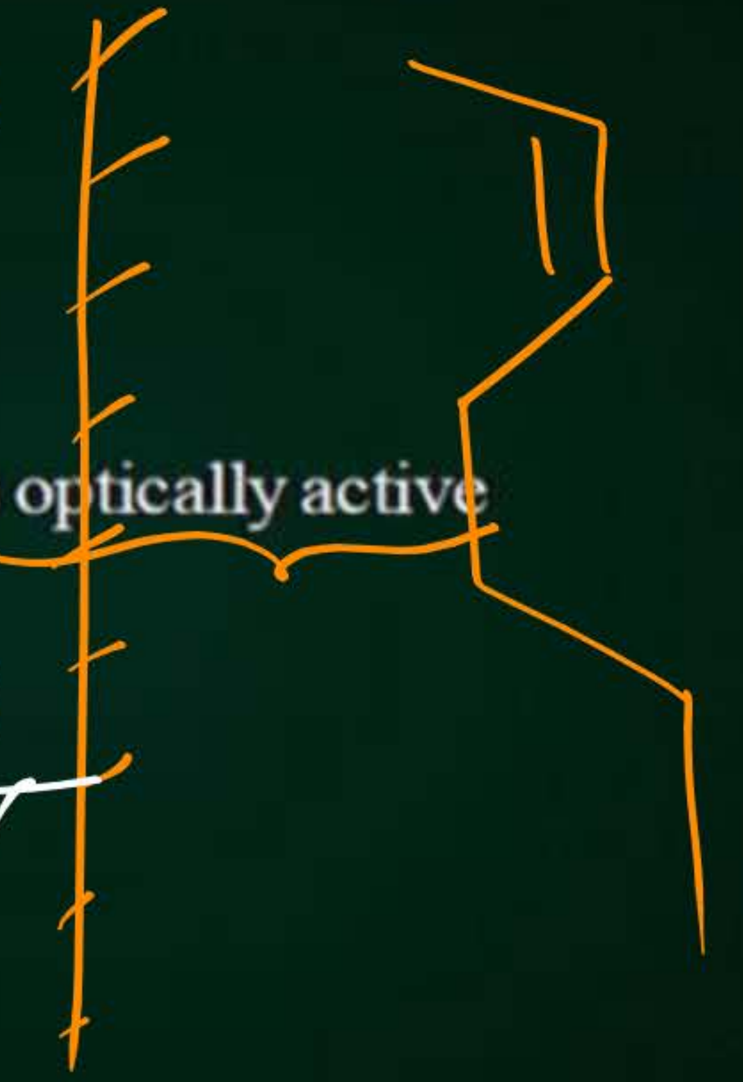
QUESTION [01 July, JEE Mains 2023]

Given below are two statement

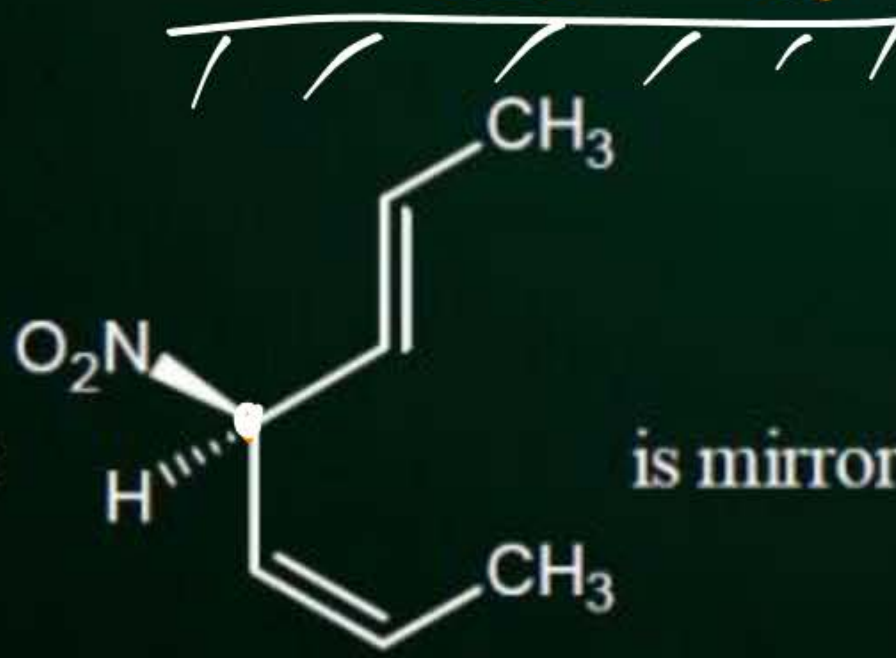
Statement I : The compound


CH3
cis
NO2
H
(A)
CH3
Trans

is optically active



Statement II :


CH3
O2N
H
CH3

is mirror image of above compound A.

A Both Statement I and Statement II are correct.

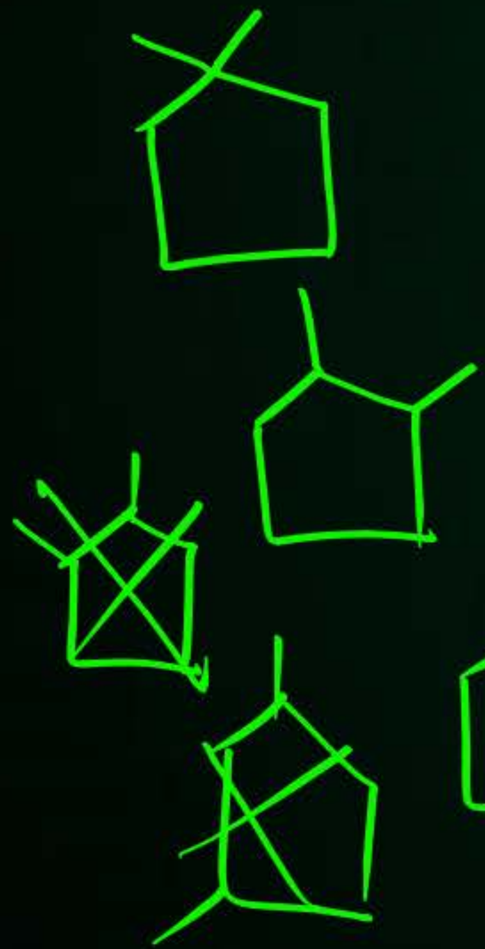
B Both Statement I and Statement II are incorrect.

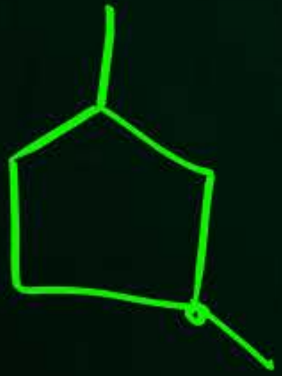
[✓ C] Statement I is correct but Statement II is incorrect.

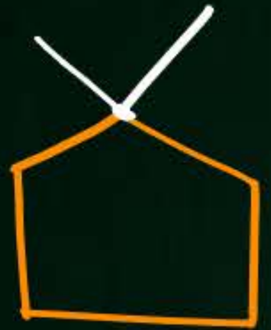
D Statement I is incorrect but Statement II is correct.

QUESTION [27 June, JEE Mains 2023]

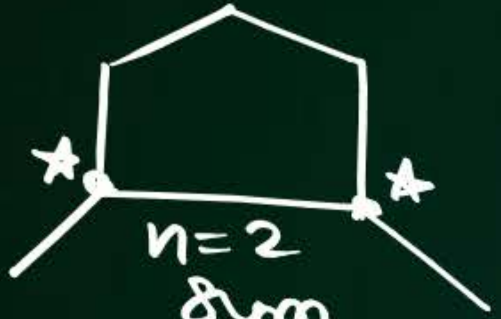
Total number of possible stereoisomers of dimethyl cyclopentane is 7.







①

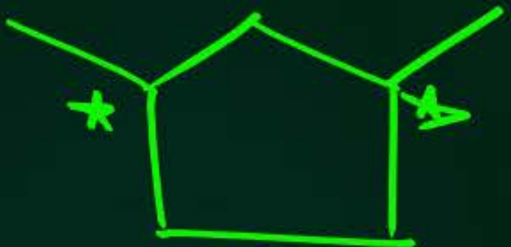


n=2

sym

③

$$\left(2^{n-1}+2^{\frac{n}{2}-1}\right)$$



n=2

sym

③

$$2^{n-1}+2^{\frac{n}{2}-1}$$

QUESTION [26 Aug, JEE Mains 2021]

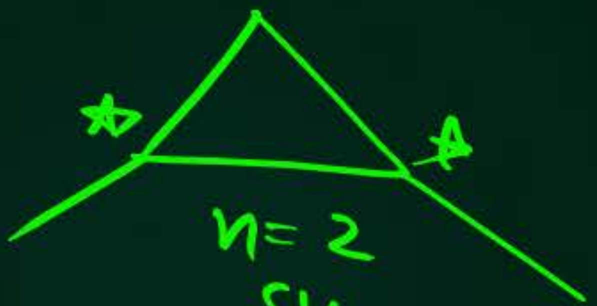
The number of stereoisomers possible for 1, 2-dimethyl cyclopropane is:

A two

B one

C four

[✓ D three]



n= 2

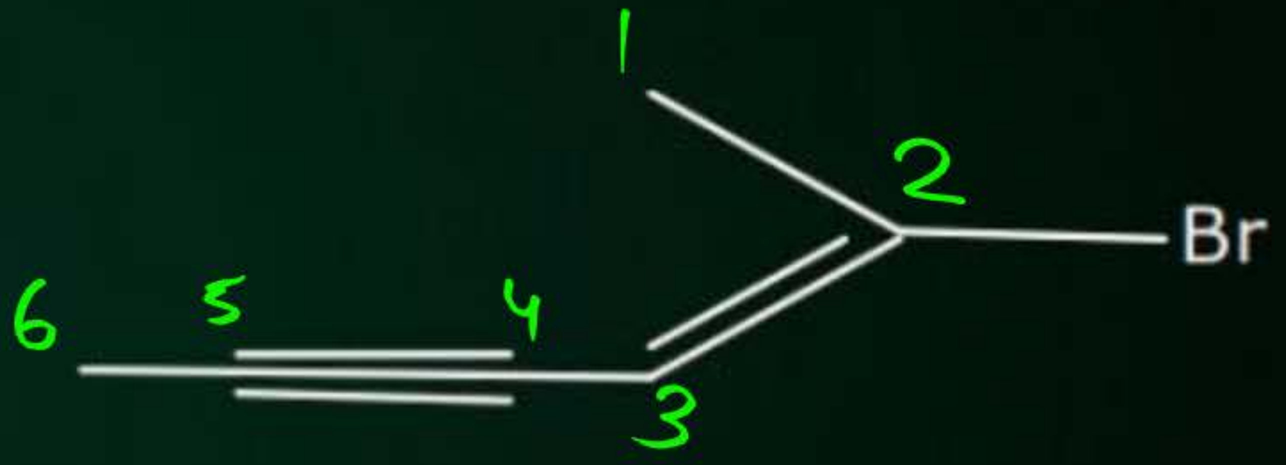
sym

③

$2^{n-1} + 2^{\frac{n}{2}-1}$

QUESTION [31 Aug, JEE Mains 2021]

Choose the correct name for compound given below:

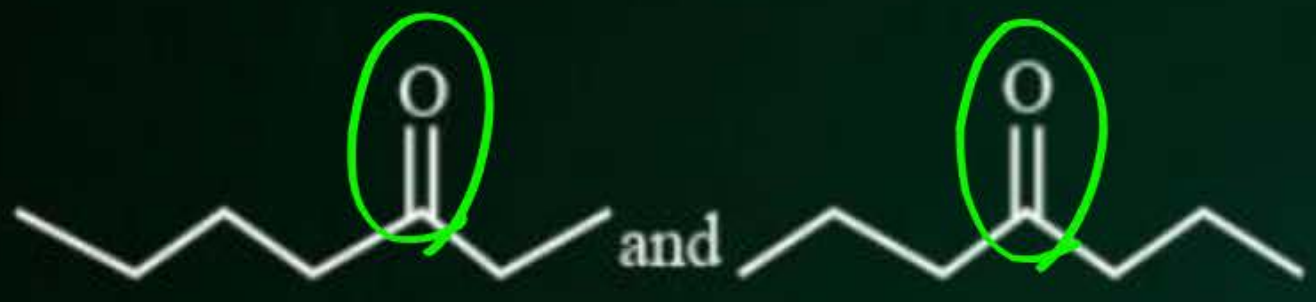


- **A** (2E)-2-Bromo-hex-4-yn-2-ene
- **B** (4E)-5-Bromo-hex-2-en-4-yne
- **C** (4E)-5-Bromo-hex-4-en-2-yne
- **D** (2E)-2-Bromo-hex-2-en-4-yne

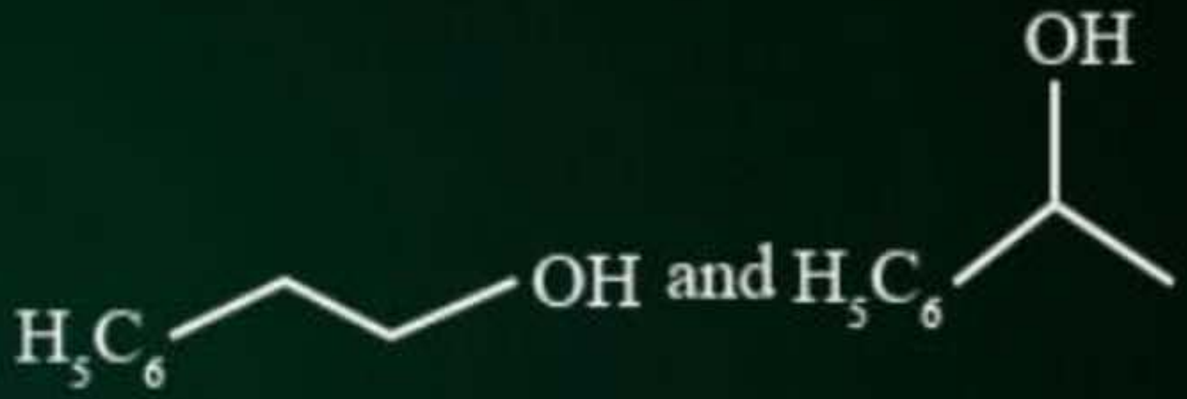
QUESTION [20 July, JEE Mains 2021]

Which one of the following pairs of isomers is an example of metamerism?

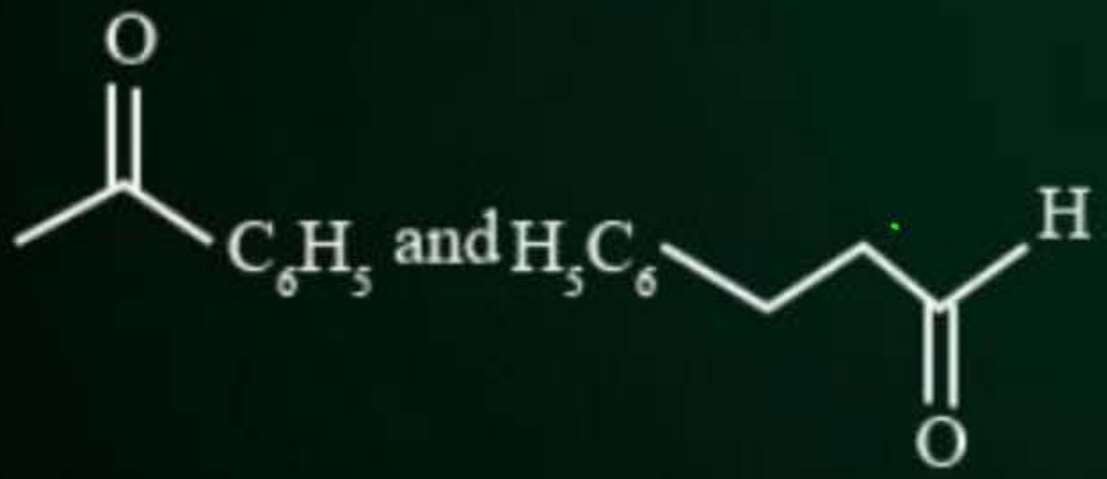
[✓ A]



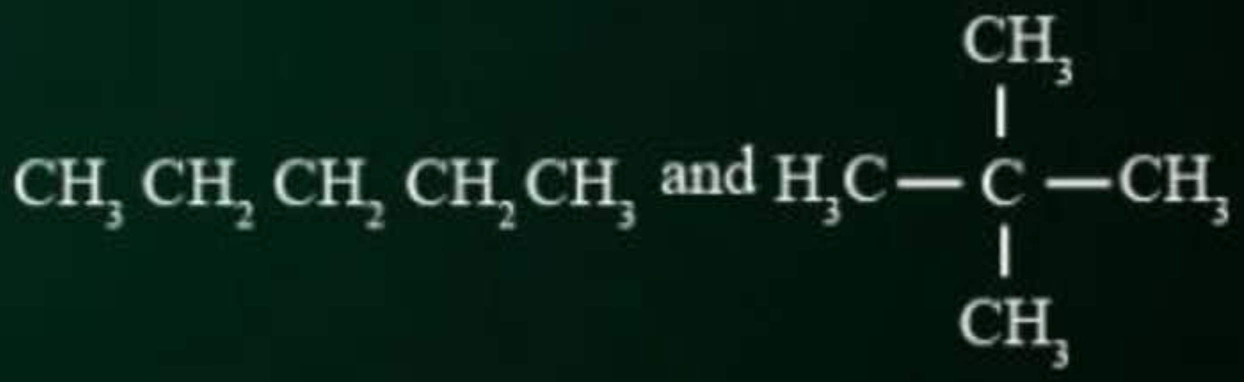
B


H_5C_6
OH
and
H_5C_6
OH

C


O
C_6H_5
and
H_5C_6
H
O

D

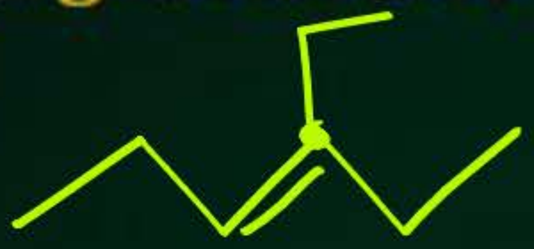


$CH_3CH_2CH_2CH_2CH_3$ and $H_3C-\overset{\displaystyle CH_3}{\underset{\displaystyle CH_3}{\overset{|}{\underset{|}{C}}}}-CH_3$

QUESTION [22 July, JEE Mains 2021]

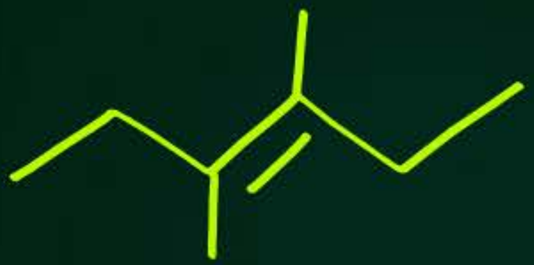
Which one of the following molecules does not show stereoisomerism?

[✓ A] 3-Ethylhex-3-ene



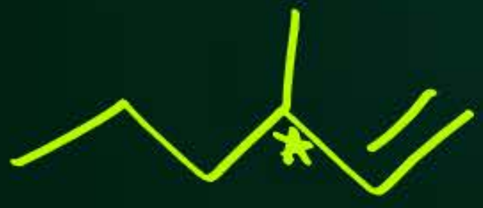
GI ×
OI ×

(B) 3, 4-Dimethylhex-3-ene



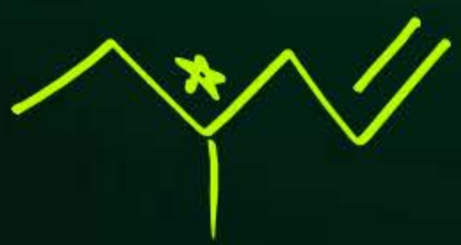
GI ✓

(C) 3-Methylhex-1-ene



OI ✓

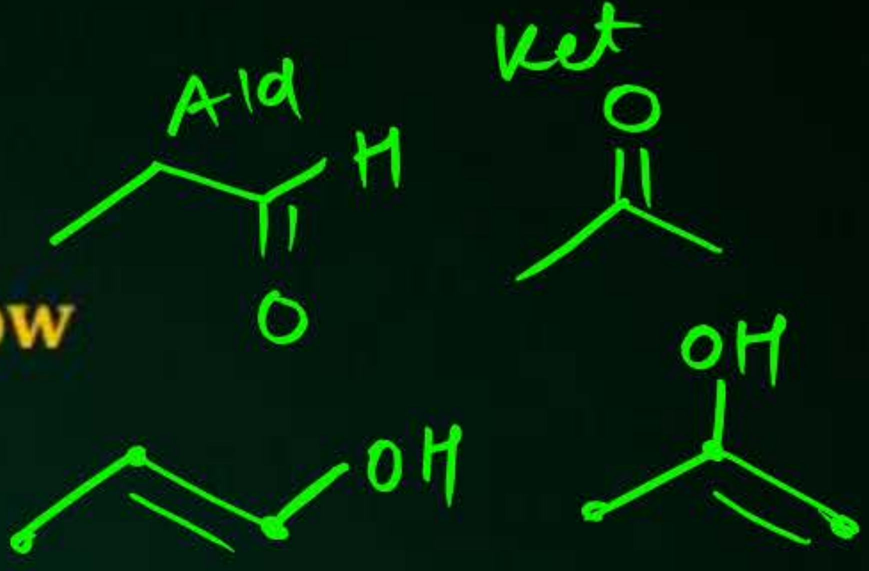
(D) 4-Methylhex-1-ene



OI ✓

QUESTION [18 March, JEE Mains 2021]

$DU = (3+1) - \left(\frac{6}{2}\right)$
$= 4 - 3 = 1$



Compound with molecular formula C_3H_6O can show

[✓ A] Functional group isomerism

B both positional isomerism and metamerism

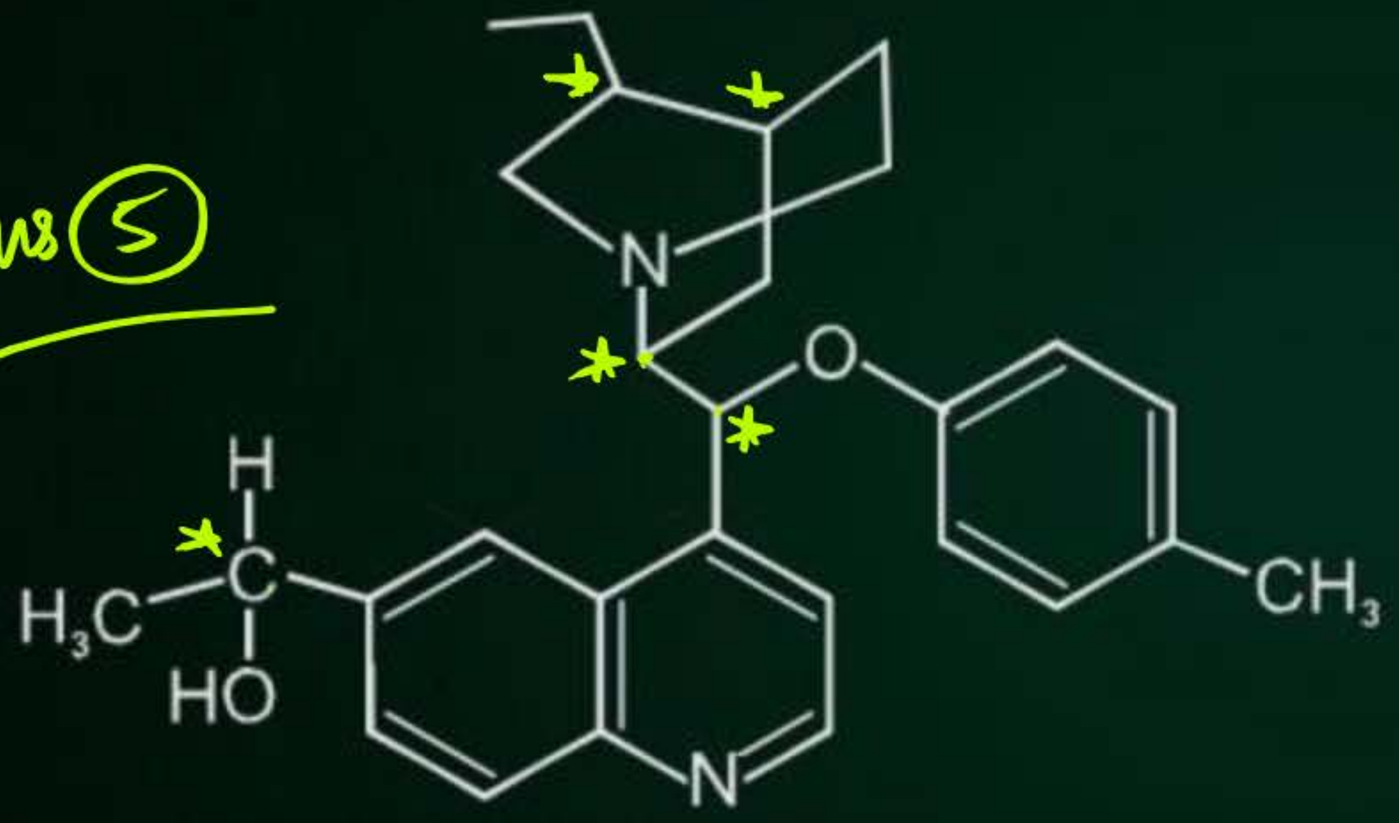
C metamerism

D positional isomerism.

QUESTION [02 Sept, JEE Mains 2020]

The number of chiral carbons present in the molecule given below is ....

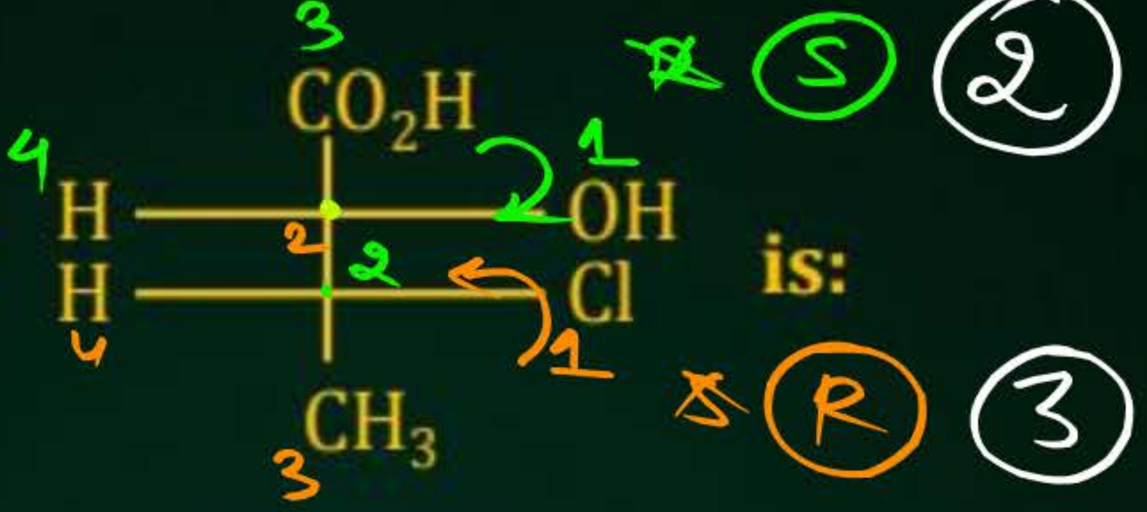
Ans ⑤



N
O
H
C
H_3C
HO
N
CH_3

QUESTION [JEE Mains 2016]

The absolute configuration of


3
CO₂H
4
H
OH
1
2
2
H
Cl
4
1
CH₃
3
S
2
R
3

is:

A (2R, 3S)

B [✓ (2S, 3R)]

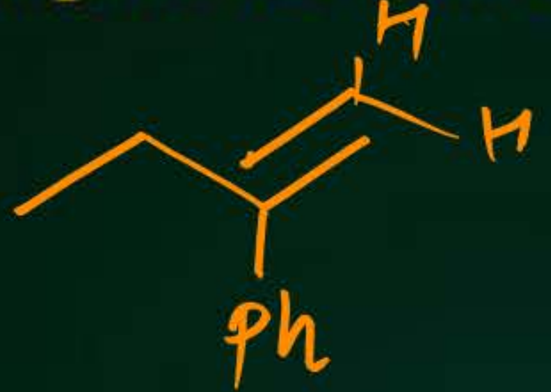
C (2S, 3S)

D (2R, 3R)

QUESTION [JEE Mains 2015]

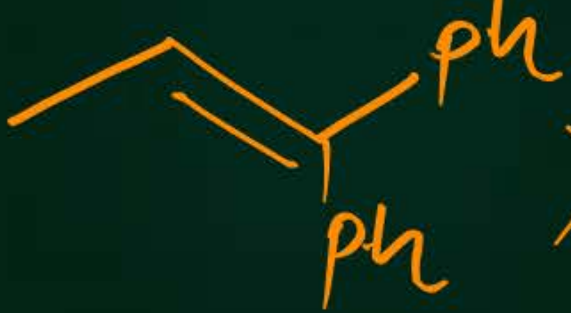
Which of the following compounds will exhibit geometrical isomerism?

(A) 2-Phenyl-1-butene



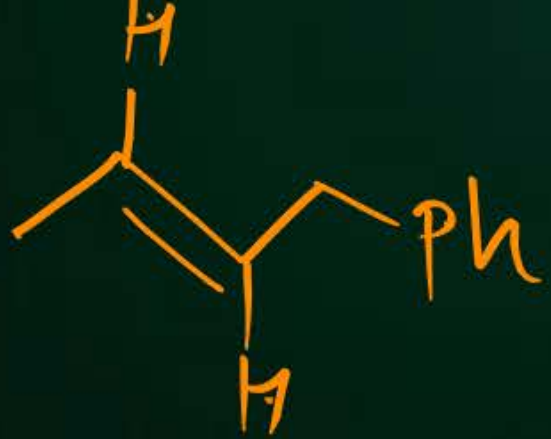
✗

(B) 1, 1-Diphenyl-1-propene

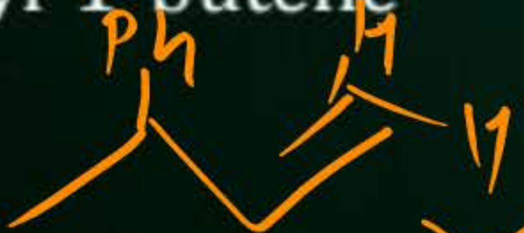


✗

(C) 1-Phenyl-2-butene ✓



(D) 3-Phenyl-1-butene

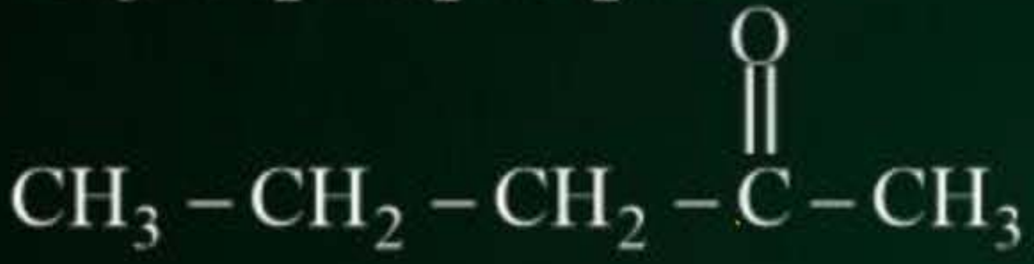


✗

QUESTION [Online JEE Mains 2015]

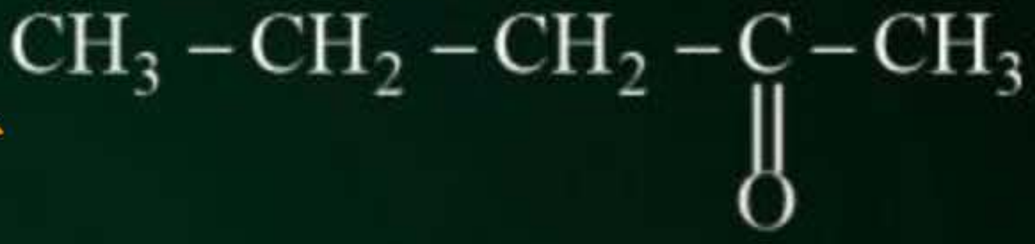
Which of the following pairs of compounds are positional isomers?

A $CH_3CH_2CH_2CH_2CHO$ and



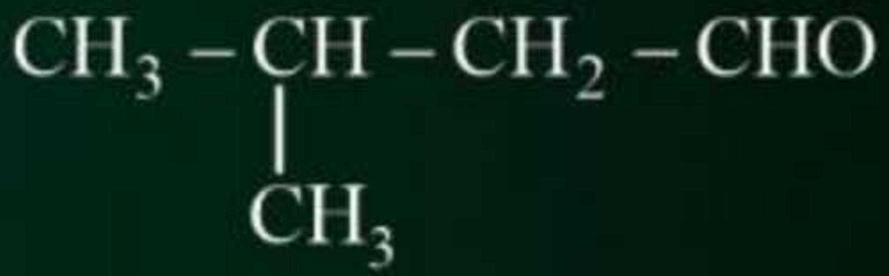
$$CH_3-CH_2-CH_2-\overset{\overset{\large O}{\|}}{C}-CH_3$$

B



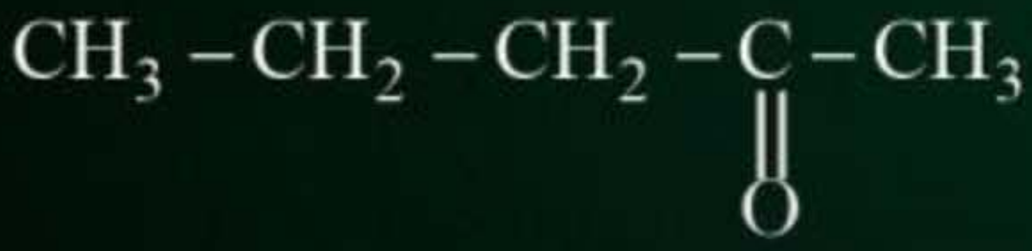
$$CH_3-CH_2-CH_2-\underset{\underset{\large O}{\|}}{C}-CH_3$$

and



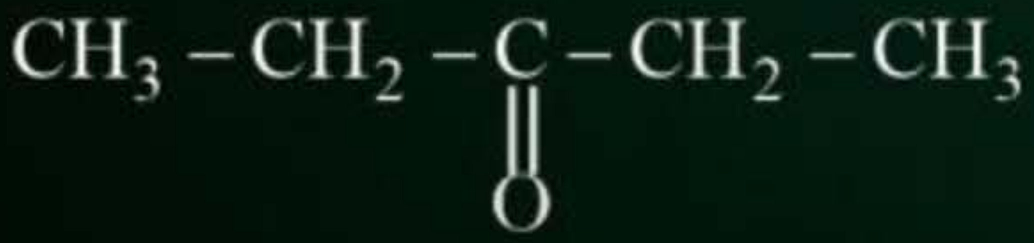
$$CH_3-\underset{\underset{\large CH_3}{|}}{CH}-CH_2-CHO$$

[✓ **C**]



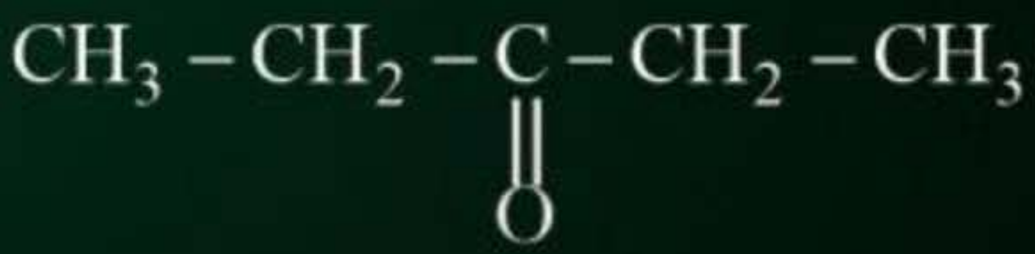
$$CH_3-CH_2-CH_2-\underset{\underset{\large O}{\|}}{C}-CH_3$$

and



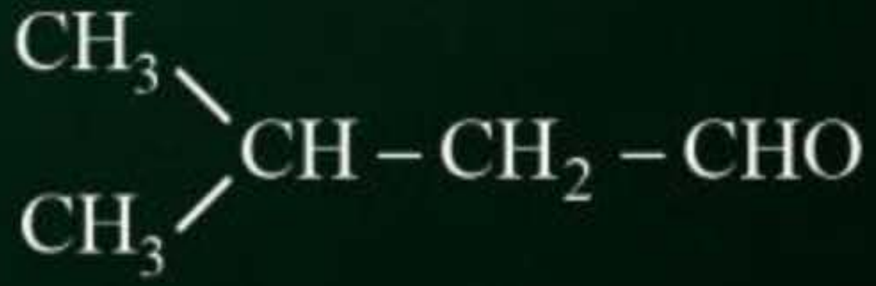
$$CH_3-CH_2-\underset{\underset{\large O}{\|}}{C}-CH_2-CH_3$$

D



$$CH_3-CH_2-\underset{\underset{\large O}{\|}}{C}-CH_2-CH_3$$

and

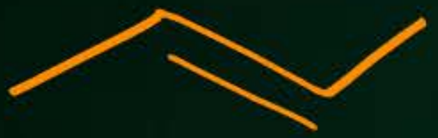


$$(CH_3)_2CH-CH_2-CHO$$

QUESTION [AIEEE 2011]

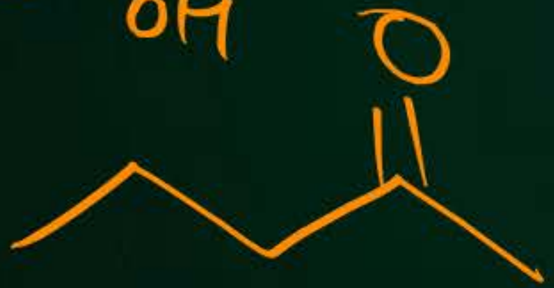
Identify the compound that exhibits tautomerism.

(A) 2-Butene

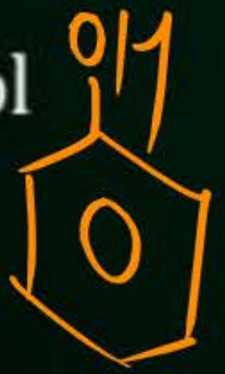


(B) Lactic acid $CH_3-\underset{OH}{\underset{|}{CH}}-COOH$

[✓ (C)] 2-Pentanone



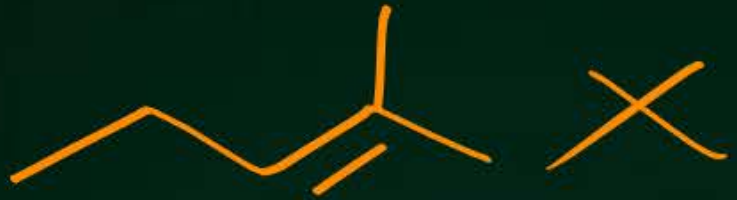
(D) Phenol



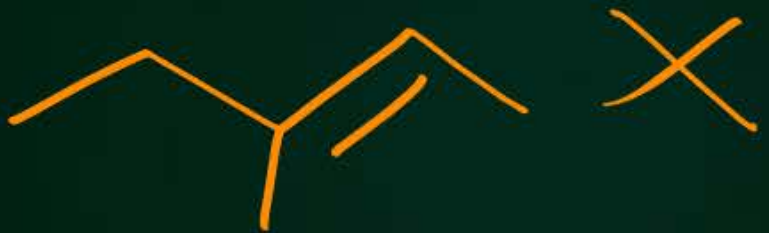
QUESTION [AIEEE 2010]

Out of the following, the alkene that exhibits optical isomerism is:

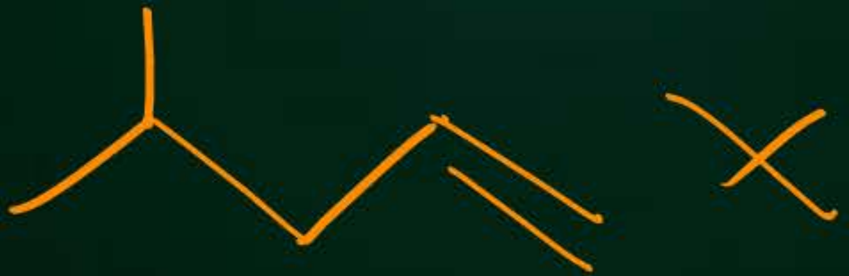
A 2-methyl-2-pentene



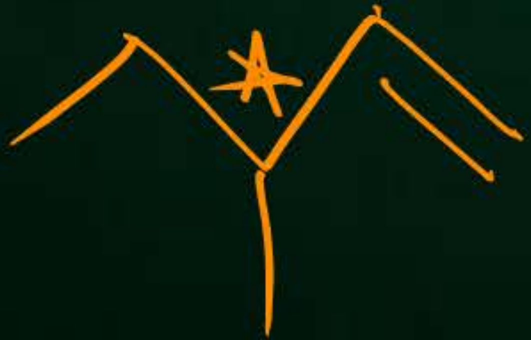
B 3-methyl-2-pentene



C 4-methyl-1-pentene



[✓ **D**] 3-methyl-1-pentene



QUESTION [AIEEE 2009]

The number of stereoisomers possible for a compound of the molecular formula CH_3-CH=CH-CH(OH)–Me is:

★ ★

$2^2 = 4$

A 3

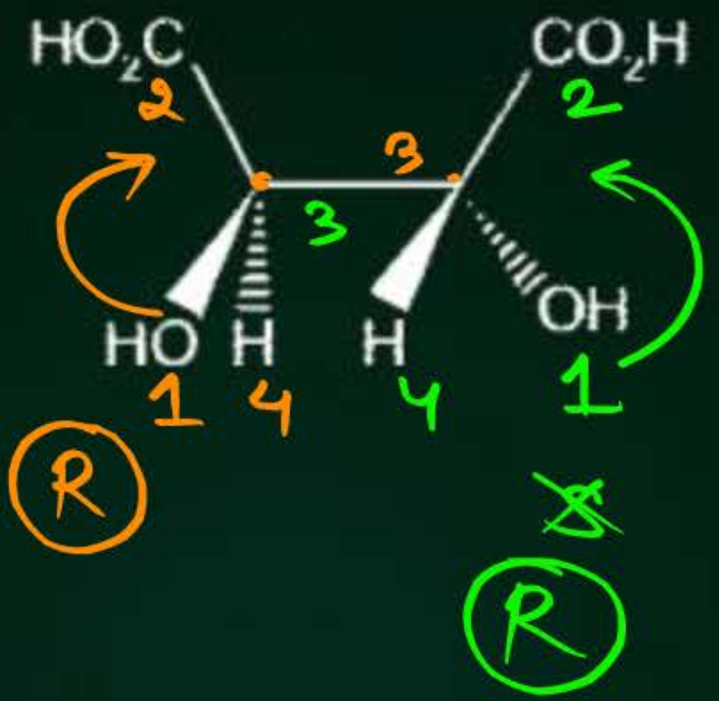
B 2

[✓ **C**] 4

D 6

QUESTION [AIEEE 2008]

The absolute configuration of



HO₂C
CO₂H
2
2
3
3
HO
H
H
OH
1
4
4
1
R
~~S~~
R

is:

A S, R

B S, S

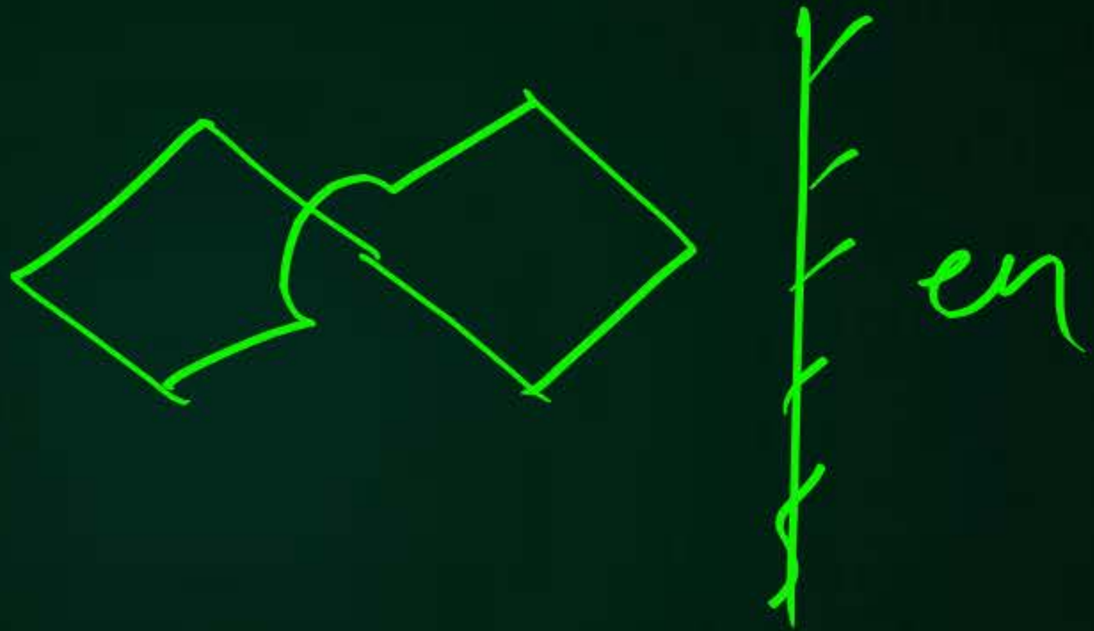
[✓ **C** R, R]

D R, S

QUESTION [AIEEE 2007]

Which one of the following conformations of cyclohexane is chiral?

- **A** Boat
- **B** [✓ Twist boat]
- **C** Rigid
- **D** Chair



Thank you!

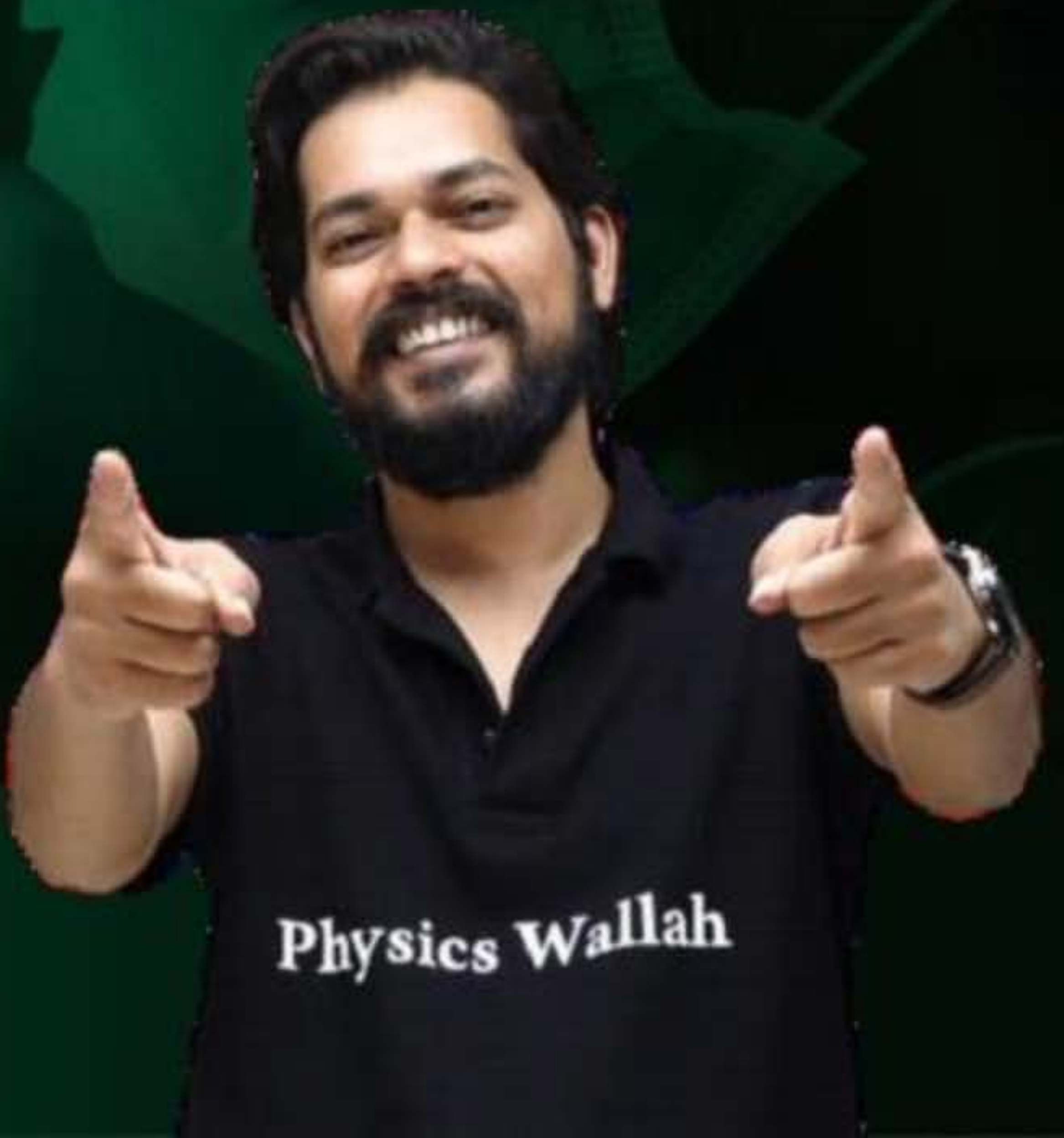
YAKEEN 2.0

FOR NEET 2025

Lecture- 01 **Organic Chemistry**

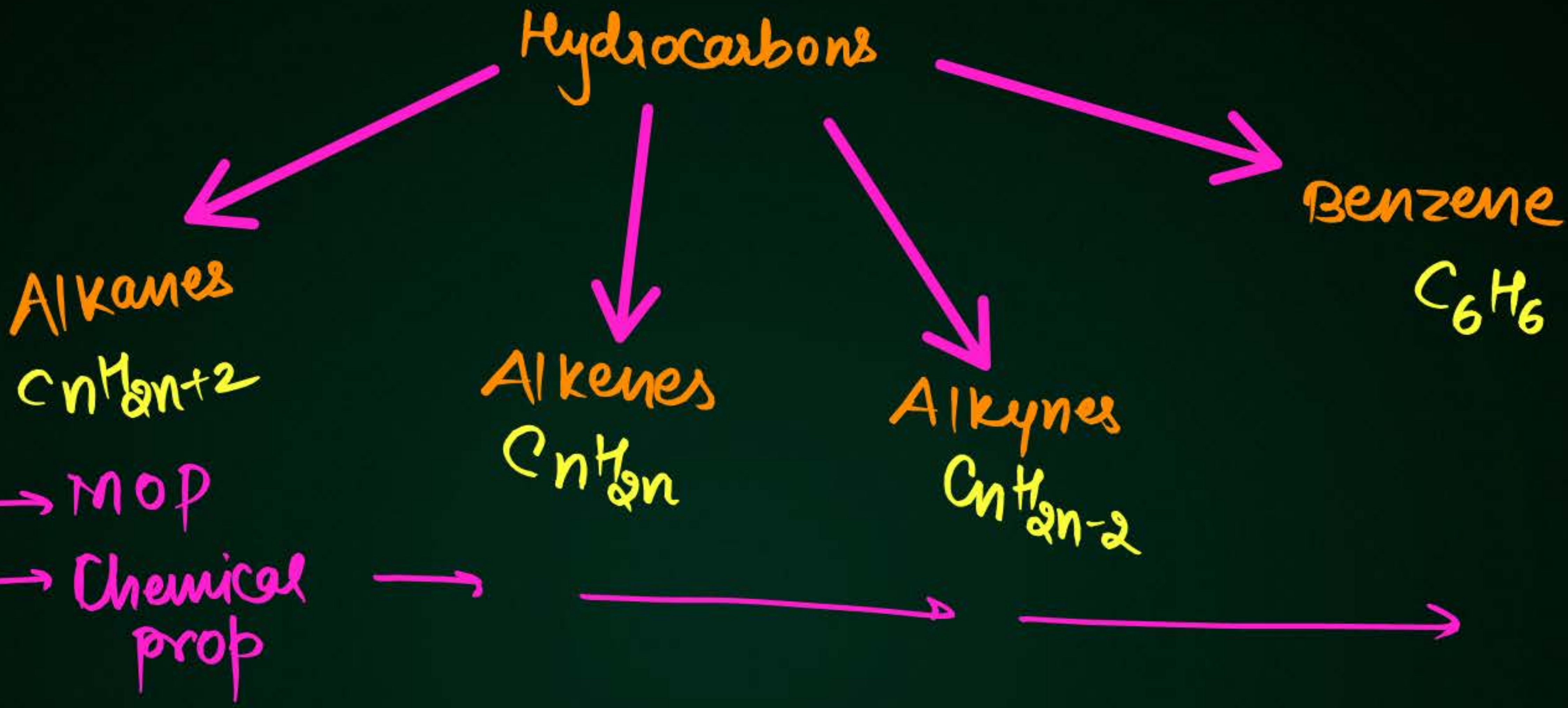
HYDROCARBONS → Rxns

By- Pankaj Sir(POPU MAMA)


Physics Wallah

Topics *to be covered*

1. Basics/Introduction ✓
2. Methods of Preparation of Alkanes ✓
3. Practice



Hydrocarbons

Alkanes

C_nH_{2n+2}

- MOP
- Chemical prop

Alkenes

C_nH_{2n}

Alkynes

C_nH_{2n-2}

Benzene

C_6H_6

Physical prop : Last

Methods of Preparation of Alkanes

$(C=C)$ & $(C\equiv C)$ ✓ ✓

Hydrogen ka addition

1. From Unsaturated hydrocarbons (Hydrogenation.):

Reagent ÷ H_2 + Catalyst
Ni, Pt, Pd

$$>\overset{H}{C}=\overset{H}{C}< \xrightarrow{H_2 + cat} >CH-CH<$$

$$-\overset{H}{\overset{H}{C}}\equiv\overset{H}{\overset{H}{C}}- \xrightarrow{②\ H_2 + cat} -CH_2-CH_2-$$

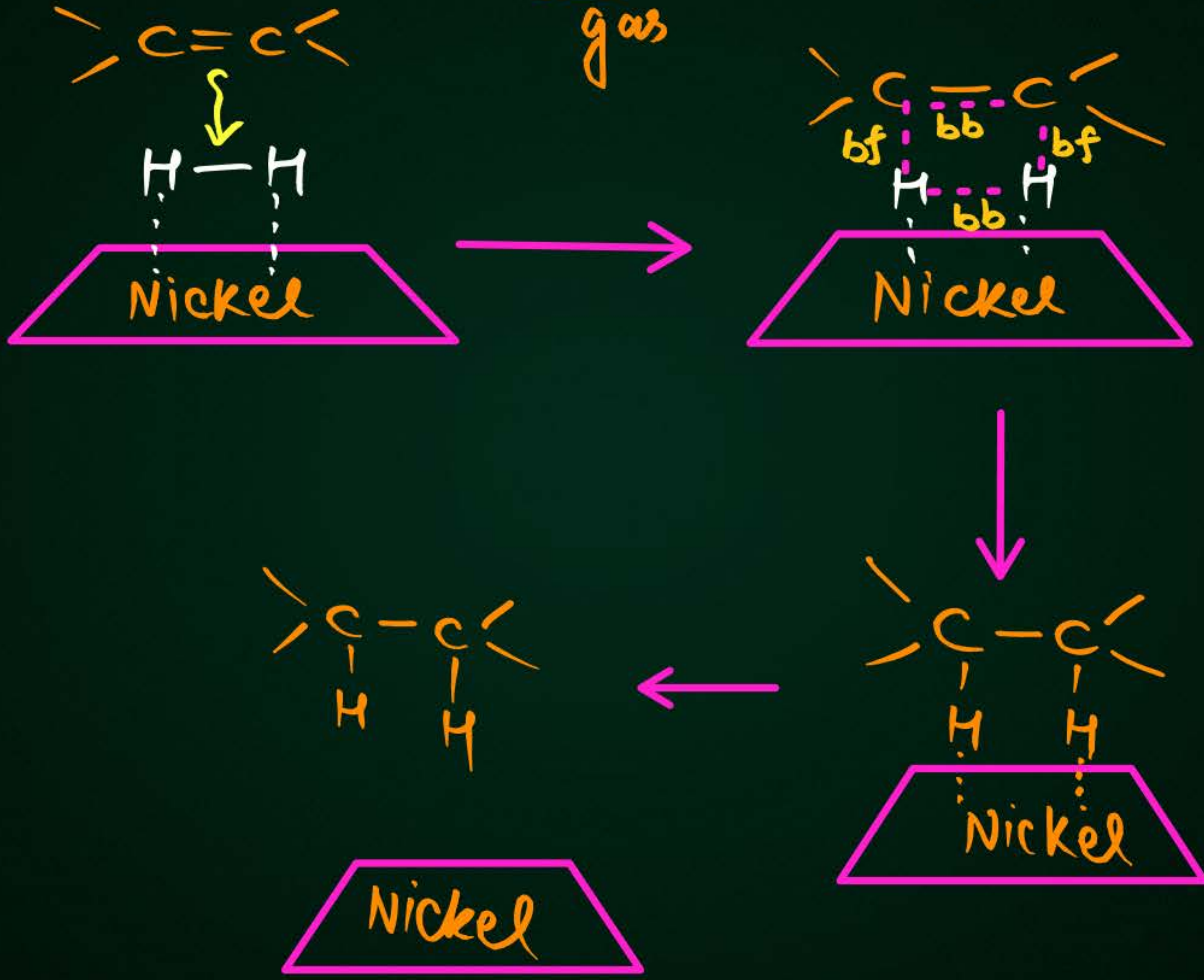
① $\overset{H}{C}H_2=\overset{H}{C}H_2 \xrightarrow{H_2 + Ni} CH_3-CH_3$

② $\overset{H}{\overset{H}{C}}H\equiv\overset{H}{\overset{H}{C}}H \xrightarrow{H_2 + Pt} CH_3-CH_3$

Mech :

Not in NCERT

$$>C=C< + \underset{\text{gas}}{H_2} \longrightarrow \underline{\text{Poor yield}}$$



>C=C<
H—H
Nickel
C—C
bf
bb
bf
H
H
bb
Nickel
C—C
H
H
Nickel
C—C
H
H
Nickel

bb → bond breaking

bf → bond formation

OP points –

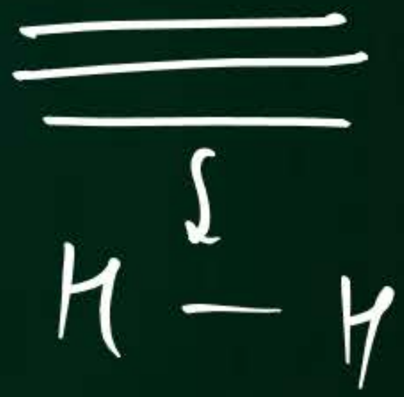
① 4 MCTS (membered cyclic transition state)

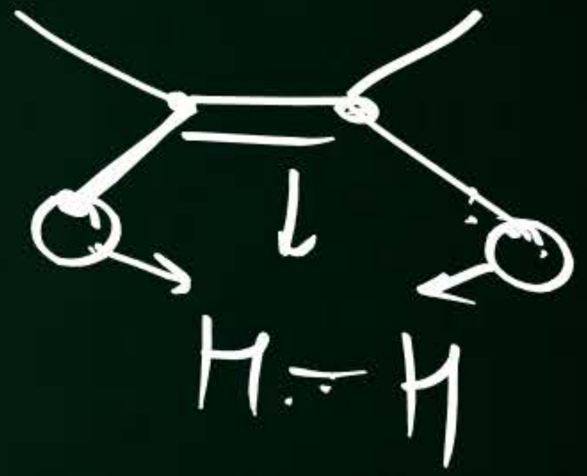
② No intermediate formation ($\overset{+}{C}, \overset{-}{C}, \overset{\cdot}{C}$)

③ R.O.R ∝ $\frac{1}{S.H}$ (S.H = steric hinderence)

④ R.O.R Alkyne > Alkene

(linear) (planar)





⑤ H.O.H (Heat of hydrogenation)

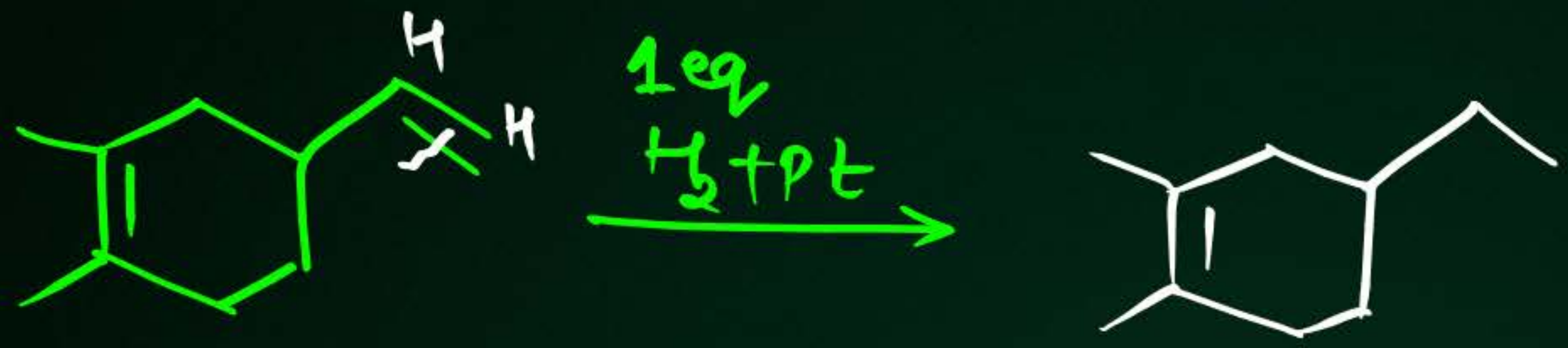
($\Delta H_{HOH} < 0$)

HOH ∝ No. of π Bond

if π Bond same HOH ∝ $\frac{1}{\text{Stability}}$

① $\overset{H}{C}H \equiv \overset{H}{C}-CH_2-CH_2-CH=CH_2 \xrightarrow{1\,eq\ H_2/Ni} CH_2=CH-CH_2-CH_2-CH=CH_2$

②



$CH_2=CH_2$ Less Hind.

✓ $CH_3-CH=CH_2$ more hindered

Q compare R·O·R & H·O·H

$CH_2=CH_2 > CH_3-CH=CH_2 > CH_3-CH=CH-CH_3$

2. From Alkyl halides:

$R-F$ ×

ROR

$R-Cl < R-Br < R-I$

$C-F$

BE↑ strong bond

[BE↓ ROR↑]

- Alkyl halides (except fluorides) on reduction with zinc and dilute hydrochloric acid give alkanes.

Reagent :- Zn/dil acid

$Zn + dil\ HCl$

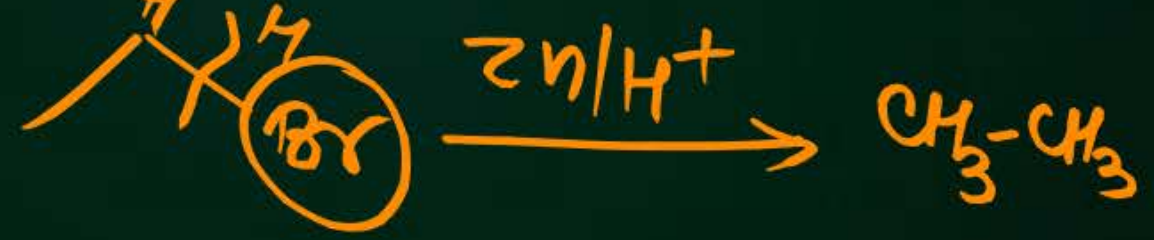
$\downarrow$

$ZnCl_2 + \boxed{H_2}$

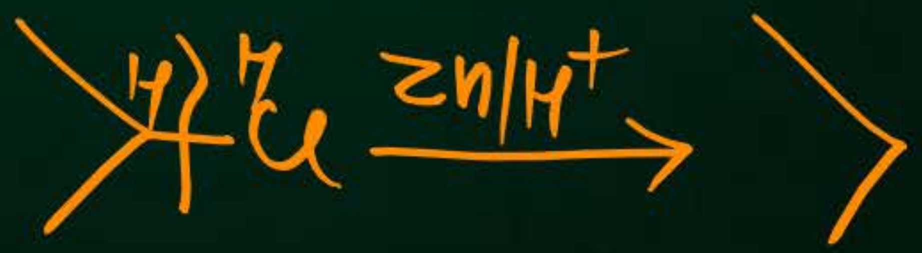
$$\underset{H}{R}-\underset{H}{X} \longrightarrow R-H + HX$$

$$R-\boxed{X} \longrightarrow R-\boxed{H}$$

Q 1)



2)



3. Wurtz Reaction:

Reagent :- Na + dry/ether
(Solvent)

$2Na \longrightarrow 2Na^{+} + 2e^{\ominus}$

$2\dot{X} + 2e^{\ominus} \longrightarrow 2X^{\ominus}$

$\downarrow 2Na^{+}$

$2NaX$

$$2\ \dot{R}-\dot{X} \xrightarrow[\text{dry ether}]{Na} R-R + 2NaX$$

$\dot{R} + \dot{R}$

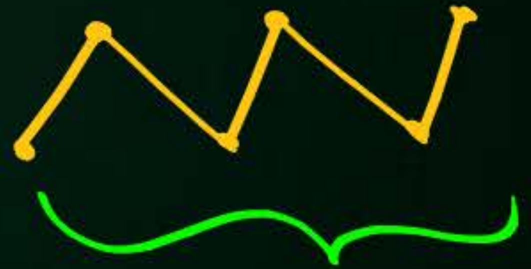
$\downarrow$ coupling

$R-R$

① $2\dot{C}H_3-\dot{Cl} \xrightarrow[\text{dry ether}]{Na} \underbrace{CH_3-CH_3} + 2NaX$

$\dot{C}H_3 + \dot{C}H_3$

② $2CH_3-CH_2-\dot{C}H_2-\dot{Br} \xrightarrow[\text{ether}]{Na/dry}$



$CH_3-CH_2-\dot{C}H_2 + \dot{C}H_2-CH_2-CH_3$

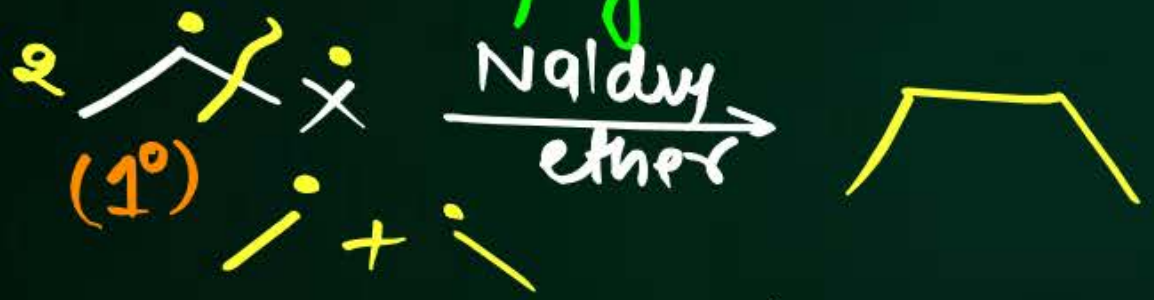
$\# \text{ ROR} \quad 1^\circ\ R{-}X > 2^\circ\ R{-}X > 3^\circ\ R{-}X$

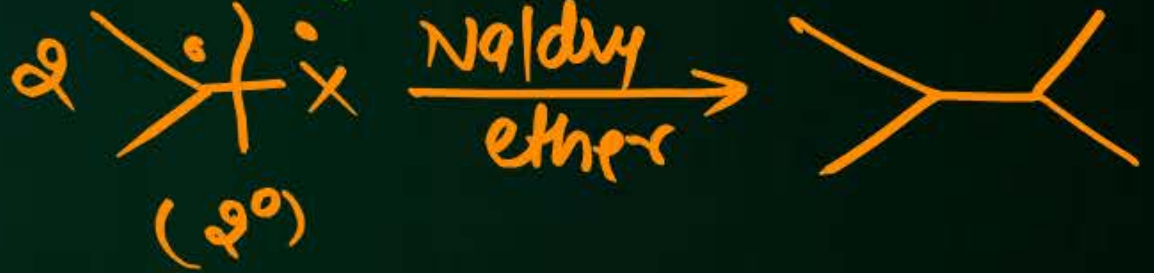
OP points –

① useful for the prep of alkanes containing even no of 'C' atoms (symmetrical alkane)

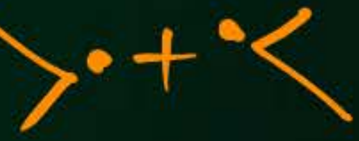
② R·O·R $R{-}I > R{-}Br > R{-}Cl$

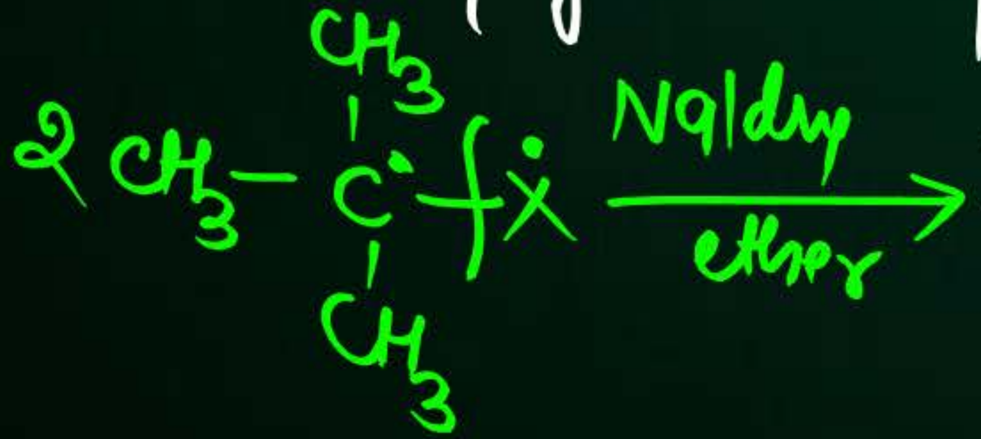
③ 1° & 2° RX mainly give combination (coupling) product





④ 3° R–X mainly gives Disproportionation prod.



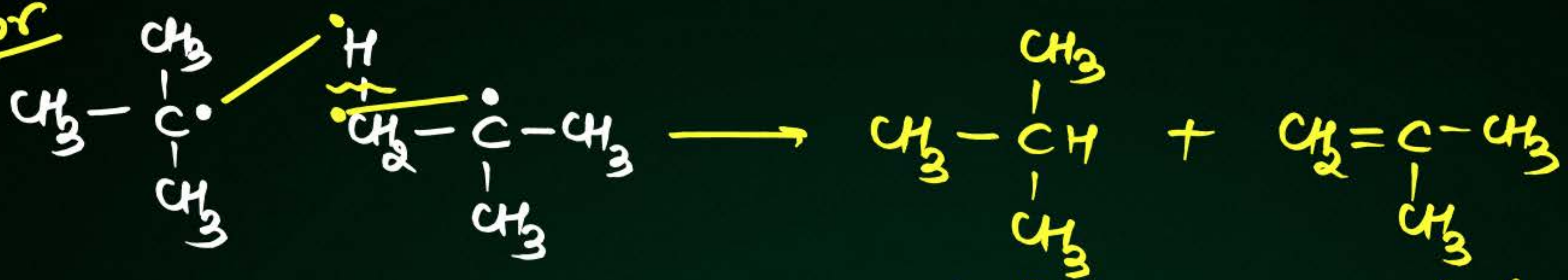


$$2\,CH_3-\overset{\displaystyle CH_3}{\underset{\displaystyle CH_3}{\overset{|}{\underset{|}{C}}}}-X \xrightarrow[\text{ether}]{\text{Na/dry}} \text{Less combination}$$

→ Not prefer combi

Bulkyness ↑

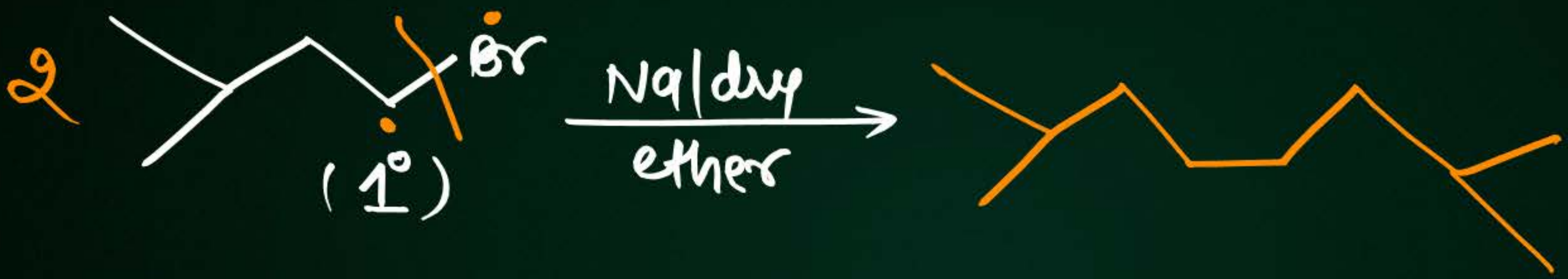
Disprapor

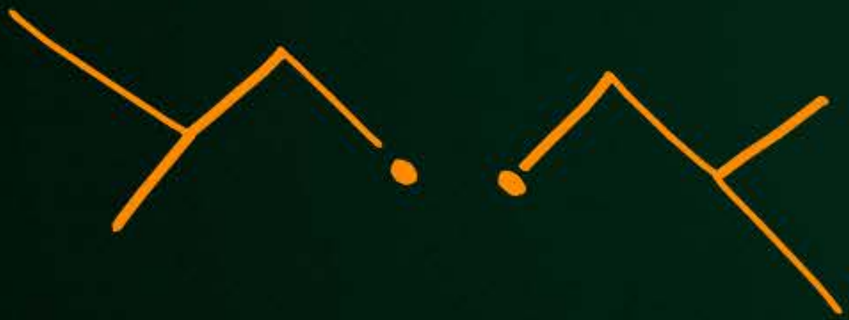


$$\mathrm{CH_3-\overset{CH_3}{\underset{CH_3}{\dot{C}}}\quad \dot{H}-CH_2-\underset{CH_3}{\dot{C}}-CH_3 \longrightarrow CH_3-\overset{CH_3}{\underset{CH_3}{C}}H + CH_2=\underset{CH_3}{C}-CH_3}$$

isobutane Isobutene

Q

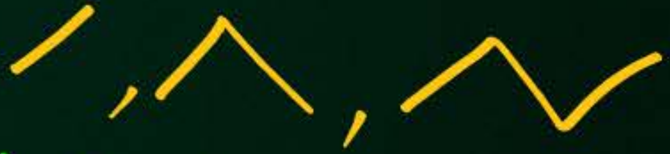




CH4 Can not be prep by wurtz Rxn

Q $2\,\dot{C}H_3 \mid \dot{C}l + 2\,CH_3-\dot{C}H_2 \mid \dot{C}l \xrightarrow[\text{ether}]{\text{Na/dry}}$ Total alkanes

③



$\dot{C}H_3 + \dot{C}H_3$ ✓

$\dot{C}H_3 + \dot{C}H_2-CH_3$ ✓

$CH_3-\dot{C}H_2 + \dot{C}H_2-CH_3$

Types of Wurtz Reaction:

1. Intermolecular ✓ $2R-X \xrightarrow[\text{ether}]{\text{Na/dry}} R-R$

   $R^{\bullet} + R^{\bullet}$

2. Intramolecular

   within the molecule

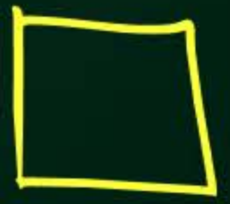
$2\ \dot{C}H_2-\dot{C}H_2$ ($\cancel{Cl}$, $\cancel{Cl}$) $\xrightarrow{\text{Na/dry ether}} 2\ CH_2=CH_2$

Intra

$2\ {}^{\bullet}CH_2-{}^{\bullet}CH_2 \longrightarrow 2\ CH_2=CH_2$

Inter

$\dot{C}H_2-\dot{C}H_2 + \dot{C}H_2-\dot{C}H_2 \longrightarrow$

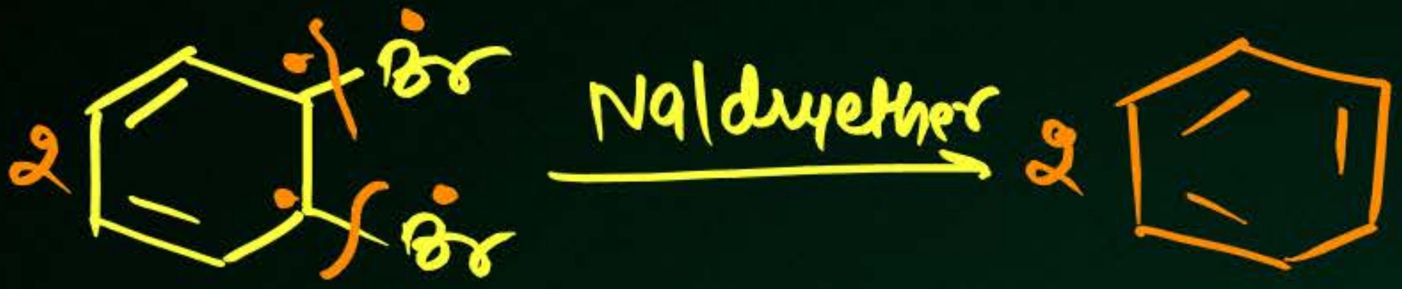


Intra molecular rxns are faster than intermolecular rxn but product should be stable A✓, NA✓

AA × (unstable at Room temp)

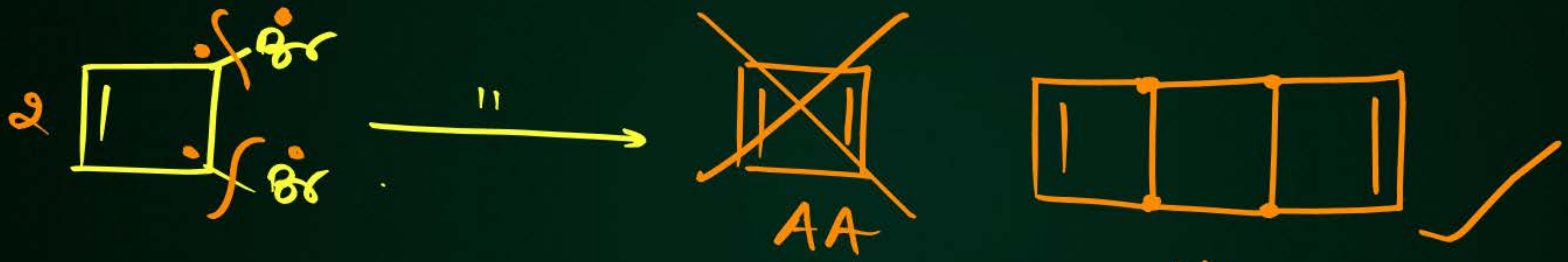
Cycloalkyne < 8 ×

Q. ①


2
Br
Br
Na/dry ether
2

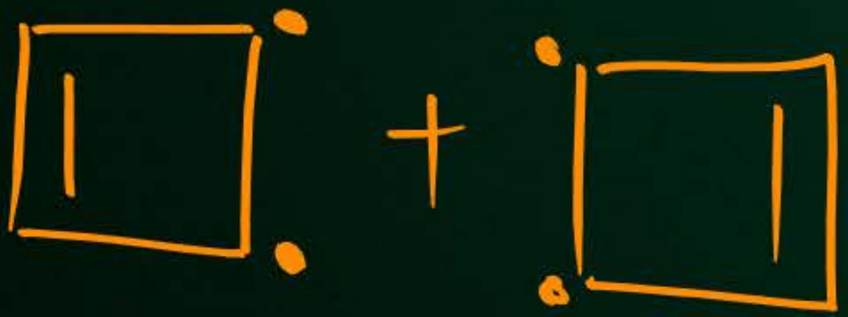
Aro

②



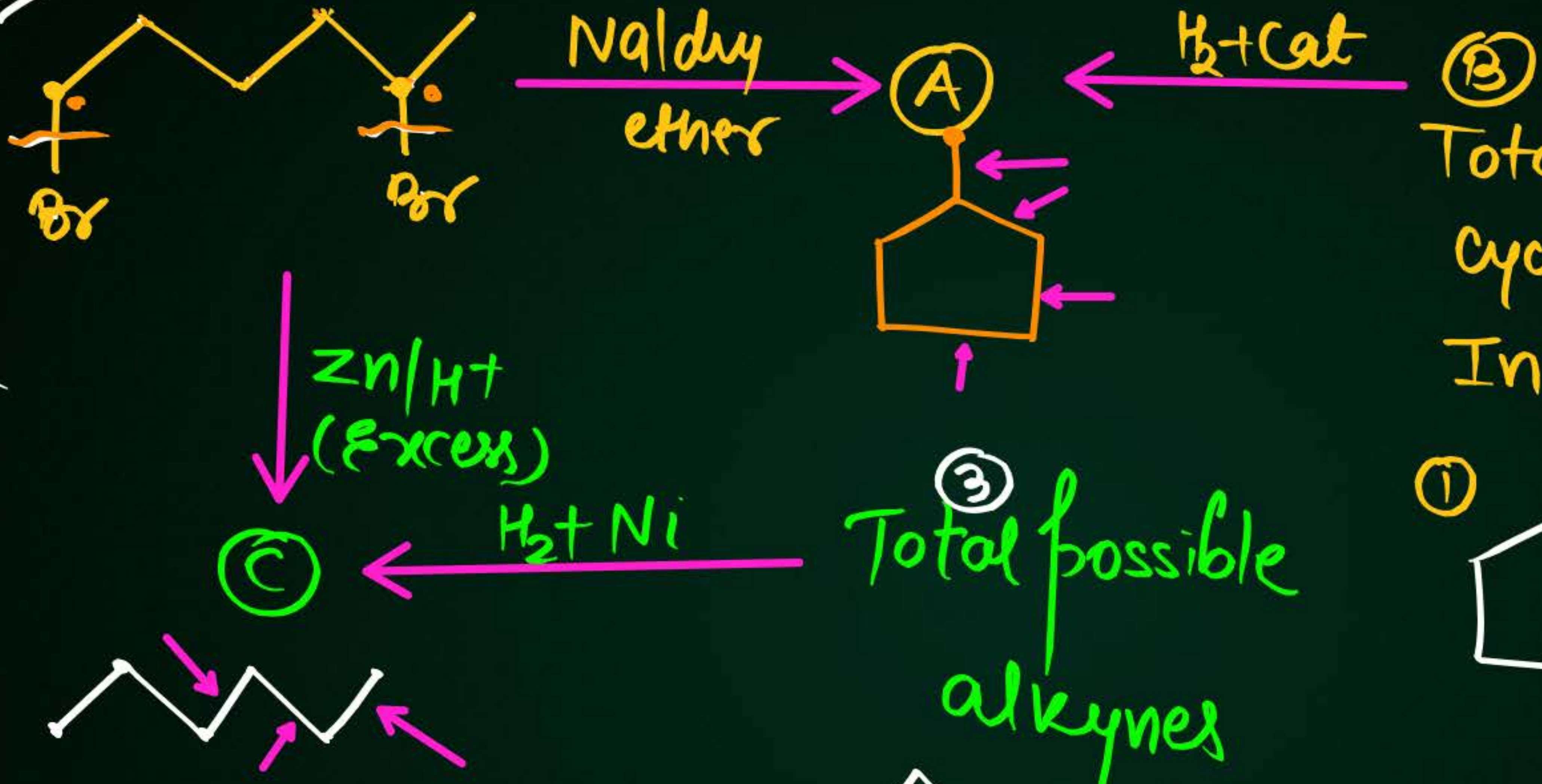
AA

NA



PSS

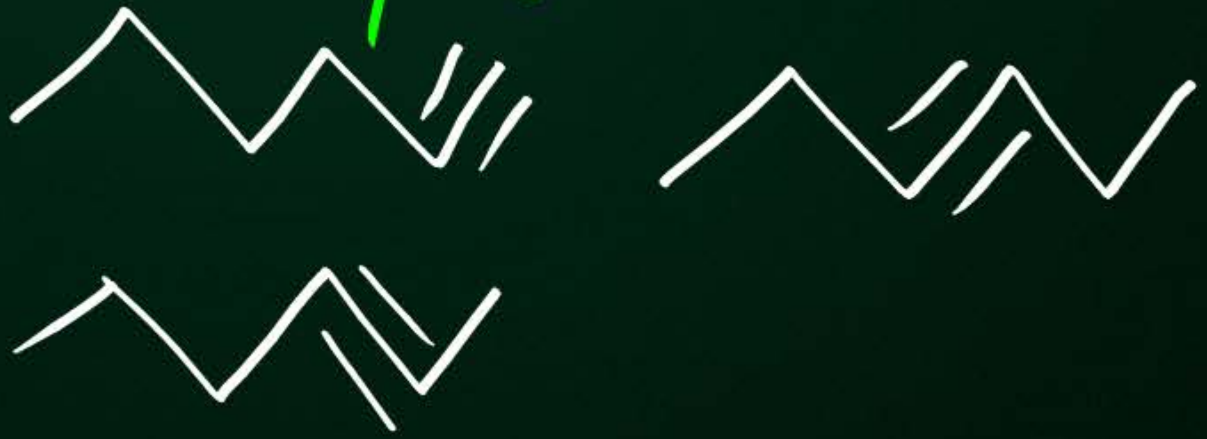
Pankaj sir special

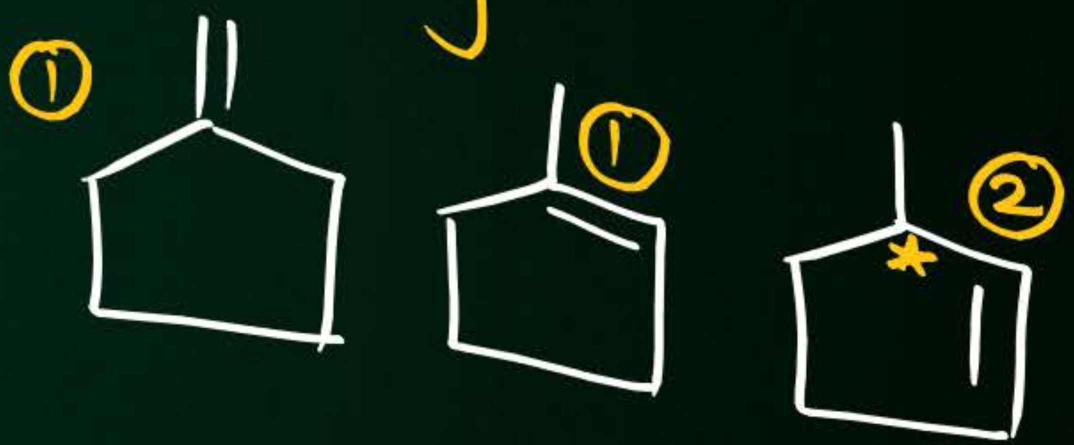

Br
Br
Na/dry ether
A
H_2+Cat
B
Zn/H+
(Excess)
C
H_2+Ni

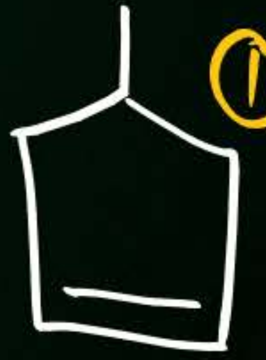
Ans ⑤

Total no of possible cycloalkenes Including stereo

③ Total possible alkynes



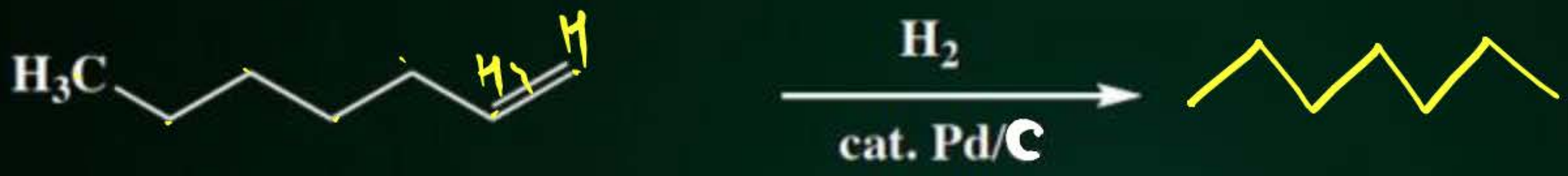


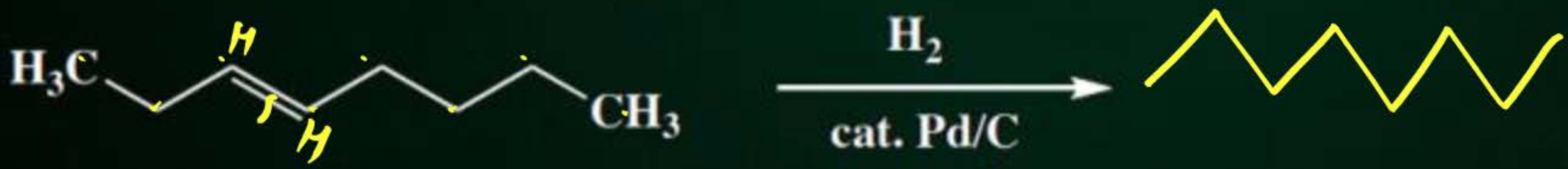


Reagent		funcⁿ	
① Hydrogenation	$H_2 + \overset{Ni, Pt, Pd}{Cat}$	$>\overset{H}{C}=\overset{H}{C}< \longrightarrow >CH-CH<$ $-C\equiv C- \longrightarrow -CH_2-CH_2-$	π bond se tod H, H denge
② R–X ka redⁿ	Zn/H^+	$\overset{H}{R}-\overset{H}{X} \longrightarrow R-H$	X hatao, H lagao
③ Wurtz rxn	Na/dry ether	$2\dot{R}-\dot{X} \longrightarrow \dot{R}+\dot{R} \longrightarrow R-R$	

QUESTION

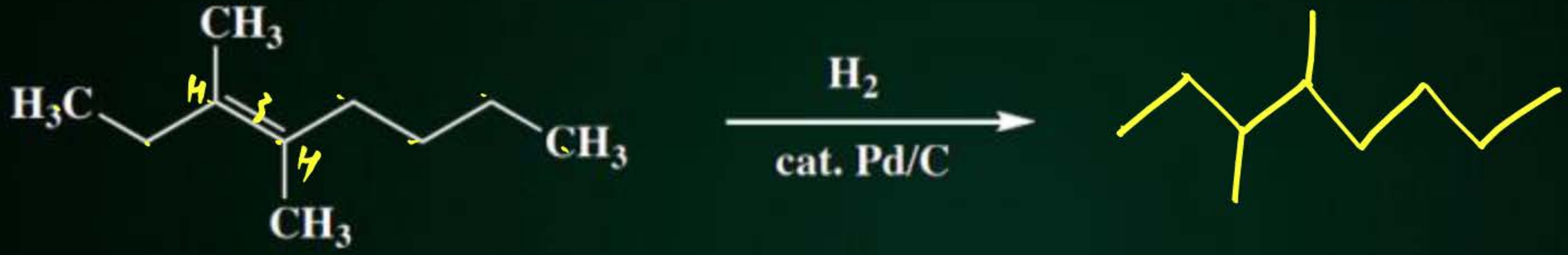
Write the product of the following compounds:

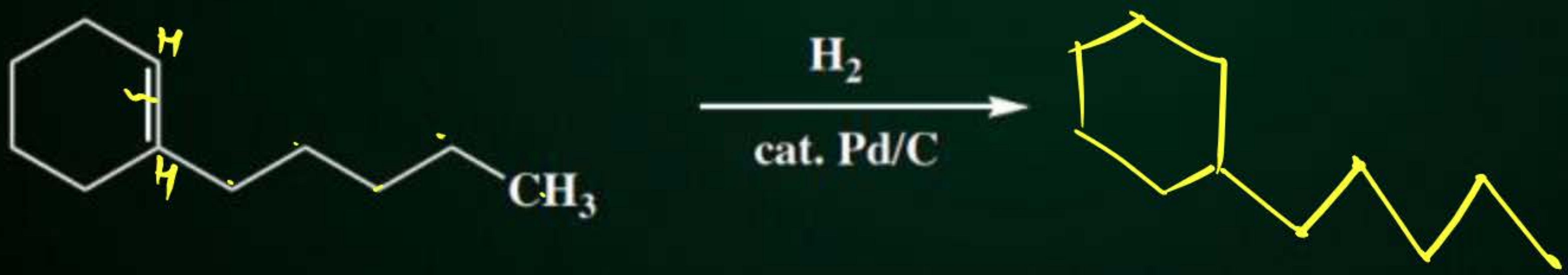

H₃C
H
H
H
H₂
cat. Pd/C


H₃C
H
H
CH₃
H₂
cat. Pd/C

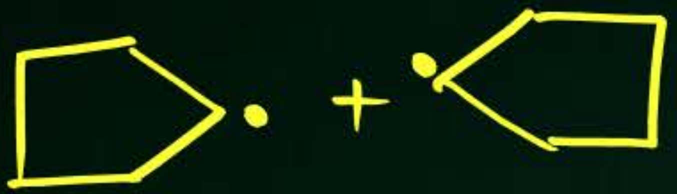
QUESTION

Write the product of the following compounds:


CH3
H3C
H
H
CH3
CH3
H2
cat. Pd/C

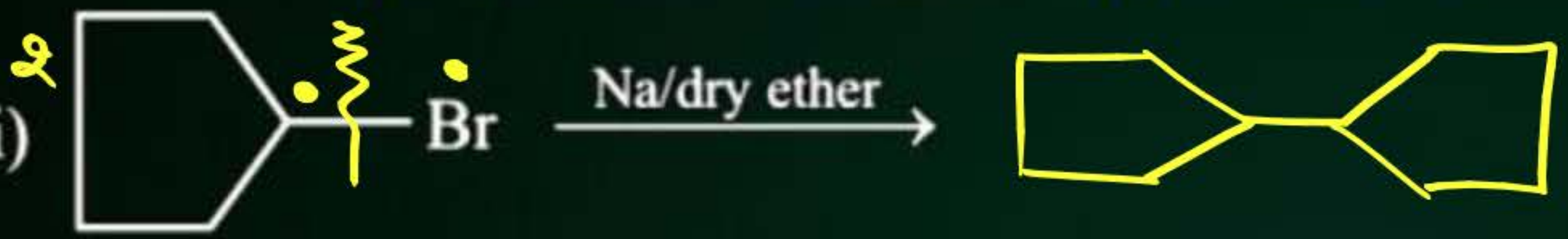

H
H
CH3
H2
cat. Pd/C

QUESTION

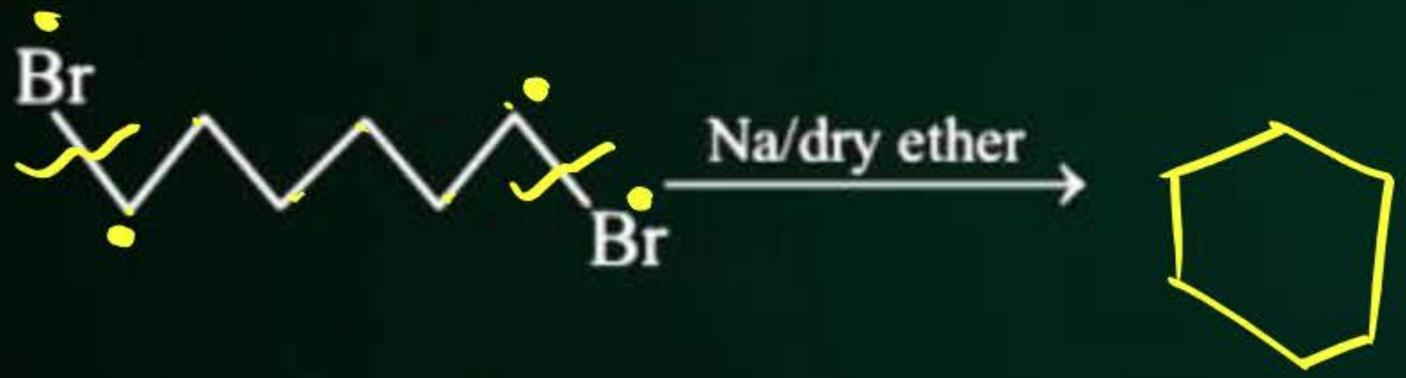


Write the major product of following reactions.

(i)

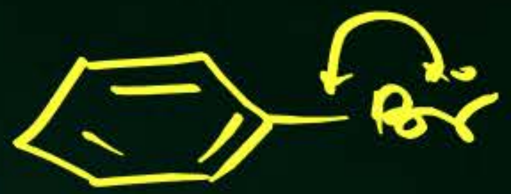

Br
Na/dry ether

(ii)


Br
Br
Na/dry ether

QUESTION

$CH_2=CH-\ddot{Br}$



Which among the following compounds will give wurtz reaction?

(A) $CH_2=\dot{C}H\,|\,\dot{B}r$ ✗

(B) $\dot{C}_6H_5\,|\,\dot{B}r$ ✗

(C) $CH_2=CH-\dot{C}H_2\,|\,\dot{B}r$ ✓

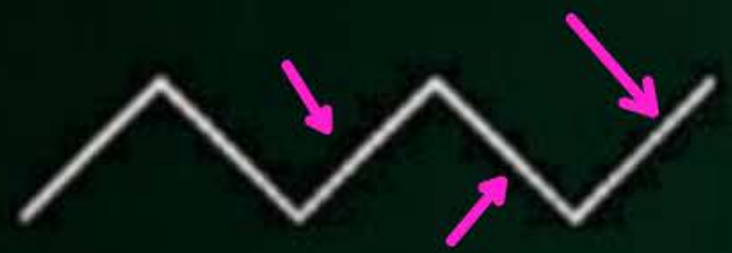
(D) $HC\equiv\dot{C}\,|\,\dot{B}r$ ✗

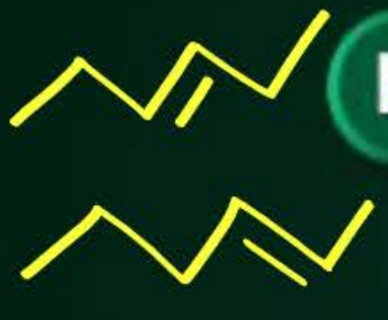
$CH\equiv C-\ddot{Br}$

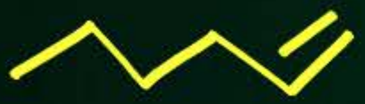
QUESTION

C_6H_{12} (P) has only two types of alkenes that can be reduced to only one type of alkane C_6H_{14}(Q). Q is:

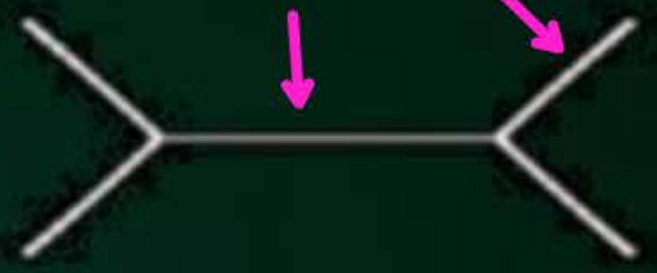
(A)

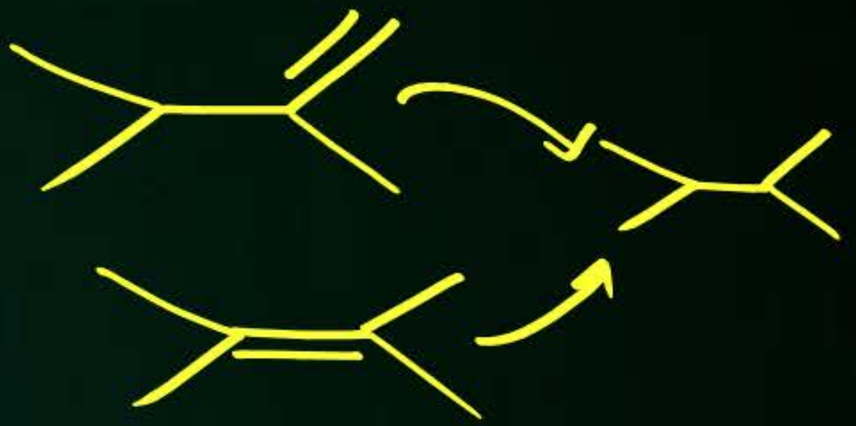




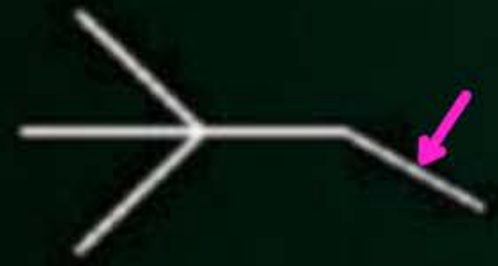


(B)

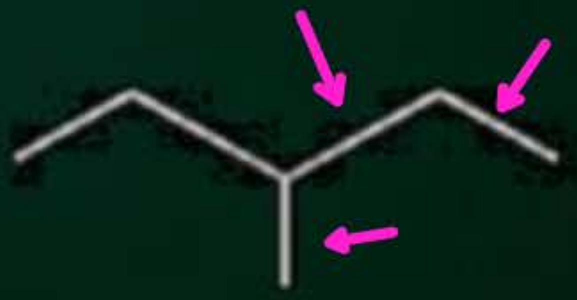




(C)

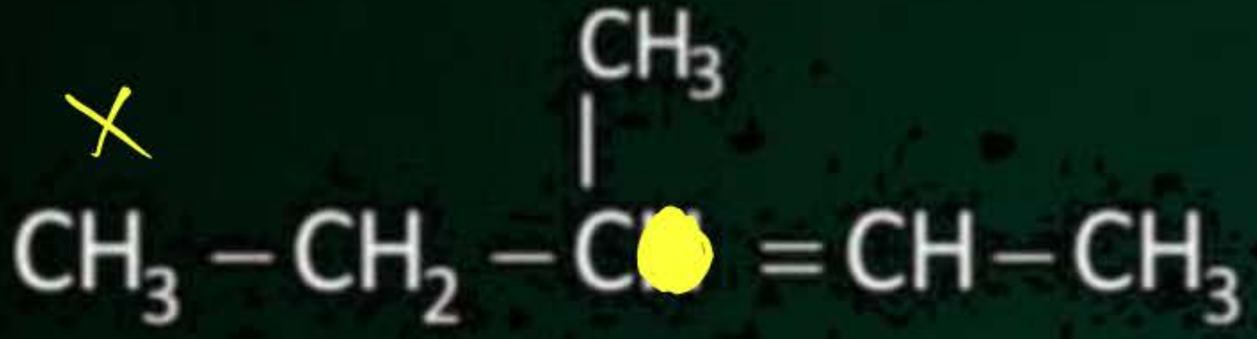


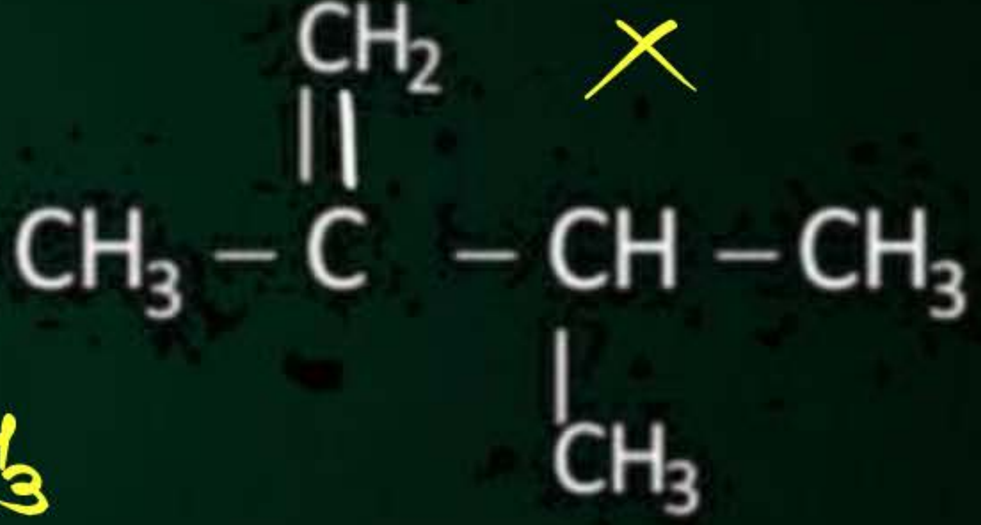
(D)

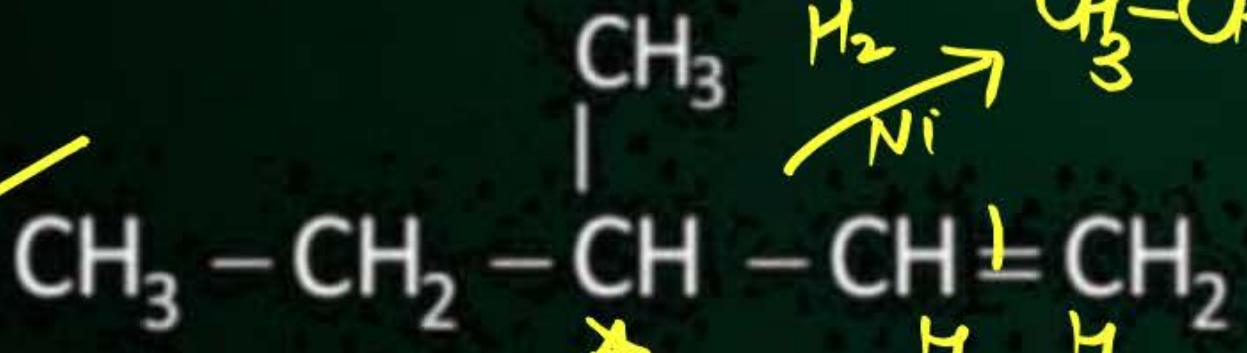


QUESTION

A compound C_6H_{12} an optically active hydrocarbon gives optically inactive compound C_6H_{14} on catalytic hydrogenation. Compound is:

(A) 
$CH_3-CH_2-\overset{\overset{CH_3}{|}}{C}=CH-CH_3$

(B) 
$CH_3-\overset{\overset{CH_2}{||}}{C}-\underset{\underset{CH_3}{|}}{CH}-CH_3$

(C) 
$CH_3-CH_2-\overset{\overset{CH_3}{|}}{\underset{*}{CH}}-CH=CH_2$

$\xrightarrow[Ni]{H_2} CH_3-CH_2-\overset{\overset{CH_3}{|}}{CH}-CH_2-CH_3$

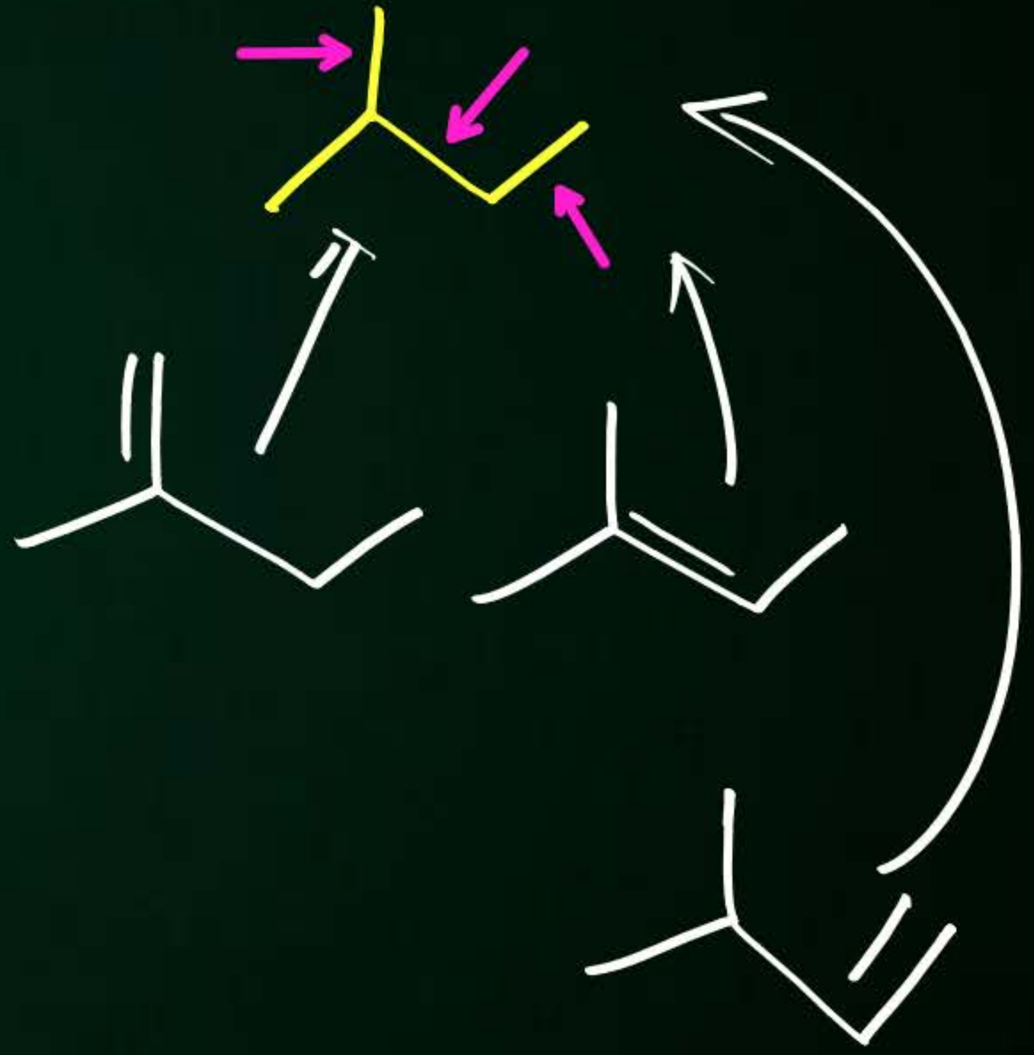
always O.A

(D) All

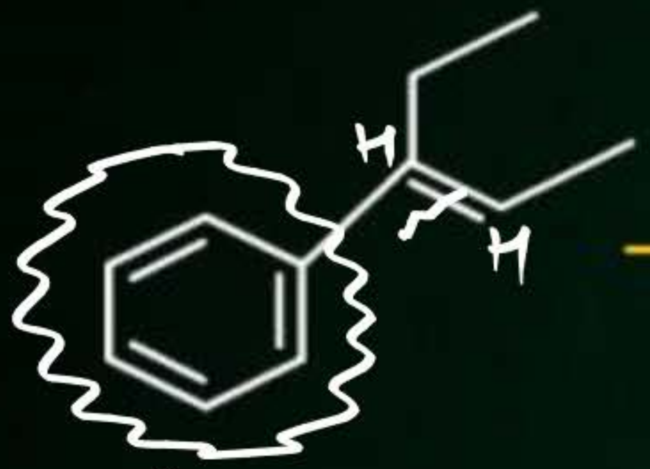
QUESTION

On catalytic reduction (H_2/Pt) how many alkenes will give 2-methylbutane?

- **A** 1
- **B** 2
- **C** [✓ 3]
- **D** 4



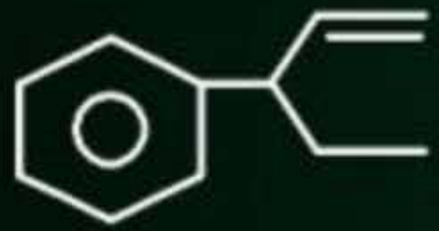
QUESTION



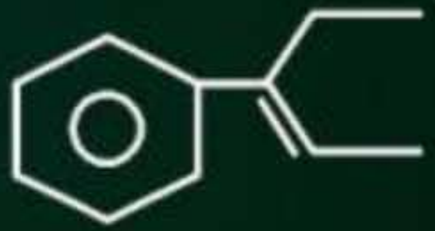
Aro

$\xrightarrow[H_2]{1\ \text{mol}}$ **(A). (A) would be:**

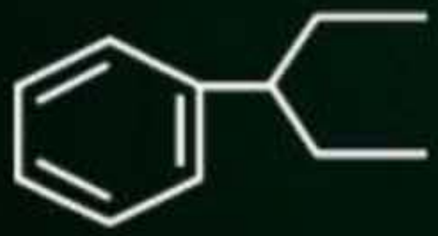
A



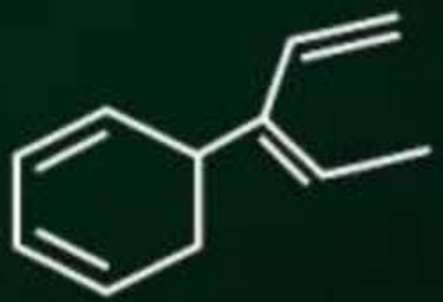
B



C



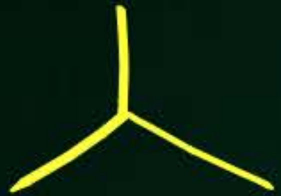
D



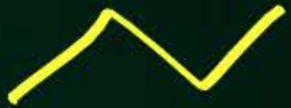
QUESTION

Which of the following compounds can be best prepared by Wurtz-reaction?

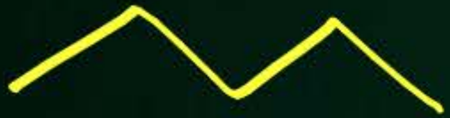
(A) Iso-butane



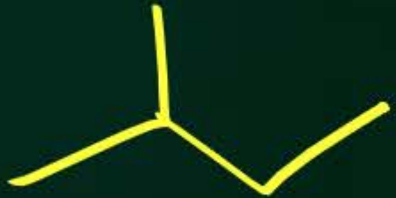
[✓ (B)] n-butane



(C) n-pentane



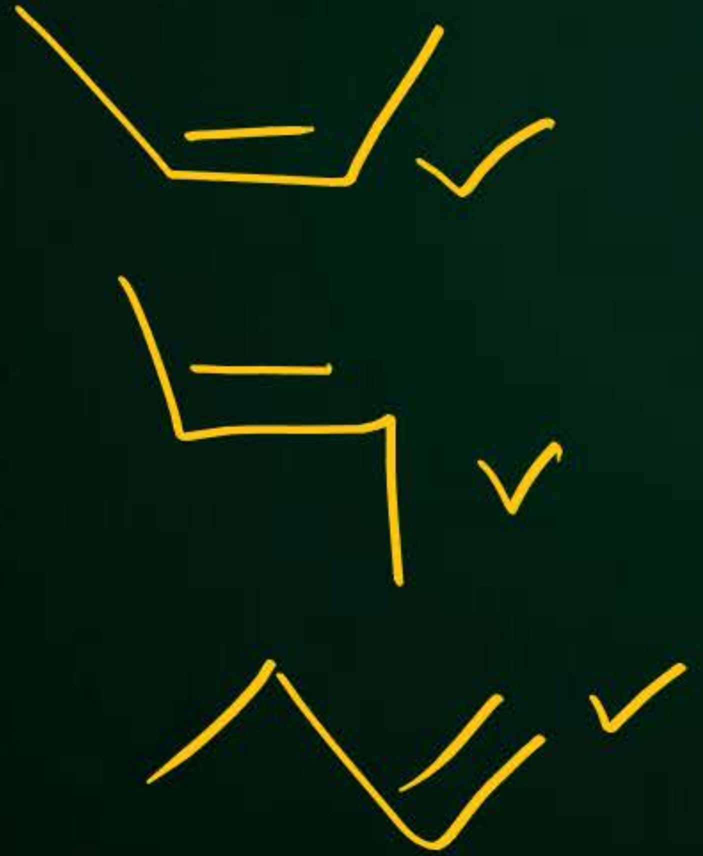
(D) Iso-pentane

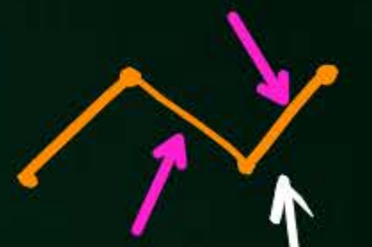


QUESTION

On catalytic reduction with H_2/Pt how many alkenes will give *n*-butane including stereo?

- **A** 1
- **B** 2
- **C** 3 ✓
- **D** 4





$CH_3-CH_2-CH=CH_2$

① 1-butene

$CH_3-CH=CH-CH_3$

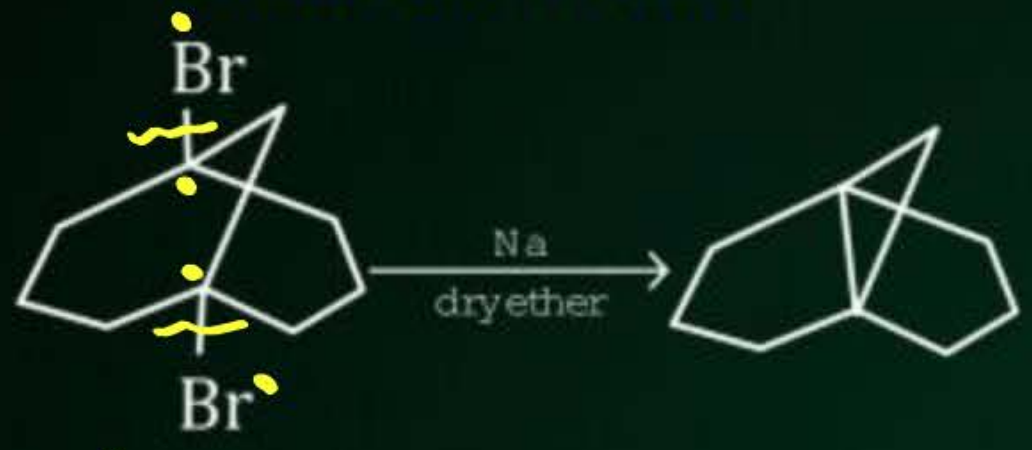
②

cis/Trans

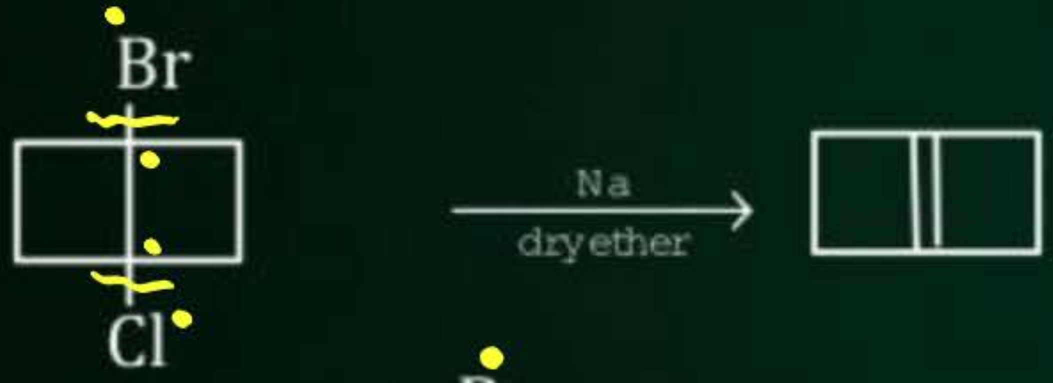
QUESTION

Which of the following does not represent major product of that reaction ?

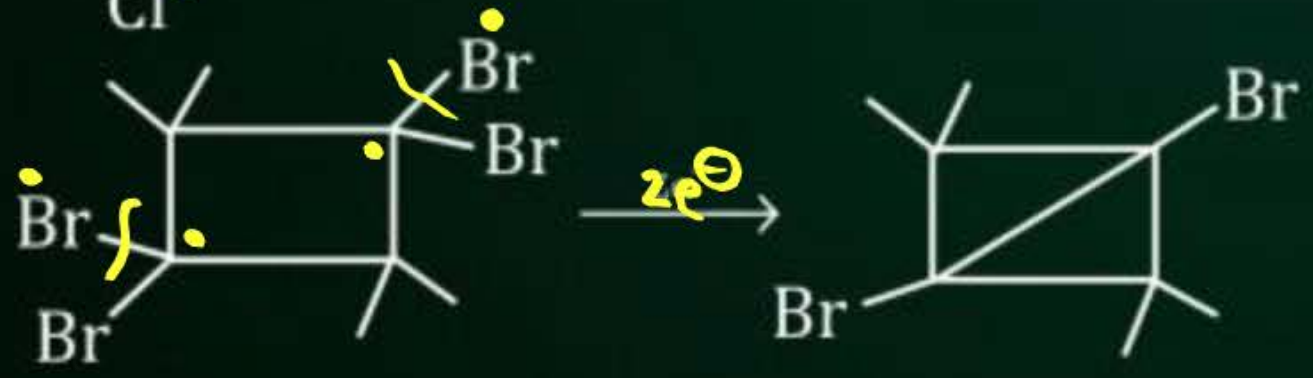
Ⓐ


Br
Na
dry ether
Br

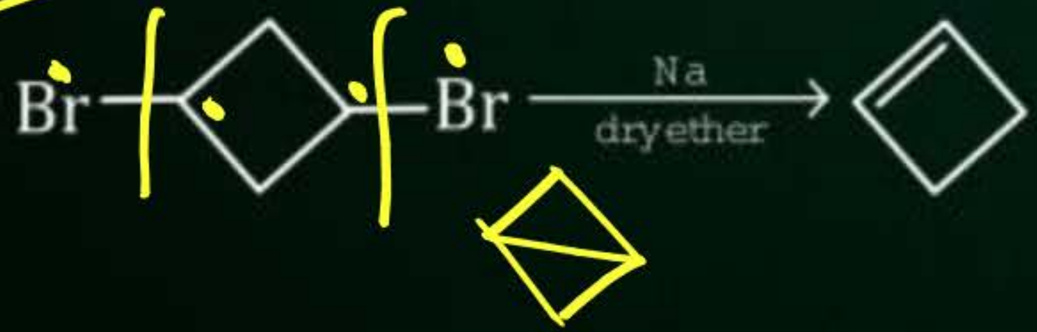
Ⓑ


Br
Na
dry ether
Cl

Ⓒ

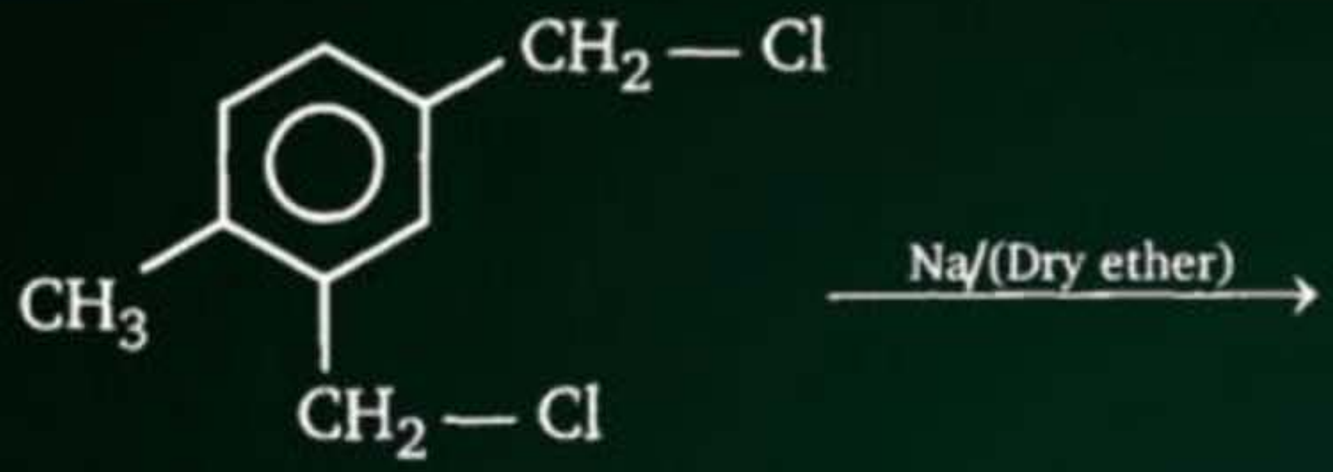

Br
Br
Br
Br
2e⊖
Br
Br

Ⓓ


Br
Br
Na
dry ether

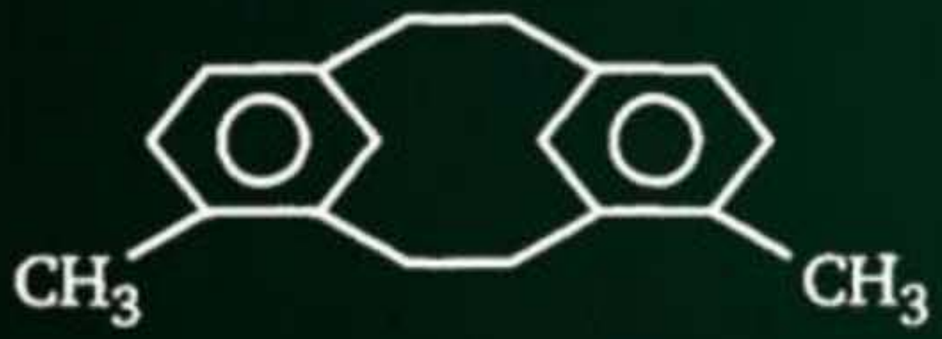
Home Work

QUESTION ①

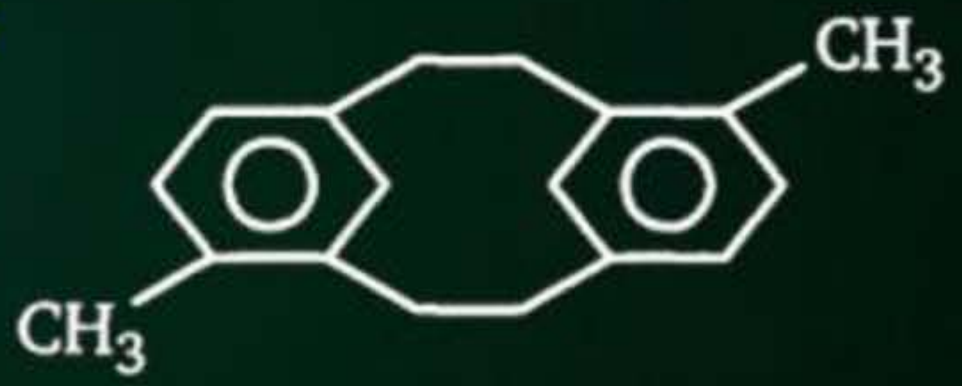

CH$_2$—Cl
CH$_3$
CH$_2$—Cl
Na/(Dry ether)

Product obtained in above Wurtz reaction is:

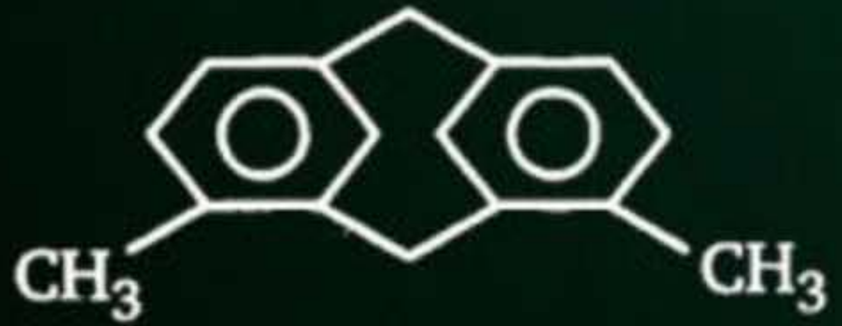
A



B



C



D Both (A) and (B)

QUESTION ②

Ethyl iodide and n-propyl iodide are allowed to undergo Wurtz reaction. The alkane which will not be obtained in this reaction is:

Ⓐ butane

Ⓑ propane

Ⓒ pentane

Ⓓ hexane

QUESTION 03

Which of the following alkanes can be synthesisec in good yield by the Wurtz reaction?

- A $(CH_3)_2CH-CH_2-CH(CH_3)_2$
- B $(CH_3)_2CH-CH_2CH_2-CH(CH_3)_2$
- C $CH_3CH_2-C(CH_3)_2-CH_2CH_3$
- D $(CH_3)_3C-CH_2-CH_2-CH_3$

QUESTION 04

An alkyl bromide reacts with sodium to form 4, 5-diethyl octane. The alkyl bromide is:

A $CH_3(CH_2)_2CH_2Br$

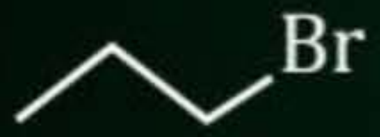
B $CH_3(CH_2)_4CH_2Br$

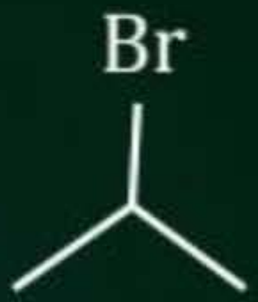
C $CH_3(CH_2)_3CHBrCH_3$

D $CH_3(CH_2)_2CHBrCH_2CH_3$

QUESTION 05

Which of the following alky bromides may be used for the synthesis of 2, 3-dimethyl butane by Wurtz reaction?

A 

B 

C Isobutyl bromide

D *s*-butyl bromide

QUESTION ⑥ (AIIMS 2012)

Which one of the following cannot be prepared by Wurtz reaction?

Ⓐ CH_4

Ⓑ C_2H_6

Ⓒ C_3H_8

Ⓓ C_4H_{10}

QUESTION 07

Assertion: Wurtz reaction is not preferred for the preparation of alkanes containing odd number of carbon atoms.

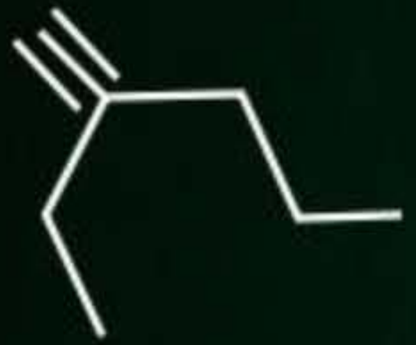
Reason: It is not possible to prepare alkanes with odd number of carbon atoms through Wurtz reaction.

- A Both Assertion and Reason are correct and Reason is the correct explanation for Assertion.
- B Both Assertion and Reason are correct but Reason is not the correct explanation for Assertion.
- C Assertion is correct but Reason is incorrect.
- D Both Assertion and Reason are incorrect.

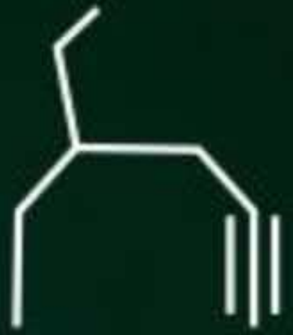
QUESTION 08

Which alkyne gives 3-ethyl hexane on catalytic hydrogenation?

(A)



(B)

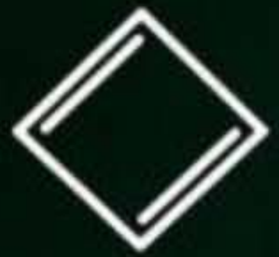


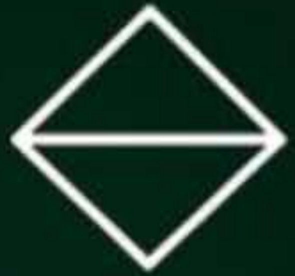
(C) Both (A) & (B)

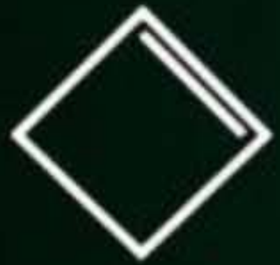
(D) None of these

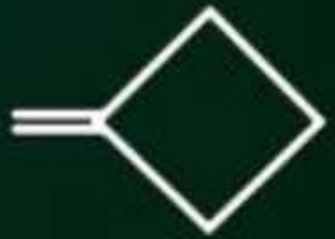
QUESTION 09

When 1-bromo-3-chloro Cyclobutane reacts with Na/dry ether then formed product is:

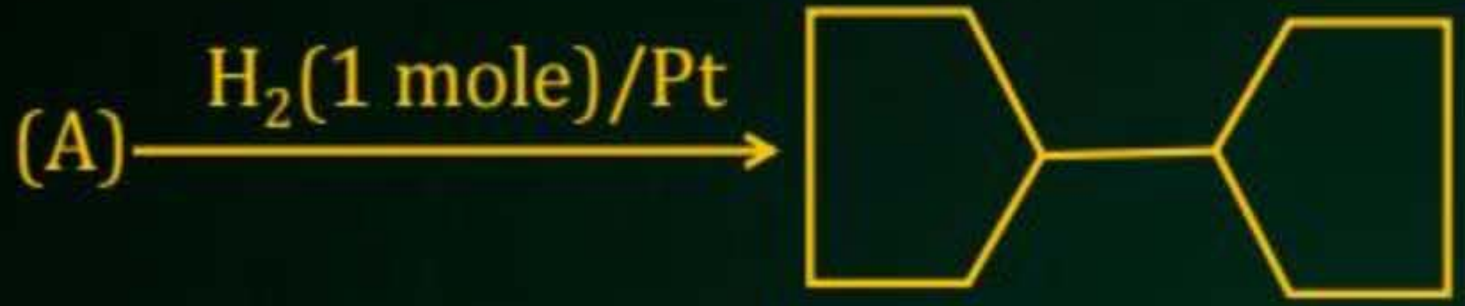
A


B


C


D


QUESTION 10


(A)
H_2(1 mole)/Pt

Double bond equivalent (degree of Unsaturation) of (A) is:

- **A** 1
- **B** 2
- **C** 3
- **D** 4

ANSWER KEY

1.D
2.B
3.B
4.D
5.B
6.A
7.C
8.C
9.B
10.C

Home Work From PW Module (Yakeen NEET)

Prarambh: Q 01, 05, 06, 07, 18, 32, 33, 34, 36

Prabal: Q 10, 30, 33

Thank you!!

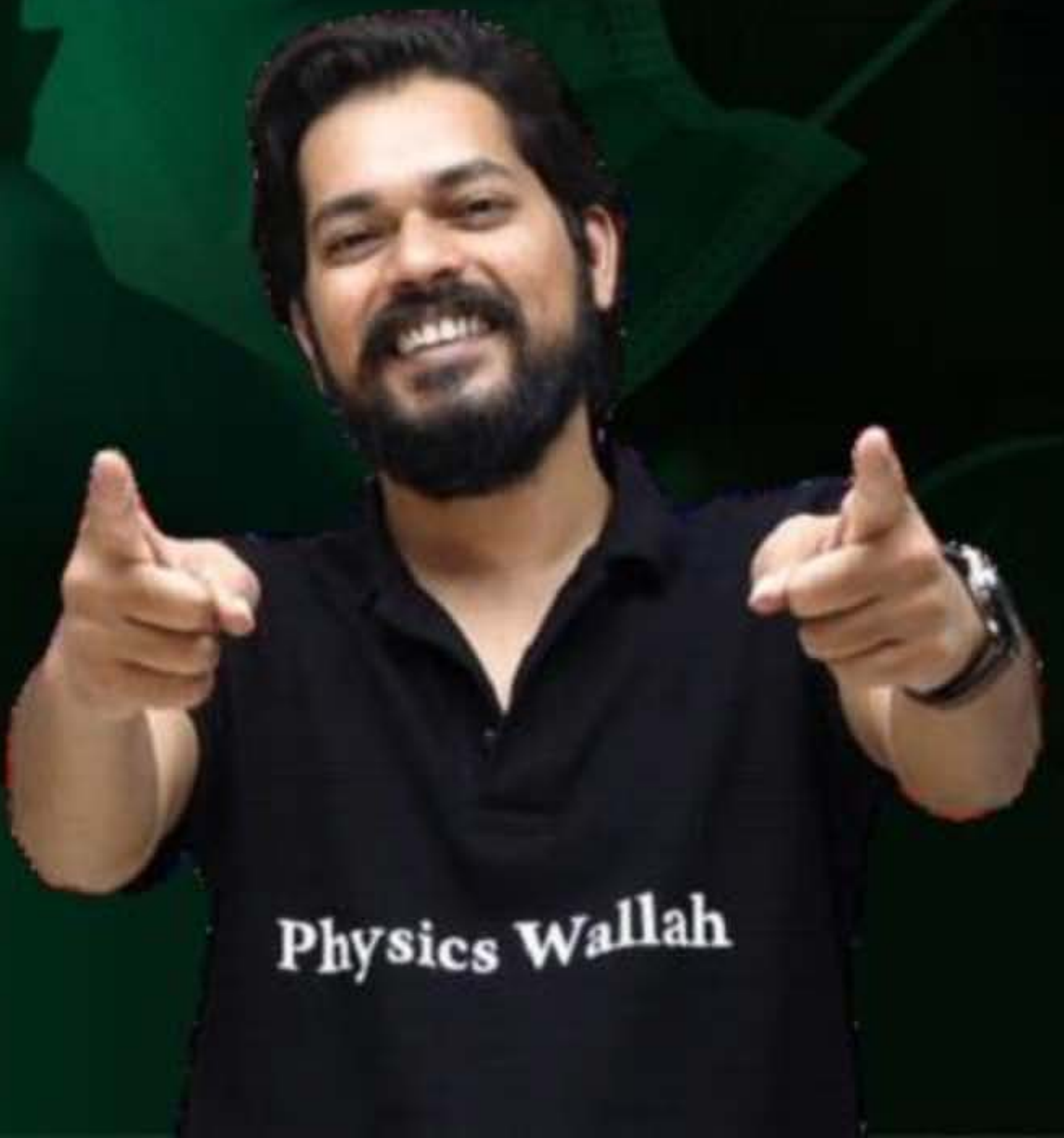
YAKEEN 2.0

FOR NEET 2025

Lecture- 02 | **Organic Chemistry**

HYDROCARBONS

By- Pankaj Sir(POPU MAMA)

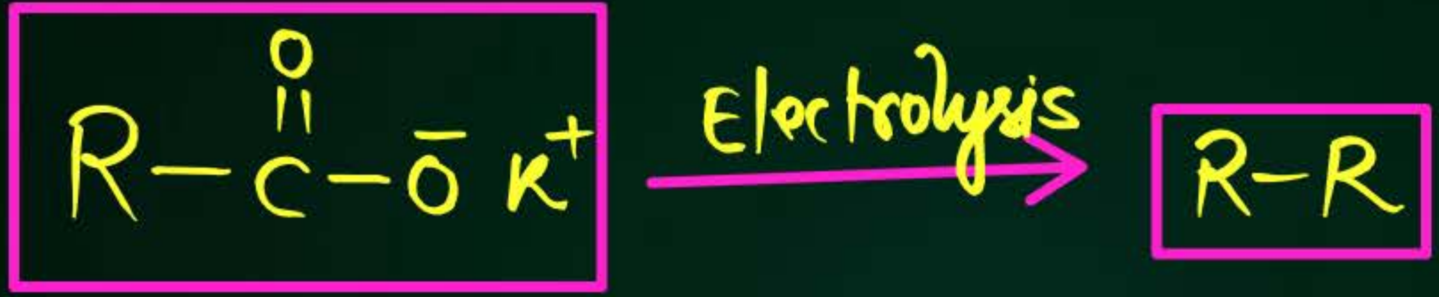

Physics Wallah

Topics *to be covered*

1. Methods of Preparation of Alkanes part 2 ✓
2. Practice

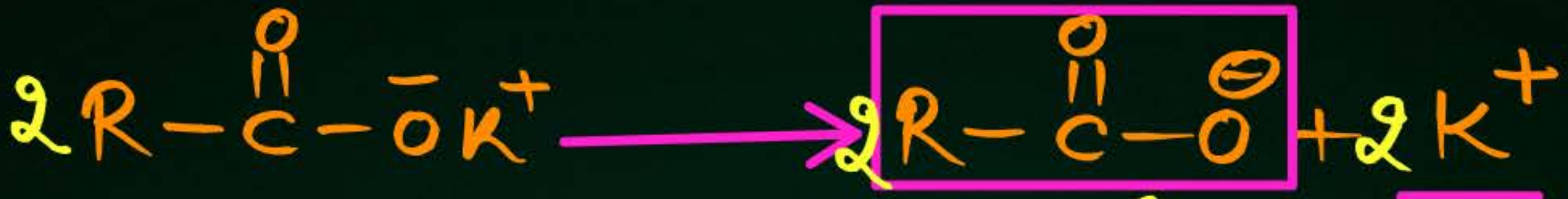
4. Kolbe's electrolytic method:

- An aqueous solution of sodium or potassium salt of a carboxylic acid on electrolysis gives alkane containing even number of carbon atoms at the anode.



$$\boxed{R-\overset{O}{\overset{\|}{C}}-\bar{O}\,K^+} \xrightarrow{\text{Electrolysis}} \boxed{R-R}$$

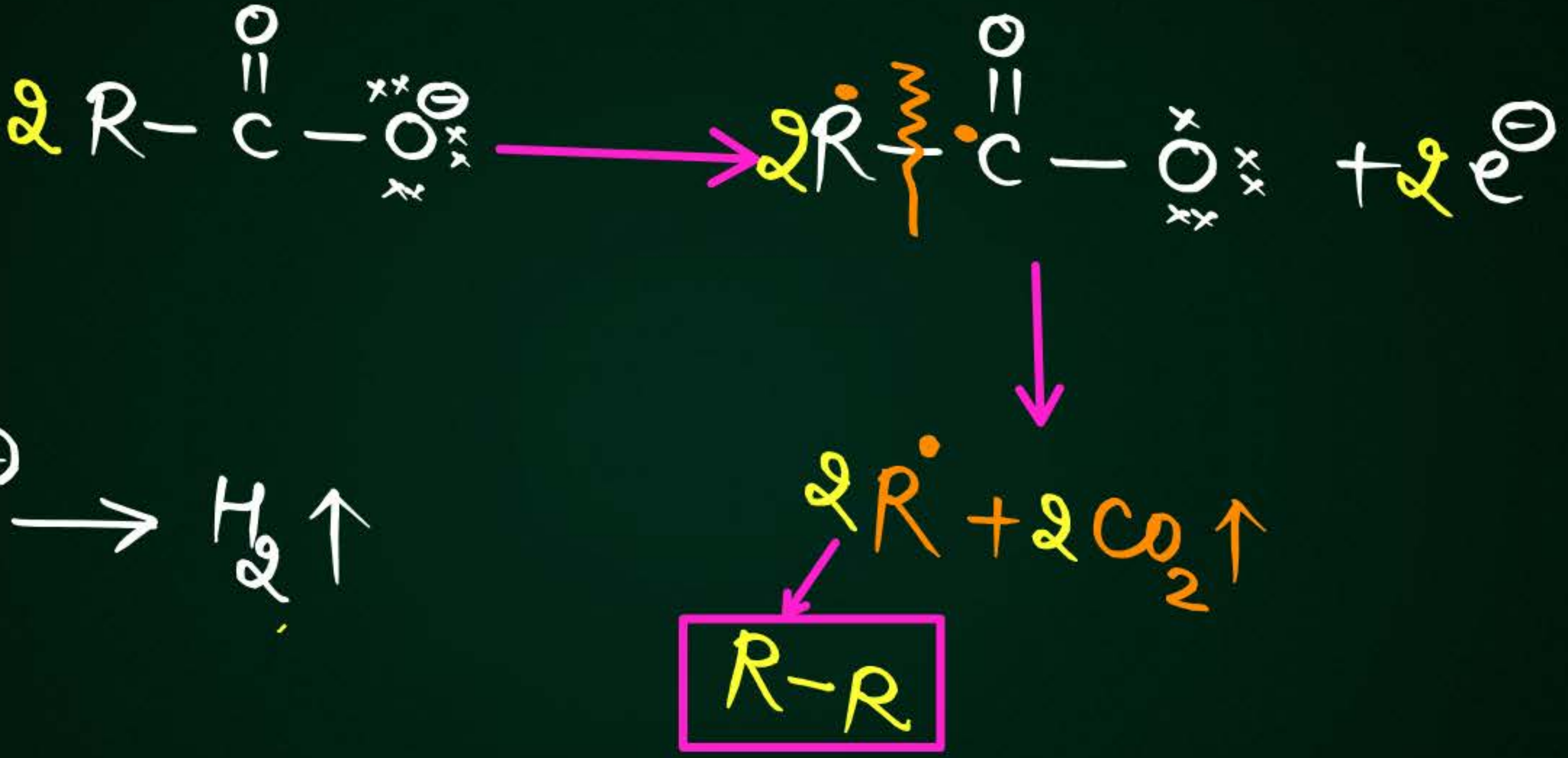
Mech ÷



$$2R-\overset{\overset{O}{\|}}{C}-\overset{-}{O}K^{+} \longrightarrow 2\boxed{R-\overset{\overset{O}{\|}}{C}-O^{\ominus}}+2K^{+}$$

$$2HOH \longrightarrow 2HO^{\ominus}+2\boxed{H^{+}}$$

At Anode ÷



$$2R-\overset{\overset{O}{\|}}{C}-\ddot{\underset{\times\times}{O}}{}^{\ominus} \longrightarrow 2\dot{R}\,\vdots\,\dot{C}(=O)-\dot{O} + 2e^{\ominus}$$

$$\downarrow$$

$$2\dot{R}+2CO_2\uparrow$$

$$\boxed{R-R}$$

At Cathode ÷

$$2H^{+}+2e^{\ominus} \longrightarrow H_2\uparrow$$

E°_{R} Low Li

K^{+}

H^{+} ✓

F

E°_{R} High

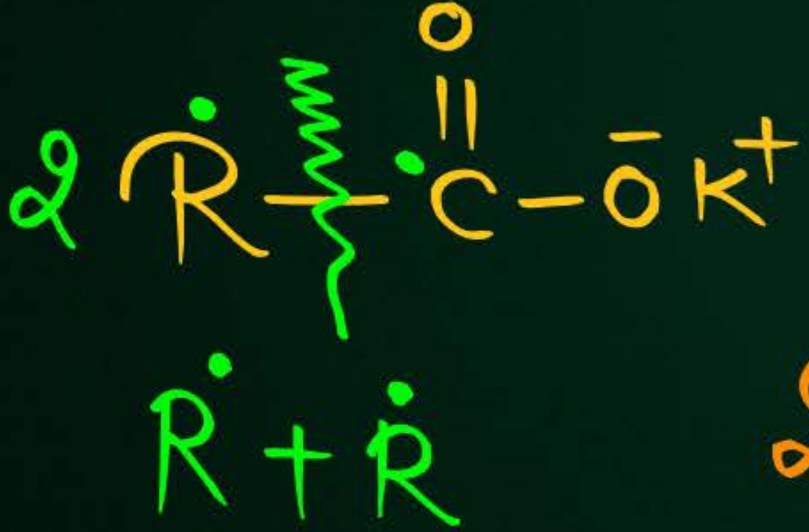
op points ÷

① Alkane & CO_2 evolved at anode

② H_2 evolved at cathode

③ Nature of sol^n after electrolysis is BASIC ($p^H \uparrow$)

D.M ÷



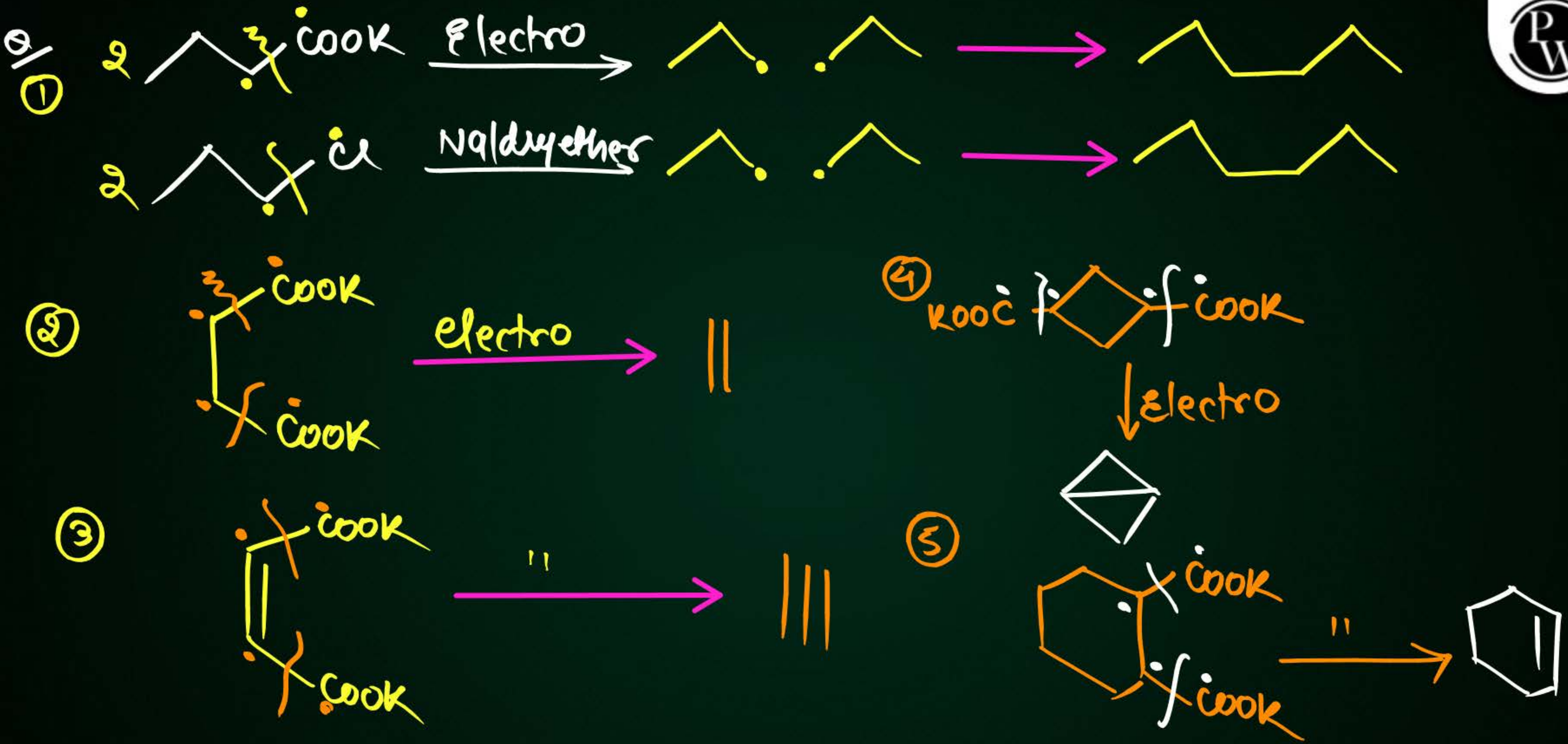
$$2\,\dot{R}-\overset{\overset{O}{\|}}{\dot{C}}-\bar{O}K^{+} \longrightarrow R-R$$

$$\dot{R}+\dot{R}$$

(Kolbe's, wurtz ke chacha ka ladka hai)

$$2\,R-\dot{X} \xrightarrow[\text{dry ether}]{Na} R-R$$

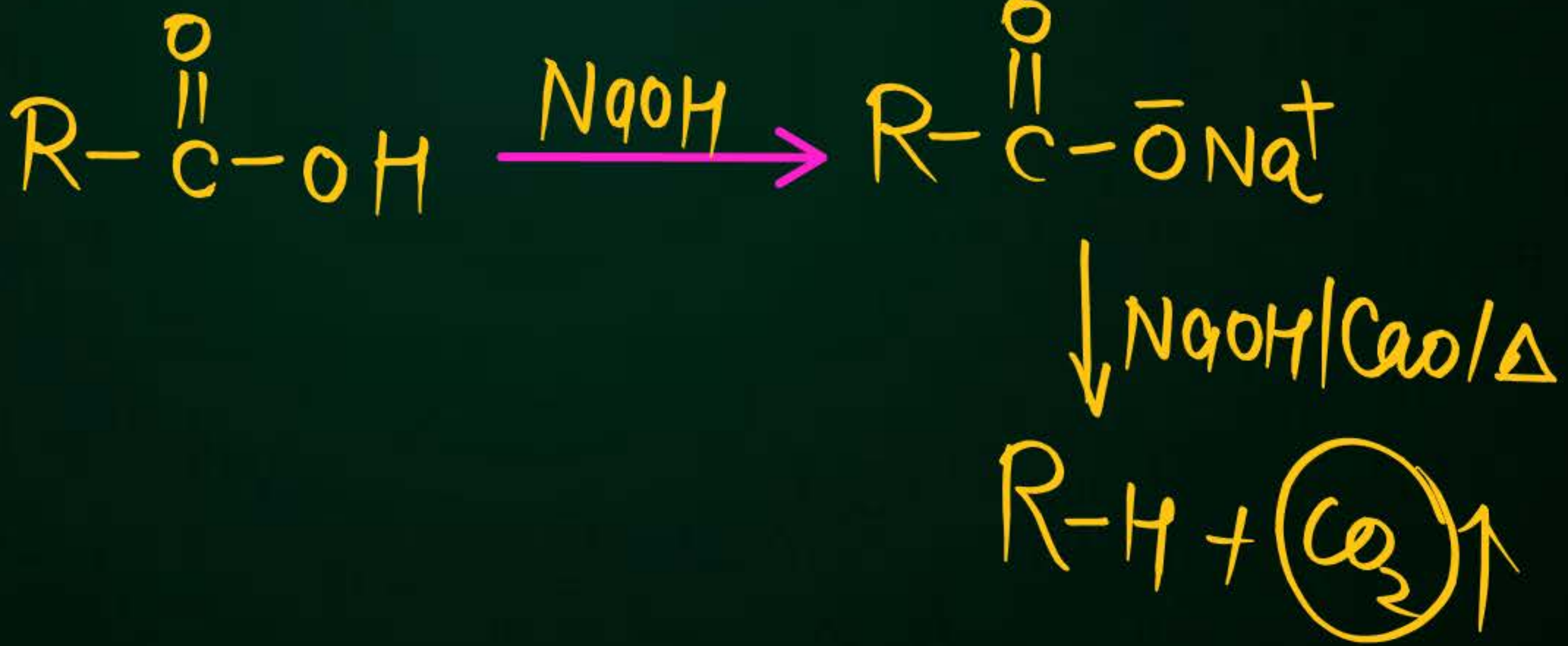
$$\dot{R}+\dot{R}$$


Q/ ①
2
COOK
Electro
2
Cl
Na/dry ether
②
COOK
electro
COOK
③
COOK
"
COOK
④
ROOC
COOK
electro
⑤
COOK
"
COOK

5. Decarboxylation

Soda lime $NaOH + CaO / \Delta$

- Sodium salts of carboxylic acids on heating with soda lime (mixture of sodium hydroxide and calcium oxide) give alkanes containing one carbon atom less than the carboxylic acid.
- This process of elimination of carbon dioxide from a carboxylic acid is known as decarboxylation.

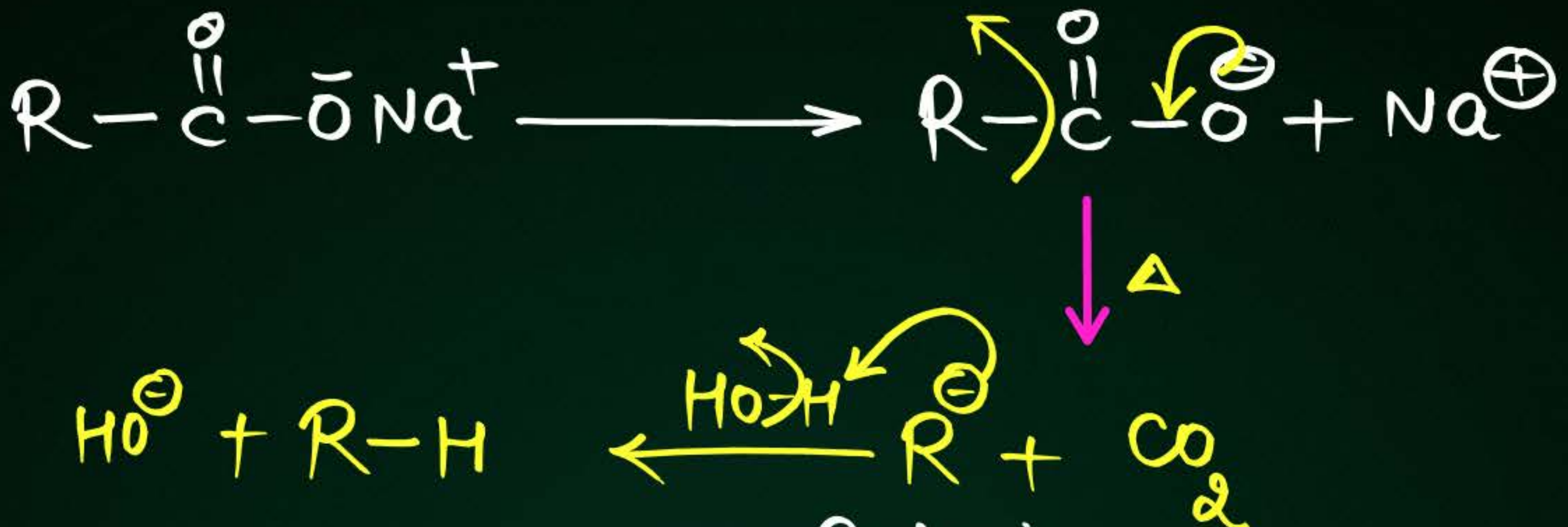


$$R-\overset{\overset{O}{\|}}{C}-OH \xrightarrow{NaOH} R-\overset{\overset{O}{\|}}{C}-\bar{O}Na^{+}$$

$$\downarrow NaOH | CaO / \Delta$$

$$R-H + CO_3 \uparrow$$

Mech



$$R-\overset{O}{\overset{\|}{C}}-\bar{O}Na^{+} \longrightarrow R-\overset{O}{\overset{\|}{C}}-O^{\ominus} + Na^{\oplus}$$

$$\downarrow \Delta$$

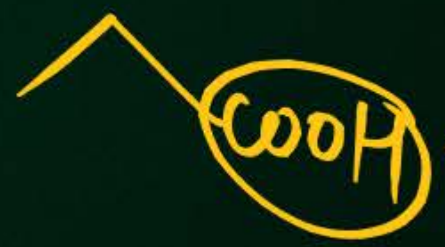
$$HO^{\ominus} + R-H \xleftarrow{HO-H} R^{\ominus} + CO_2$$

Carbanion

op point ÷ // $\boxed{R.O.R \propto \text{stability of } \overset{\ominus}{C}}$

8 ① $CH_3COONa \xrightarrow[\Delta]{NaOH/CaO} CH_4$

②

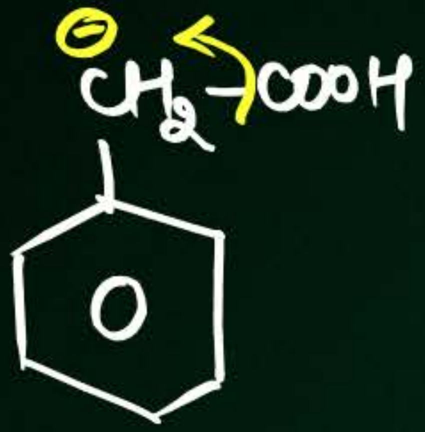


$\xrightarrow{''} CH_3-CH_3$

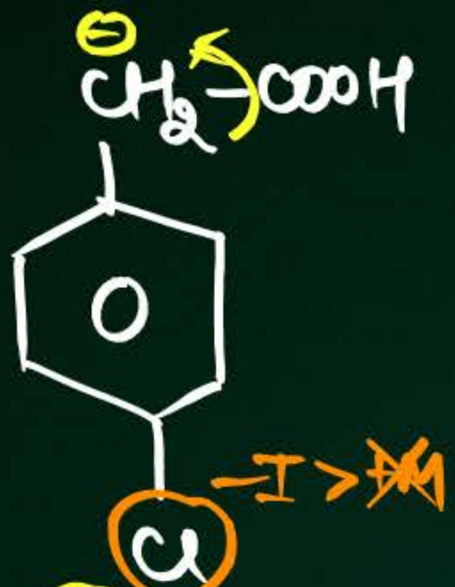
D.M ÷ $R-\boxed{COOH} \longrightarrow R-\boxed{H}$

$R-\boxed{COONa} \longrightarrow R-\boxed{H}$

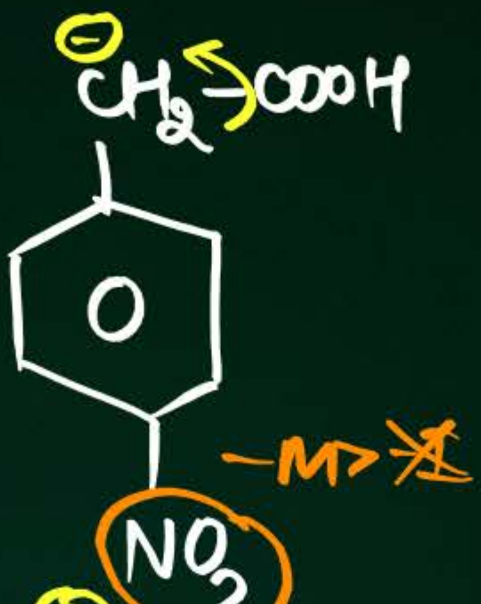
Q Compare R.O.R towards decarboxylation



①



②



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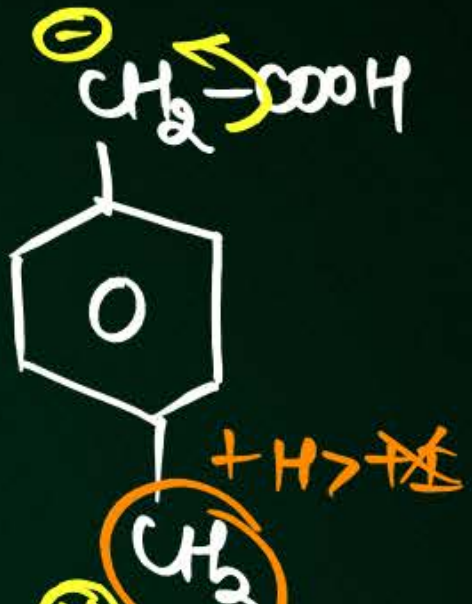
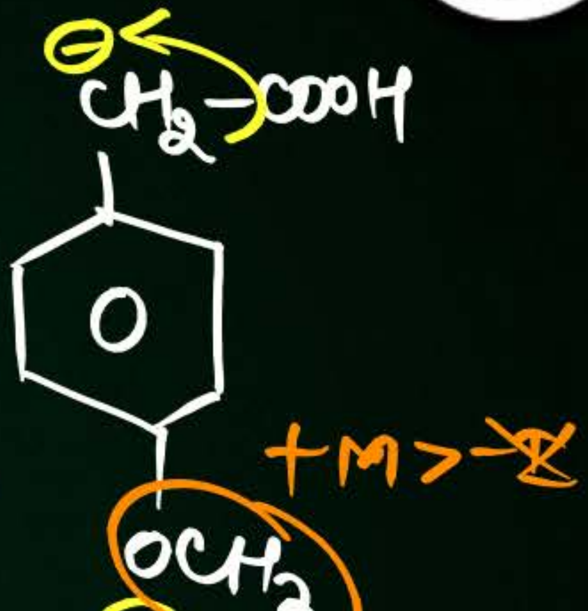


④



⑤

③ > ② > ① > ④ > ⑤

6. Corey house synthesis

used for both sym & unsym alkane

Reagent :- Gilman reagent R_2CuLi $(R-Cu + \overset{\ominus}{R}Li^{+})$

$$R'-X \xrightarrow[\boxed{R-Cu}+\overset{\ominus}{R}Li^{+}]{R_2CuLi} R-R' + R-Cu + LiX$$

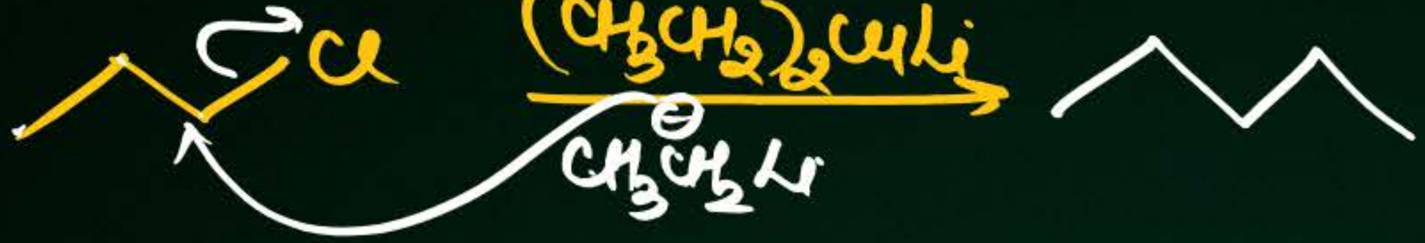
B.S $\overset{\ominus}{C}H_3 > \overset{\ominus}{N}H_2 > \overset{\ominus}{O}H > F^{\ominus}$

A.S $CH_4 < NH_3 < H_2O < HF$

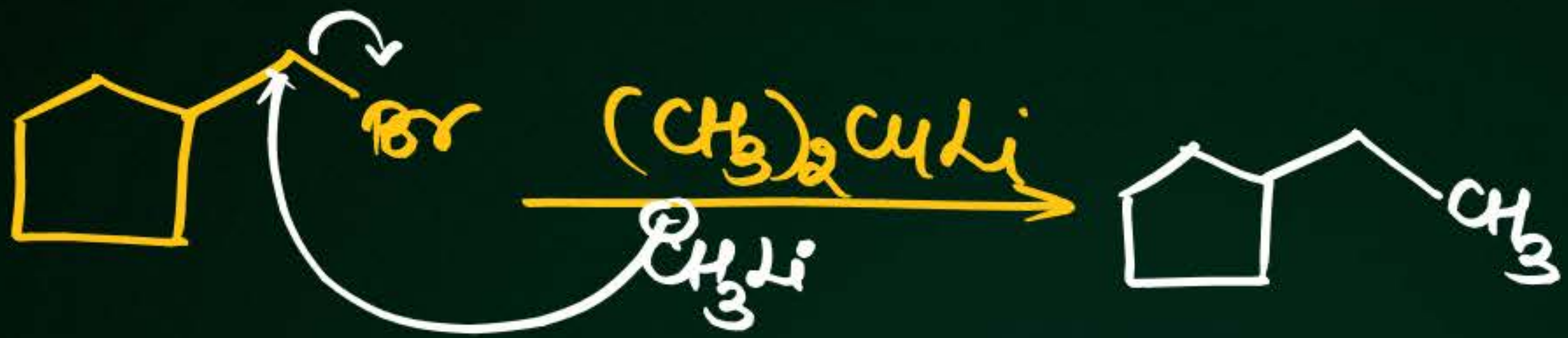
Q

$$CH_3-CH_2-Br \xrightarrow[\boxed{CH_3-Cu}+\overset{\ominus}{C}H_3Li^{+}]{(CH_3)_2CuLi} CH_3-CH_2-CH_3 + LiBr + CH_3-Cu$$

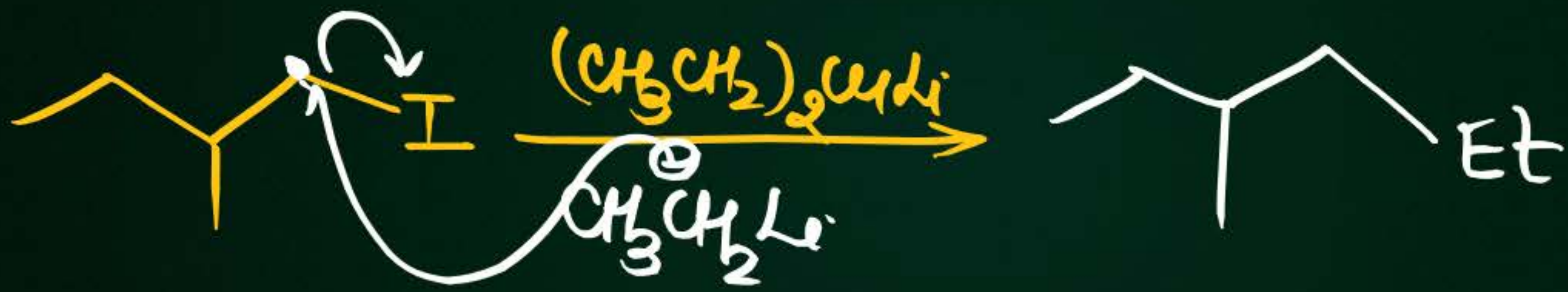
Q ①


Cl
$(CH_3CH_2)_2CuLi$
$\overset{\ominus}{C}H_3CH_2Li$

②


Br
$(CH_3)_2CuLi$
$\overset{\ominus}{C}H_3Li$
CH_3

③

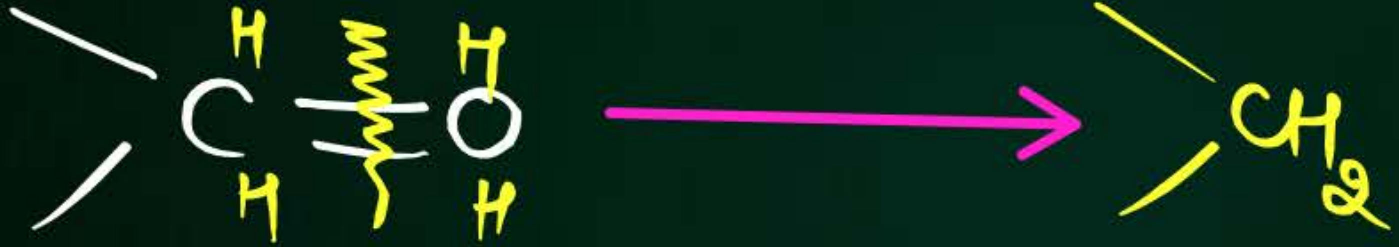

I
$(CH_3CH_2)_2CuLi$
$\overset{\ominus}{C}H_3CH_2Li$
Et

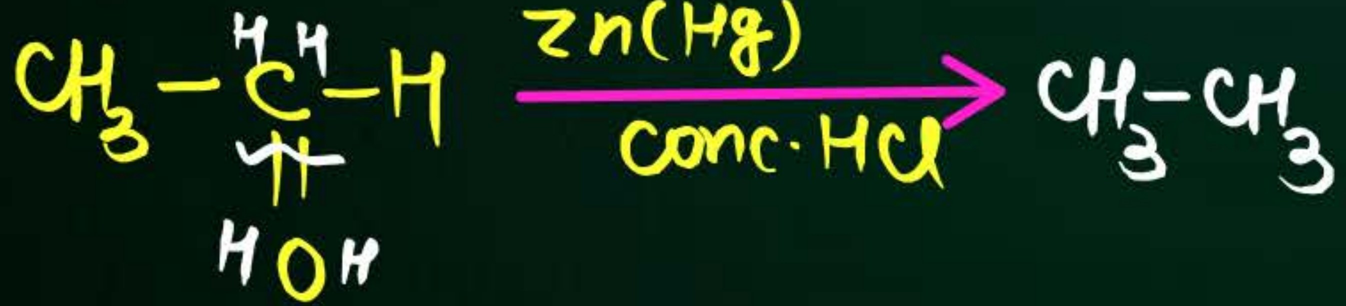
7. Clemmensons reduction

Carbonyl comp ⟶ Alkane

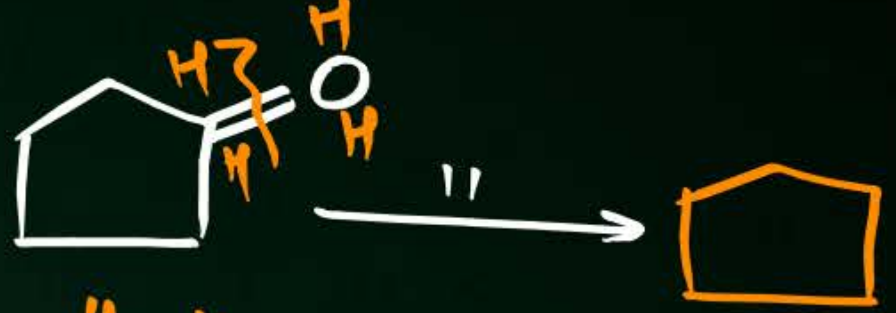
Reagent ÷ Zn(Hg) | Conc HCl

$Zn + HCl \rightarrow ZnCl_2 + \boxed{H_2}$



Q ①


$CH_3-\underset{\underset{O}{\|}}{C}-H \xrightarrow[\text{conc. HCl}]{Zn(Hg)} CH_3-CH_3$

②


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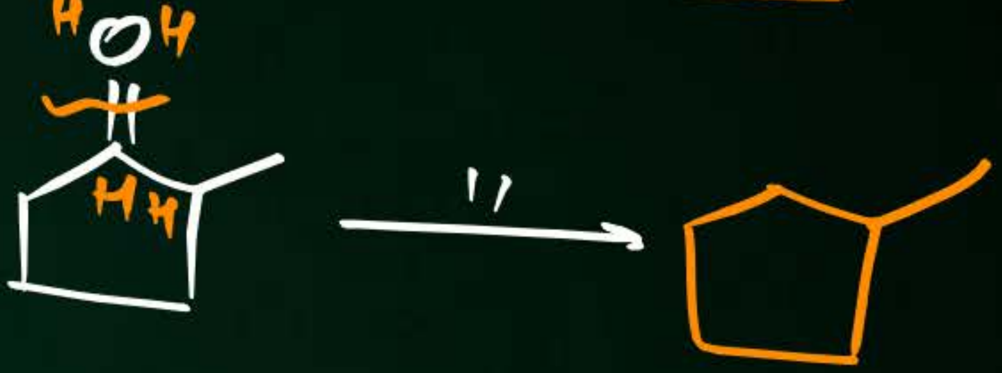
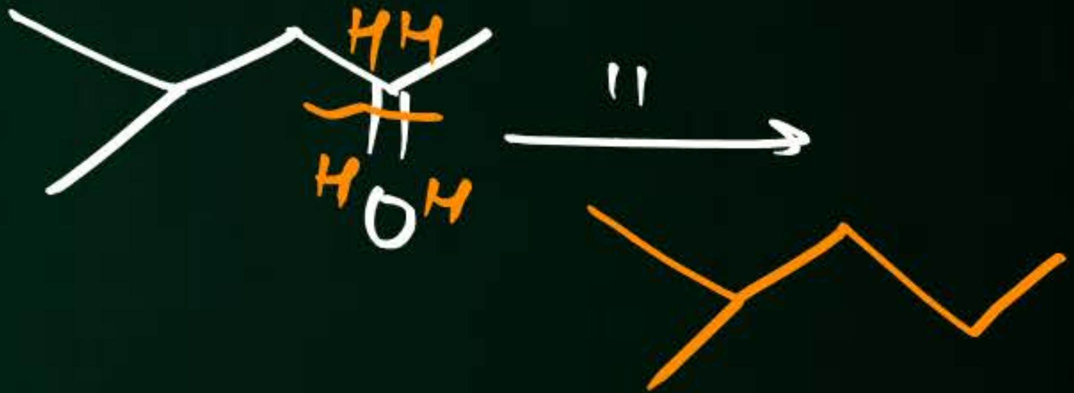
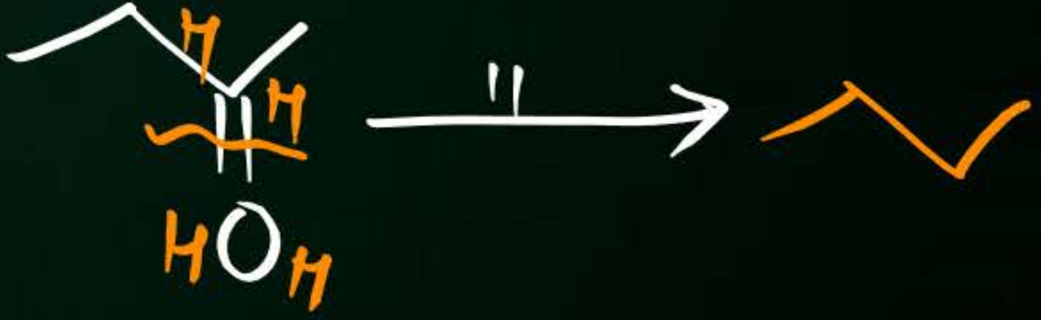


④


⑤


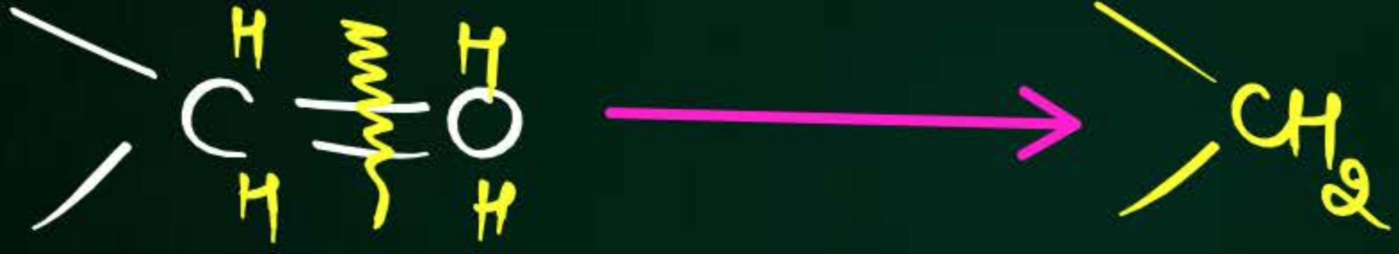
8. wolf kishner reduction

Carbonyl comp ⟶ Alkane

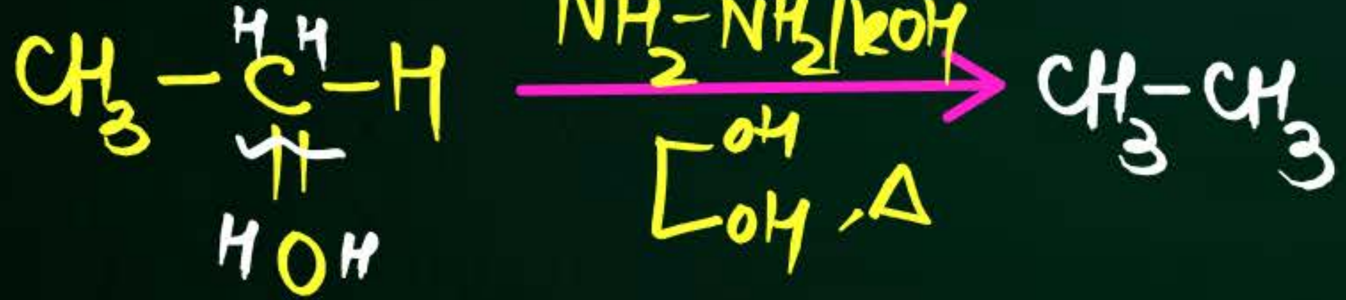
Reagent ÷ $NH_2-NH_2/KOH,\ \left[{OH \atop OH}\right. / \Delta$

solvent

(clem, wolf ke mama ka Ladka hai)

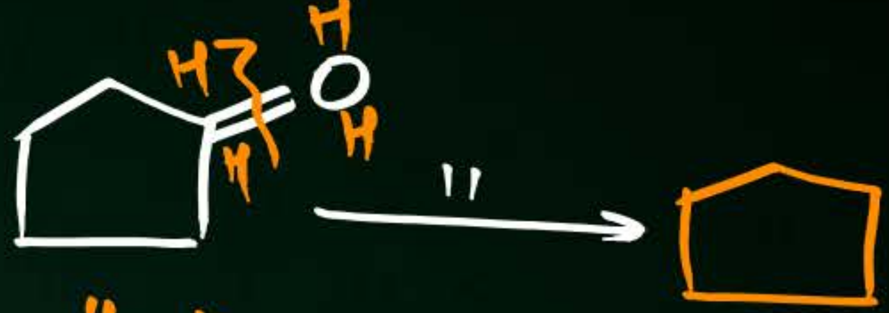


Q ①

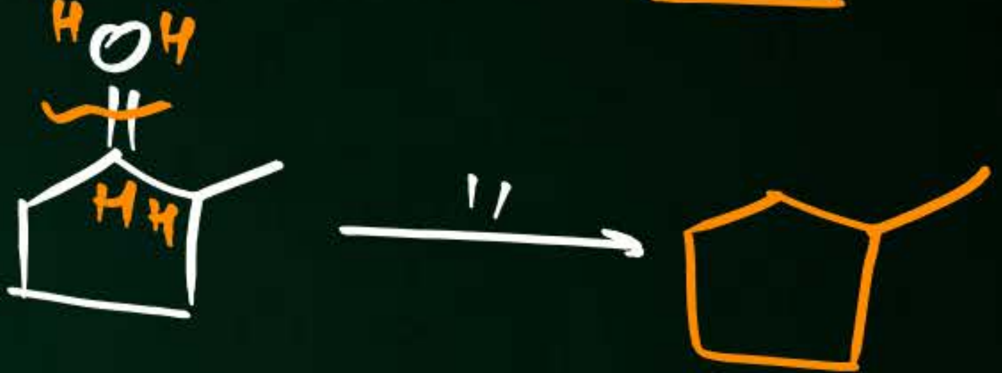


$CH_3-\underset{\underset{O}{\|}}{C}-H \xrightarrow[\left[{OH \atop OH}\right., \Delta]{NH_2-NH_2/KOH} CH_3-CH_3$

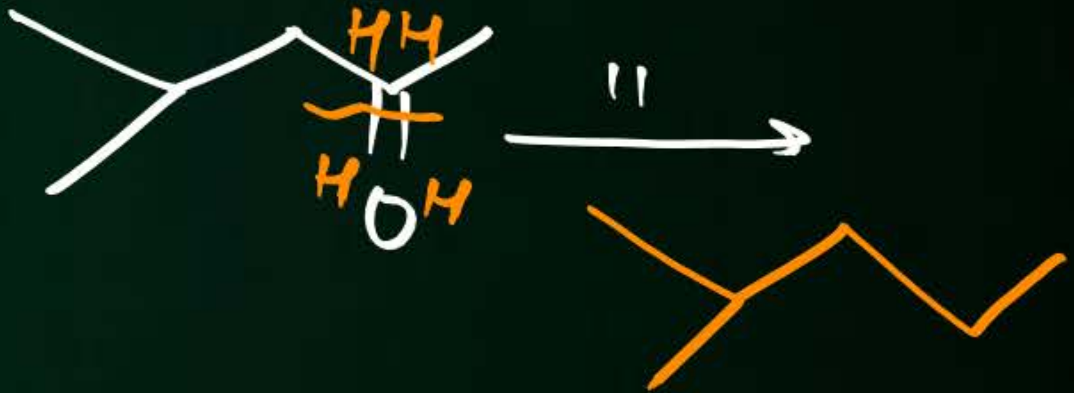
②



③



④



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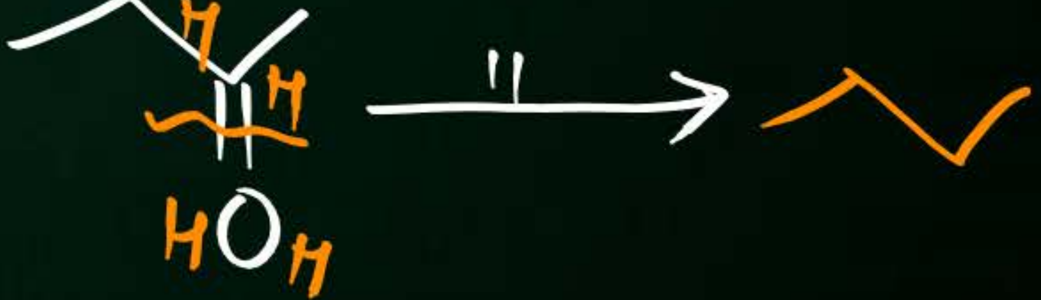
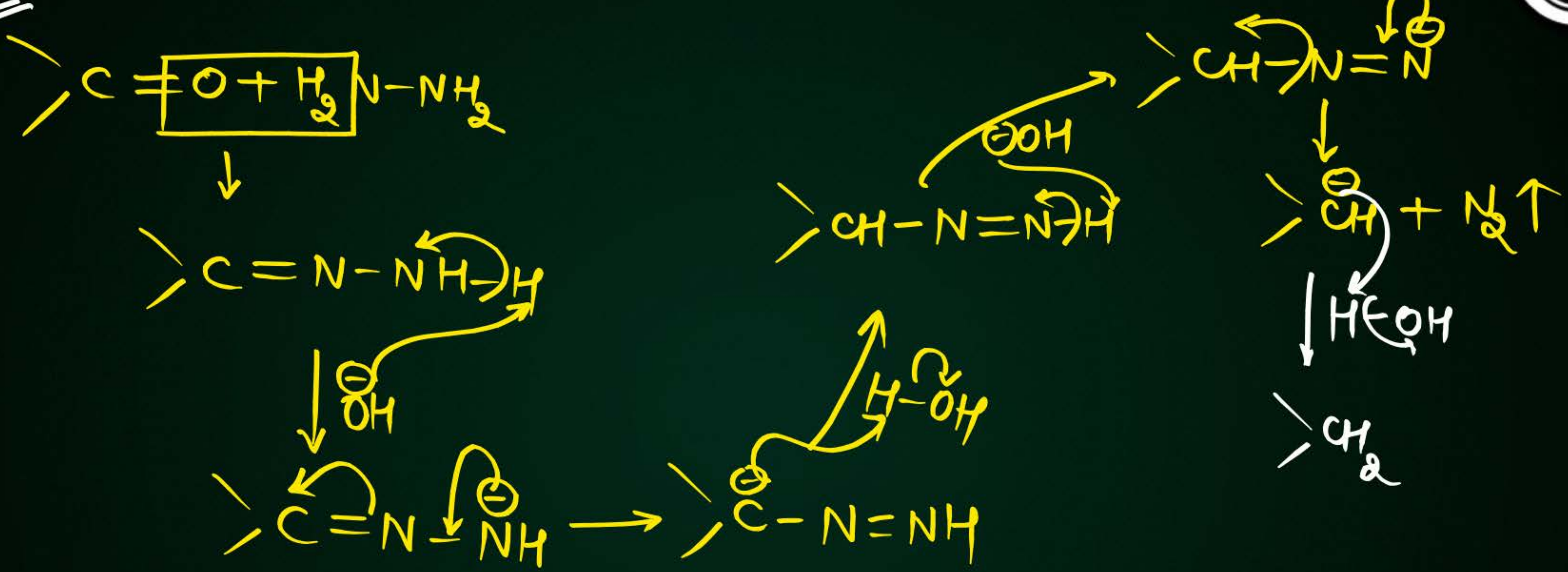


Mech



C=O + H2N-NH2
C=N-NH-H
⊖OH
C=N-N⊖H
C⊖-N=NH
H-OH
CH-N=N-H
⊖OH
CH-N=N⊖
CH⊖ + N2↑
H-OH
CH2

9. Hydrolysis of carbides

$$Al_4C_3 \xrightarrow{H_2O} 4\ Al(OH)_3 + 3CH_4$$

↓

$$4Al^{3+} + 3\ C^{4-}$$

$$Be_2C \xrightarrow{H_2O} 2Be(OH)_2 + CH_4$$

↓

$$2Be^{2+} + C^{4-}$$

$$CaC_2 \xrightarrow{H_2O} Ca(OH)_2 + CH\equiv CH$$

$$Ca^{2+} + \bar{C}\equiv\bar{C}$$

$$Mg_2C_3 \xrightarrow{H_2O} 2\ Mg(OH)_2 + CH\equiv C-CH_3$$

↓

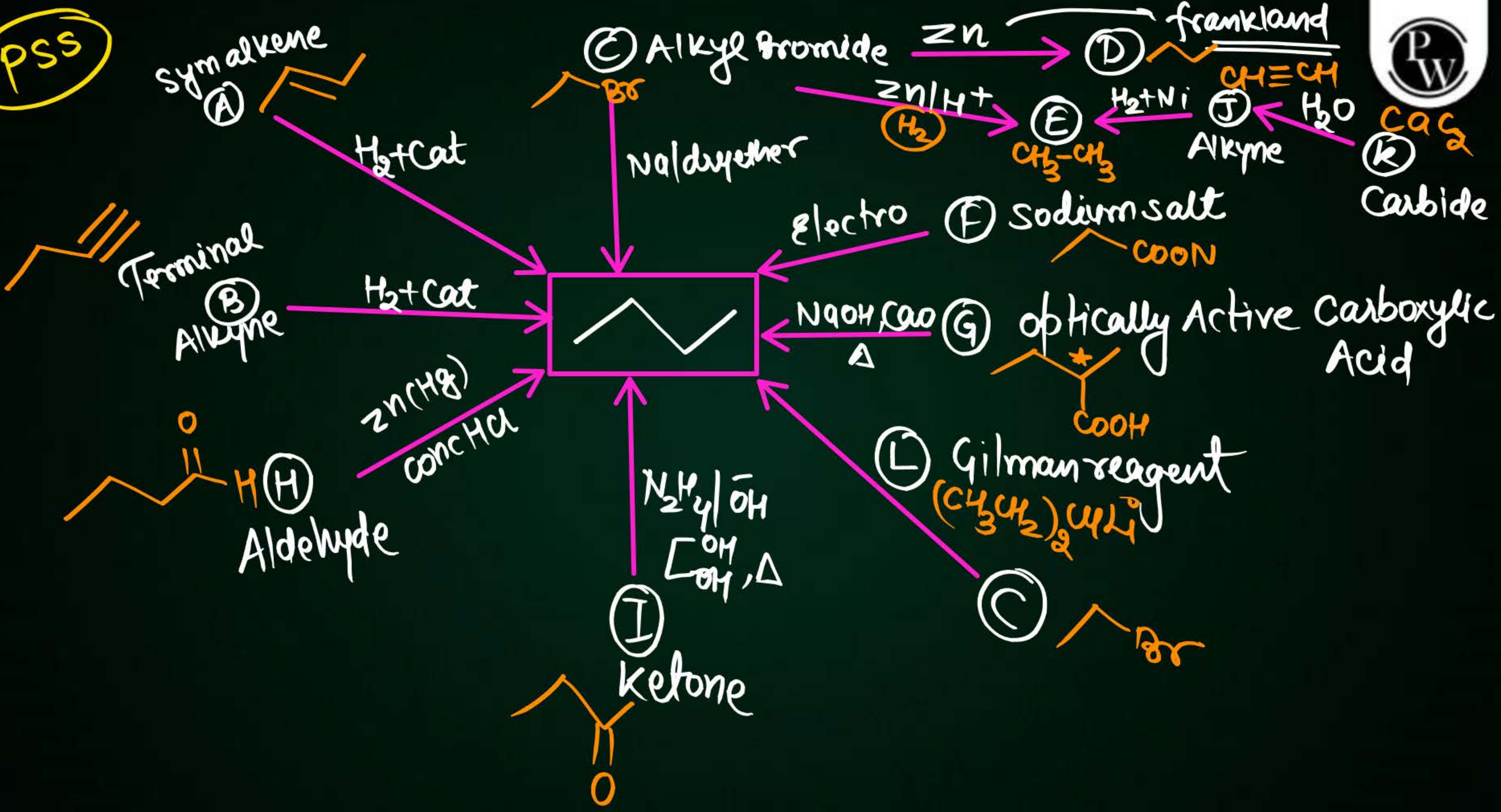
$$2Mg^{2+} + \bar{C}\equiv C-C^{3-}$$

$$B_4C \xrightarrow{H_2O} \text{NO Rxn}$$

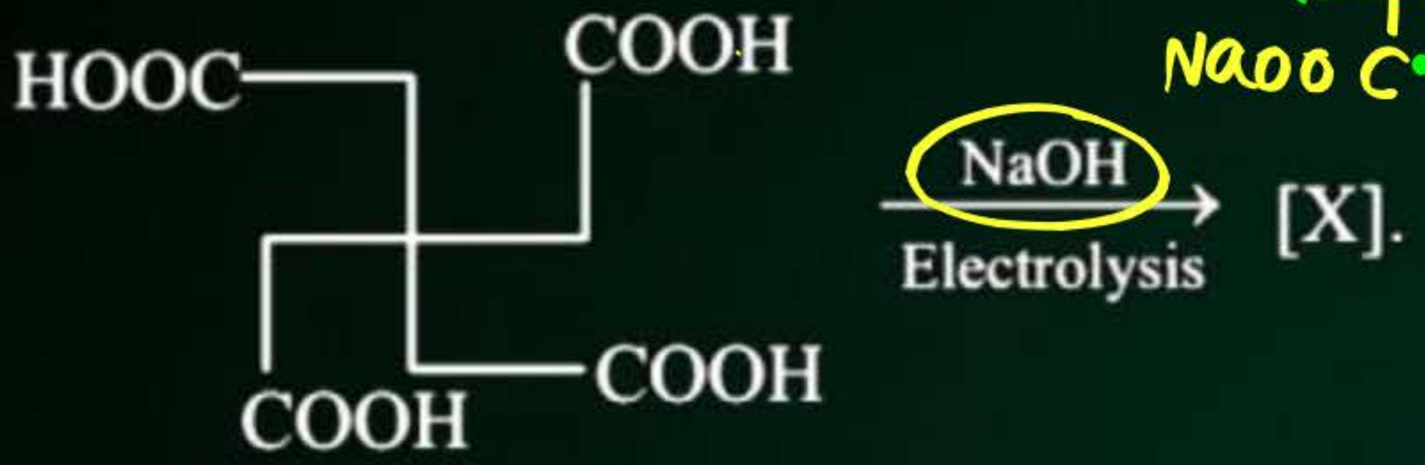
$$SiC \xrightarrow{H_2O} \text{NO Rxn}$$

Covalent

PSS

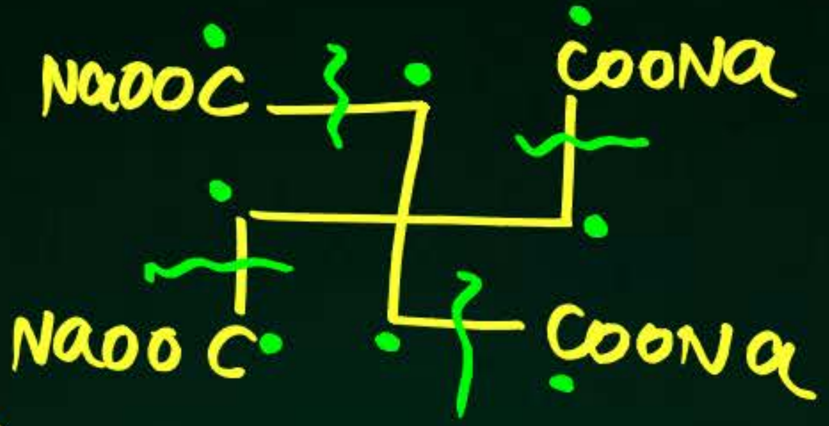

Sym alkene
Ⓐ
H_2+Cat
Terminal
Ⓑ
Alkyne
H_2+Cat
Zn(Hg)
conc HCl
O
H Ⓗ
Aldehyde
Ⓒ Alkyl Bromide
Br
Na/dry ether
Zn
frankland
Ⓓ
Zn/H+
(H_2)
Ⓔ
CH_3-CH_3
H_2+Ni
Ⓙ
CH≡CH
Alkyne
H_2O
Ⓚ
CaC_2
Carbide
electro
Ⓕ Sodium salt
COONa
NaOH, CaO
Δ
Ⓖ optically Active Carboxylic Acid
*
COOH
N_2H_4/$\bar{O}H$
OH, OH, Δ
Ⓘ
Ketone
O
Ⓛ Gilman reagent
$(CH_3CH_2)_2CuLi$
Ⓒ
Br

QUESTION

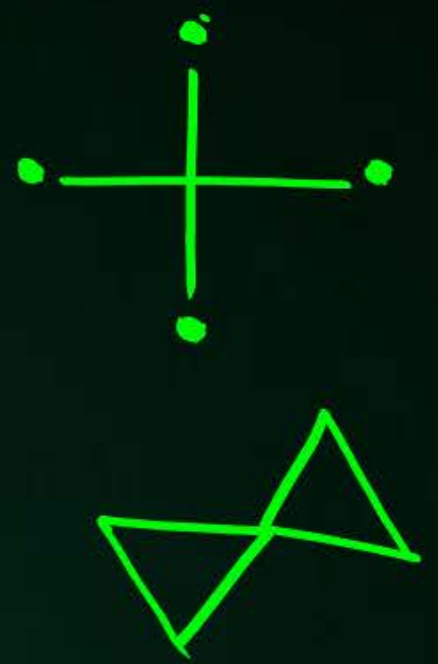


HOOC
COOH
COOH
COOH
NaOH
Electrolysis
[X].

Identify (X).



NaOOC
COONa
NaOOC
COONa



QUESTION

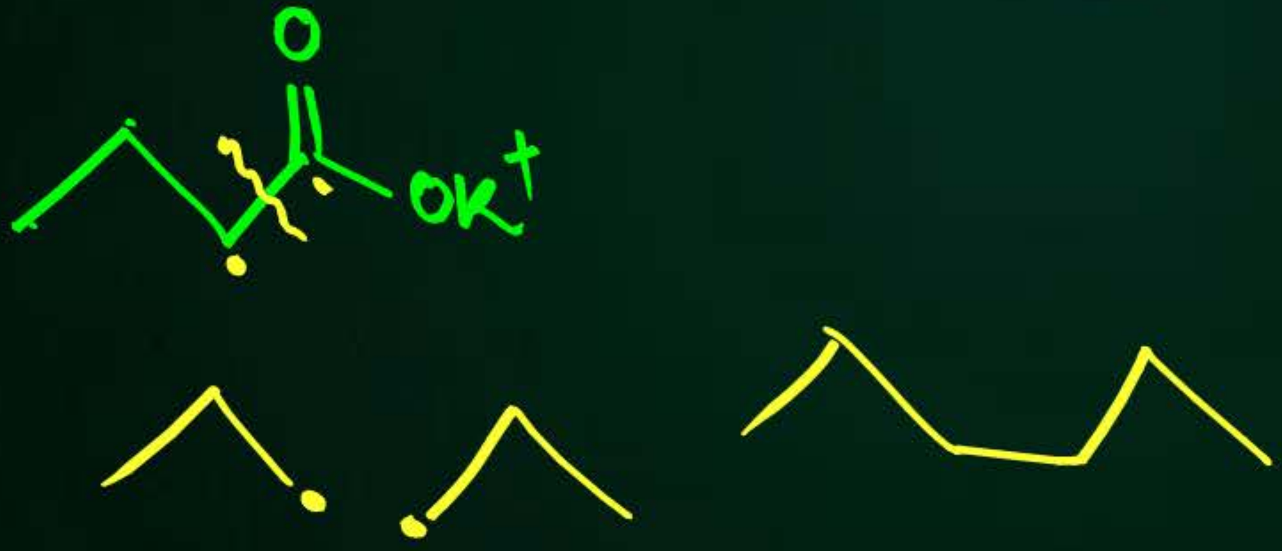
Kolbe's synthesis of sodium salt of butanoic acid gives:

[✓ (A)] n-hexane

(B) iso-butane

(C) n-butane

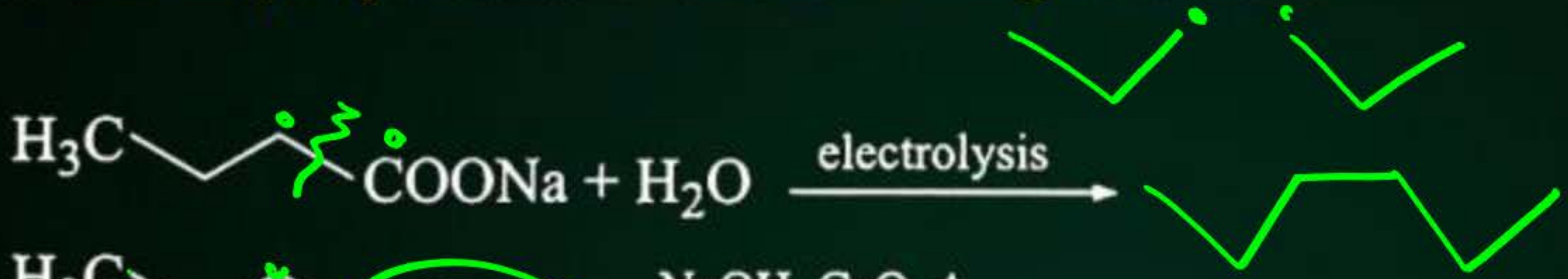
(D) propane



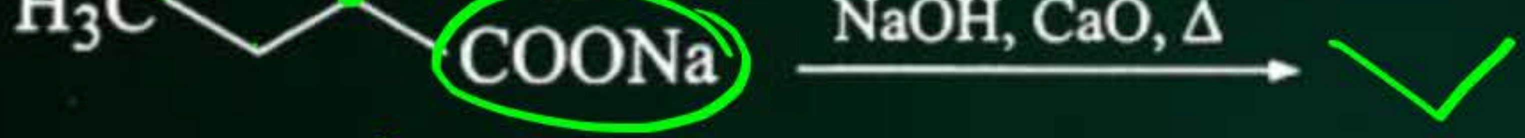
QUESTION

Write the major product of the following reactions.

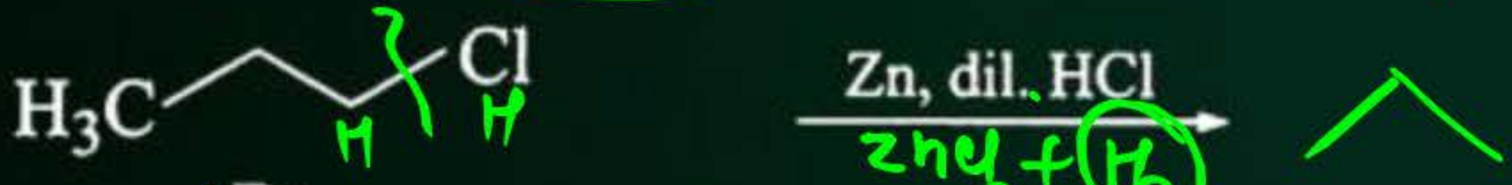
A


H3C
COONa + H2O
electrolysis

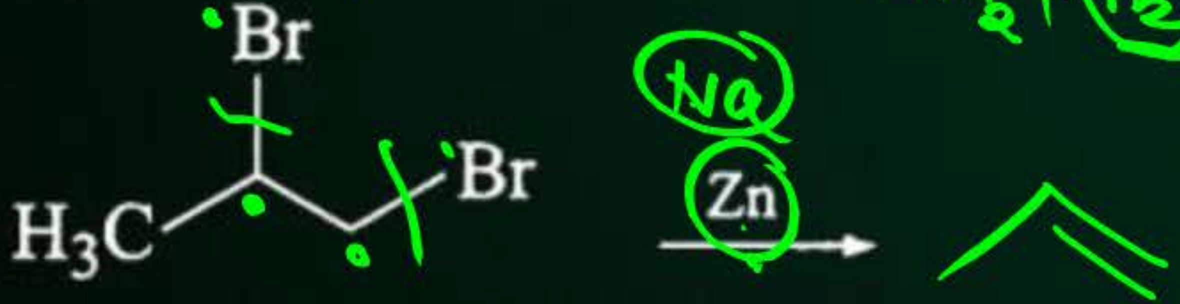
B


H3C
COONa
NaOH, CaO, Δ

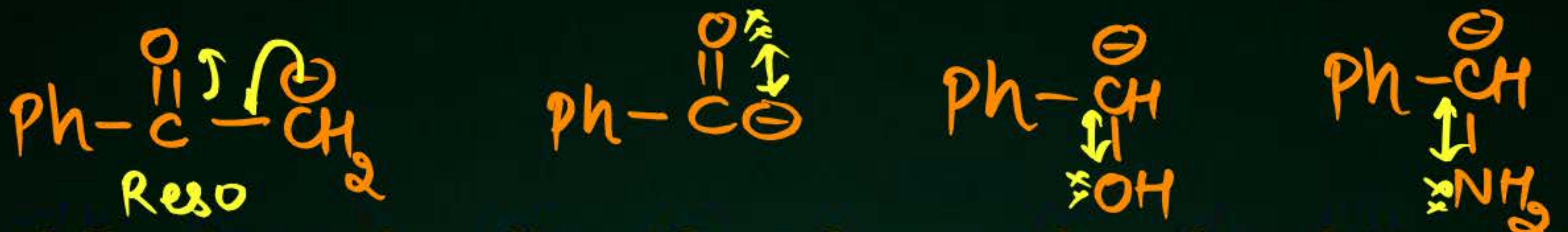
C


H3C
Cl
H
H
Zn, dil. HCl
ZnCl2 + H2

D


Br
Br
H3C
Na
Zn

QUESTION

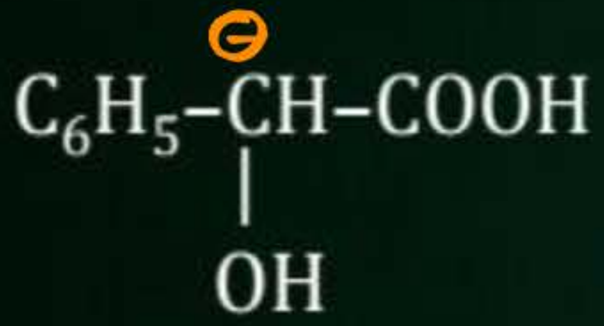


Which of the following carboxylic acids undergoes decarboxylation easily?

[✓ (A)] $C_6H_5CO\overset{\ominus}{C}H_2COOH$

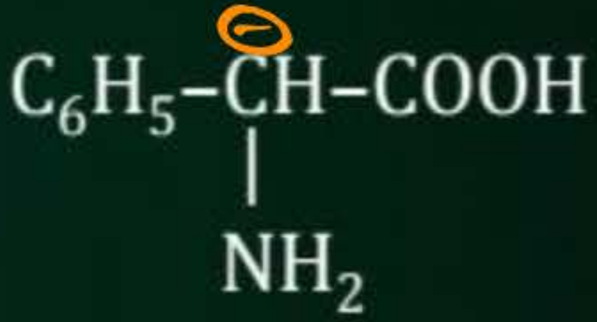
(B) $C_6H_5\overset{\ominus}{C}OCOOH$

(C)



$C_6H_5-\overset{\ominus}{C}H(OH)-COOH$

(D)



$C_6H_5-\overset{\ominus}{C}H(NH_2)-COOH$

QUESTION

Which of the following statement is correct regarding Kolbe electrolytic process?

✓ I. Alkane containing even number of carbon atoms are prepared.

✓ II. Sodium or potassium salt of carboxylic acid are taken as substrate.

✗ III. H_2 gas is deposited at anode. ✗

[✓ A] I and II

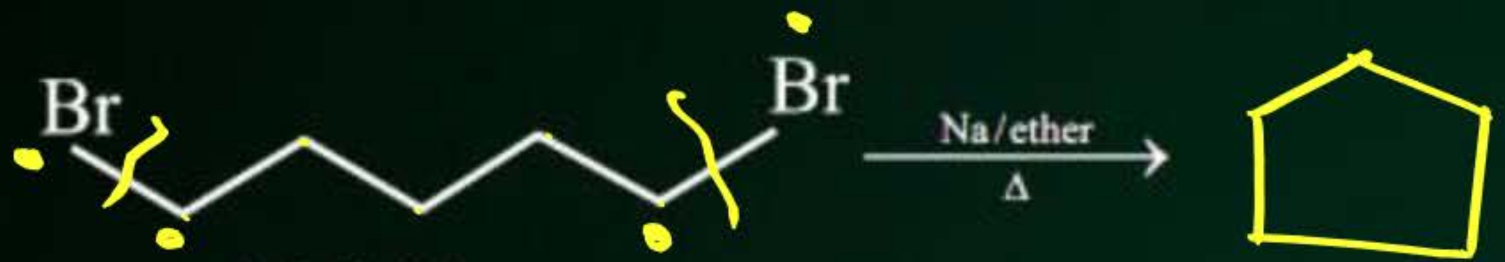
B II and III

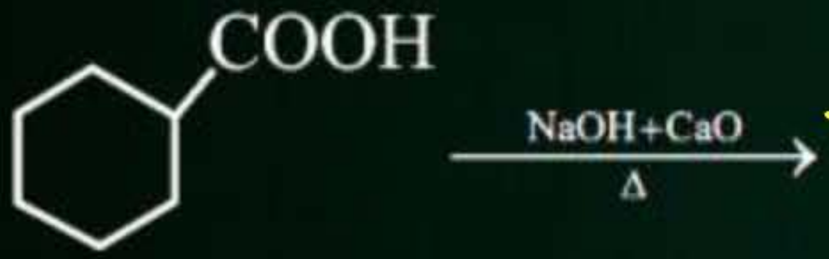
C I and III

D All of the above

QUESTION

Write product of following reactions.

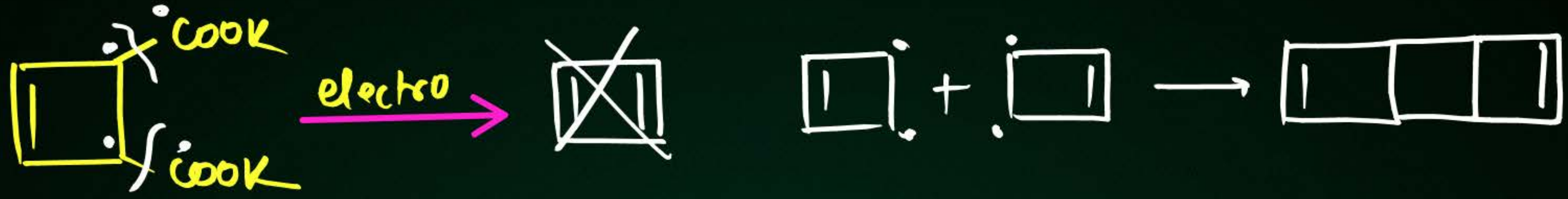

Br
Br
Na/ether
Δ


COOH
NaOH+CaO
Δ

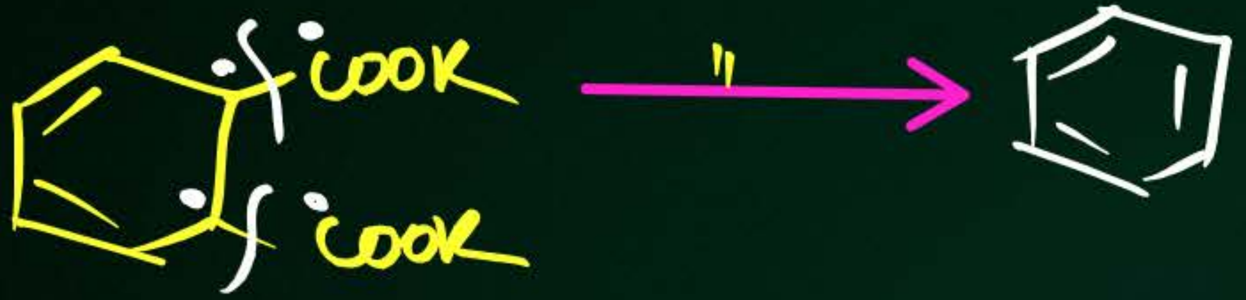
Thodiderbad

Q/

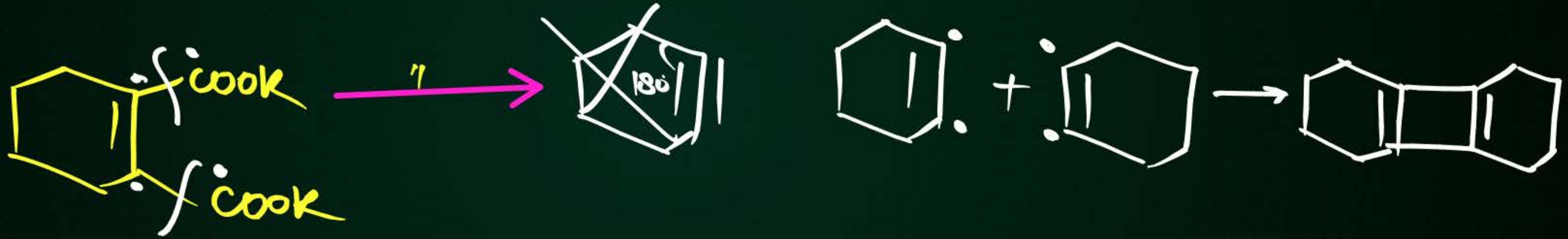
1)


COOK
COOK
electro

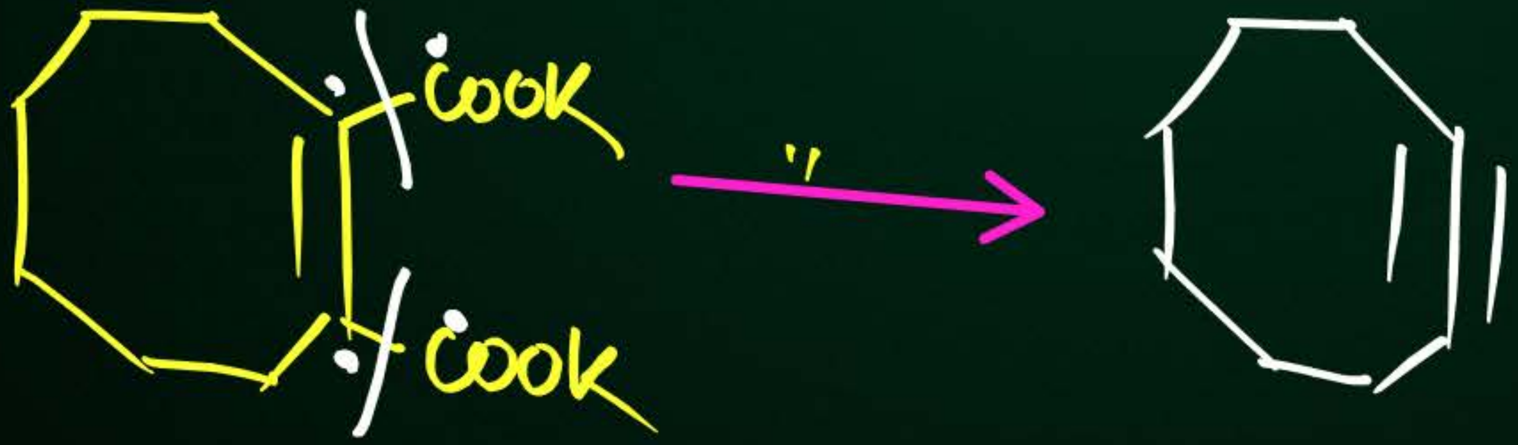
2)



3)


COOK
COOK
"
180°

4)



Home Work

QUESTION 01

When sodium acetate is heated with soda lime, the reaction is called:

Ⓐ Dehydration

Ⓑ Decarboxylation

Ⓒ Dehydrogenation

Ⓓ Dehydrohalogenation

QUESTION 02

The gases liberated at anode in the Kolbe's electrolysis of sodium acetate are:

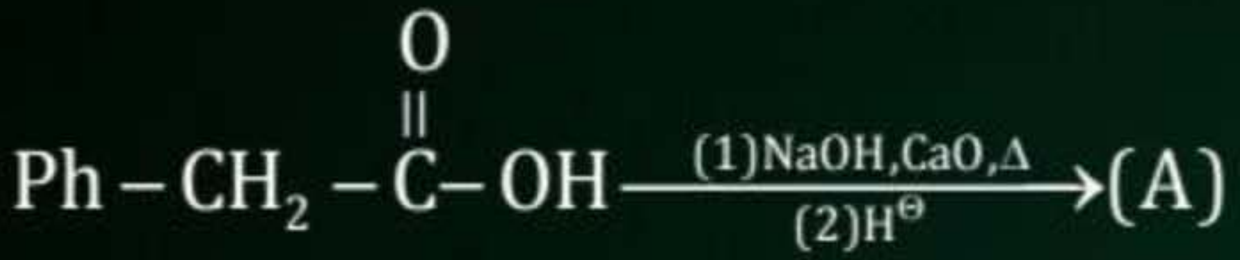
A CO_2 & H_2

B C_2H_6 & CO_2

C H_2 & C_2H_6

D H_2 & O_2

QUESTION 03



$$\mathrm{Ph-CH_2-\overset{\overset{O}{\|}}{C}-OH \xrightarrow[(2)H^{\ominus}]{(1)NaOH,CaO,\Delta} (A)}$$

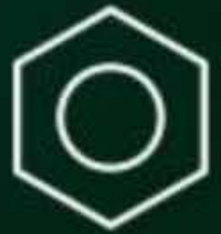
Product (A) is:

A $Ph-CO_2H$

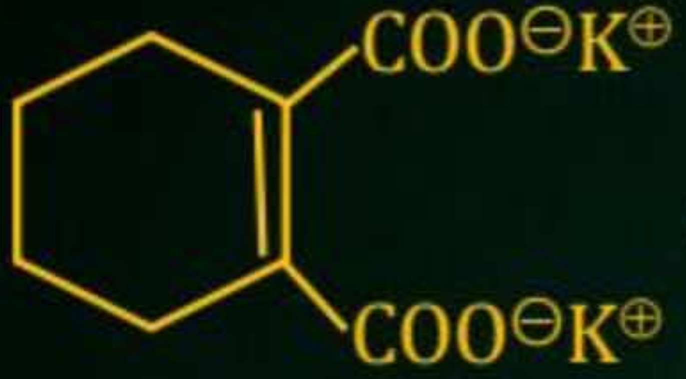
B $Ph-CH_2-OH$

C $Ph-CH_3$

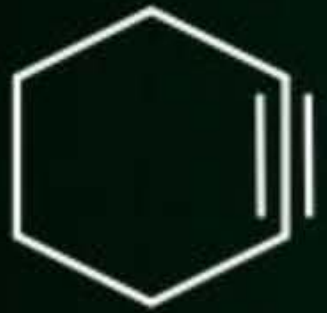
D

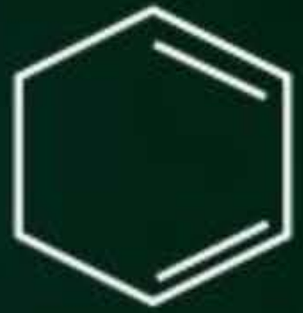


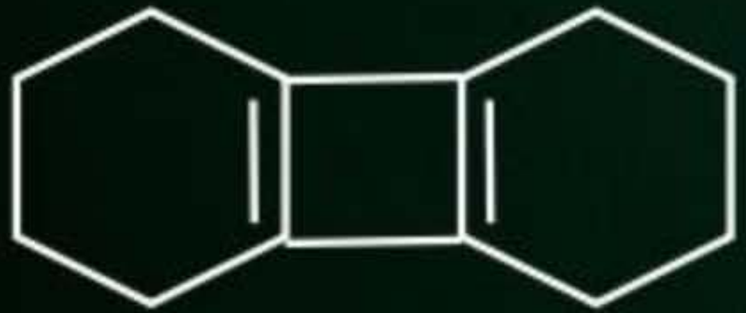
QUESTION 04



$\xrightarrow{\text{Electrolysis}}$ product:

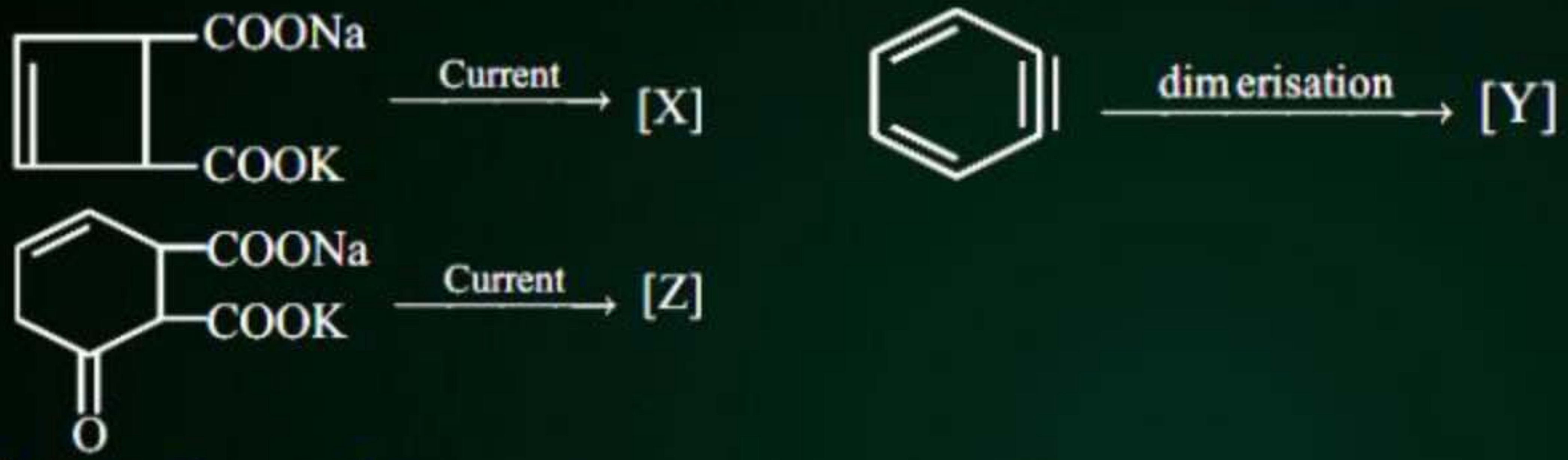
Ⓐ 

Ⓑ 

Ⓒ 

Ⓓ None of these

QUESTION 05


COONa
COOK
Current
[X]
dimerisation
[Y]
COONa
COOK
O
Current
[Z]

Aromatic products are:

- (A) All
- (B) Y & Z
- (C) X & Y
- (D) Z

QUESTION 06

Pure methane can be prepared by:

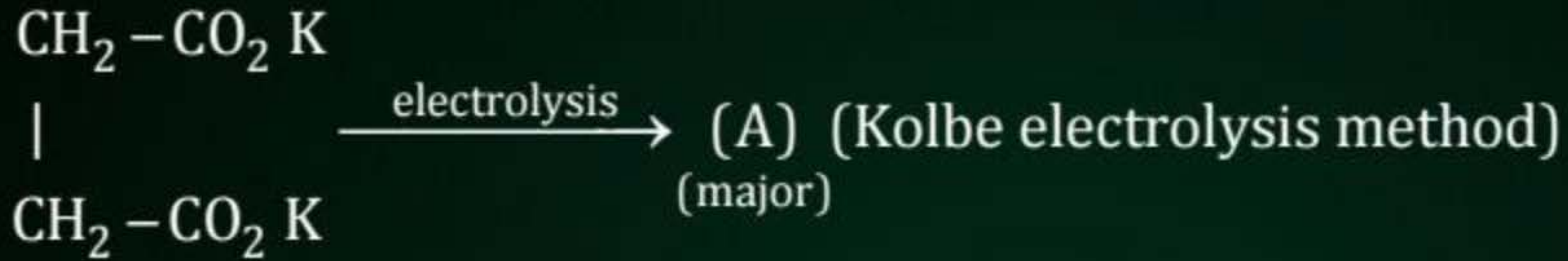
(A) Wurtz reaction

(B) Kolbe electrolysis method

(C) soda-lime de-carboxylation

(D) reduction with H_2

QUESTION 07



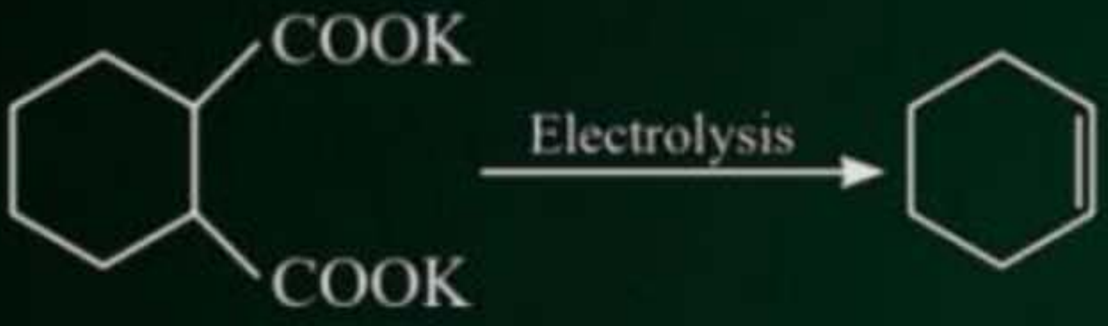
$$\begin{array}{l} CH_2-CO_2K \\ | \\ CH_2-CO_2K \end{array} \xrightarrow{\text{electrolysis}} \underset{\text{(major)}}{(A)} \text{ (Kolbe electrolysis method)}$$

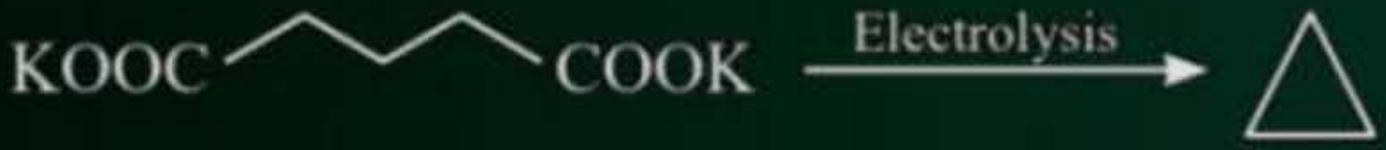
Product (A) of the reaction is:

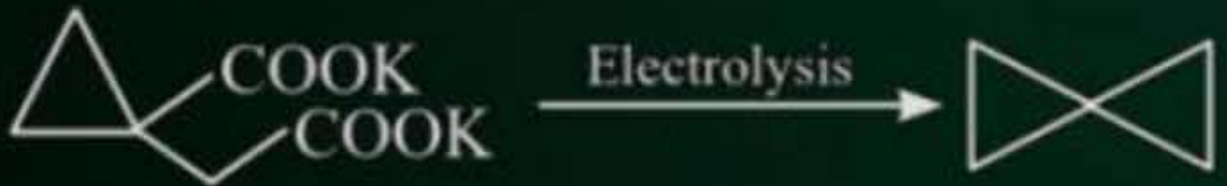
- **A** CH_3-CH_3
- **B** $CH_2=CH_2$
- **C** $CH_3-CH=CH_2$
- **D** None of these

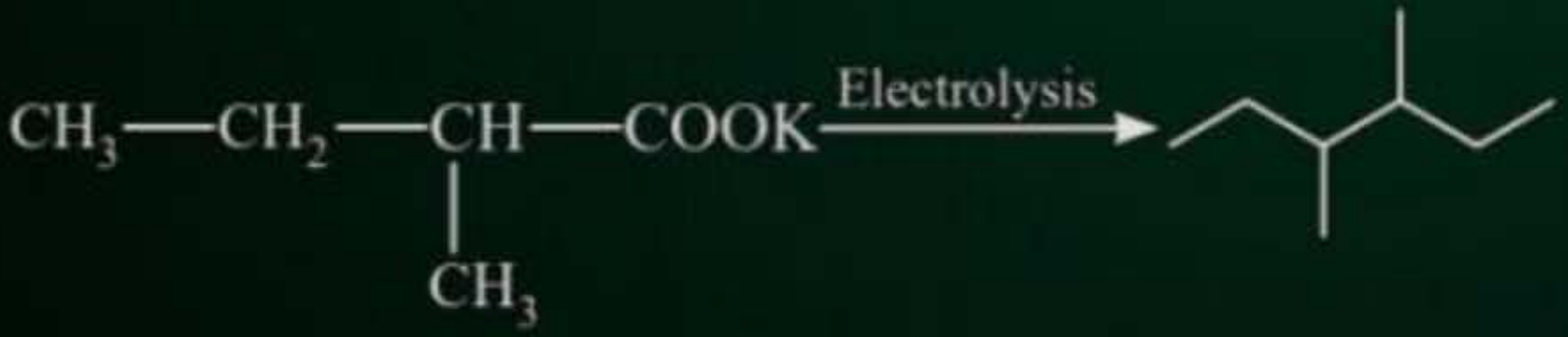
QUESTION 08

In which of the following reaction, the Kolbe's electrolysis product is incorrectly mentioned?

A

COOK
COOK
Electrolysis

B

KOOC
COOK
Electrolysis

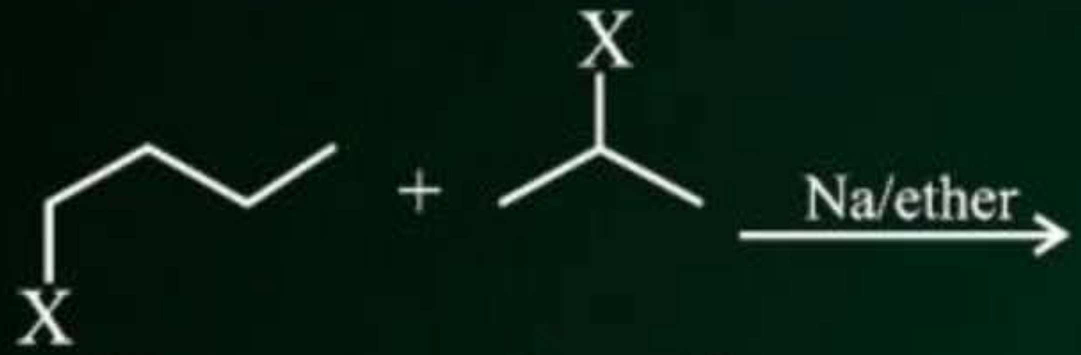
C

COOK
COOK
Electrolysis

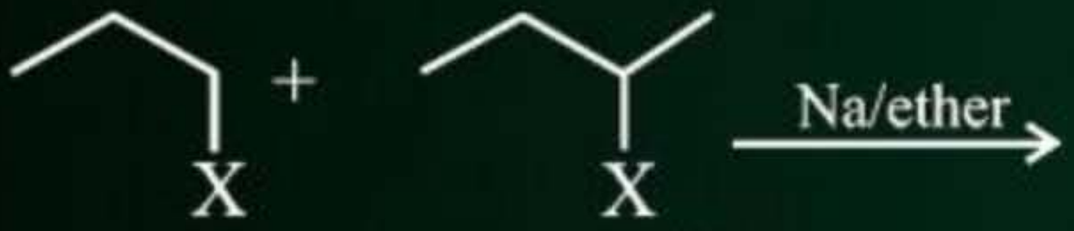
D

Electrolysis

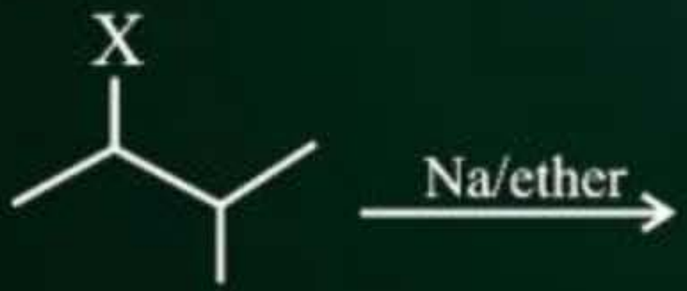
$$CH_3-CH_2-\underset{\substack{|\\ CH_3}}{CH}-COOK \xrightarrow{\text{Electrolysis}}$$

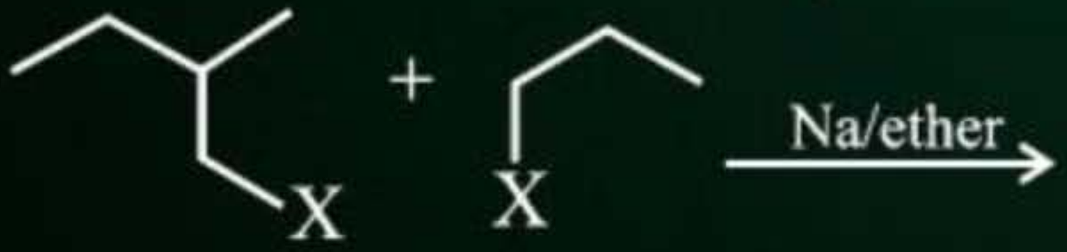
QUESTION 09

3-Methylhexane can be prepared by

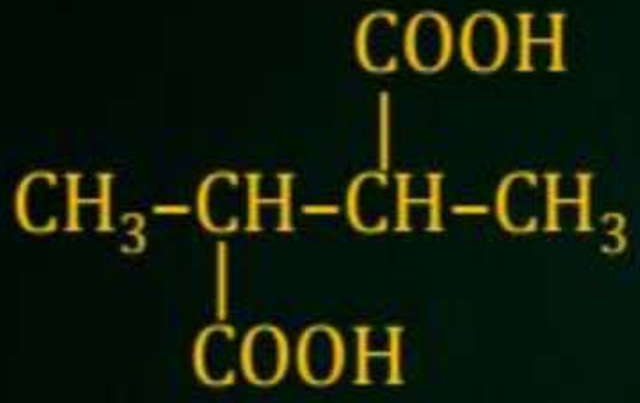
A 

B 

C H_3C-CH_2-X + 

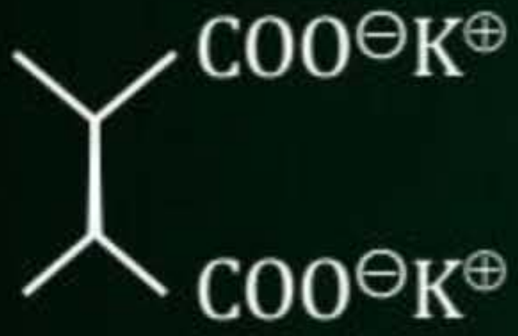
D 

QUESTION 10

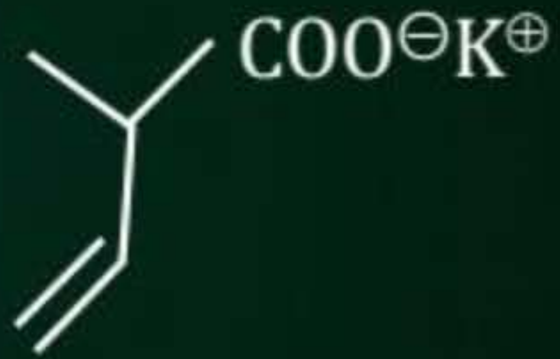


$$\mathrm{CH_3{-}\underset{\underset{COOH}{|}}{C}H{-}\overset{\overset{COOH}{|}}{C}H{-}CH_3} \xrightarrow[\text{Electrolysis}]{\text{KOH}} \text{Product:}$$

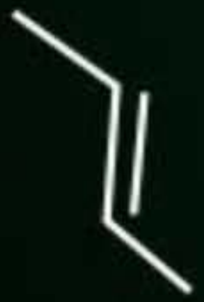
Ⓐ



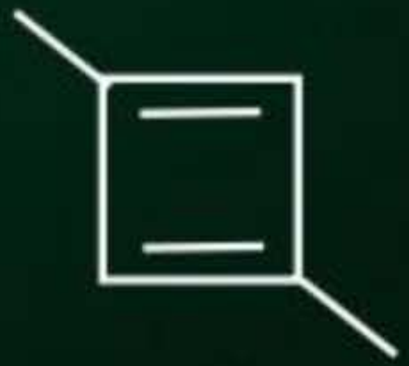
Ⓑ



Ⓒ



Ⓓ



ANSWER KEY

1. B
2. B
3. C
4. C
5. D
6. C
7. B
8. C
9. B
10. C

Home Work From PW Module (Yakeen NEET)

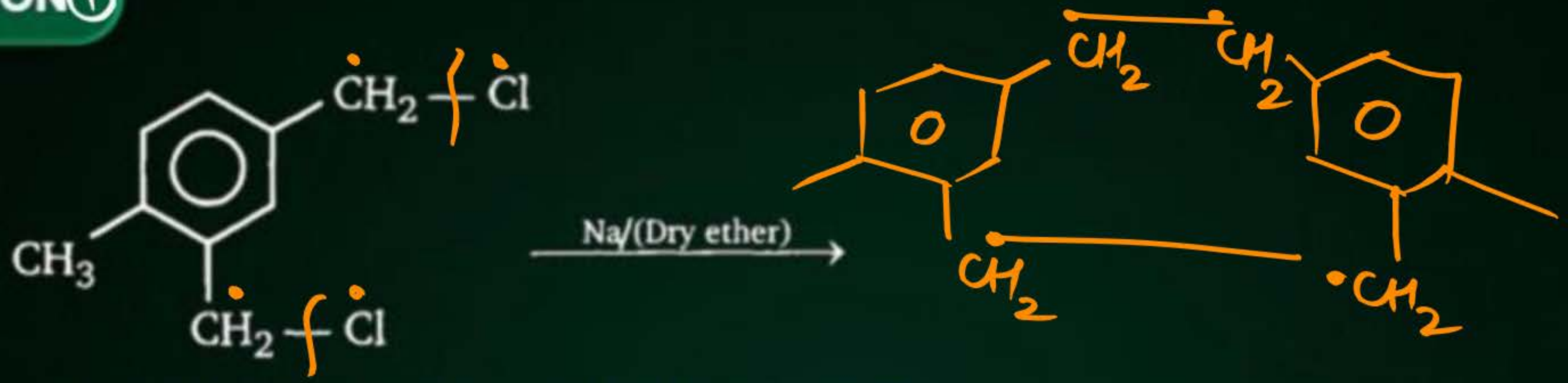
Prarambh: Q 01, 05, 06, 07, 18, 32, 33, 34, 36

Prabal: Q 10, 30, 33

Home Work

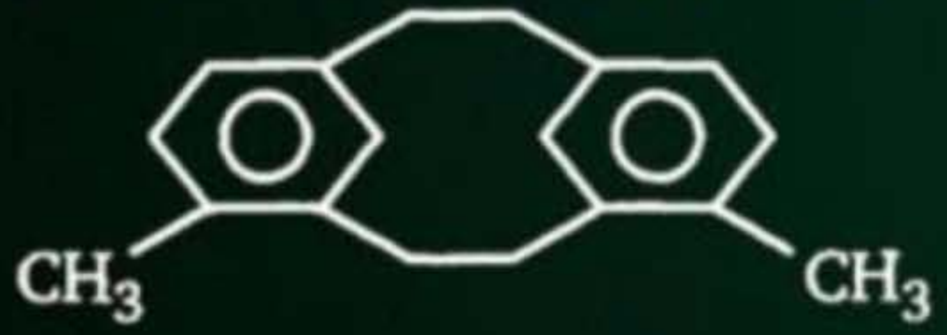
Discussion of L-01

QUESTION ①

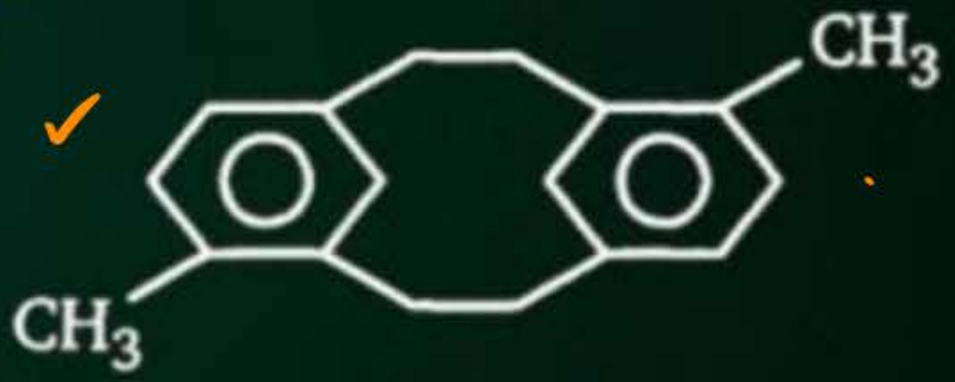

CH₂
Cl
CH₃
CH₂
Cl
Na/(Dry ether)
CH₂
CH₂
CH₂
CH₂

Product obtained in above Wurtz reaction is:

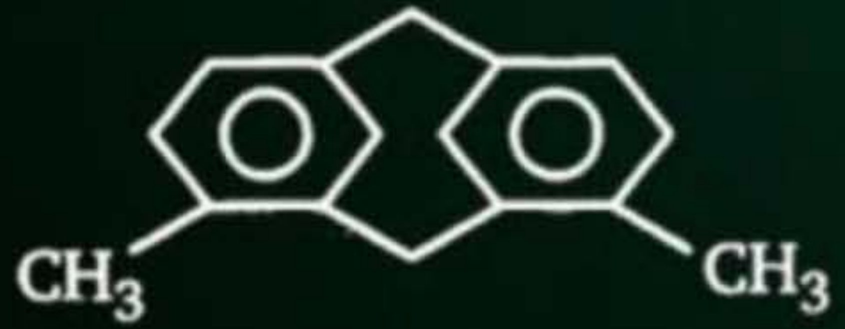
A ✓



B ✓



C



D ✓ Both (A) and (B)

QUESTION ②

Ethyl iodide and n-propyl iodide are allowed to undergo Wurtz reaction. The alkane which will not be obtained in this reaction is:

- (A) butane
- [✓ (B)] propane
- (C) pentane
- (D) hexane

$$C_2H_5-I + C_3H_7-I \longrightarrow$$

$$C_2H_5-C_2H_5 \quad C_2H_5-C_3H_7$$

$$C_3H_7-C_3H_7$$

QUESTION 03

Which of the following alkanes can be synthesisec in good yield by the Wurtz reaction?

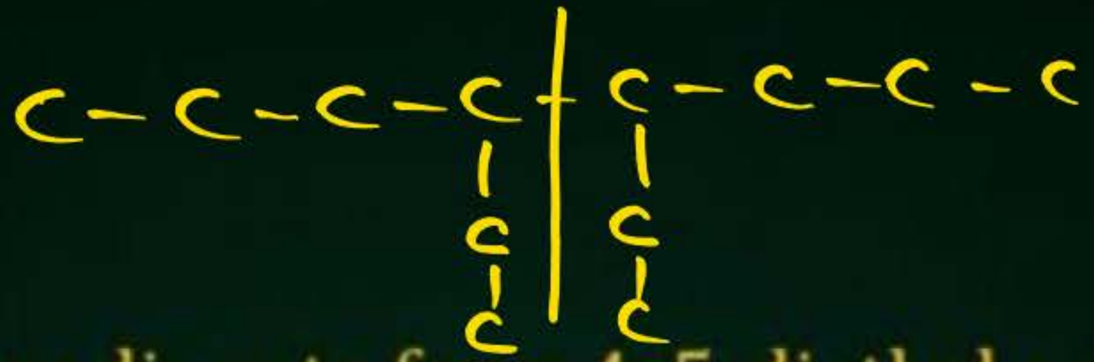
A $(CH_3)_2CH-CH_2-CH(CH_3)_2$

[✓ B] $\underbrace{(CH_3)_2CH-CH_2}\,|\,\underbrace{CH_2-CH(CH_3)_2}$

C $CH_3CH_2-C(CH_3)_2-CH_2CH_3$

D $(CH_3)_3C-CH_2-CH_2-CH_3$

QUESTION 04



An alkyl bromide reacts with sodium to form 4, 5-diethyl octane. The alkyl bromide is:

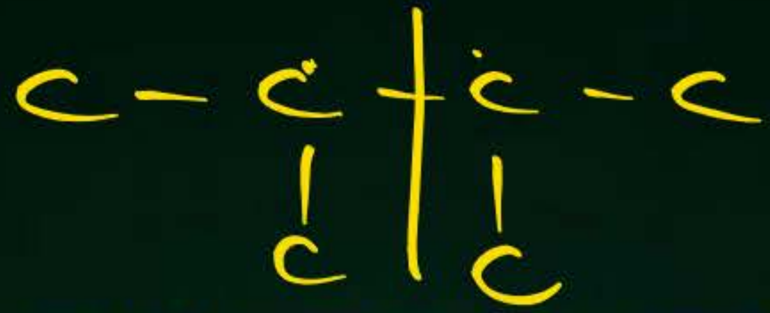
(A) $CH_3(CH_2)_2CH_2Br$

(B) $CH_3(CH_2)_4CH_2Br$

(C) $CH_3(CH_2)_3CHBrCH_3$

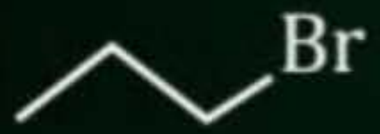
[✓ (D)] $CH_3(CH_2)_2\overset{3}{C}HBr\overset{2}{C}H_2\overset{1}{C}H_3$

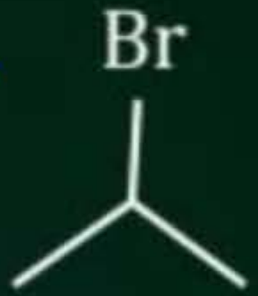
QUESTION 05



$C-\underset{C}{\underset{|}{C}}-\underset{C}{\underset{|}{C}}-C$

Which of the following alkyl bromides may be used for the synthesis of 2, 3-dimethyl butane by Wurtz reaction?

(A) 

[✓ (B)] 

(C) Isobutyl bromide

(D) *s*-butyl bromide

QUESTION ⑥ (AIIMS 2012)

Which one of the following cannot be prepared by Wurtz reaction?

- A [✓ CH_4]
- B C_2H_6
- C C_3H_8
- D C_4H_{10}

QUESTION 07

Assertion: Wurtz reaction is not preferred for the preparation of alkanes containing odd number of carbon atoms.

Reason: It is not possible to prepare alkanes with odd number of carbon atoms through Wurtz reaction.

(A) Both Assertion and Reason are correct and Reason is the correct explanation for Assertion.

(B) Both Assertion and Reason are correct but Reason is not the correct explanation for Assertion.

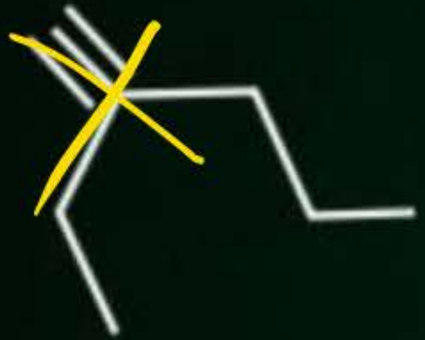
[✓ (C)] Assertion is correct but Reason is incorrect.

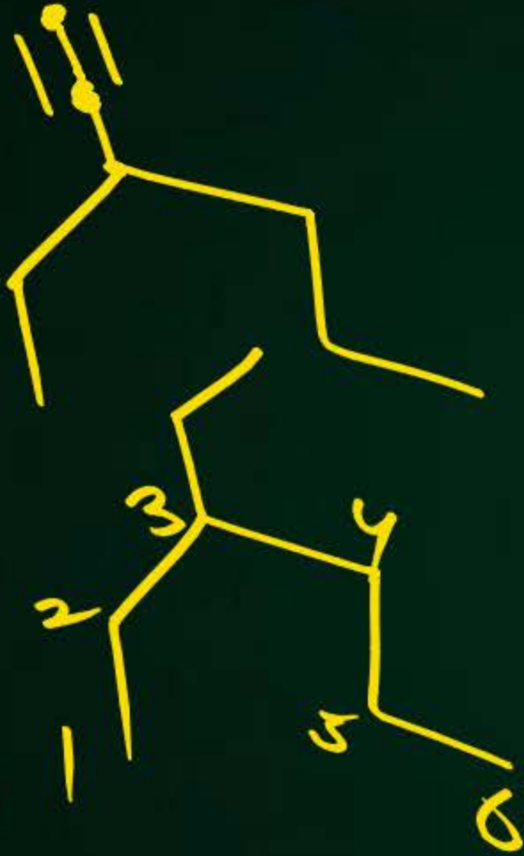
(D) Both Assertion and Reason are incorrect.

QUESTION 08

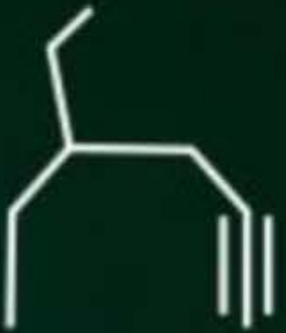
Which alkyne gives 3-ethyl hexane on catalytic hydrogenation?

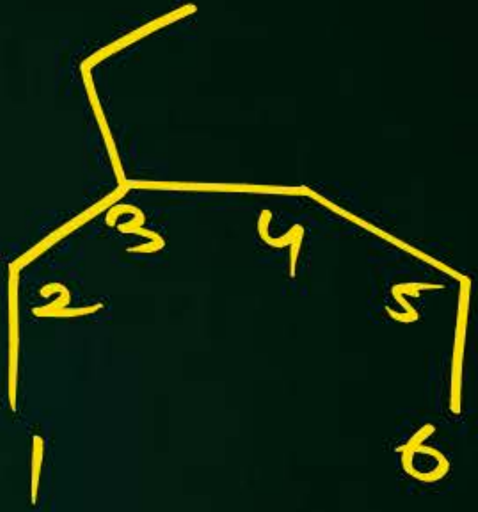
(A)





(B)

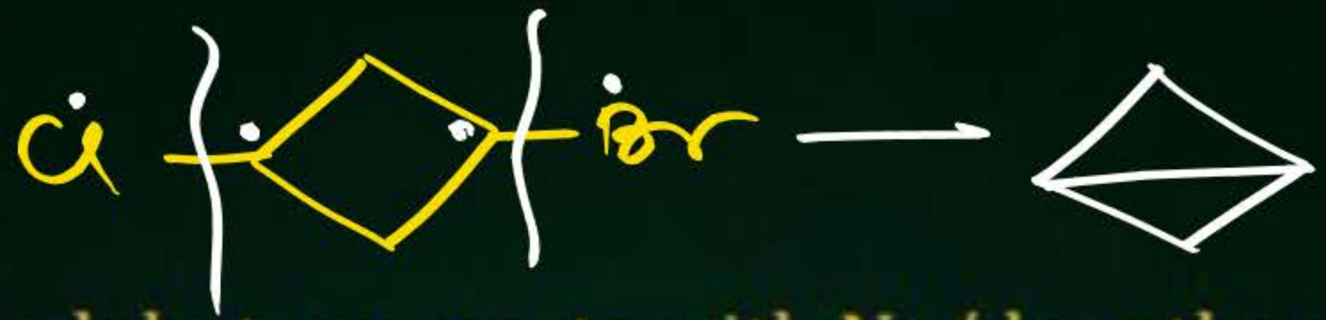




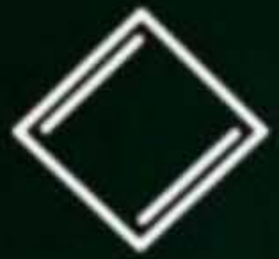
(C) [✓ Both (A) & (B)]

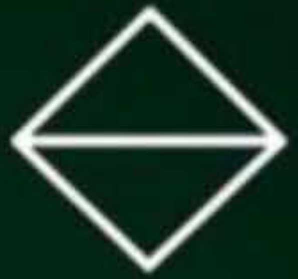
(D) None of these

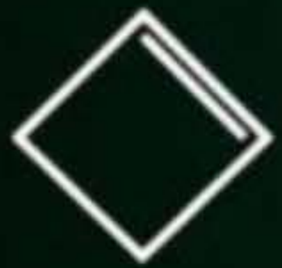
QUESTION 09

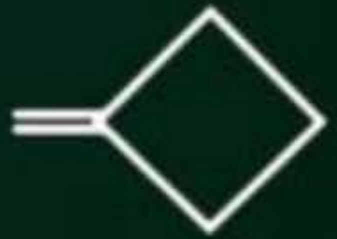


When 1-bromo-3-chloro Cyclobutane reacts with Na/dry ether then formed product is:

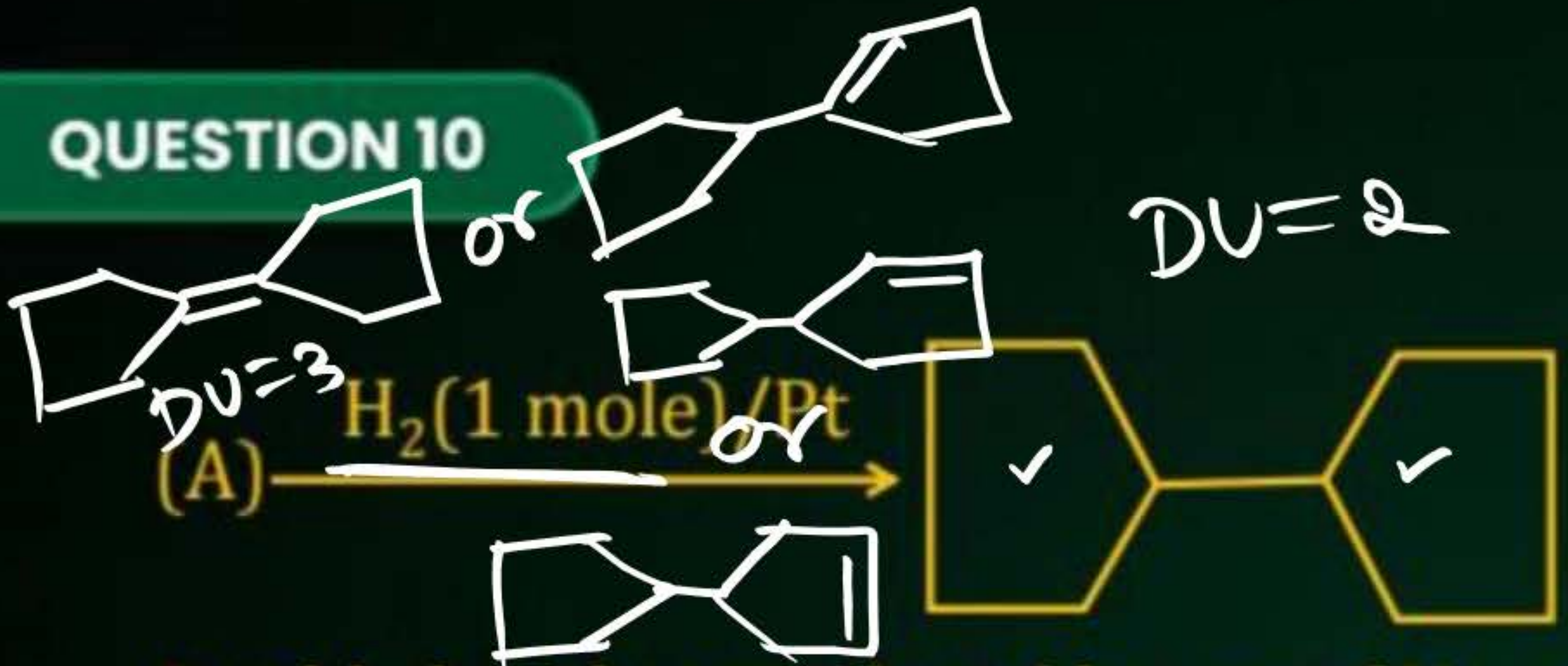
A


[✓ B]


C


D


QUESTION 10


or
DU=3
(A)
H_2(1 mole)/Pt
or
DU=2
✓
✓

Double bond equivalent (degree of Unsaturation) of (A) is:

- A 1
- B 2
- C [✓ 3]
- D 4

ANSWER KEY

1. D
2. B
3. B
4. D
5. B
6. A
7. C
8. C
9. B
10. C

Thank you!!

YAKEEN 2.0

FOR NEET 2025

Lecture- 03 **Organic Chemistry**

HYDROCARBONS

By- Pankaj Sir(POPU MAMA)

Physics Wallah

Topics *to be covered*

1. Chemical Properties of Alkanes ✓
2. Practice

Chemical Properties of Alkanes

Maha imp.

Free radical substitution Rxn

1. Halogenation:

$$R-\boxed{H}\xrightarrow[h\nu]{X_2}R-\boxed{X}+H-X$$

$$R-\boxed{H+X}-X$$

Mech

$$CH_4 + Cl_2 \xrightarrow{h\nu} CH_3-Cl + HCl$$

① chain initiation

$$\dot{Cl} \wr \dot{Cl} \xrightarrow{h\nu} \dot{Cl} + \dot{Cl}$$

② Chain propogation

✓ a) $\dot{C}H_3 \wr \dot{H} + \dot{Cl} \xrightarrow[\text{or slow}]{R.D.S} \dot{C}H_3 + H-Cl$

✓ b) $\dot{Cl} \wr \dot{Cl} + \dot{C}H_3 \longrightarrow \boxed{CH_3-Cl} + \dot{Cl}$

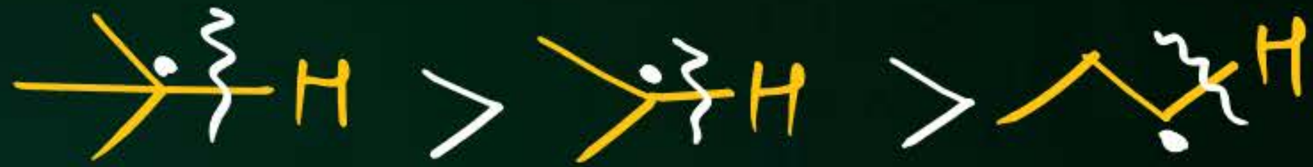
③ Chain Termination

$\dot{Cl} + \dot{Cl} \longrightarrow Cl-Cl$ $\quad$ $\dot{C}H_3 + \dot{Cl} \rightarrow CH_3-Cl$

$\dot{C}H_3 + \dot{C}H_3 \longrightarrow CH_3-CH_3$

OP Points

1. Radical formation
2. Formation of alkyl radical is RDS
3. No rearrangement
4. R.O.R for C-H 3° > 2° > 1°



5. R.O.R for X_2 ---- $\boxed{F_2 > Cl_2 > Br_2 > I_2}$
6. Maximum amount of R-X is formed in chain propagation step.
7. Fluorination- It is highly exothermic & uncontrolled Reaction.
8. Iodination-It takes place only when Oxidizing agent like HIO_3, HNO_3

$$R-H + I_2 \rightleftharpoons R-I + \boxed{HI}$$ good reducing agent

$$HI + HIO_3 \longrightarrow I_2 + H_2O \qquad HI + HNO_3 \rightarrow I_2 + NO_2 + H_2O$$

9. Radical reaction involves

A. Initiation ✓ B. Propagation ✓ C. Termination ✓

10. Radical reaction can be slow down by adding O_2, S_2 or any other peroxide.

$$\dot{R} + \dot{O}-\dot{O} \longrightarrow R-O-\dot{O}$$

$\dot{O}\pm\dot{O}$ $\dot{S}\pm\dot{S}$ $R-\dot{O}\wr\dot{O}-R$

Papa ↑ mummy ↑

Reactivity ($Cl_2 > Br_2$)

11. Chlorination is more reactive less selective.

r_p = r.o.r at 1° (C) r.o.r $r_p : r_s : r_t = 1 : 3.8 : 5$

r_s = " " 2° (C)

r_t = " " 3° (C)

Bromination is more selective less reactive.

r.o.r $r_p : r_s : r_t = 1 : 82 : 1600$

$$\underset{(Excess)}{CH_4 + Cl_2} \xrightarrow{h\nu} CH_3-Cl \xrightarrow{Cl_2} CH_2Cl_2 \xrightarrow{Cl_2} CHCl_3 \xrightarrow{Cl_2} CCl_4$$

12. For good yield of R-X we have to take R-H in excess. If X_2 is used in excess then fully halogenated product is obtained.

$$\underset{(Excess)}{R-H} + X_2 \xrightarrow{h\nu} \boxed{R-X} + HX$$

How to find total number of monohalogenated products

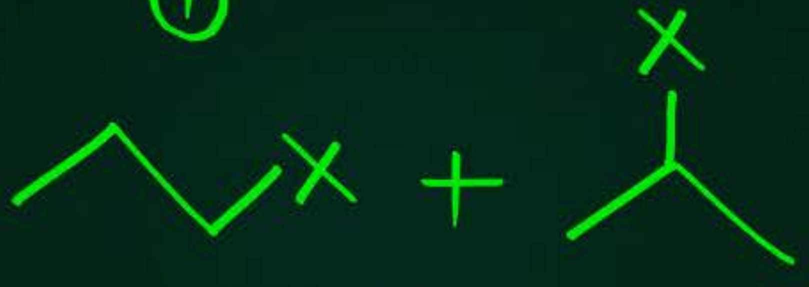
$\rightarrow CH_4 \xrightarrow[h\nu]{X_2} CH_3-X$

①

$CH_3-\overset{\swarrow}{CH_3} \longrightarrow CH_3-CH_2-X$

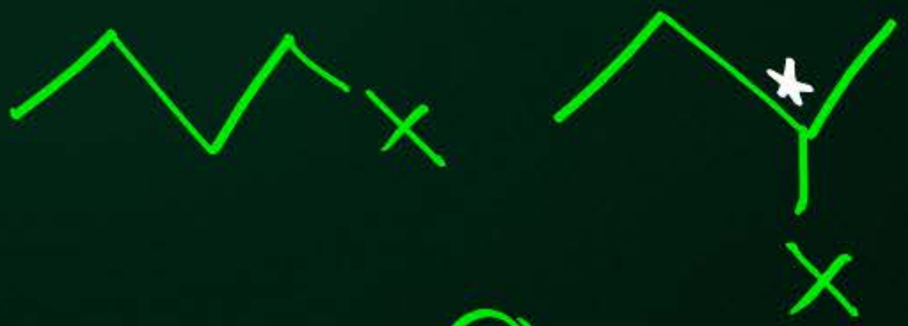
①

$CH_3-\overset{\swarrow}{CH_2}-\overset{\swarrow}{CH_3} \longrightarrow$



②

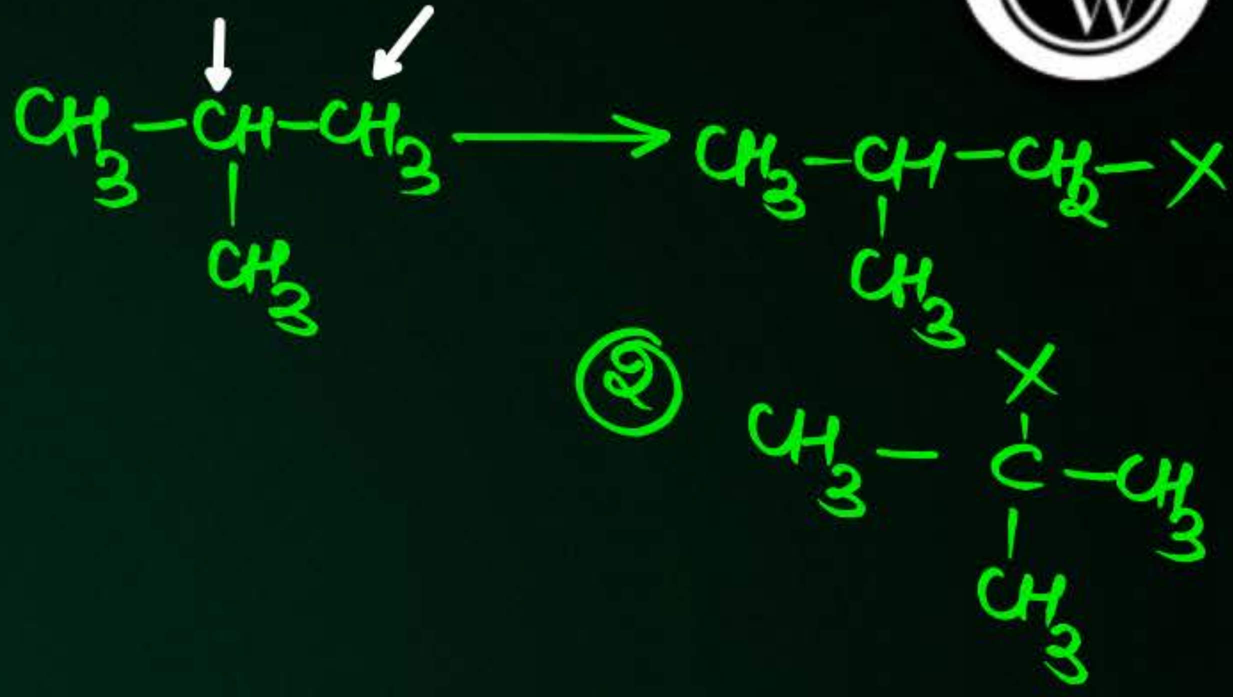
$CH_3-CH_2-\overset{\swarrow}{CH_2}-\overset{\swarrow}{CH_3} \longrightarrow$



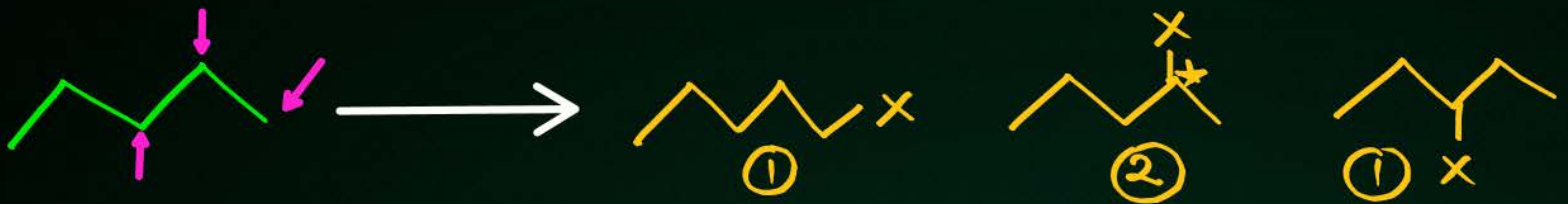
②

Including stereo

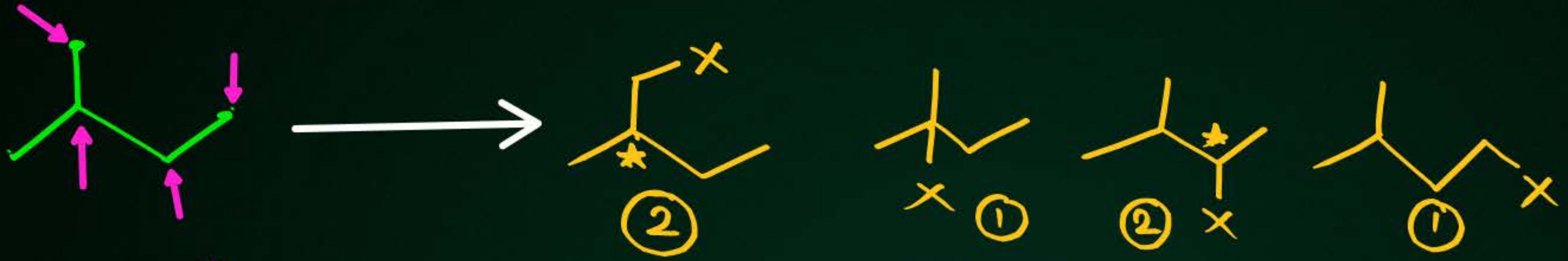
③


CH3-CH-CH3
CH3
CH3-CH-CH2-X
CH3
X
CH3-C-CH3
CH3

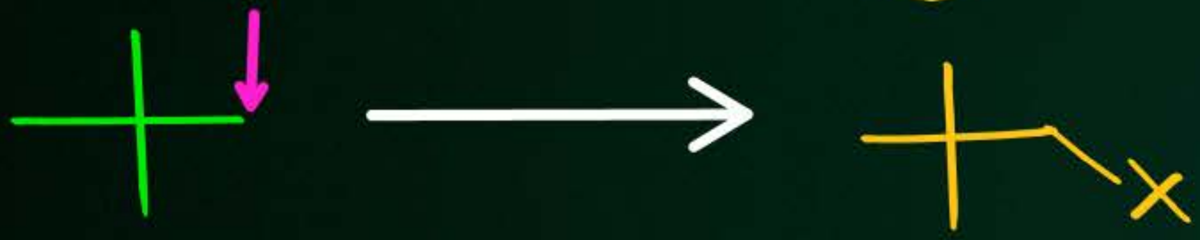
②



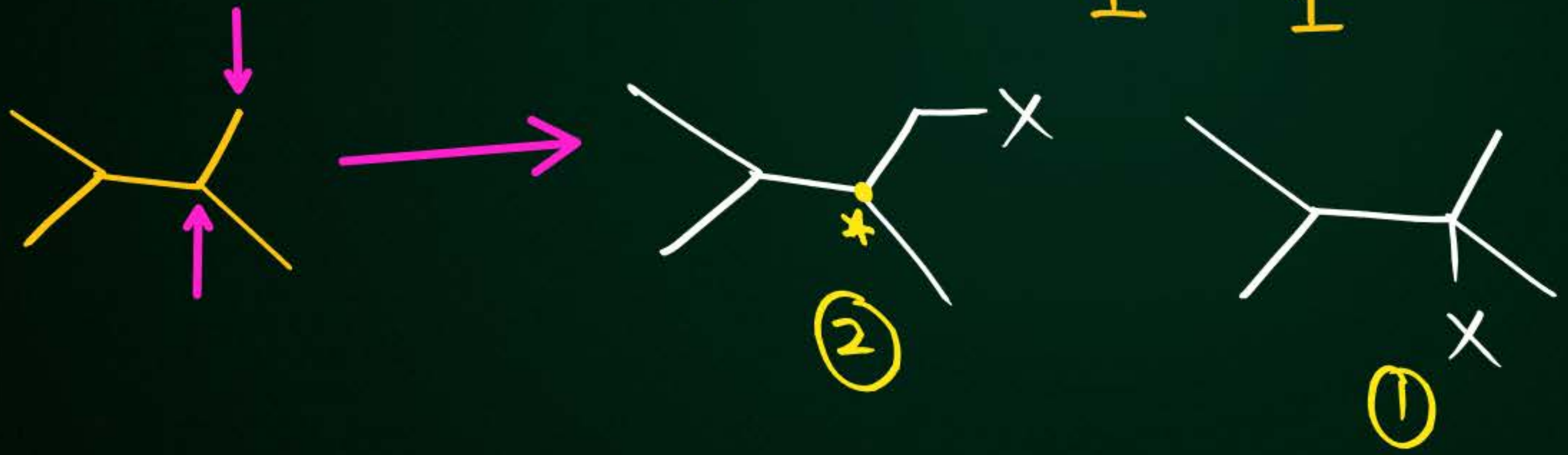
E.S	I.S
3	4



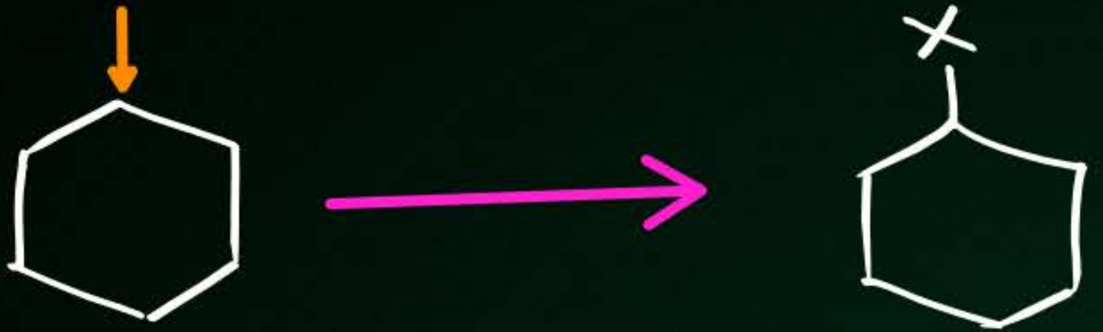
E.S	I.S
4	6



E.S	I.S
1	1



E.S	I.S
2	3

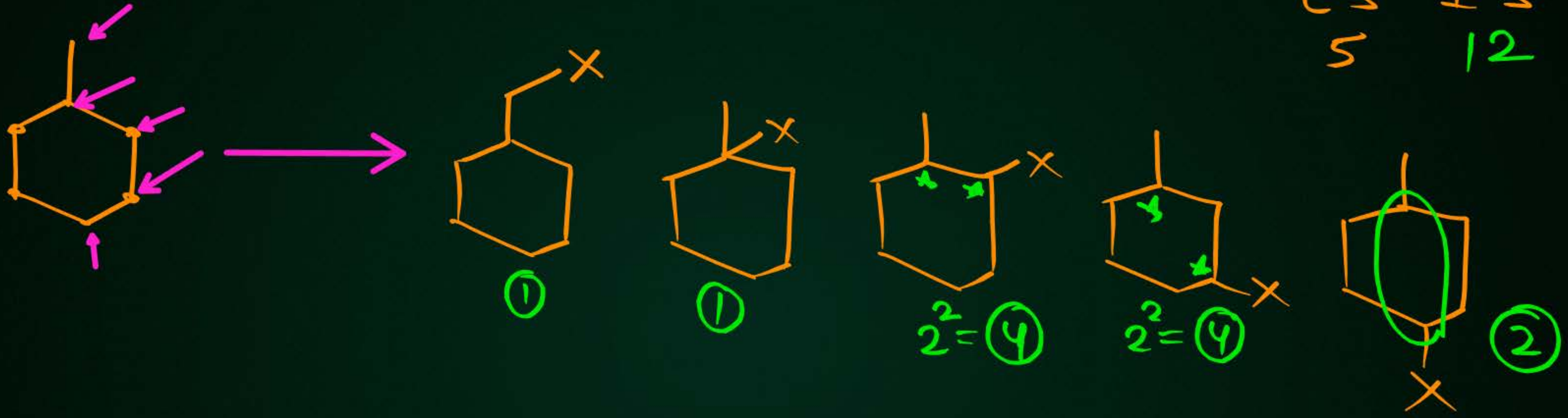


E·S I·S

1 1

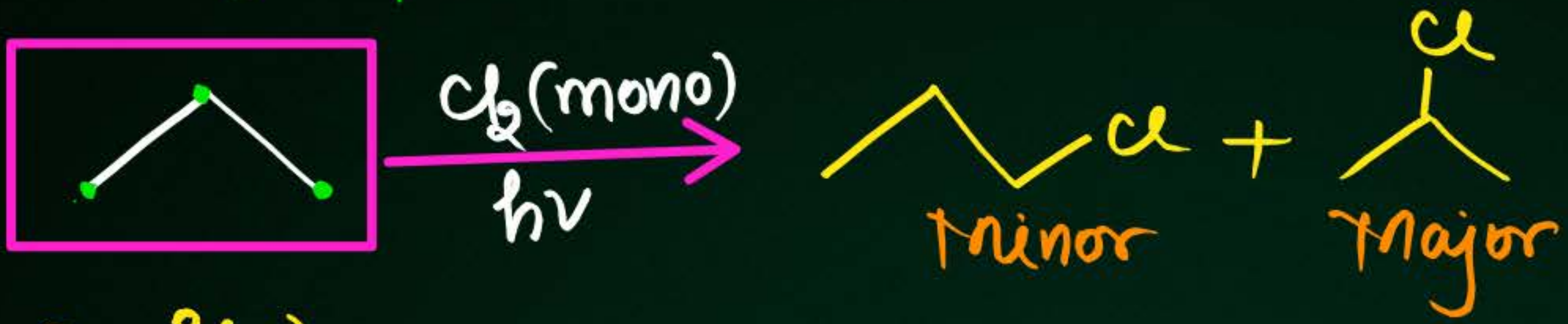
E·S I·S

5 12


X
X
X
X
X
①
①
2² = ④
2² = ④
②

How to major product in chlorination & Bromination

$r_p : r_s : r_t = 1 : 3.8 : 5$ (Cl)
$= 1 : 82 : 1600$ (Br)


Cl_2(mono)
hν
Cl
Cl
Minor
Major

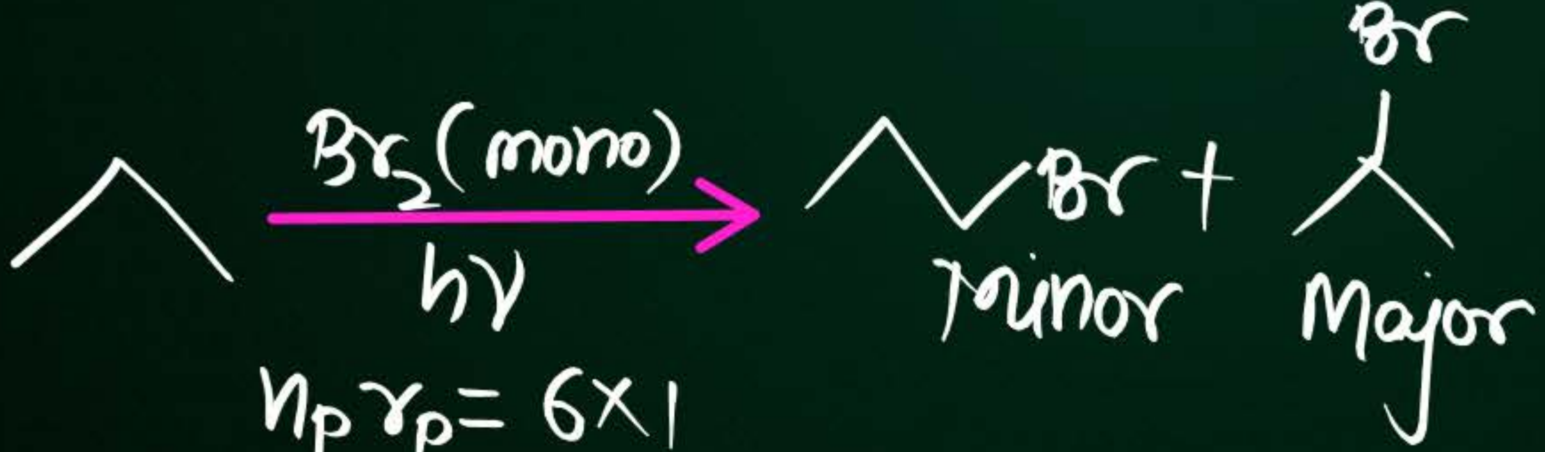
NO. of 1°(H) $n_p = 6$ $n_p r_p = 6 \times 1$

NO. of 2°(H) $n_s = 2$ $n_s r_s = 2 \times 3.8$ ✓

NO. of 3°(H) $n_t = 0$

major prod

$3° > 2° > 1°$


Br_2(mono)
hν
Br
Br
Minor
Major

$n_p r_p = 6 \times 1$

$n_s r_s = 2 \times 82$ ✓

formula for calculation of %

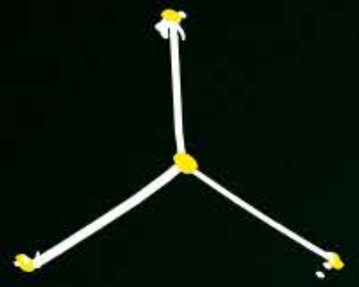
$$\% \, 1° = \frac{n_p r_p}{n_p r_p + n_s r_s + n_t r_t} \times 100$$

$$\% \, 2° = \frac{n_s r_s}{n_p r_p + n_s r_s + n_t r_t} \times 100$$

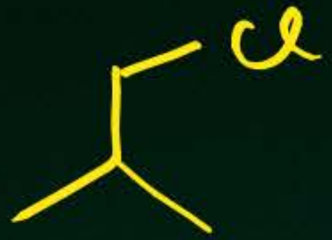
$$\% \, 3° = \frac{n_t r_t}{n_p r_p + n_s r_s + n_t r_t} \times 100$$

n_p = no of 1°(H)
n_s = " " 2°(H)
n_t = " " 3°(H)

r_p = r.o.r at 1°C
r_s = " " 2°C
r_t = " " 3°C



$\xrightarrow[h\nu]{Cl_2(\text{mono})}$ Major



$n_p = 9$ $n_p r_p = 9 \times 1$

$n_t = 1$ $n_t r_t = 1 \times 5$

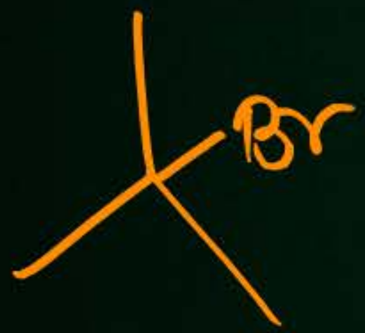
$\boxed{9 > 5}$

$r_p : r_s : r_t$

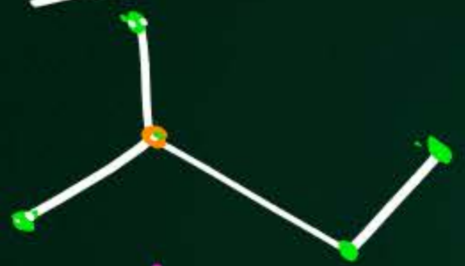
$= 1 : 3.8 : 5$

$\Big\downarrow \begin{matrix} Br_2(\text{mono}) \\ h\nu \end{matrix}$

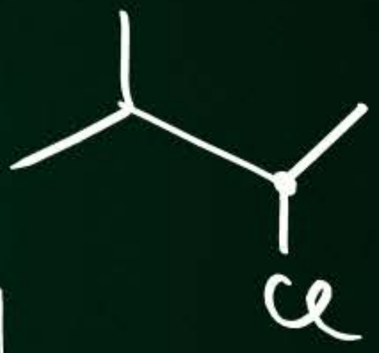
major



Q* $\underline{\text{M.S}}$



$\xrightarrow{Cl_2/h\nu}$ Major



$n_p = 6$ $n_p r_p = 6 \times 1$

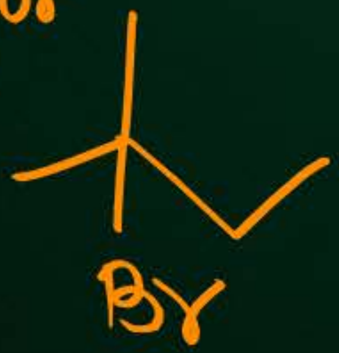
$n_p' = 3$ $n_p' r_p = 3 \times 1$

$n_s = 2$ $n_s r_s = 2 \times 3.8$ ✓

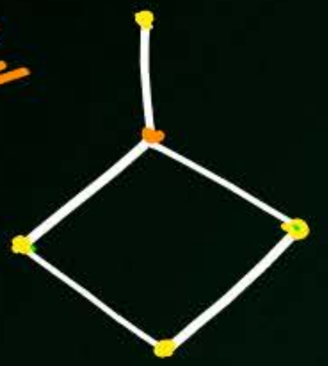
$n_t = 1$ $n_t r_t = 1 \times 5$

$\Big\downarrow Br_2/h\nu$

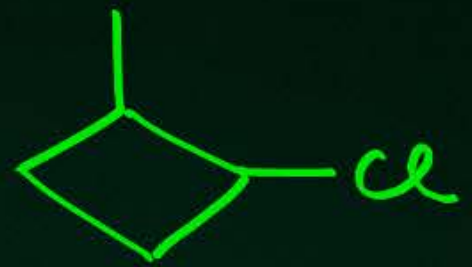
Major



Q M.S



$\xrightarrow{Cl_2/h\nu}$ Major



✓ $n_p = 3$ $n_p r_p = 3\times1$

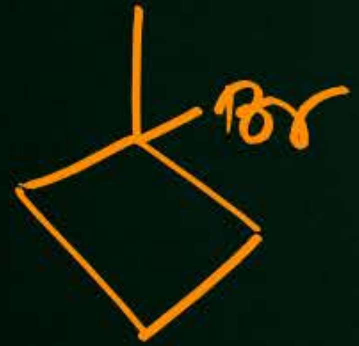
✓ $n_s = 4$ $n_s r_s = 4\times3.8$ ✓

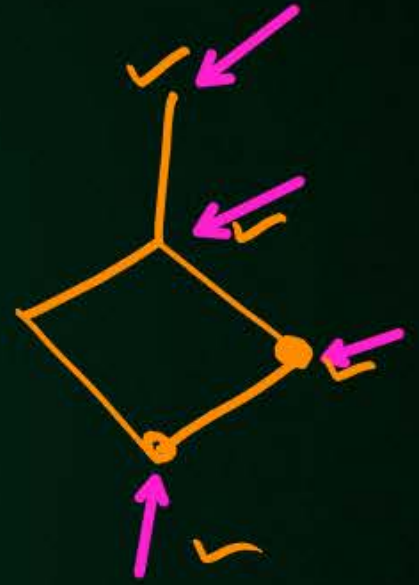
✓ $n'_s = 2$ $n'_s r_s = 2\times3.8$

✓ $n_t = 1$ $n_t r_t = 1\times5$

$\downarrow$ Br_2 $h\nu$

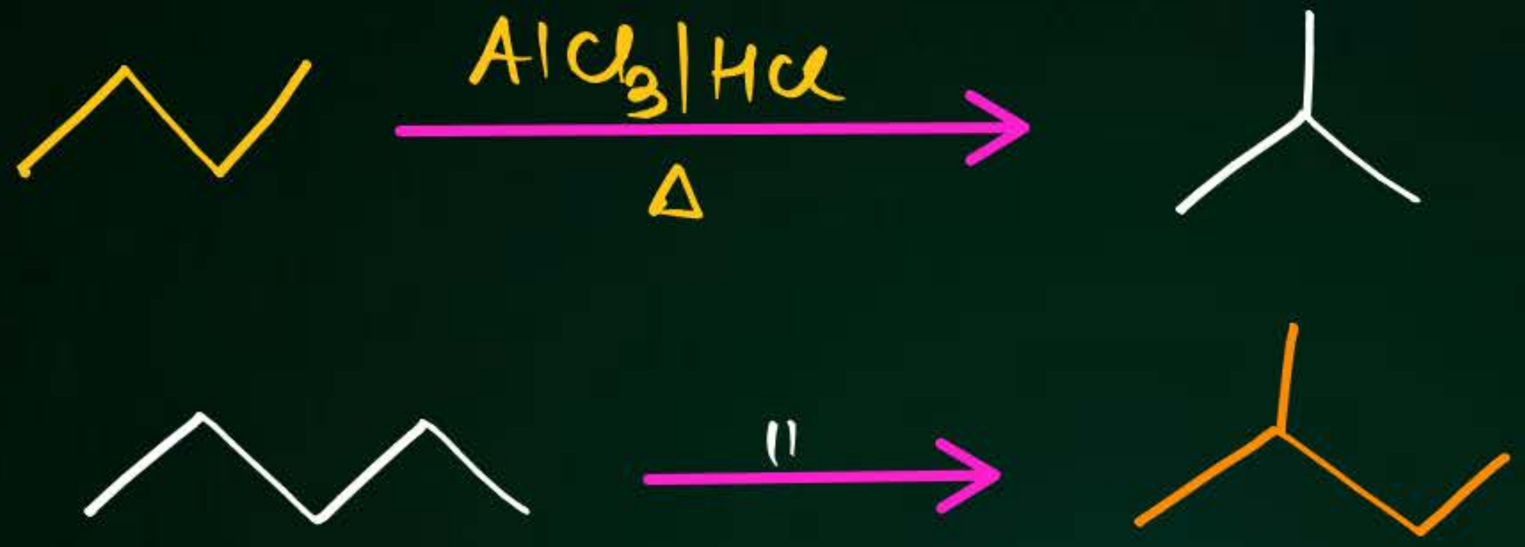
Major





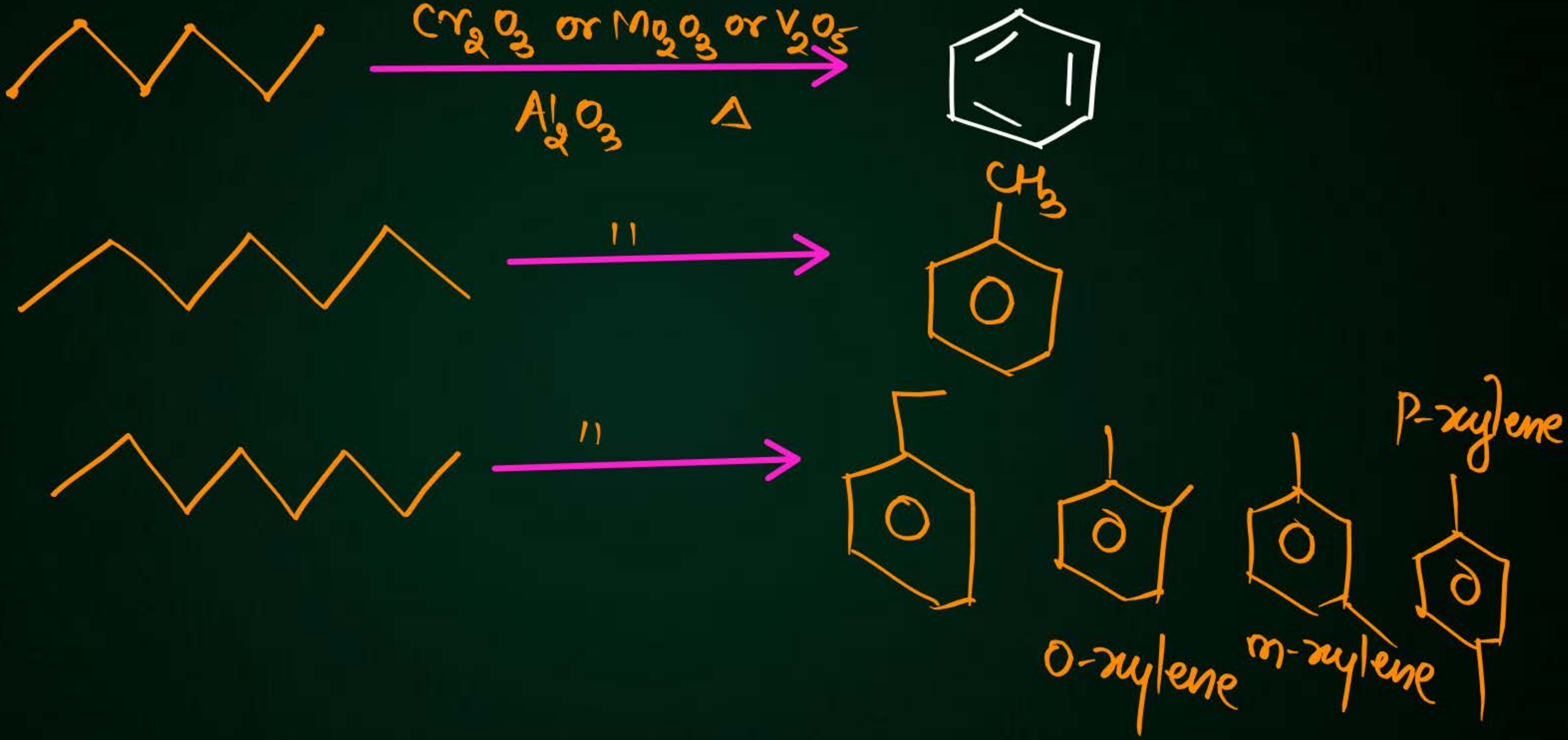
2. Isomerization:

Ek 'C' kam ka isomer



$AlCl_3 | HCl$
Δ
''

3. Aromatization:


Cr_2O_3 or Mo_2O_3 or V_2O_5
Al_2O_3 Δ
CH_3
''
''
p-xylene
o-xylene
m-xylene

4. Pyrolysis or cracking:

$$\underbrace{C_6H_{14}}_{} \xrightarrow{773K} \left\lfloor \begin{array}{l} \rightarrow \underline{C_6H_{12}} + H_2 \\ \rightarrow \underline{C_4H_8} + \underline{C_2H_6} \quad \checkmark \\ \rightarrow \underline{C_3H_6} + \underline{C_2H_4} + \underline{CH_4} \end{array} \right.$$

5. Reaction with steam:

$$CH_4 + H_2O \xrightarrow{\Delta} \underbrace{CO + 3H_2}_{\text{water gas (syngas)}}$$

6. Combustion:

Complete

$$C_xH_y + \left(x + \frac{y}{4}\right)O_2 \longrightarrow xCO_2 + \frac{y}{2}H_2O$$

7. Controlled Oxidation:

(i) $2CH_4 + O_2 \xrightarrow{Cu/523K/100atm} 2CH_3OH$ ✓

Methanol

(13.21)

(ii) $CH_4 + O_2 \xrightarrow[\Delta]{Mo_2O_3} HCHO + H_2O$ ✓

Methanal

(13.22)

(iii) $2CH_3CH_3 + 3O_2 \xrightarrow[\Delta]{(CH_3COO)_2Mn} 2CH_3COOH$ ✓

Ethanoic acid

$+ 2H_2O$

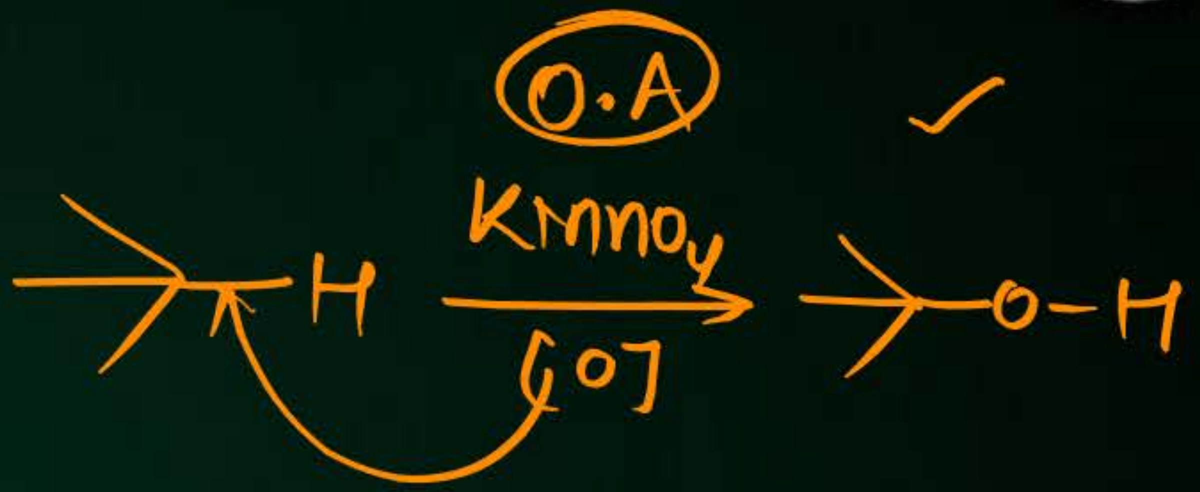
(13.23)

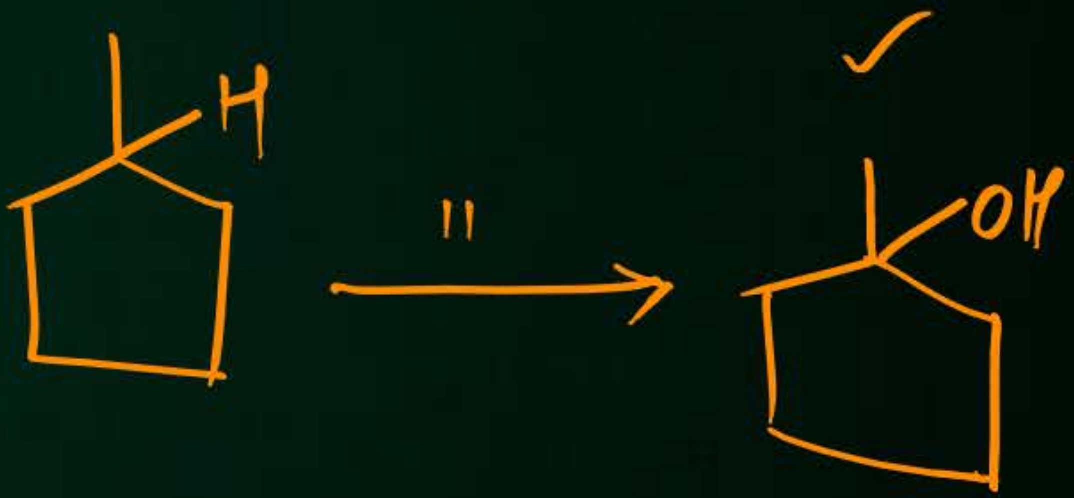
* (iv) Ordinarily alkanes resist oxidation but alkanes having tertiary H atom can be oxidized to corresponding alcohols by potassium permanganate.

$(CH_3)_3CH \xrightarrow[Oxidation]{KMnO_4} (CH_3)_3COH$

2-Methylpropane 2-Methylpropan-2-ol

(13.24)





QUESTION (NCERT Exemplar)

Which of the following reactions of methane is incomplete combustion:

Ⓐ $2CH_4 + O_2 \xrightarrow{Cu/523\ K/100\ atm} 2CH_3OH$ ✗

Ⓑ $CH_4 + O_2 \xrightarrow{Mo_2O_3} HCHO + H_2O$ ✗

Ⓒ $CH_4 + O_2 \longrightarrow C(s) + 2H_2O(l)$ ✓

Ⓓ $CH_4 + 2O_2 \longrightarrow \underline{CO_2}(g) + 2H_2O\ (l)$

QUESTION* (NCERT Exemplar)

Some oxidation reactions of methane are given below. Which of them is/are controlled oxidation reactions?

A $CH_4(g) + 2O_2(g) \longrightarrow CO_2(g) + 2H_2O(l)$ comp comb

B $CH_4(g) + O_2(g \longrightarrow C(s) + 2H_2O\ (l)$ incomp comb

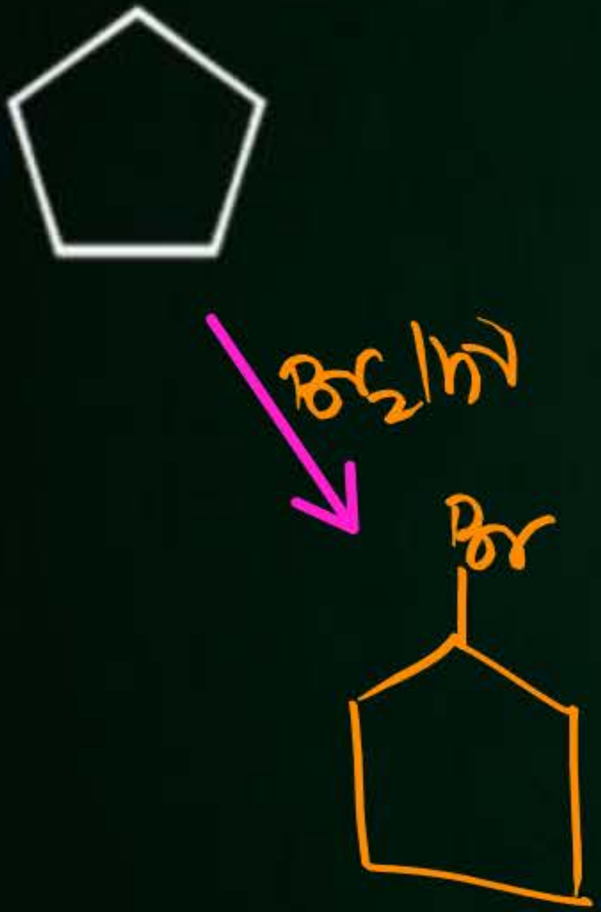
C $CH_4(g) + O_2(g) \xrightarrow{Mo_2O_3} HCHO + H_2O$ ✓

D $2CH_4\ (g) + O_2(g) \xrightarrow{Cu/523/100\ atm} 2CH_3OH$ ✓

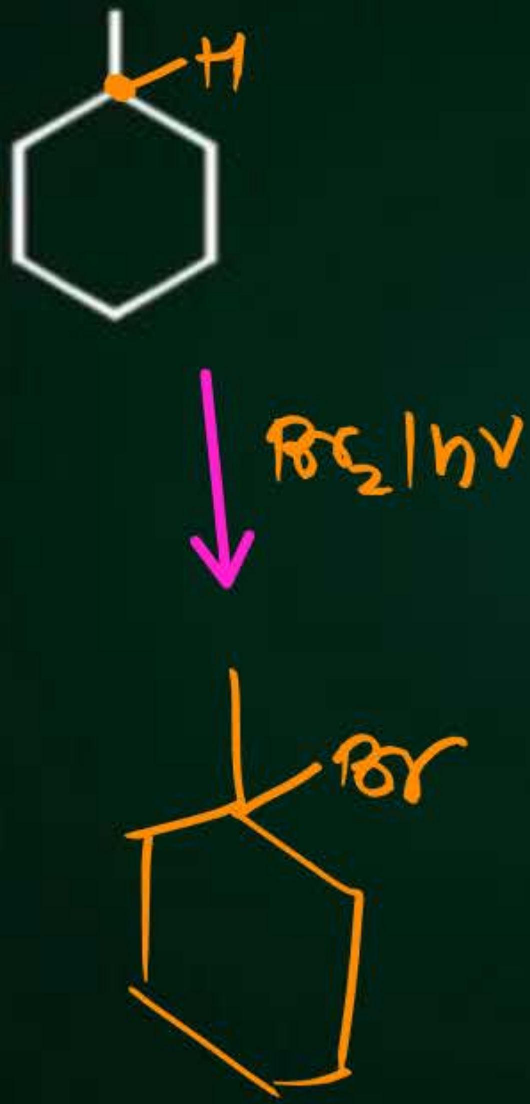
QUESTION

Give the major product of monobromination of following compounds.

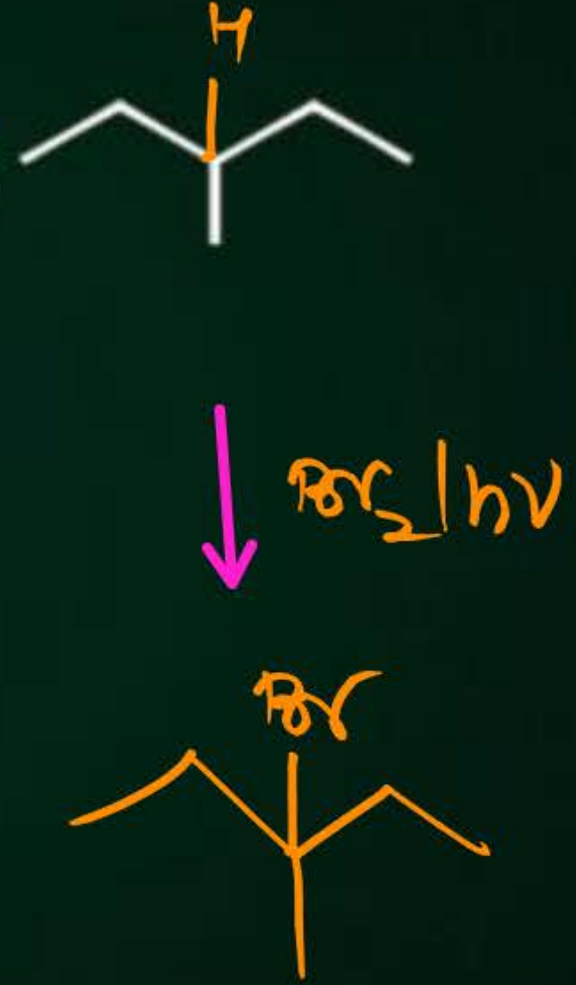
(a)



(b)



(c)



QUESTION

$$CH_4 + \overset{(excess)}{Cl_2} \longrightarrow \underline{\underline{CCl_4}}$$

Methane reacts with excess of chlorine in diffused sunlight to give the final product as

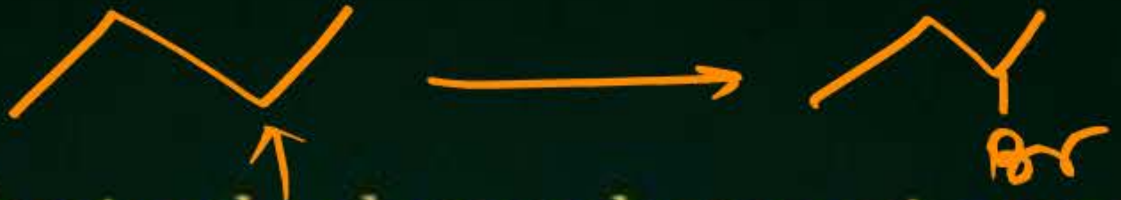
A Chloroform

B Methyl Chloride

C Methylene chloride

[✓ D] Carbon tetrachloride

QUESTION



major

What will the chief product obtained when n-butane is treated with Br_2 in the presence of light at 130°C?

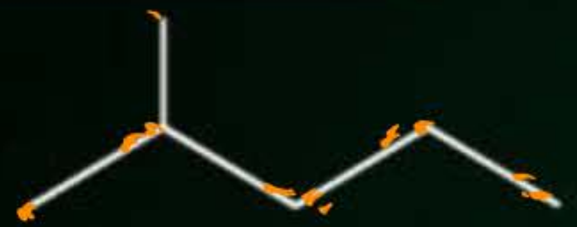
[✓ A] $CH_3-CH_2-CHBr-CH_3$

B $(CH_3)_2CHCH_2Br$

C $(CH_3)_3CBr$

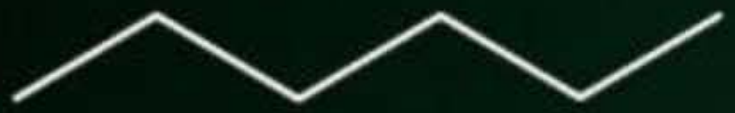
D $CH_3-CH_2-CH_2-CH_2-Br$

QUESTION

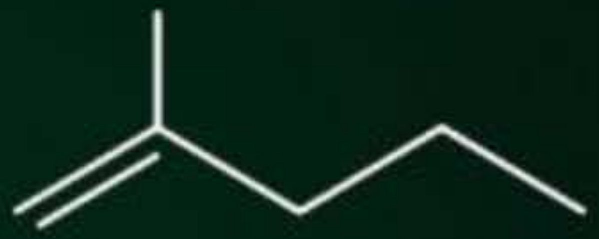


$\xrightarrow[250°C]{AlCl_3.HCl}$ Product is:

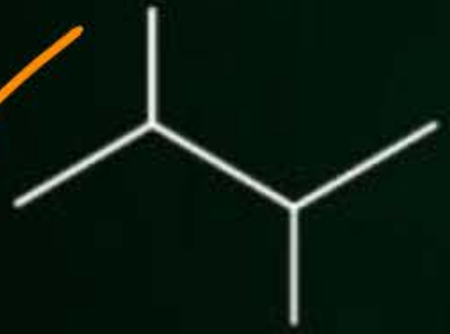
A



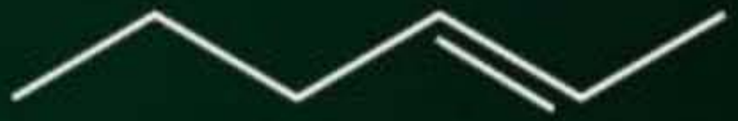
B



C



D



QUESTION

Photochemical halogenation of alkane is an example of:

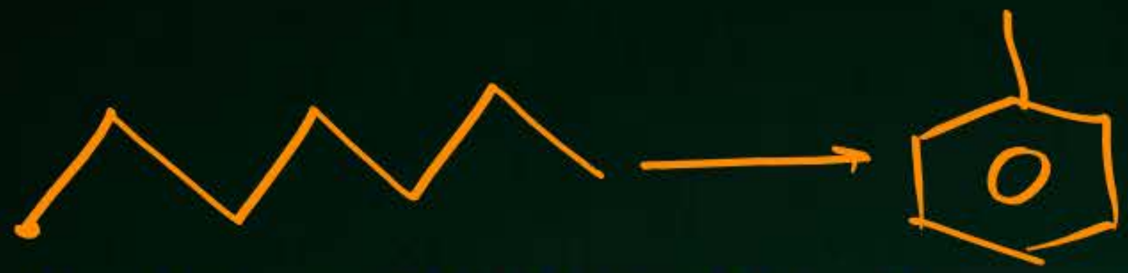
A electrophilic substitution

B nucleophilic substitution

[✓ C] free radical substitution

D nucleophilic addition

QUESTION



n-Heptane on heating to 773 K at 10-20 atm. Presence of V_2O_5 and Al_2O_3 gives:

[✓ A toluene]

B cycloheptane

C benzene

D 2-heptene

QUESTION

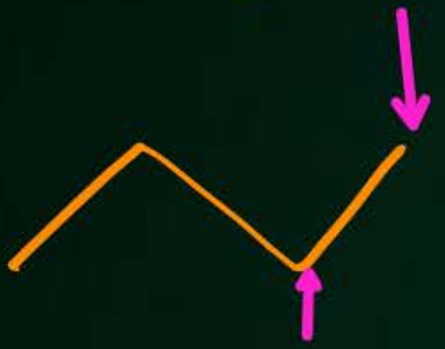
Which of the following halogenation of alkanes is reversible reaction?

- (A) Fluorination
- (B) Chlorination
- (C) Bromination
- [✓ (D) Iodination]

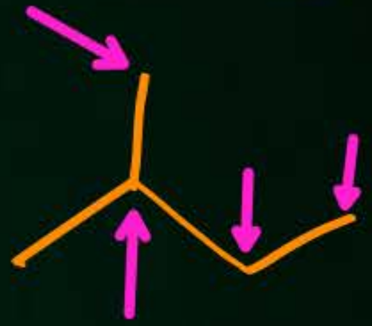
QUESTION

Which of the following alkane on halogenation gives only one mono halogenated product?

A n-butane

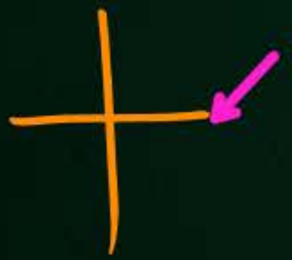


B 2-methyl butane



[✓ **C**] 2, 2-dimethylpropane

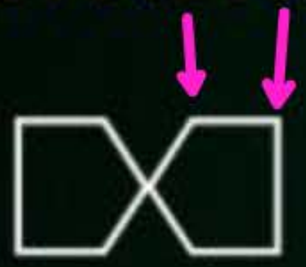
D None of these



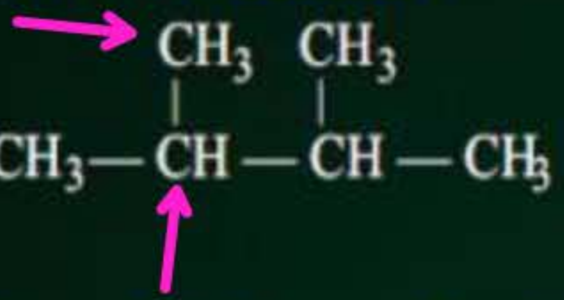
QUESTION

Yu have following four compounds,

(I)

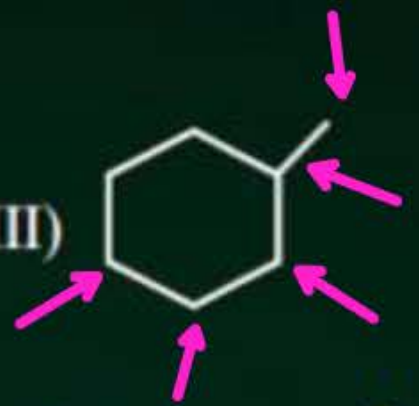


(II)

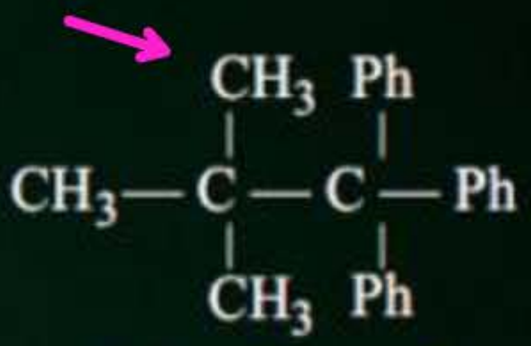


$CH_3-\overset{CH_3}{CH}-\overset{CH_3}{CH}-CH_3$

(III)



(IV)



$CH_3-\underset{CH_3}{\overset{CH_3}{C}}-\underset{Ph}{\overset{Ph}{C}}-Ph$

Select those compounds which will give two products on mono chlorination by $Cl_2/h\nu$ (Excluding stereoisomers)

A II & IV

B II & III

C [✓ I & II]

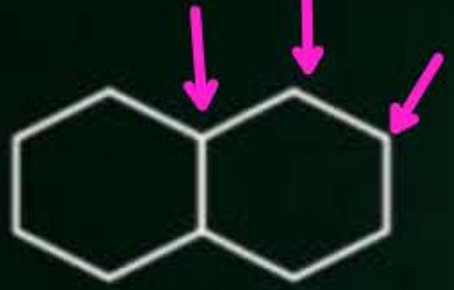
D I, II & III

QUESTION

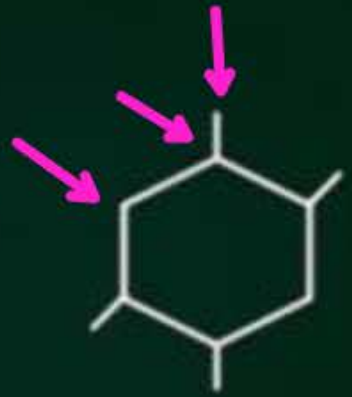
$C_{10}H_{20} \xrightarrow[hv]{Cl_2}$ A, $\underbrace{\text{one monochloro derivative,}}$

So A will be-

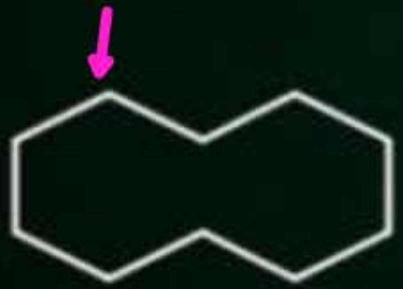
(A)



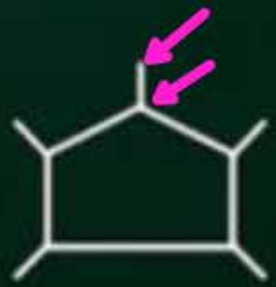
(B)



[✓ (C)]



(D)



QUESTION

$\dot{Cl} + \dot{Cl} \xrightarrow{h\nu} 2\dot{Cl}$

In the free radical chlorination of methane, the chain initiating step involves the formation of

[✓ A] Chlorine radical

B Hydrogen chloride

C Methyl radical

D Chloromethyl radical.

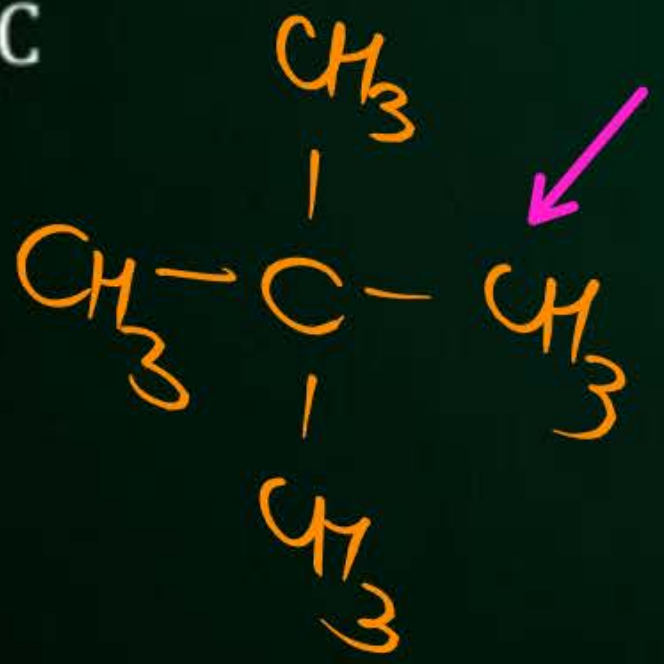
QUESTION

Which of the following molecules of alkane will give two monohalogenated product on reaction with halogen in presence of sunlight?

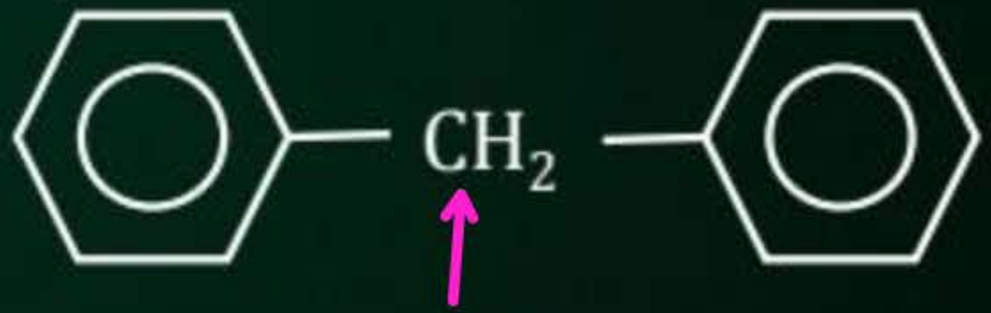
(A) $H_3C-\overset{\swarrow}{CH_3}$

[✓ (B)] $H_3C-\overset{\downarrow}{CH_2}-\overset{\swarrow}{CH_3}$

(C) $(H_3C)_4C$

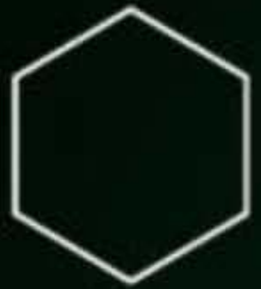


(D)



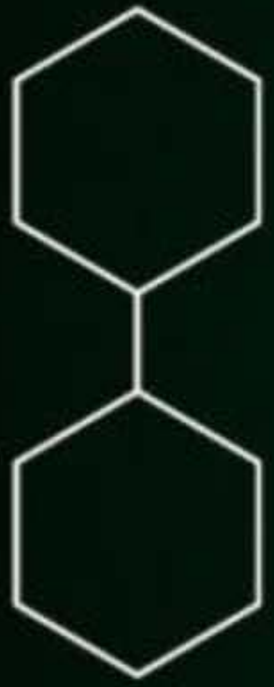
Home Work

QUESTION 01

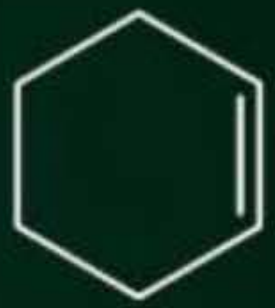


$\xrightarrow{Br_2}$ (A) $\xrightarrow[\text{Dry ether}]{Na}$ (B) Product B is:

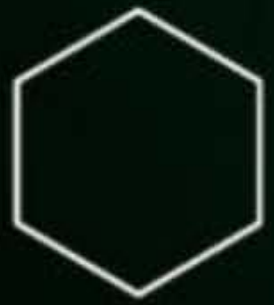
Ⓐ



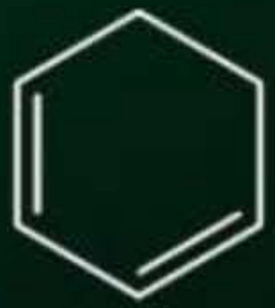
Ⓑ



Ⓒ

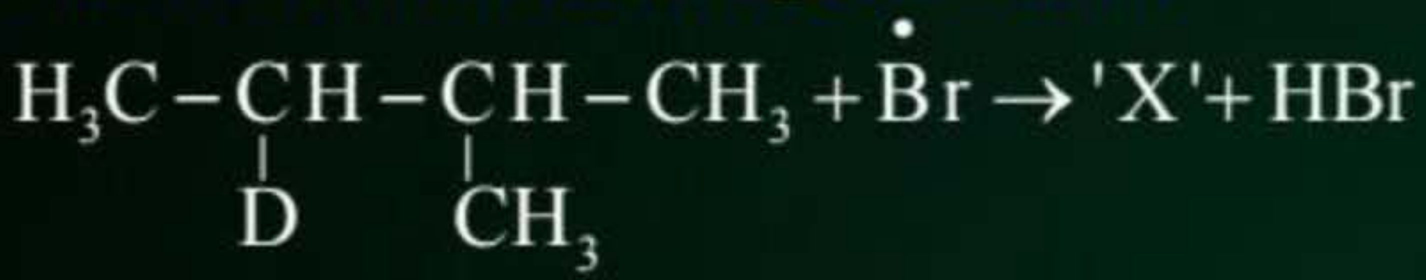


Ⓓ



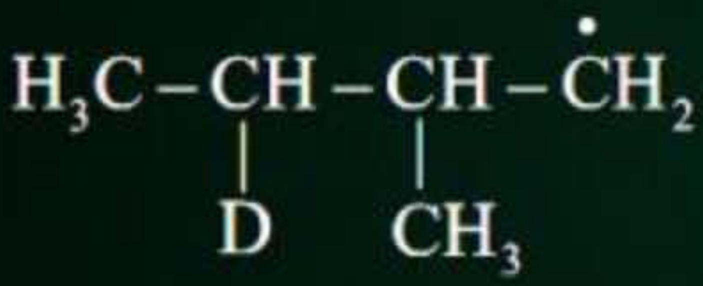
QUESTION 02

Consider the following reactions

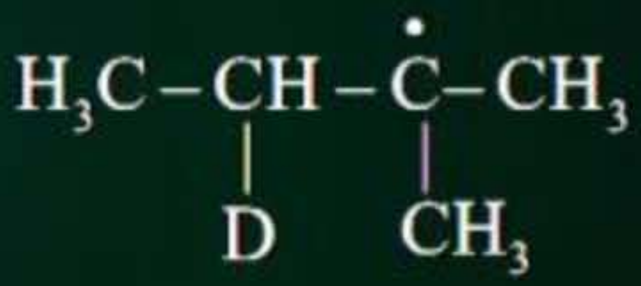


$H_3C-\underset{D}{\underset{|}{C}}H-\underset{CH_3}{\underset{|}{C}}H-CH_3+\dot{B}r \rightarrow 'X'+HBr$

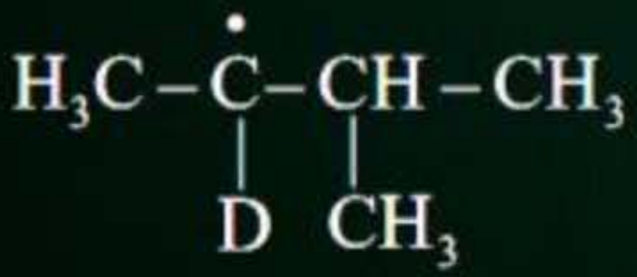
Identify the structure of the major product 'X'

Ⓐ 

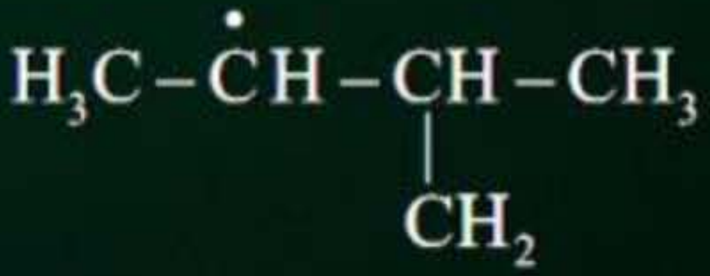
$H_3C-\underset{D}{\underset{|}{C}H}-\underset{CH_3}{\underset{|}{C}H}-\dot{C}H_2$

Ⓑ 

$H_3C-\underset{D}{\underset{|}{CH}}-\underset{CH_3}{\underset{|}{\dot{C}}}-CH_3$

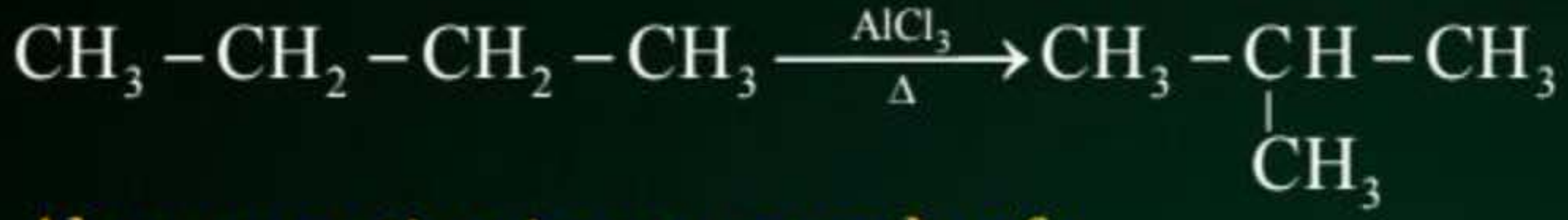
Ⓒ 

$H_3C-\underset{D}{\underset{|}{\dot{C}}}-\underset{CH_3}{\underset{|}{C}H}-CH_3$

Ⓓ 

$H_3C-\dot{C}H-\underset{CH_2}{\underset{|}{C}H}-CH_3$

QUESTION 03



$$\mathrm{CH_3-CH_2-CH_2-CH_3 \xrightarrow[\Delta]{AlCl_3} CH_3-\underset{\underset{CH_3}{|}}{C}H-CH_3}$$

Above reaction is an example of:

A Isomerization

B polymerization

C cracking

D de-hydrogenation

QUESTION 04

How much volume of oxygen will be needed for complete combustion of 10 lit. of ethane:

- (A) 135 lit.
- (B) 35 lit.
- (C) 175 lit.
- (D) 205 lit.

QUESTION 05

Select the chain propagation steps in the free-radical chlorination of methane.

(1) $Cl_2 \longrightarrow 2Cl^\bullet$

(2) $Cl^\bullet + CH_4 \longrightarrow CH_3Cl + H^\bullet$

(3) $Cl\bullet + CH_4 \longrightarrow CH_3^\bullet + HCl$

(4) $H^\bullet + Cl_2 \longrightarrow HCl + Cl^\bullet$

(5) $CH_3^\bullet + Cl_2 \longrightarrow CH_3Cl + Cl^\bullet$

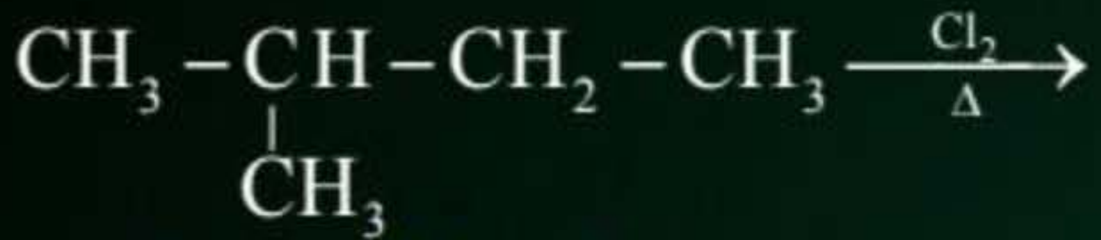
Ⓐ 2, 3, 5

Ⓑ 1, 3, 6

Ⓒ 3, 5

Ⓓ 2, 3, 4

QUESTION 06



$$CH_3-\underset{\displaystyle CH_3}{\underset{|}{C}}H-CH_2-CH_3 \xrightarrow[\Delta]{Cl_2}$$

Number of chiral centers generated during monochlorination in the above reaction:

A 1

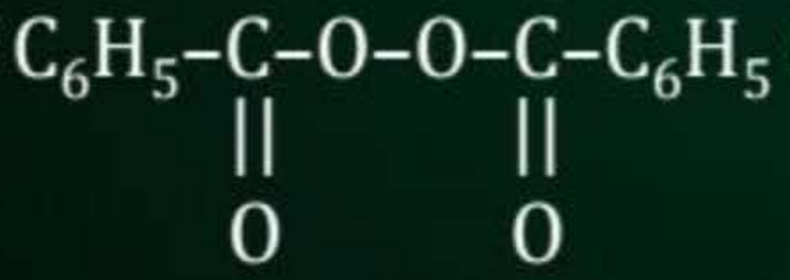
B 2

C 3

D 4

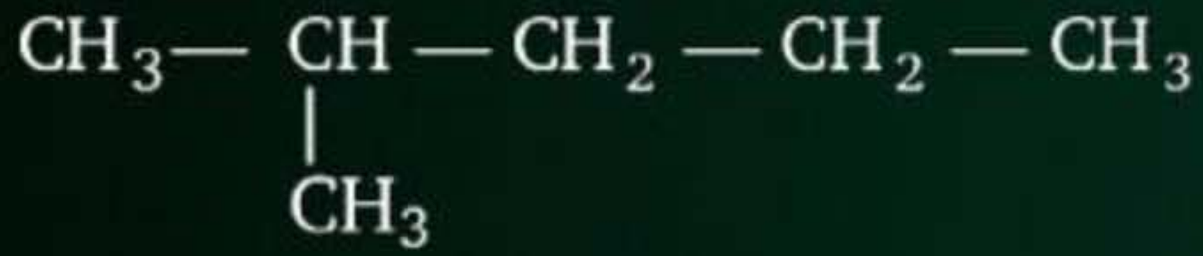
QUESTION 07

Which statement is incorrect about free radical halogenation of alkanes?

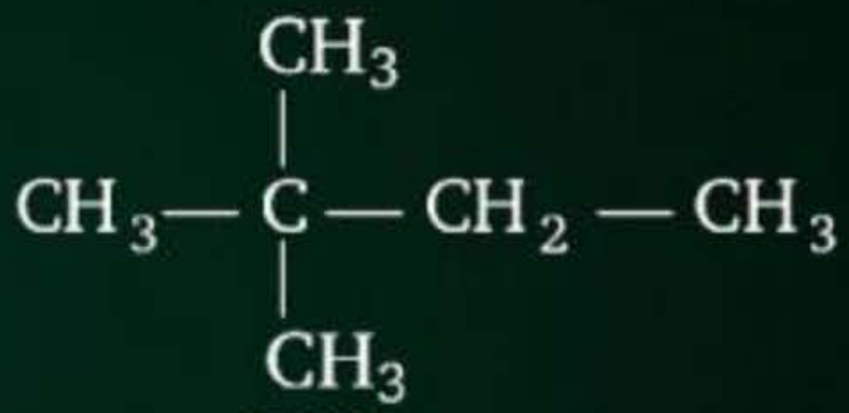
- **A** The number of product molecules formed by one photon is very high.
- **B** If O_2 is added, initially the rate of reaction decreases, then increases.
- **C** Inhibitors combine with free radical and terminate the chain reaction.
- **D** Presence of  $C_6H_5-\underset{\underset{O}{\|}}{C}-O-O-\underset{\underset{O}{\|}}{C}-C_6H_5$ inhibits the free radical reaction.

QUESTION 08

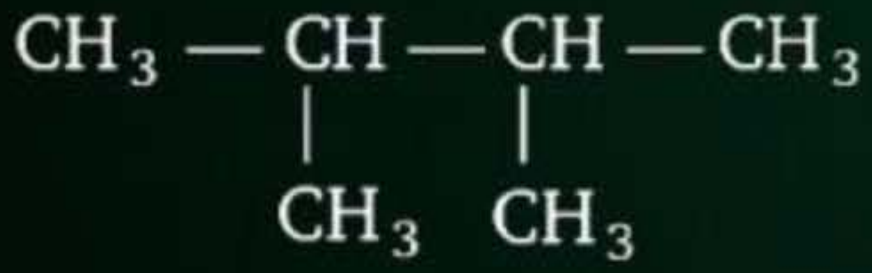
An alkane (mol. wt. = 86) on bromination gives only two monobromo derivatives (excluding stereoisomers). The alkane is:

(A) 

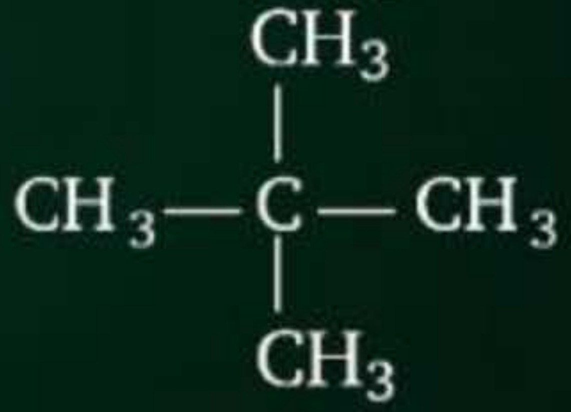
$CH_3-\underset{\displaystyle CH_3}{\underset{|}{CH}}-CH_2-CH_2-CH_3$

(B) 

$CH_3-\overset{\displaystyle CH_3}{\overset{|}{\underset{\displaystyle CH_3}{\underset{|}{C}}}}-CH_2-CH_3$

(C) 

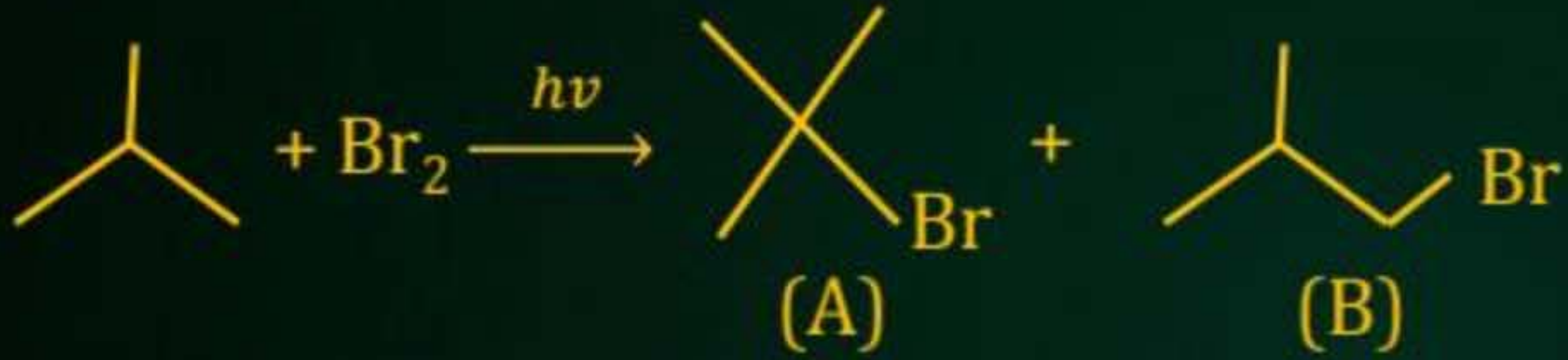
$CH_3-\underset{\displaystyle CH_3}{\underset{|}{CH}}-\underset{\displaystyle CH_3}{\underset{|}{CH}}-CH_3$

(D) 

$CH_3-\overset{\displaystyle CH_3}{\overset{|}{\underset{\displaystyle CH_3}{\underset{|}{C}}}}-CH_3$

QUESTION 09

The relative reactivity of 1°H, 2°H and 3°H in bromination reaction has been found to be 1 : 82 : 1600 respectively. In the reaction,



The percentage yield of (A) and (B) are expected to be:

- **A** 99.4%, 0.6%
- **B** 50%, 50%
- **C** 0.6%, 99.4%
- **D** 80%, 20%

QUESTION 10

2-methyl butane on reacting with bromine in the presence of sunlight gives maximum content of

- A 1-bromo-3-methyl butane
- B 2-bromo-3-methylbutane
- C 2-bromo-2-methyl butane
- D 1-bromo-2-methyl butane

ANSWER KEY

1. A
2. B
3. A
4. B
5. C
6. B
7. B
8. C
9. A
10. C

Home Work From PW Module (Yakeen NEET)

Prarambh: Q 10, 13, 20, 21, 22, 24, 25, 26, 27, 28, 40, 41,

Prabal: Q 02, 03, 06, 20, 40

Parikshit: Q 11, 12, 13, 14, 15, 16, 17

Sat|sun ⟶ stability of Intermediate

$\underline{C^{\oplus}}$

Thank you!!

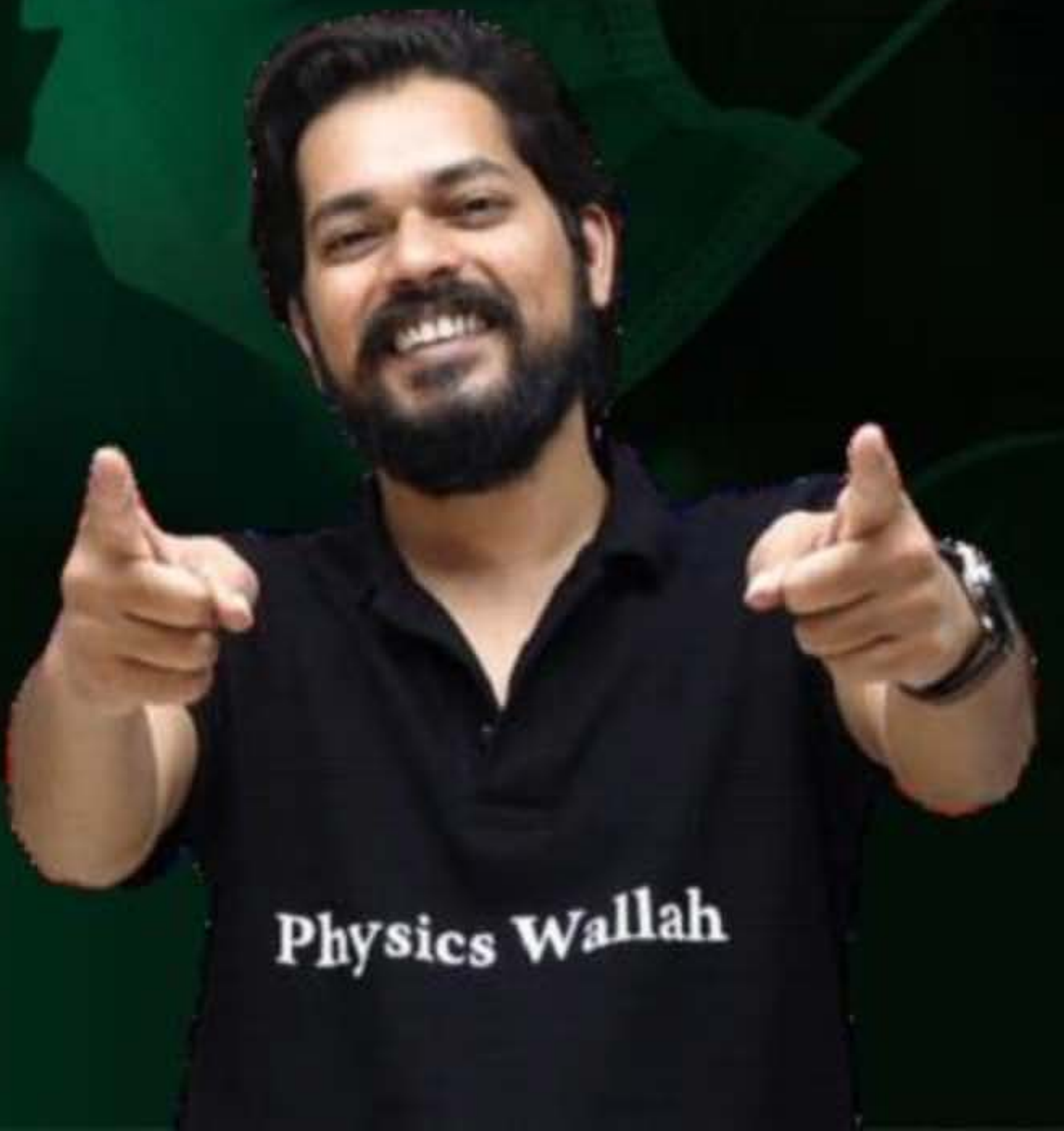
YAKEEN 2.0

FOR NEET 2025

Lecture- 04 | **Organic Chemistry**

HYDROCARBONS

By- Pankaj Sir(POPU MAMA)

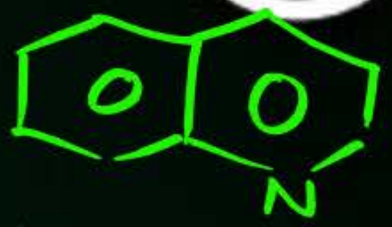

Physics Wallah

Topics *to be covered*

1. Methods of Preparation of Alkenes
2. Practice

Methods of Preparation of Alkenes

Poision $CaCO_3$
↳ S-quinoline

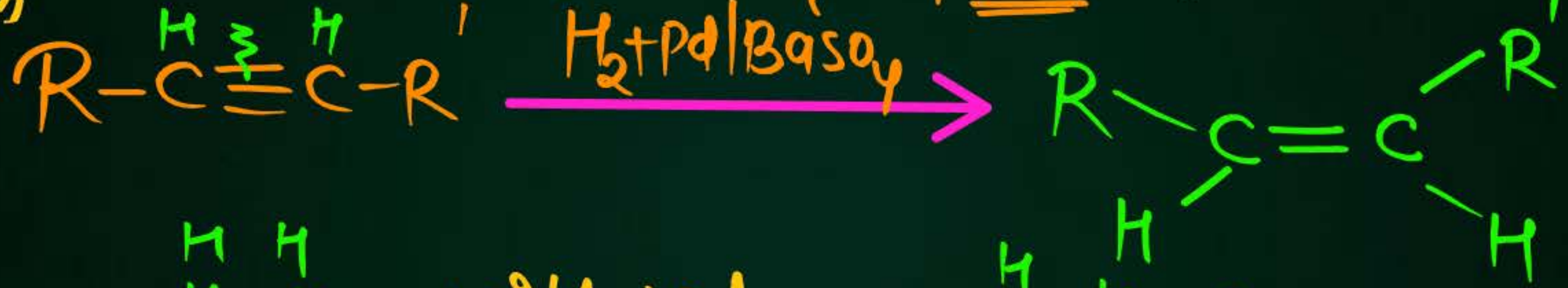


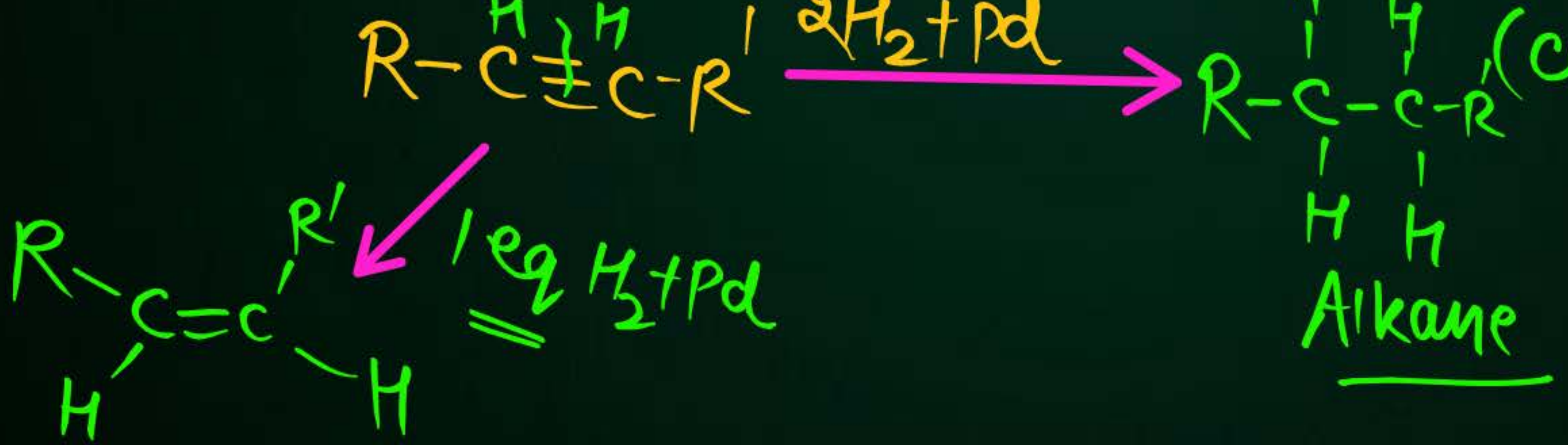
Pd|$BaSO_4$ Lindlar's catalyst

1. From alkynes:

Poision (Block Active sites)

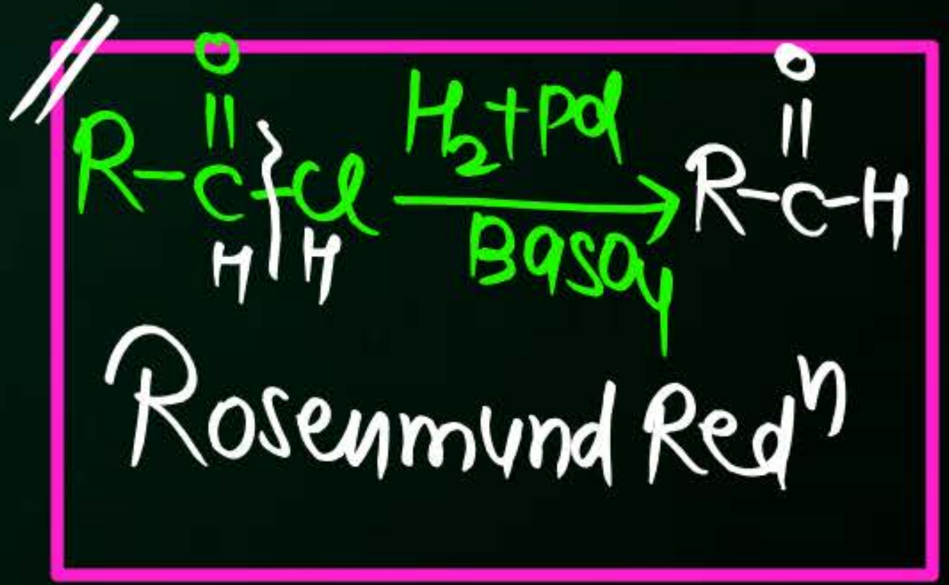
① Hydrogenation


H
H
R−C≡C−R'
H_2+Pd|$BaSO_4$
R
C=C
R'
H
H


H H
H H
R−C≡C−R'
2H_2+Pd
R−C−C−R'
H H
H H
1eq H_2+Pd
R
C=C
R'
H
H

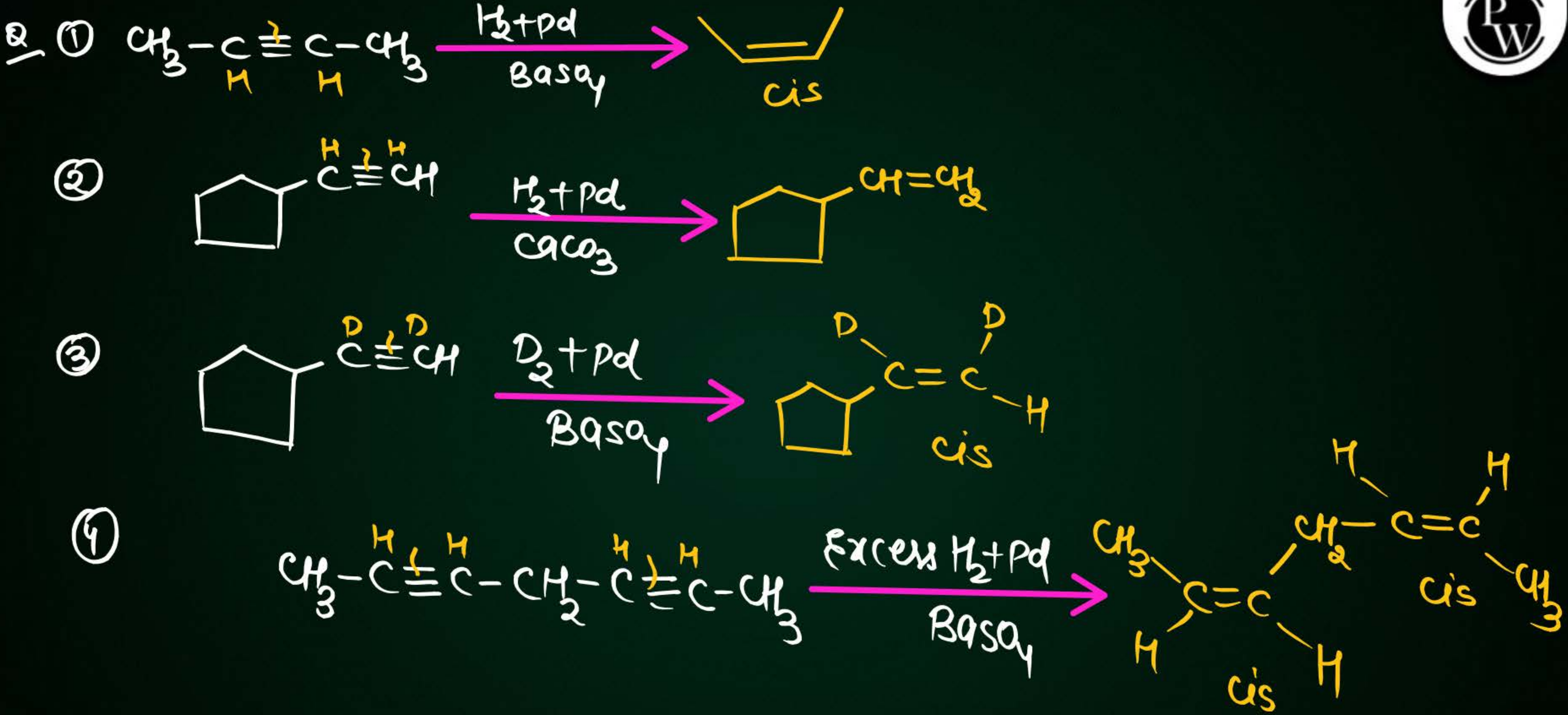
(cis-Alkene)

Alkane

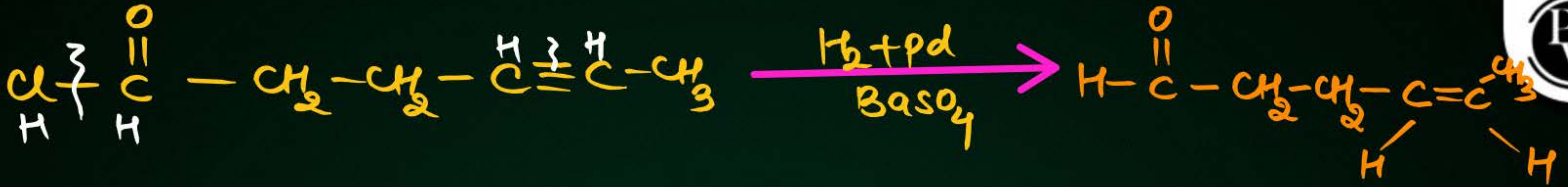


$$R-\overset{\overset{O}{\|}}{C}-Cl \xrightarrow[BaSO_4]{H_2+Pd} R-\overset{\overset{O}{\|}}{C}-H$$

Rosenmund Red^n


Q.
①
$CH_3-\overset{H}{C}\equiv\overset{H}{C}-CH_3$
$H_2 + Pd$
$BaSO_4$
cis
②
$\overset{H}{C}\equiv\overset{H}{C}H$
$H_2 + Pd$
$CaCO_3$
$CH=CH_2$
③
$\overset{D}{C}\equiv\overset{D}{C}H$
$D_2 + Pd$
$BaSO_4$
D
D
C=C
H
cis
④
$CH_3-\overset{H}{C}\equiv\overset{H}{C}-CH_2-\overset{H}{C}\equiv\overset{H}{C}-CH_3$
Excess $H_2 + Pd$
$BaSO_4$
CH_3
C=C
H
H
cis
CH_2
H
H
C=C
cis
CH_3

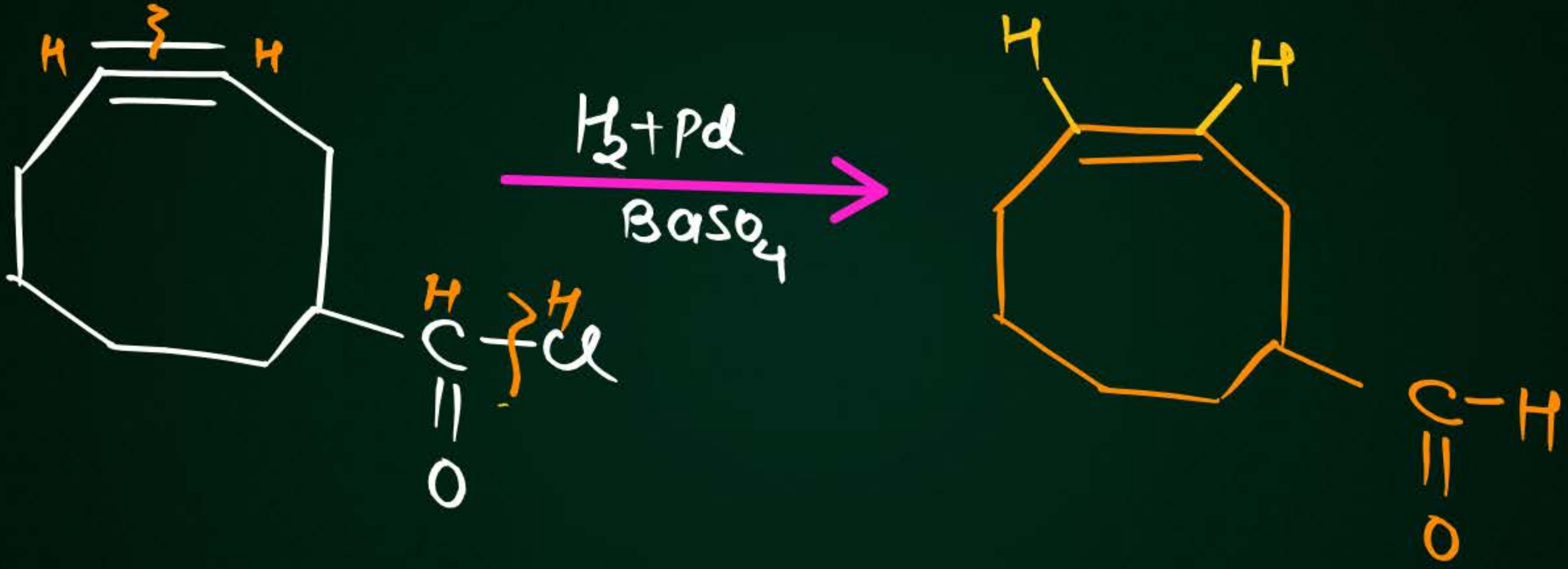
Q.



Cl
H
O
C
H
CH2
CH2
H
C
H
C
CH3
H2+Pd
BaSO4
H
O
C
CH2
CH2
C
C
CH3
H
H

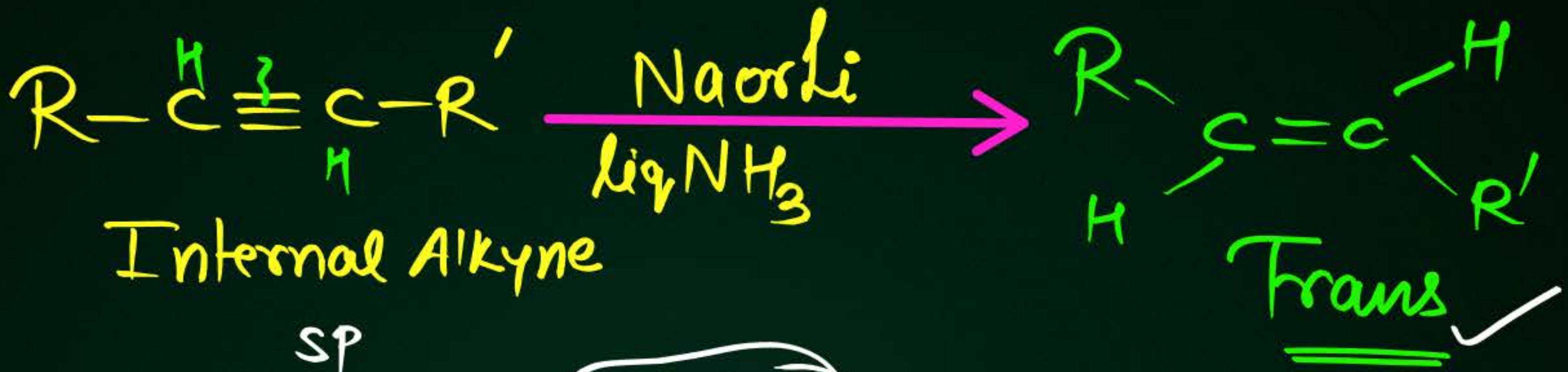
$$Cl-\overset{O}{\overset{\|}{C}}-CH_2-CH_2-C\equiv C-CH_3 \xrightarrow[BaSO_4]{H_2+Pd} H-\overset{O}{\overset{\|}{C}}-CH_2-CH_2-CH=CH-CH_3$$

Q.



H
H
H
H
C
Cl
O
H2+Pd
BaSO4
H
H
C
H
O

② Birch reduction ÷


R–C≡C–R′
H
H
Na or Li
liq NH3
R
H
C=C
H
R′

Internal Alkyne

Trans ✓

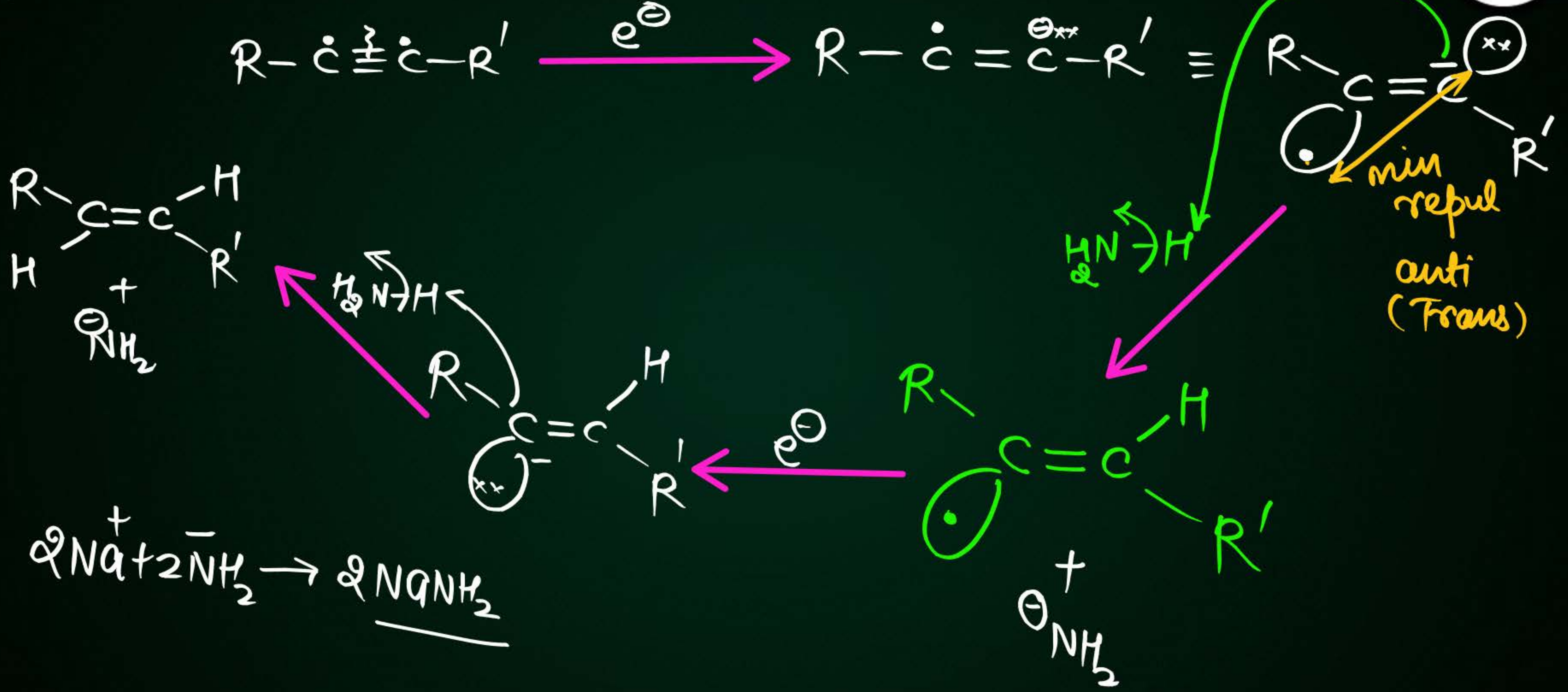
$$R-C\equiv \overset{\ominus}{\overset{sp}{C}}-\overset{+}{H} \xrightarrow[\overset{+}{Na}\,\overset{-}{NH_2}]{\boxed{Na + liq\,NH_3}} R-C\equiv\bar{C}\,\overset{+}{Na} + NH_3$$

Acidic 'H'

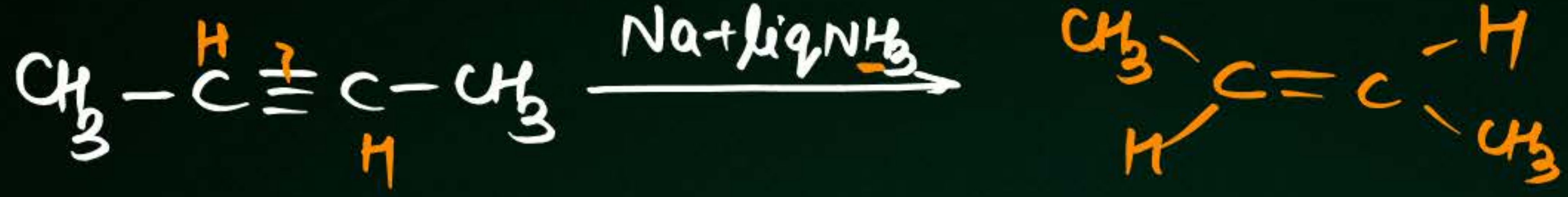
Salt

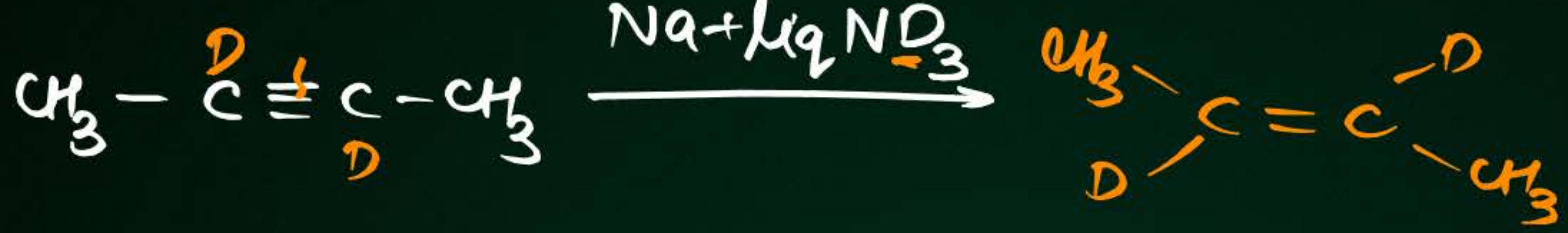
Mech :

$2Na \longrightarrow 2Na^{+} + 2e^{\ominus}$

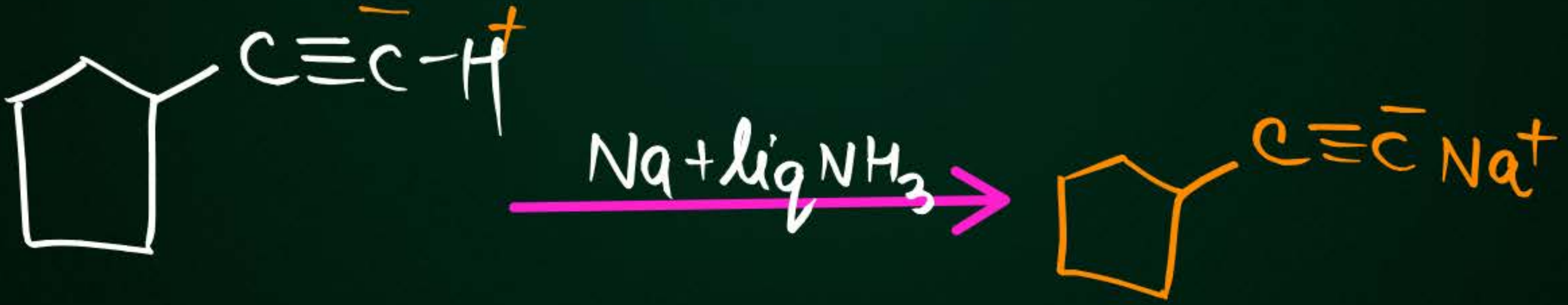

R–C≡C–R'
e⊖
R–Ċ=C⊖–R'
≡
min repul
anti
(Trans)
H₂N–H
+
⊖NH₂
e⊖
H₂N–H
R
H
R'
+
⊖NH₂

$2\overset{+}{Na} + 2\overset{-}{N}H_2 \longrightarrow 2NaNH_2$

Q. 1) 
$CH_3-\overset{H}{C}\equiv\underset{H}{C}-CH_3$
Na + liq NH₃
CH₃
H
C = C
H
CH₃

2) 
$CH_3-\overset{D}{C}\equiv\underset{D}{C}-CH_3$
Na + liq ND₃
CH₃
D
C = C
D
CH₃

3) $CH_3-C\equiv\bar{C}-H^+ \xrightarrow{Li + liq\,NH_3} CH_3-C\equiv\bar{C}\,Li^+$

4) 
$C\equiv\bar{C}-H^+$
Na + liq NH₃
$C\equiv\bar{C}\,Na^+$

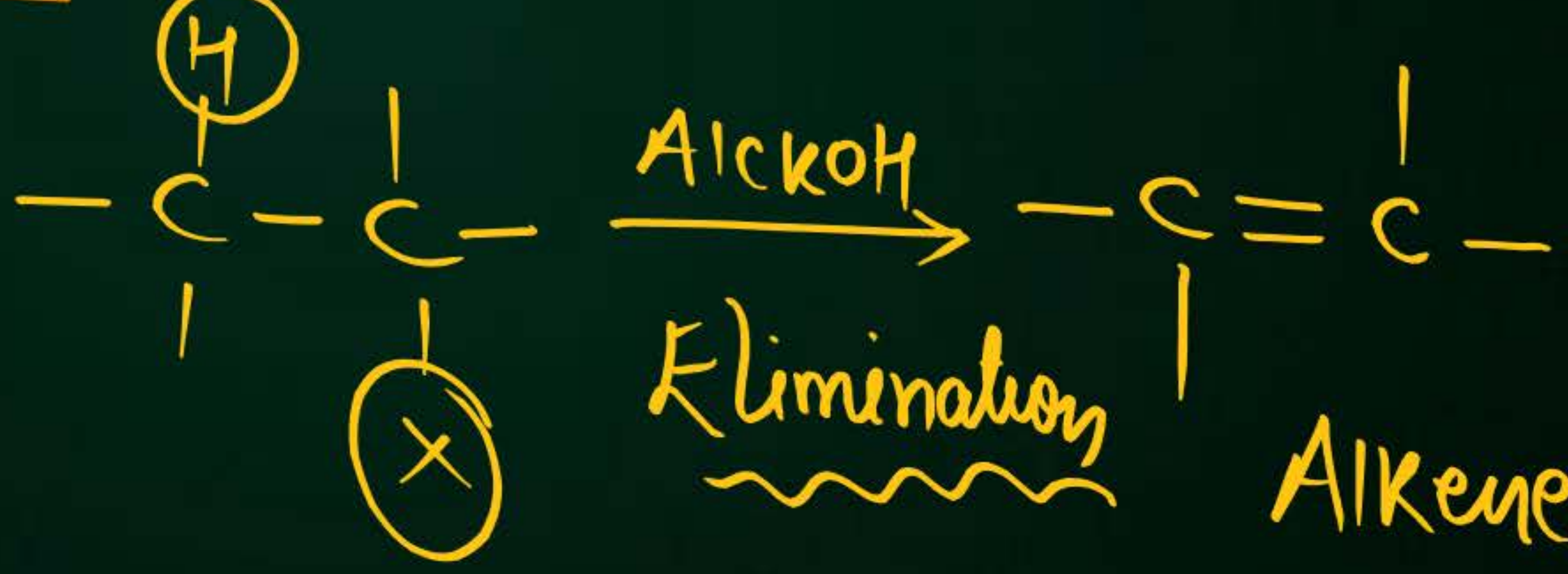
2. From alkyl halides: (Dehydrohalogenation)

β-elimination
or
α, β-elimination
or
$\boxed{E}^2$ Elimination

Reagent : Alkoxide ion (Base)
$(R-O^{\ominus})$

Alc. KOH
(Na)
↓

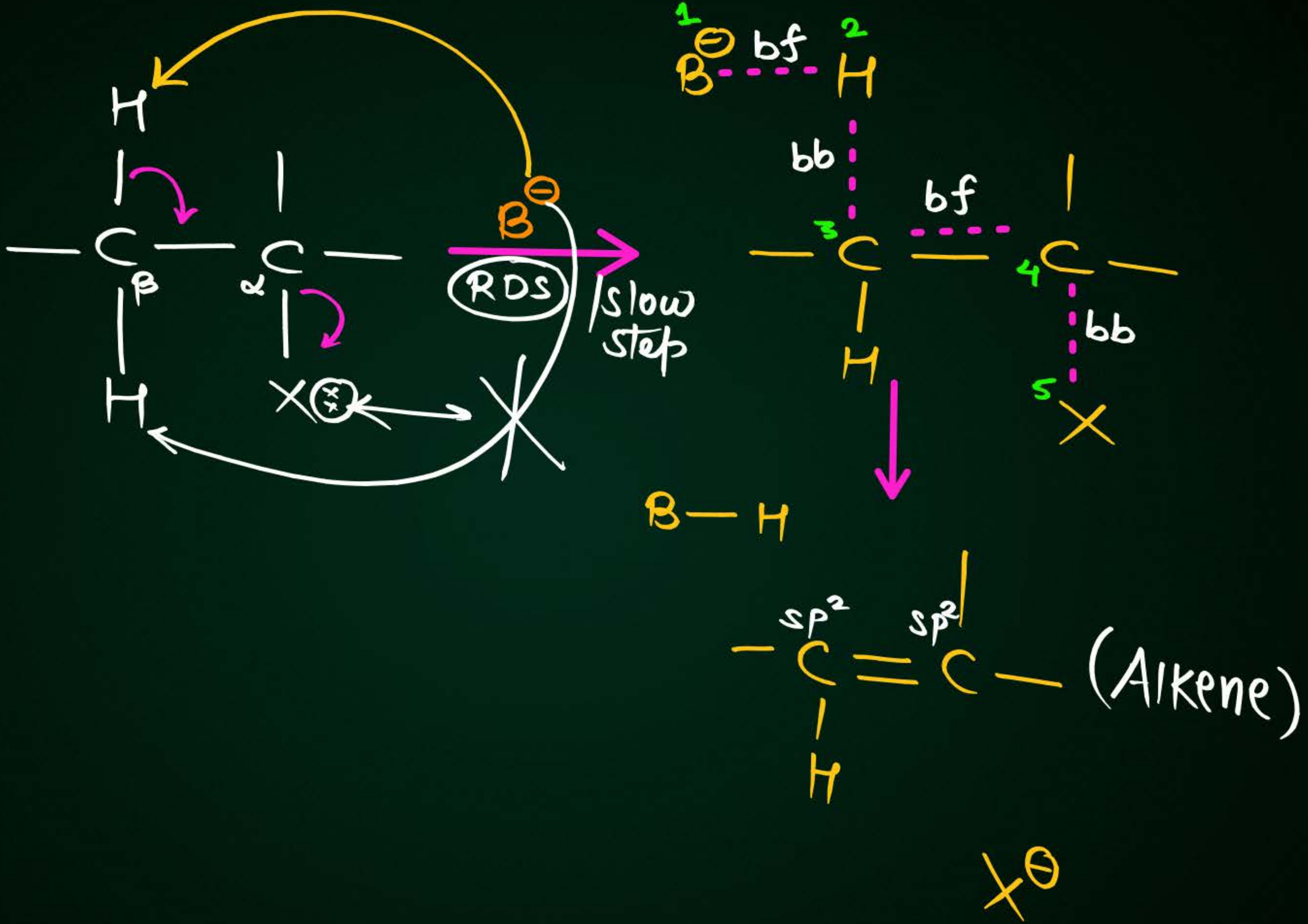
$$R\overset{-}{O}\overset{+}{H} + \overset{+}{K}\overset{-}{O}H \rightarrow R\overset{-}{O}\overset{+}{K}$$



$$-\overset{\overset{H}{|}}{\underset{|}{C}}-\overset{|}{\underset{\underset{X}{|}}{C}}- \xrightarrow[\text{Elimination}]{\text{Alc KOH}} -\underset{|}{C}=\overset{|}{C}-$$

Alkene

Mech



H
H
C β
α C
X
B⊖
RDS
slow step
1 B⊖
bf
2 H
bb
3 C
bf
4 C
bb
5 X
H
B—H
sp²
sp²
(Alkene)
H
X⊖

OP Points:

(No Rearrangement)

$(C^{+}, \bar{C}, \dot{C})$

1. No intermediate formation. Only Transition state is formed. (One step rxn)
2. All 5 atoms involve in T.S are in same plane.
3. R.O.R w.r.t. RX R – F < R – Cl < R – Br < R – I

   R.O.R w.r.t. RX ROR α Stability of alkene

   Reso ✓
   Hyper ✓
   Induc ✓

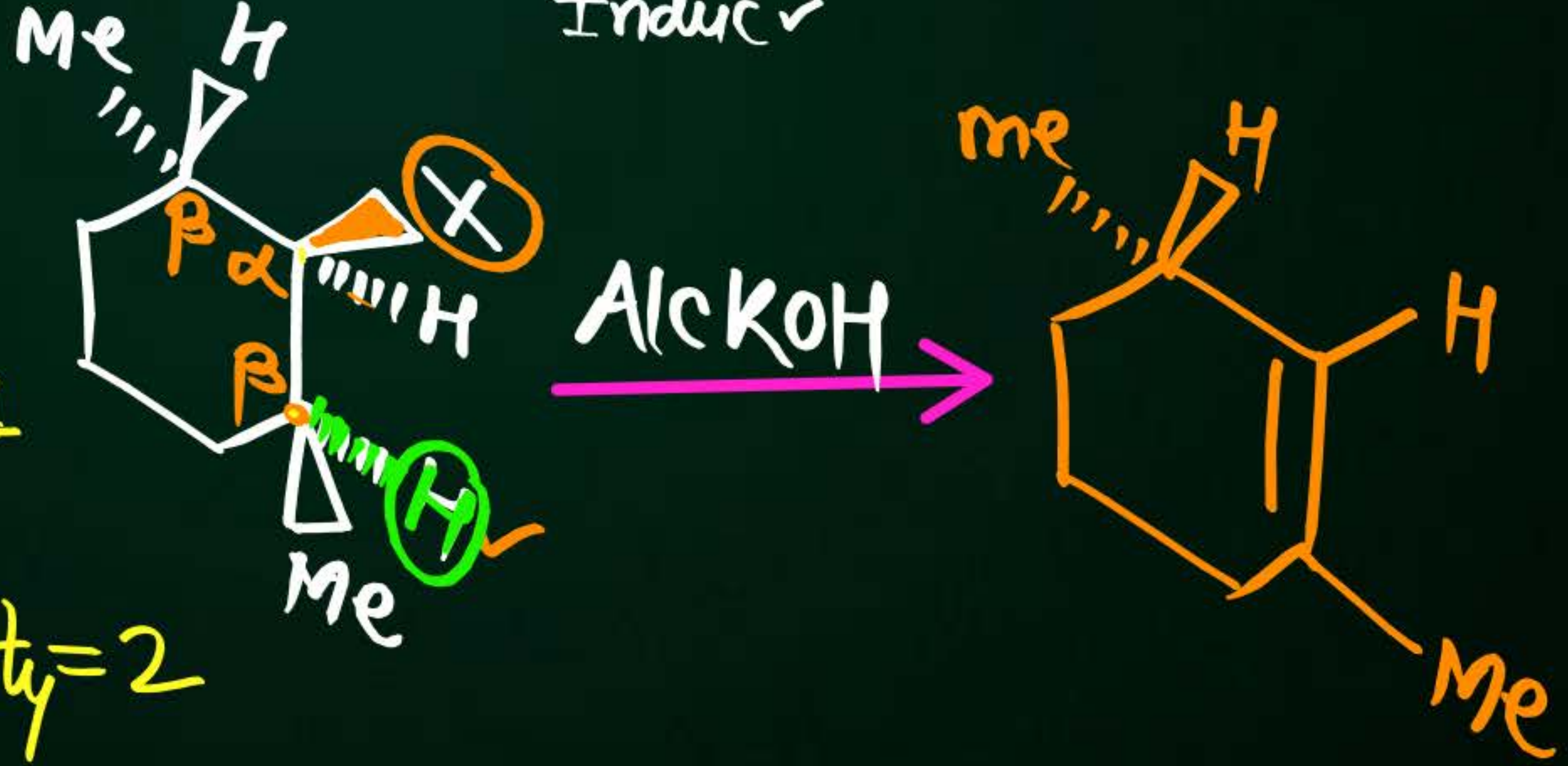
BE ↑ ROR ↓

BE C–F > C–Cl > C–Br > C–I

ROR C–F < C–Cl < C–Br < C–I

4. More stable alkene is major product.
5. Anti Elimination

X & H opposite plane



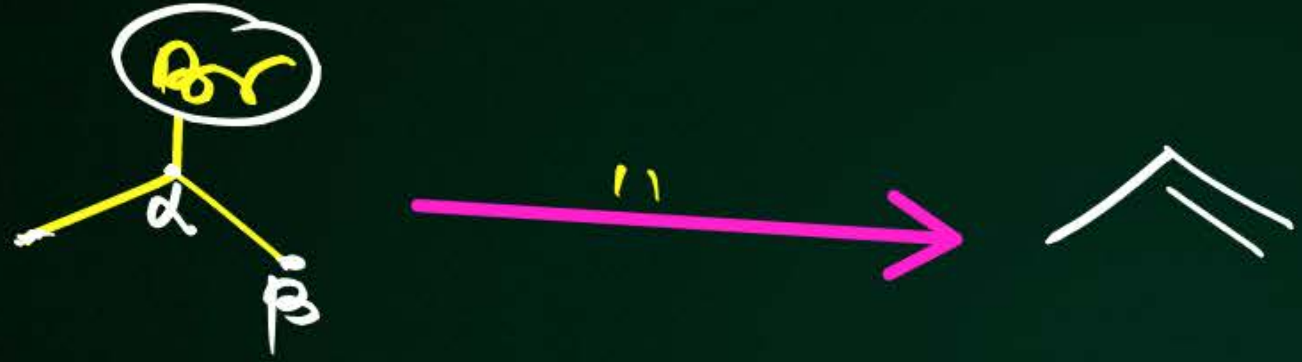
6. R·O·R $r = K[R\text{–}X]^{1}[B^{\ominus}]^{1}$

$E^{②}$ order = 2, Molecularity = 2

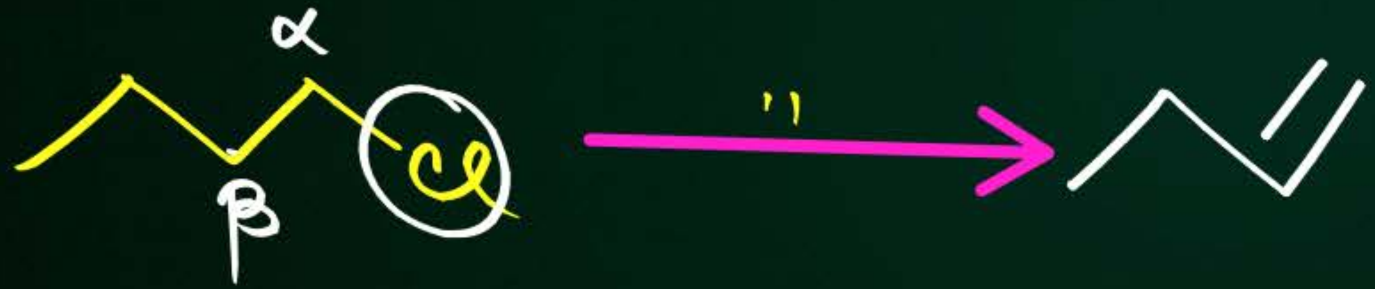
Q. ① $\underset{\beta}{CH_3}-\overset{\alpha}{CH_2}-Br \xrightarrow{AlcKOH} CH_2=CH_2$

② $CH_3-\overset{\beta}{CH_2}-\overset{\alpha}{CH_2}-Br \xrightarrow{''} CH_3-CH=CH_2$

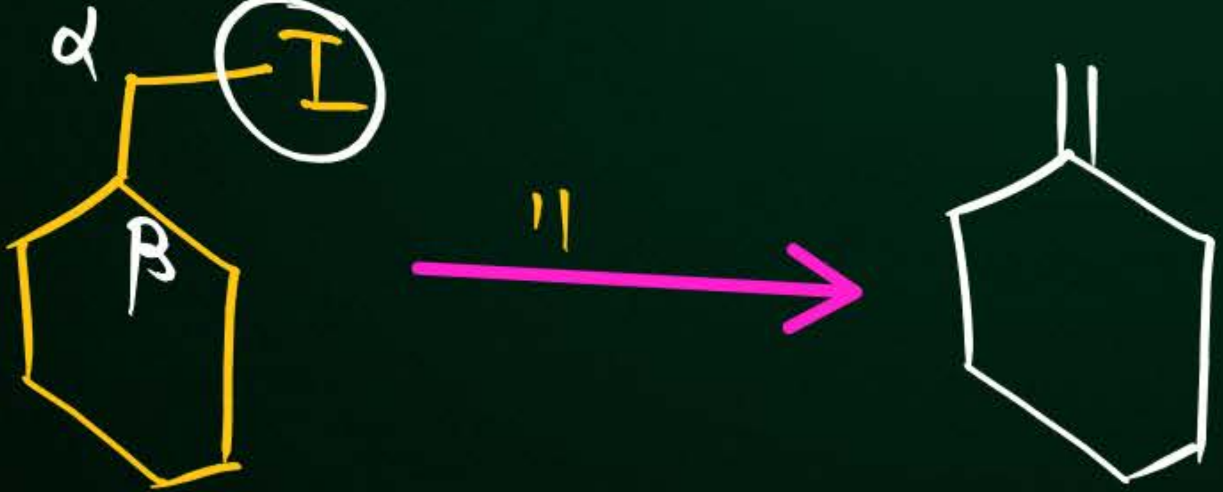
③



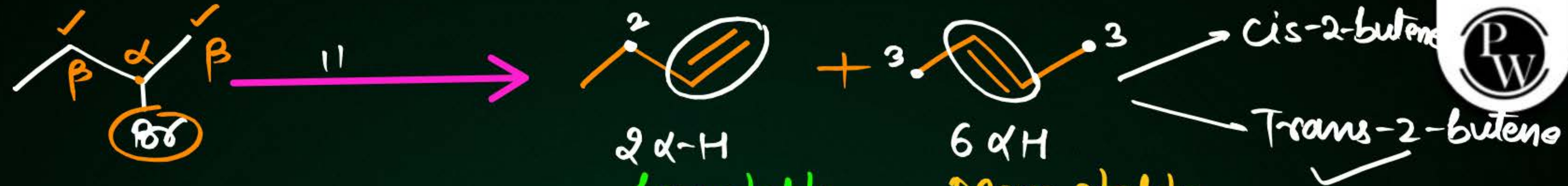
④



⑤



⑥



→ Cis-2-butene

→ Trans-2-butene

2α-H

Less stable

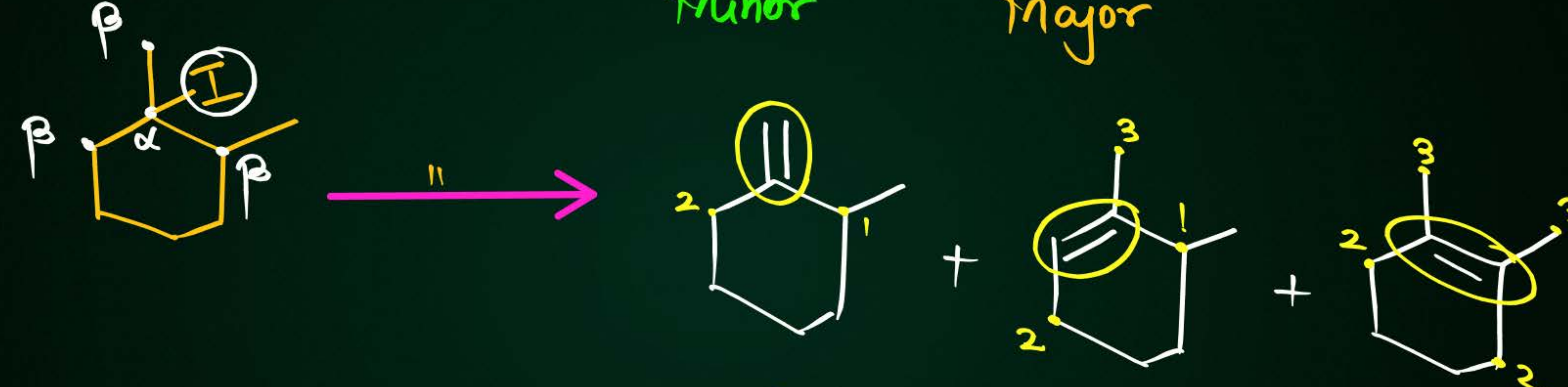
Minor

6αH

More stable

Major

⑦


β
I
β
α
β
"
2
1
3
1
2
3
3
2
2

3αH

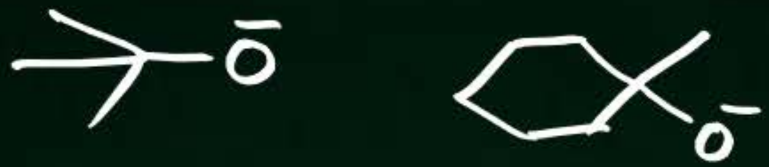
6α-H

10-αH

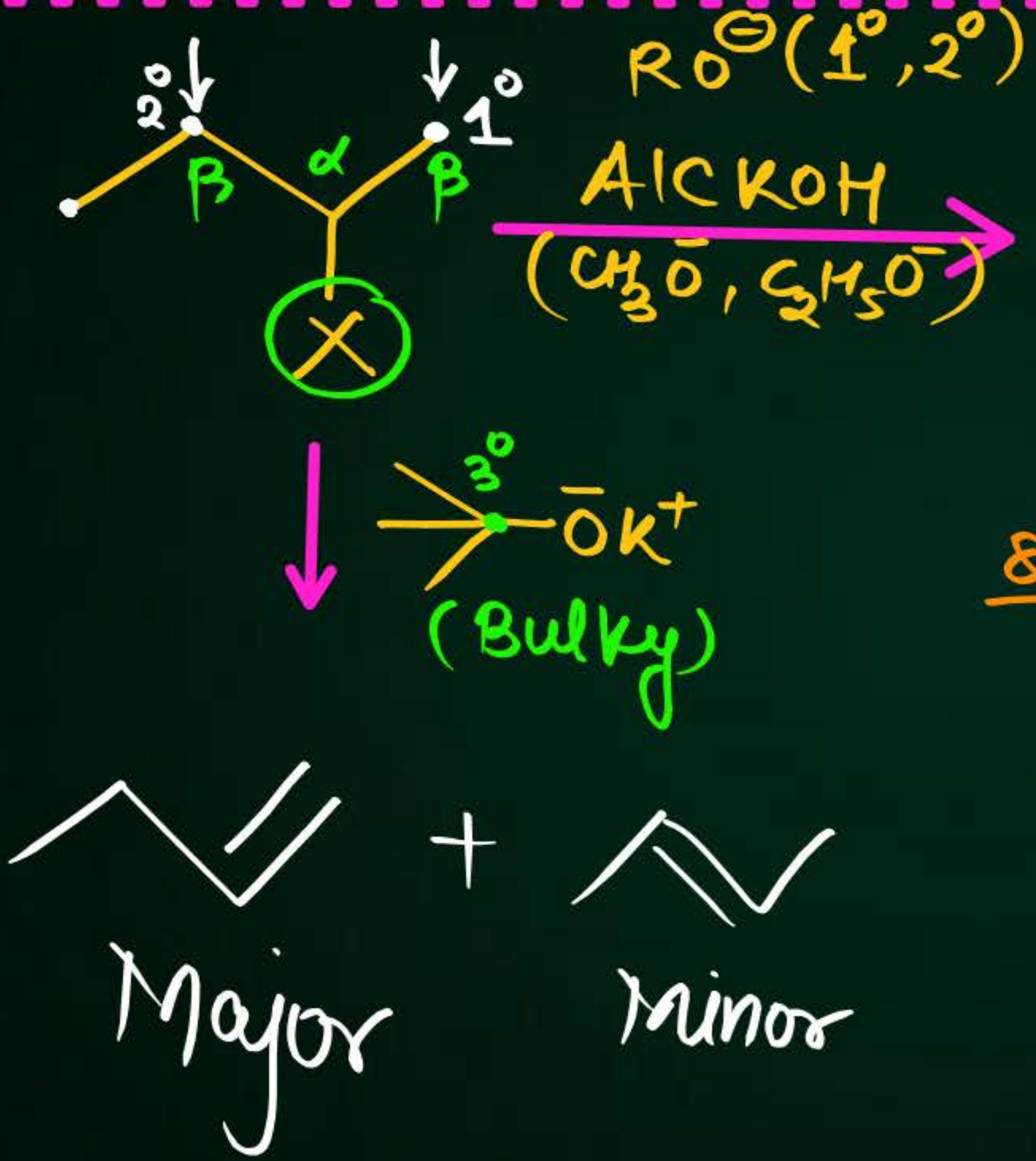
Major

OP Points:

3° Alkoxide

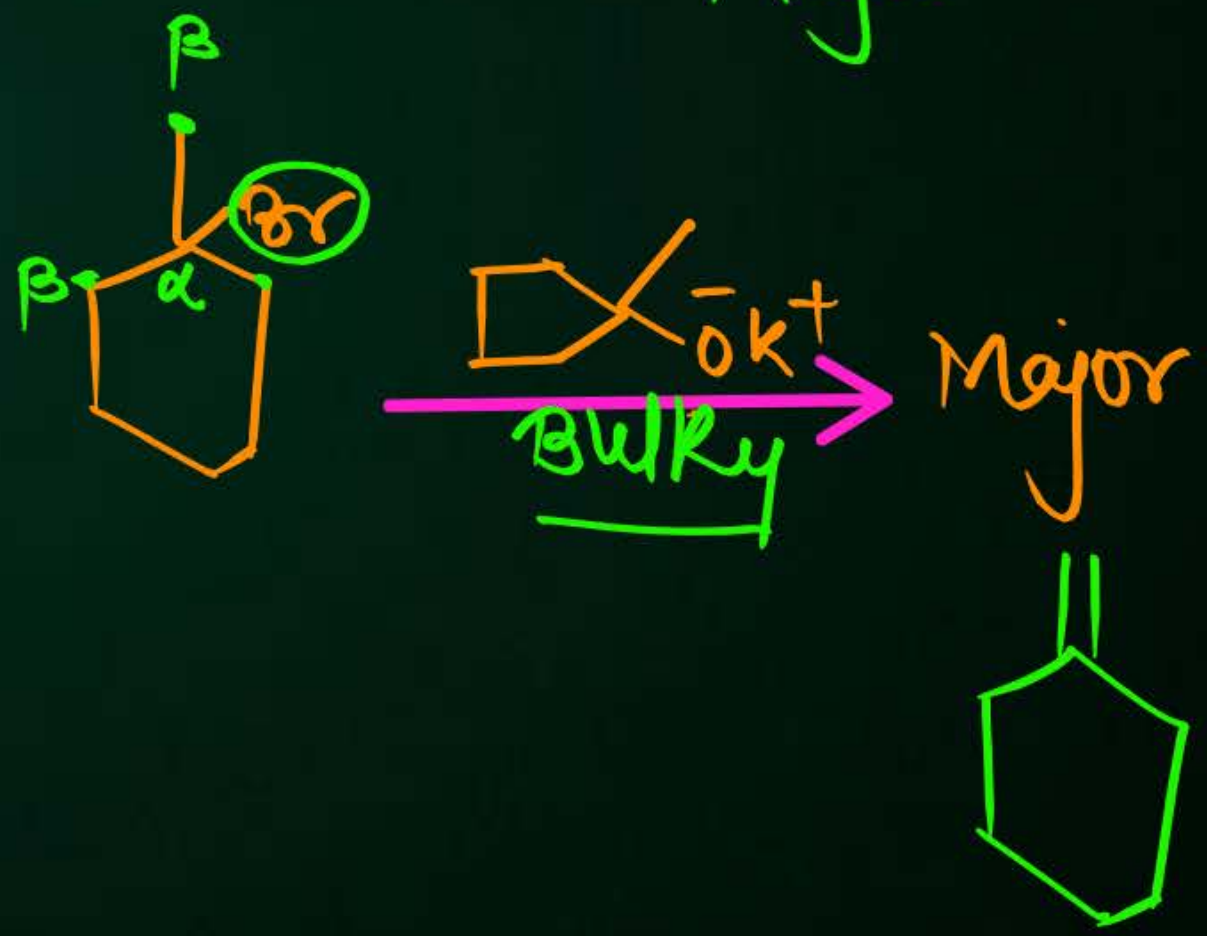


6. In case of bulky base less hindered beta H will decide major product.



2°
1°
β
α
β
X
RO⊖(1°,2°)
Alc KOH
(CH3O⁻, C2H5O⁻)
Minor
Major
3°
⁻OK⁺
(Bulky)
Major
Minor

Q



β
Br
β
α
⁻OK⁺
Bulky
Major

OP Points:

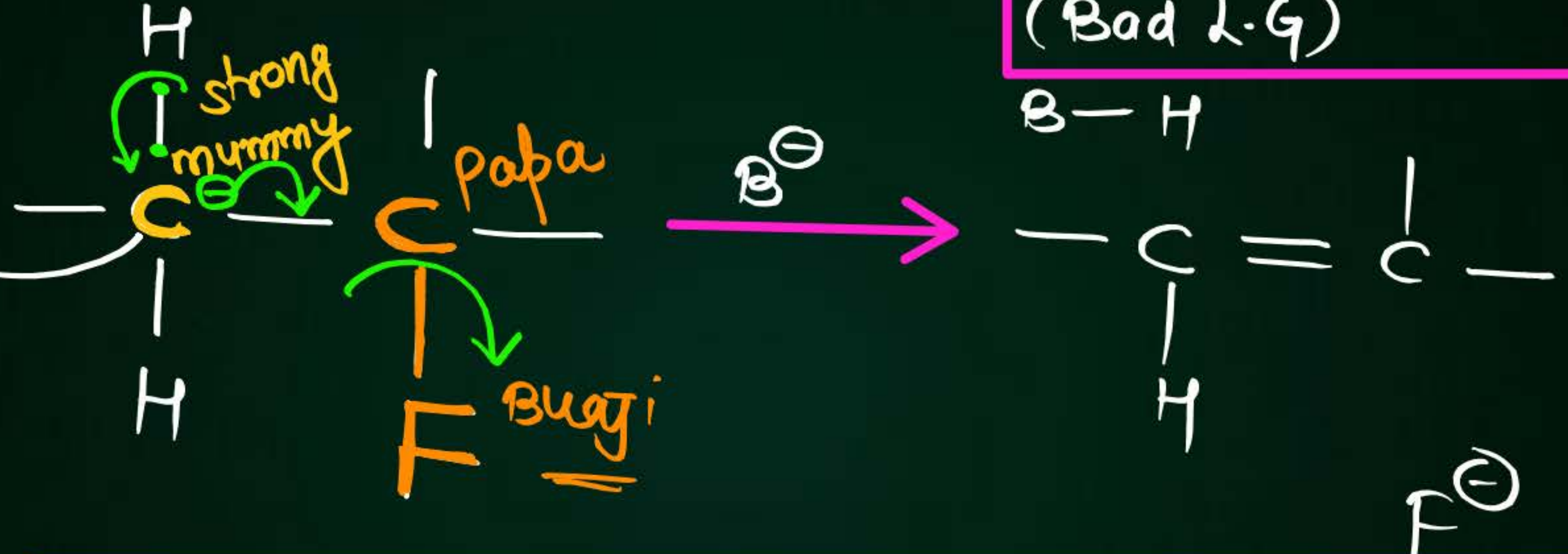
$F^{\ominus}$ Buaji

7. In case of R-F (Buaji)

E_2 ⓐ anion like charac

Cl, Br, I (Mama mausi)
(Good L.G)
F (Buaji)
(Bad L.G)

✓ (Carbanion like charac)

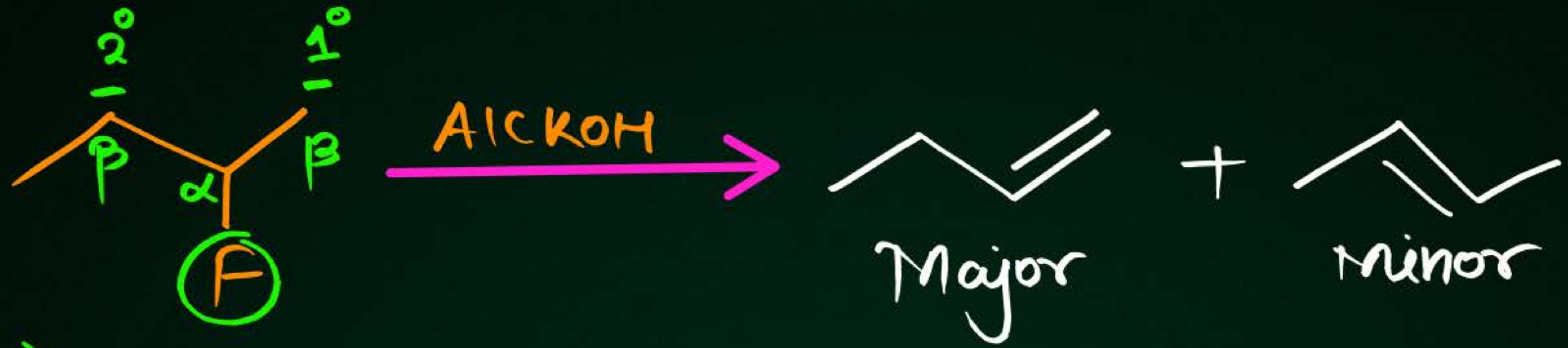

H
strong
mummy
C⊖
C
papa
F
Buaji
H
B⊖
B—H
C = C
H
F⊖

(Same period)
C — F

More stable β $C^{\ominus}$ will decide Major product

Q.

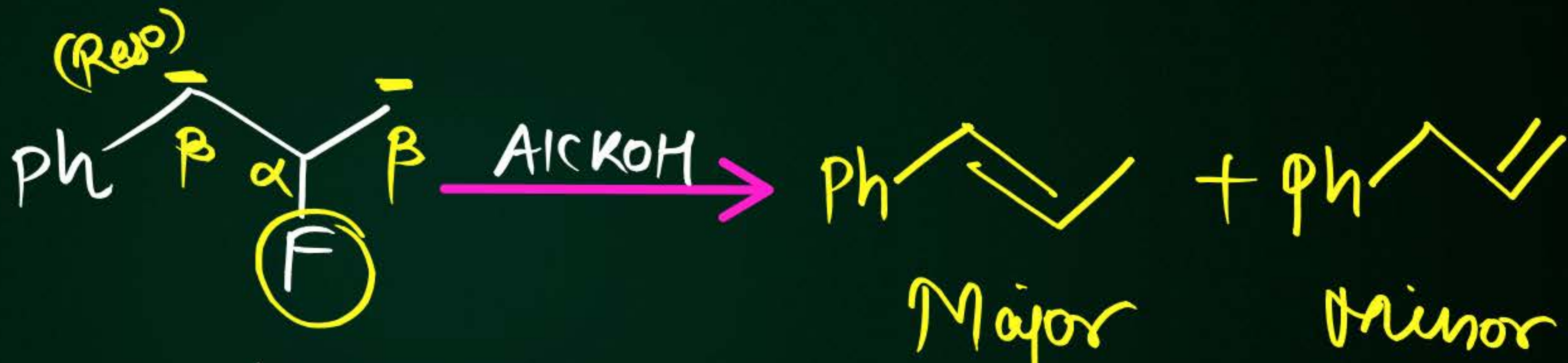
①



2°
1°
β
α
β
F
AlcKOH
Major
minor

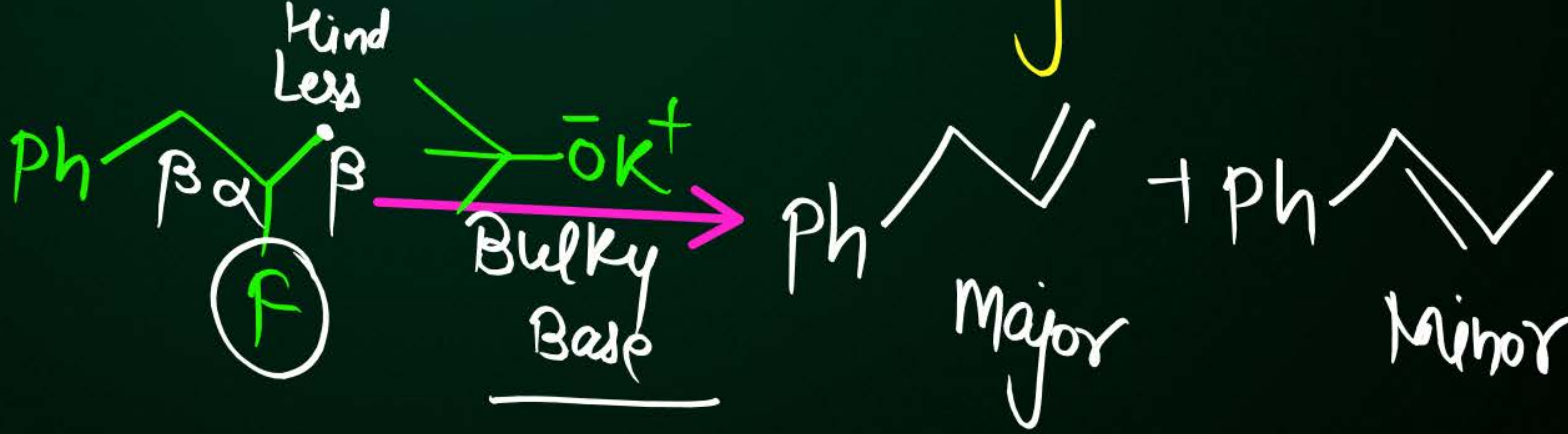
$\left(\underset{1^\circ}{\overset{\ominus}{C}} > \underset{2^\circ}{\overset{\ominus}{C}}\right)$

②



(Reso)
Ph
β
α
β
F
AlcKOH
Ph
Major
Ph
minor

③



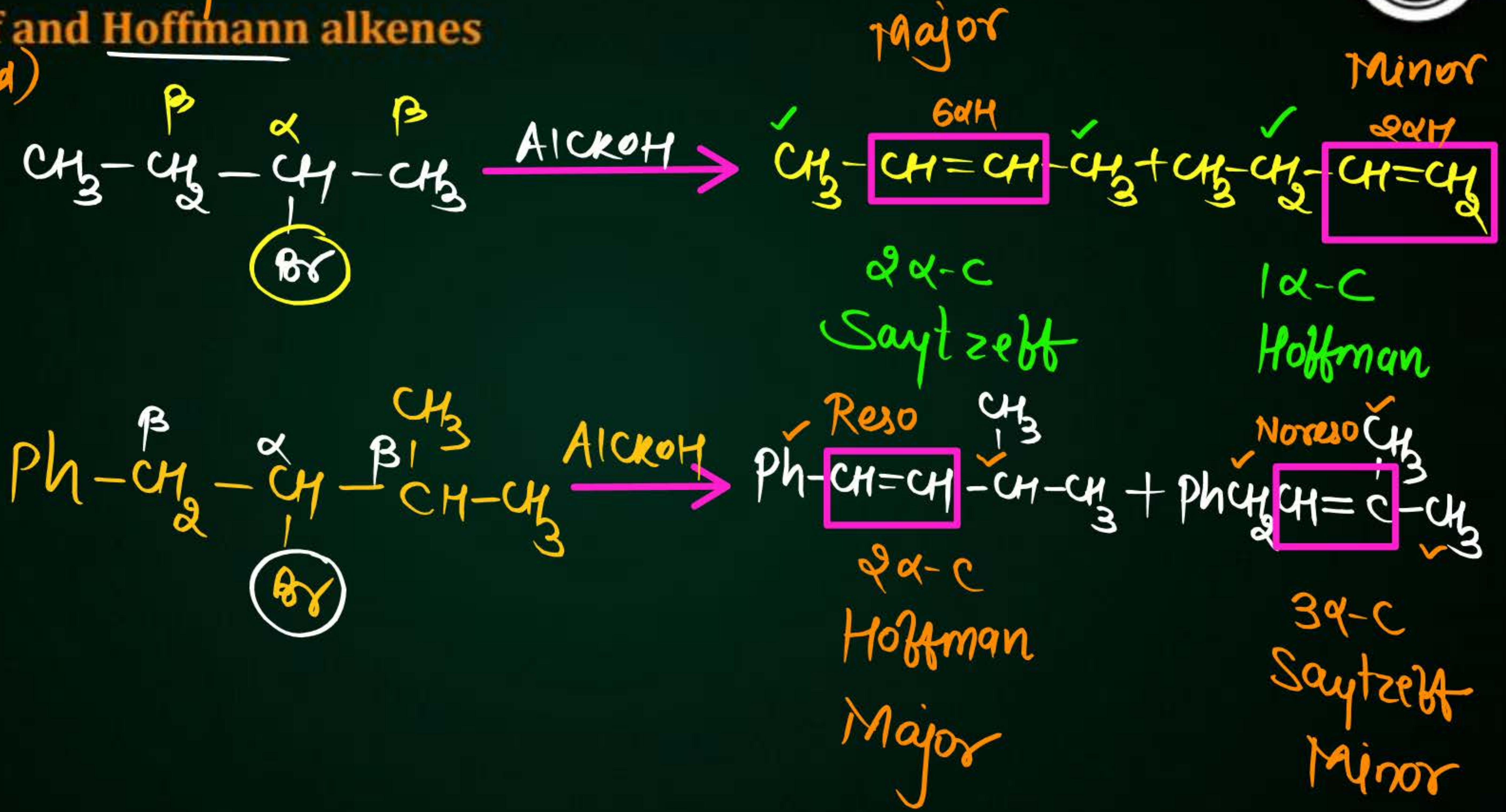
Hind
Less
Ph
β
α
β
F
$\bar{O}K^+$
Bulky
Base
Ph
Major
Ph
Minor

OP Points:

More α-C ↑ Less α-C (Less substituted) ↑

8. Saytzeff and Hoffmann alkenes

(more substituted)



$$CH_3-\overset{\beta}{CH_2}-\underset{Br}{\overset{\alpha}{CH}}-\overset{\beta}{CH_3} \xrightarrow{Alc\,KOH} CH_3-\boxed{CH=CH}-CH_3 + CH_3-CH_2-\boxed{CH=CH_2}$$

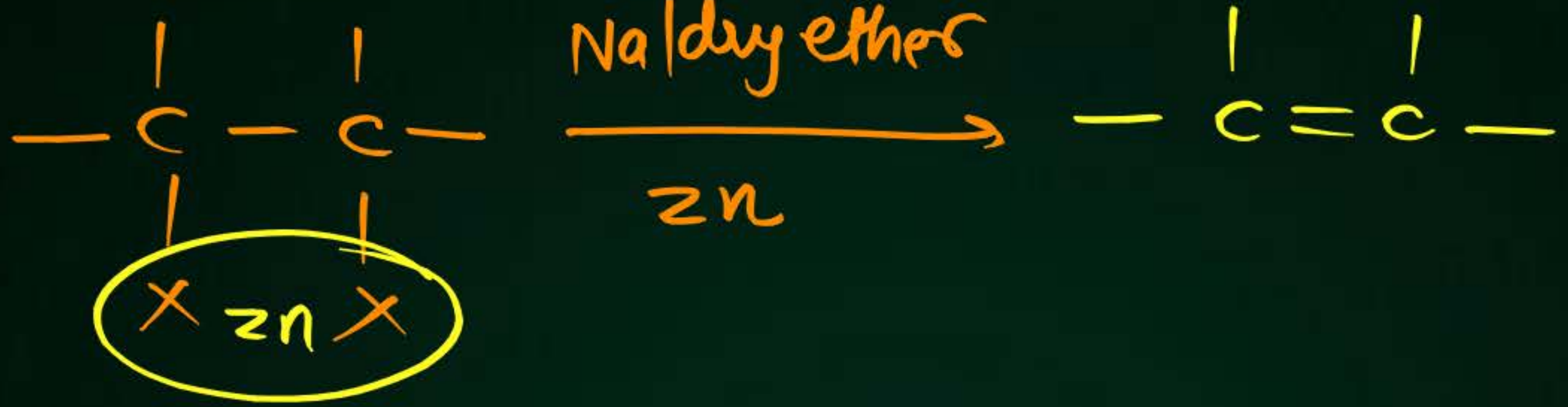
$$Ph-\overset{\beta}{CH_2}-\underset{Br}{\overset{\alpha}{CH}}-\overset{\beta}{CH}(CH_3)-CH_3 \xrightarrow{Alc\,KOH} Ph-\boxed{CH=CH}-\overset{CH_3}{CH}-CH_3 + PhCH_2\boxed{CH=\overset{CH_3}{C}}-CH_3$$

Major
6αH
2α-C
Saytzeff
Minor
2αH
1α-C
Hoffman
Reso
2α-C
Hoffman
Major
Noreso
3α-C
Saytzeff
Minor

E^2 How to find major product

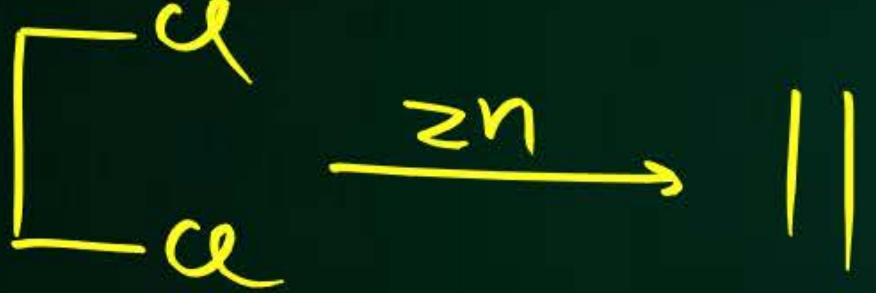
$X = Cl, Br, I$ (mama, mausi) more stable alkene is the Major product Base 1° & 2° RO^-	$X = F$ (Buggi) Base $1^\circ, 2^\circ$ RO^- more stable β $C^\ominus$ will decide the Major product	$X = F, Cl, Br, I$ Base Bulky 3° RO^- Less Hind β-H will decide Major

3. From vicinal dihalides: (De halogenation)

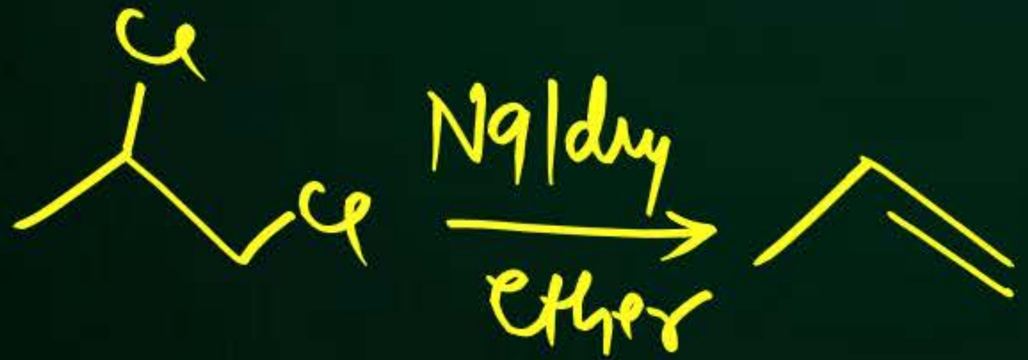

Na/dry ether
Zn
X Zn X

Q

1)



2)


Cl
Cl
Na/dry
ether

Home Work

QUESTION 01

$$B \xleftarrow[\text{Catalyst}]{\text{Lindlar's}} R-C\equiv C-R \xrightarrow{Na/NH_3} A$$

A and B are geometrical isomers (R – CH = CH – R) of which type:

(A) A is trans, B is cis

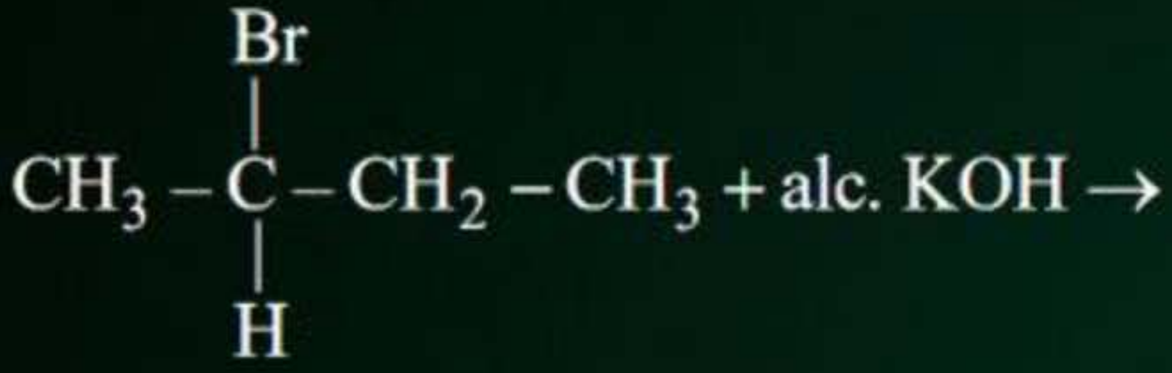
(B) A and B both are cis

(C) A and B both are trans

(D) A is cis, B is trans

QUESTION 02

Major product of the following reaction is:



$$CH_3-\overset{\overset{Br}{|}}{\underset{\underset{H}{|}}{C}}-CH_2-CH_3+\text{alc. KOH}\rightarrow$$

Ⓐ 1-Butene

Ⓑ 2-Butene

Ⓒ Butane

Ⓓ 1-Butyne

QUESTION 03

Dehalogenation of vicinal dihalides with Zn. Mainly produces

Ⓐ Alcohol

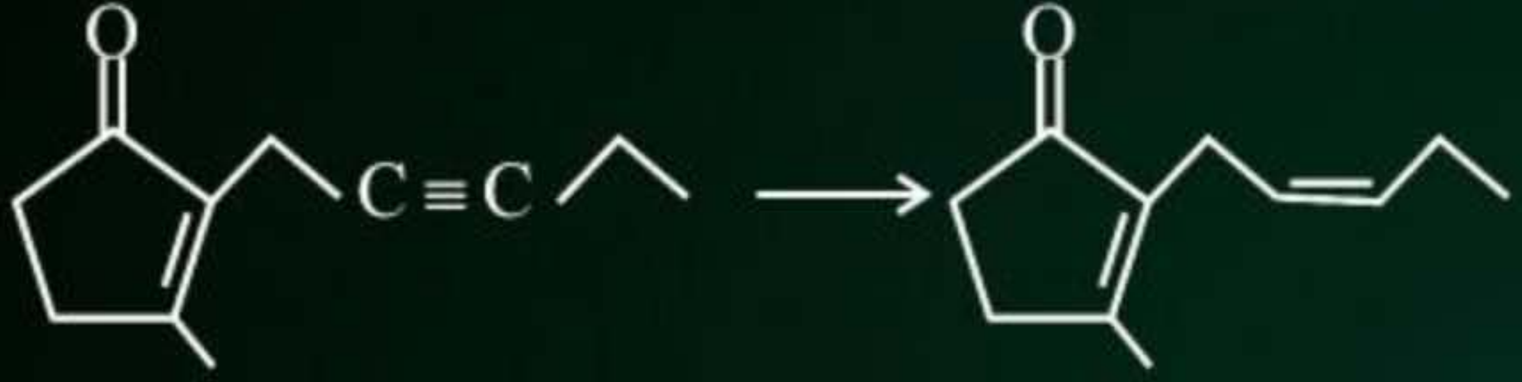
Ⓑ Alkene

Ⓒ Alkyne

Ⓓ Alkane

QUESTION 04

Which reagent will be used for the above conversion?



Ⓐ Na/Liq. NH_3

Ⓑ H_2, Pd – $CaCO_3$

Ⓒ Li, $PhNH_2$

Ⓓ H_2/Pt

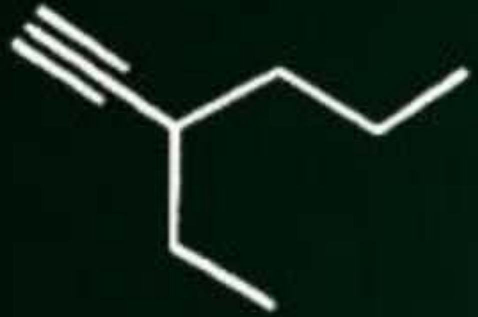
QUESTION 05

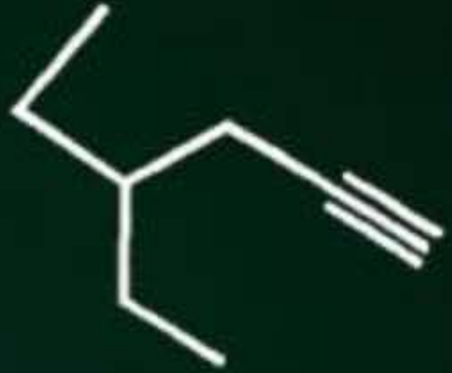
Assertion(A): Reduction of but-2-yne by Na/liq. NH_3 gives 'trans' but-2-ene.
Reason(R): It is an example of 'anti' addition.

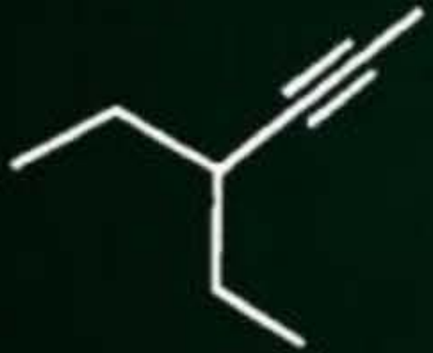
- **A** If both (A) and (R) are correct and (R) is the correct explanation for (A)
- **B** If both (A) and (R) are correct but (R) is not the correct explanation for (A)
- **C** If (A) is correct but (A) is incorrect.
- **D** If (A) is incorrect but (R) is correct.

QUESTION⑥

Which alkyne will give 3-ethylhexane on catalytic hydrogenation?

(A) 

(B) 

(C) 

(D) All of these

QUESTION 07

When 2-butyne is treated with H_2/Pd-$BaSO_4$; the product formed will be:

Ⓐ cis-2-butene

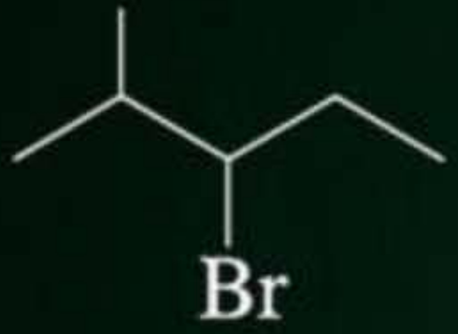
Ⓑ trans-2-butene

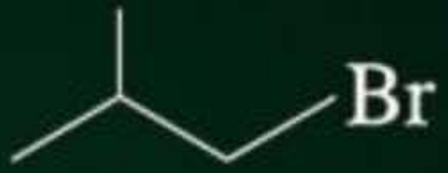
Ⓒ 1-butene

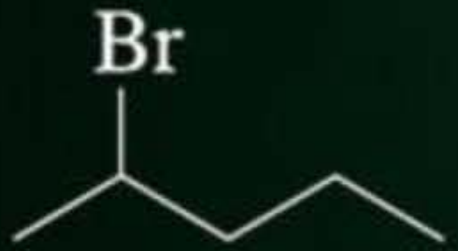
Ⓓ 2-hydroxy butane

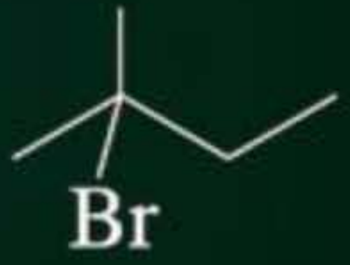
QUESTION 08

Which alkyl bromide will yield only one alkene upon E_2 elimination?

A


B


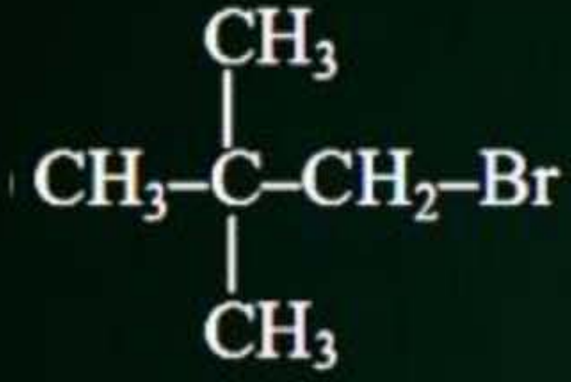
C


D


QUESTION 09

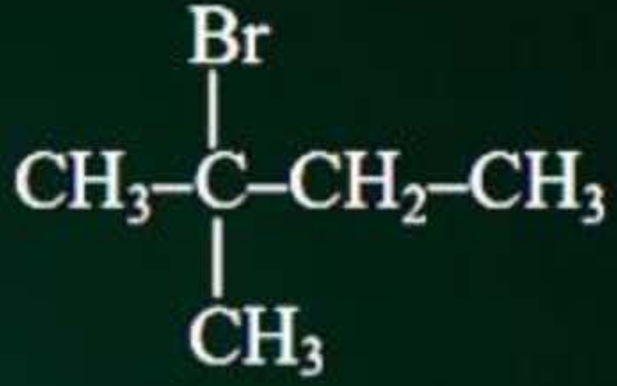
Which is most reactive towards E^2 –reactions:

(A)



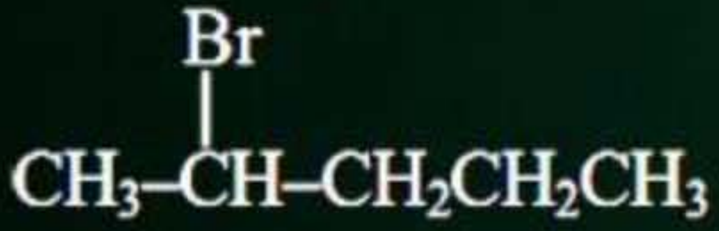
$$CH_3-\overset{CH_3}{\underset{CH_3}{C}}-CH_2-Br$$

(B)



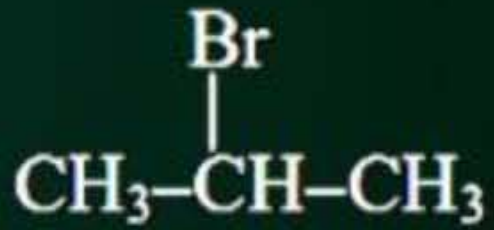
$$CH_3-\overset{Br}{\underset{CH_3}{C}}-CH_2-CH_3$$

(C)



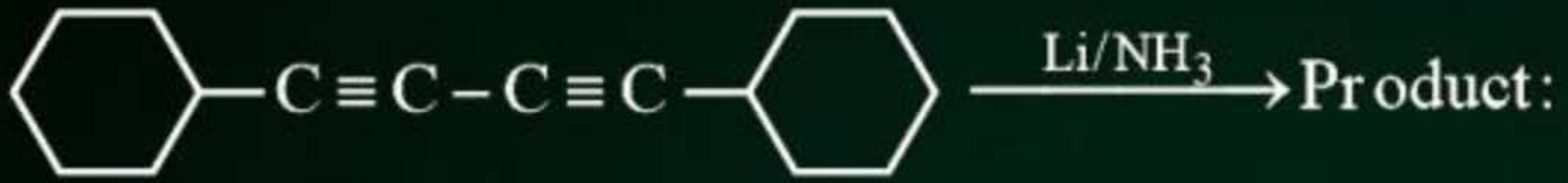
$$CH_3-\overset{Br}{CH}-CH_2CH_2CH_3$$

(D)

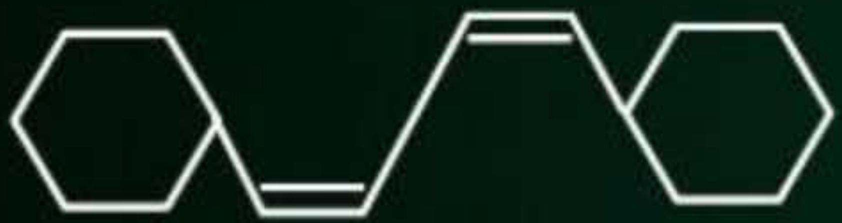


$$CH_3-\overset{Br}{CH}-CH_3$$

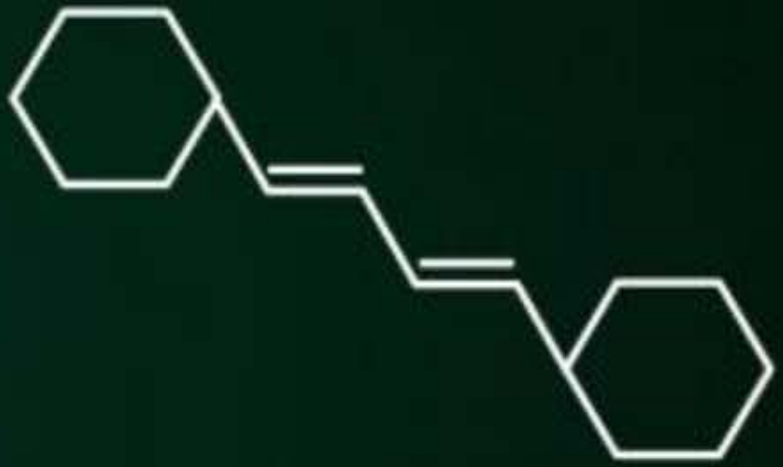
QUESTION 10


C≡C–C≡C
Li/NH3
Product:

Ⓐ

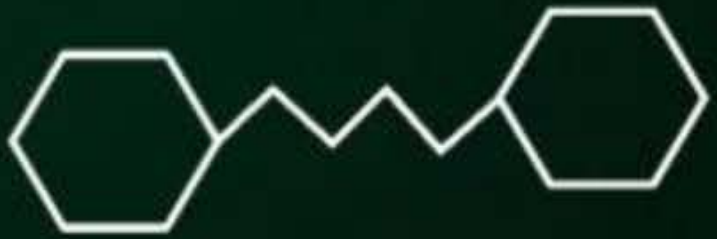


Ⓑ



Ⓒ Both (A) and (B)

Ⓓ



ANSWER KEY

1.A
2.B
3.B
4.B
5.A
6.D
7.A
8.B
9.B
10.B

Home Work From PW Module (Yakeen NEET)

Prarambh: Q 49, 55, 65, 70, 78

Prabal: Q 05

Parikshit: Q 02

Thank you!!

YAKEEN 2.0

FOR NEET 2025

Lecture- 05 Organic Chemistry

HYDROCARBONS

By- Pankaj Sir(POPU MAMA)

Physics Wallah

Topics *to be covered*

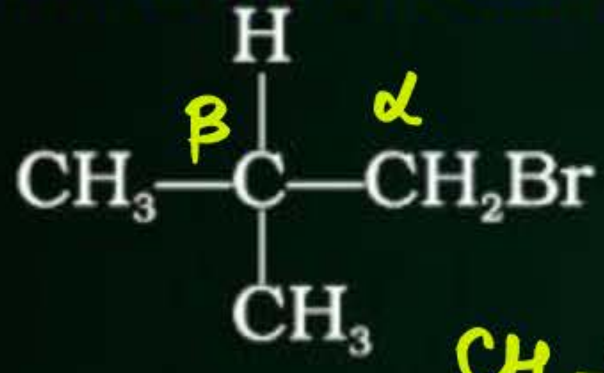
1. Methods of Preparation of Alkenes Part 02
2. Dehydration of alcohols *
3. Practice

QUESTION (NCERT Exemplar)

ROR ∝ stability of alkene

Arrange the following alkyl halides in decreasing order of the rate of β– elimination reaction with alcoholic KOH.

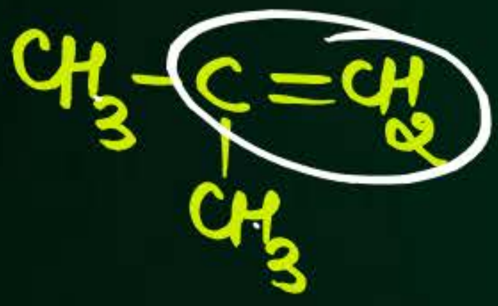
(A)



$CH_3-\underset{CH_3}{\overset{H}{C}}-CH_2Br$

(B) $\overset{\beta}{CH_3}-\overset{\alpha}{CH_2}-Br$

(C) $CH_3-\overset{\beta}{CH_2}-\overset{\alpha}{CH_2}-Br$



$CH_3-\underset{CH_3}{C}=CH_2$

6αH

$CH_2=CH_2$

0αH

$CH_3-CH=CH_2$

3αH

A) A > B > C

B) C > B > A

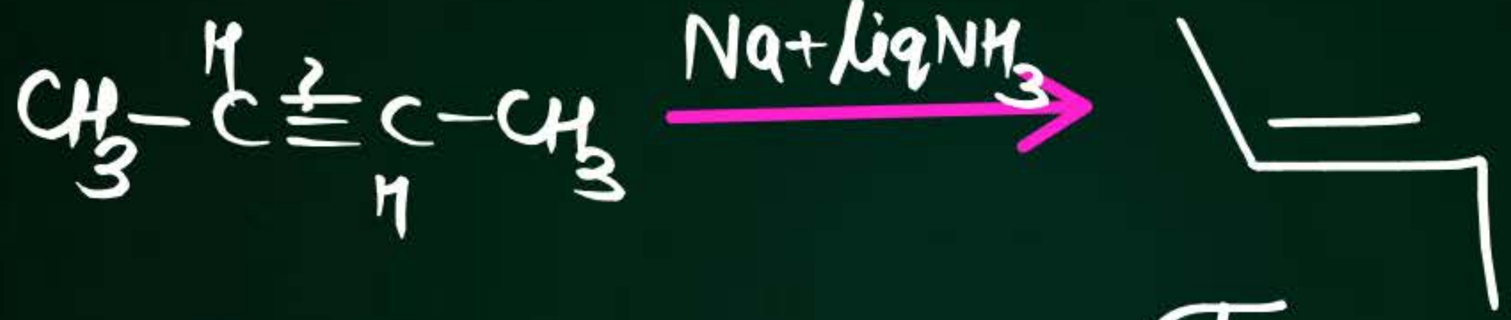
C) B > C > A

[✓ D)] A > C > B

QUESTION (NCERT Exemplar)

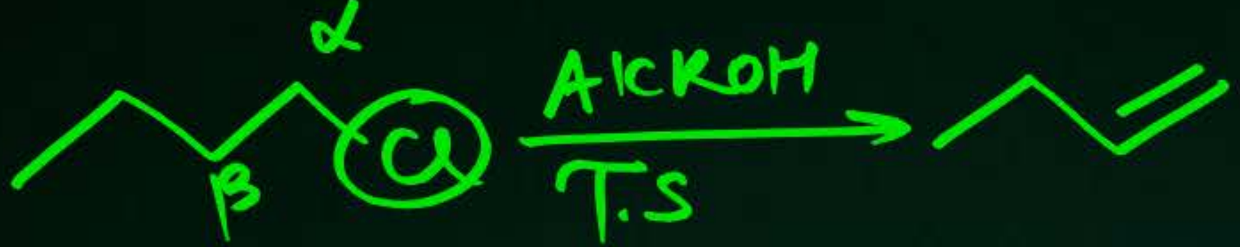
Alkynes on reduction with sodium in liquid ammonia form trans alkenes. will the butene thus formed on reduction of 2-butyne show the geometrical isomerism?

Yes


CH3–C≡C–CH3
H
2
H
Na+liqNH3

Trans-2-Butene

QUESTION



Assertion(A): 1-Chlorobutane on heating with alcoholic KOH undergoes dehydrohalogenation to yield but-1-ene.

Reason(R): It is elimination reaction involving carbonium ion intermediate.

- A If both (A) and (R) are correct and (R) is the correct explanation for (A)
- B If both (A) and (R) are correct but (R) is not the correct explanation for (A)
- [✓ C] If (A) is correct but (R) is incorrect.
- D If (A) is incorrect but (R) is correct.

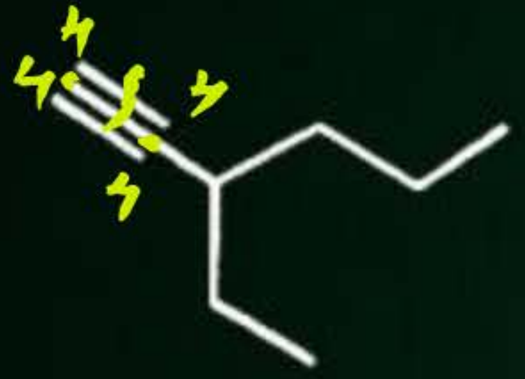
QUESTION

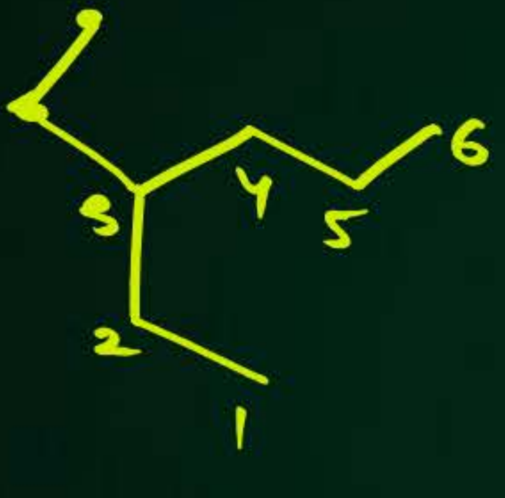
The *trans*-alkene are formed by the reduction of alkynes with:

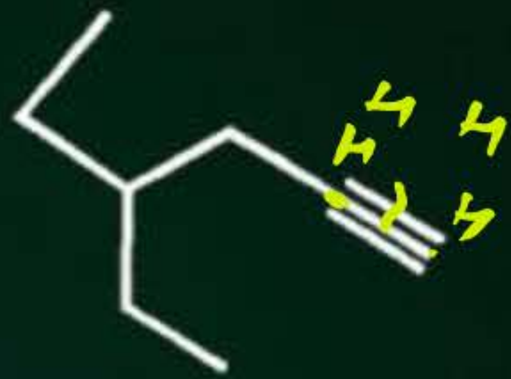
- A [✓ Na/liq. NH_3]
- B $NaBH_4$
- C Sn/HCl
- D H_2-Pd/C, $BaSO_4$

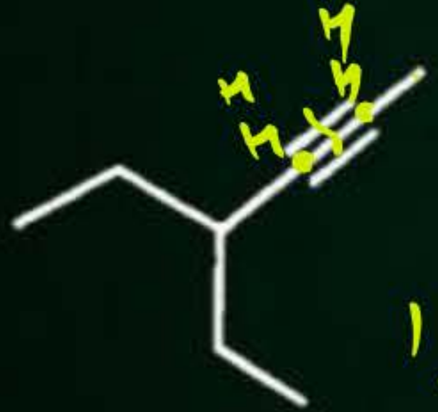
QUESTION

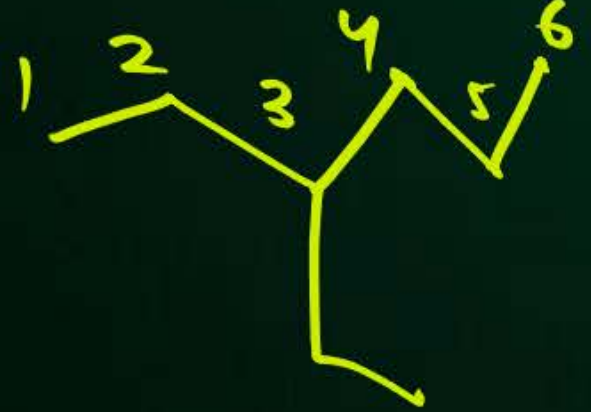
Which alkyne will give 3-ethylhexane on catalytic hydrogenation?

(A) 

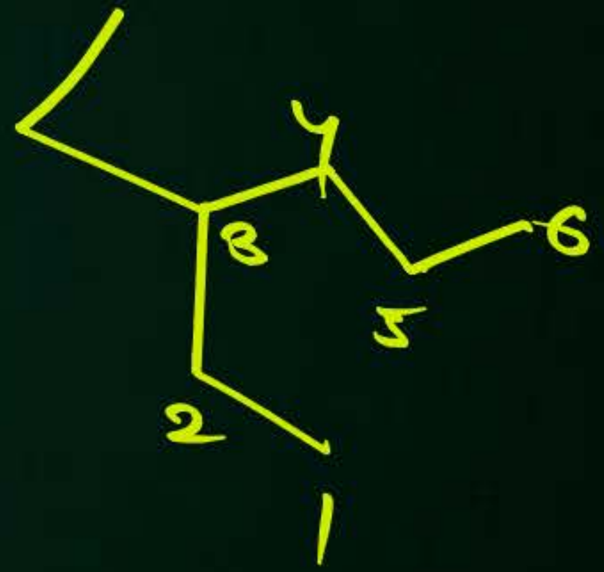


(B) 

(C) 



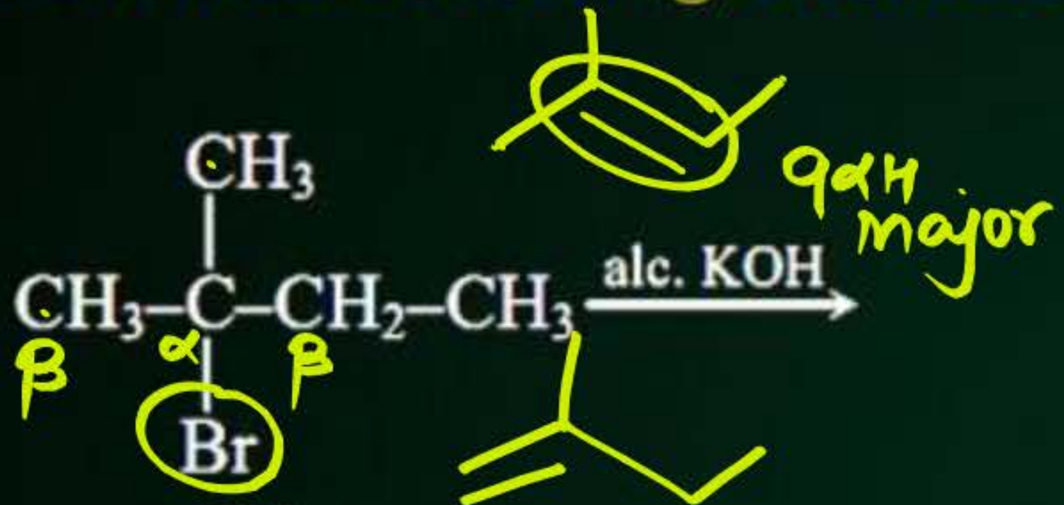
(D) All of these



QUESTION

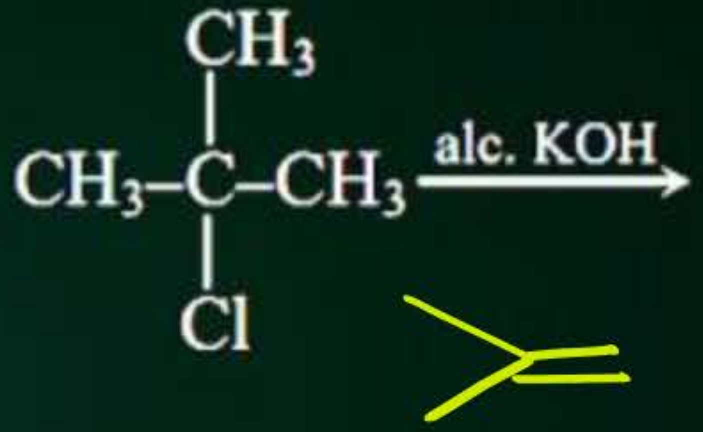
In which of the following reactions major product is formed by Saytzeff's rule:

A



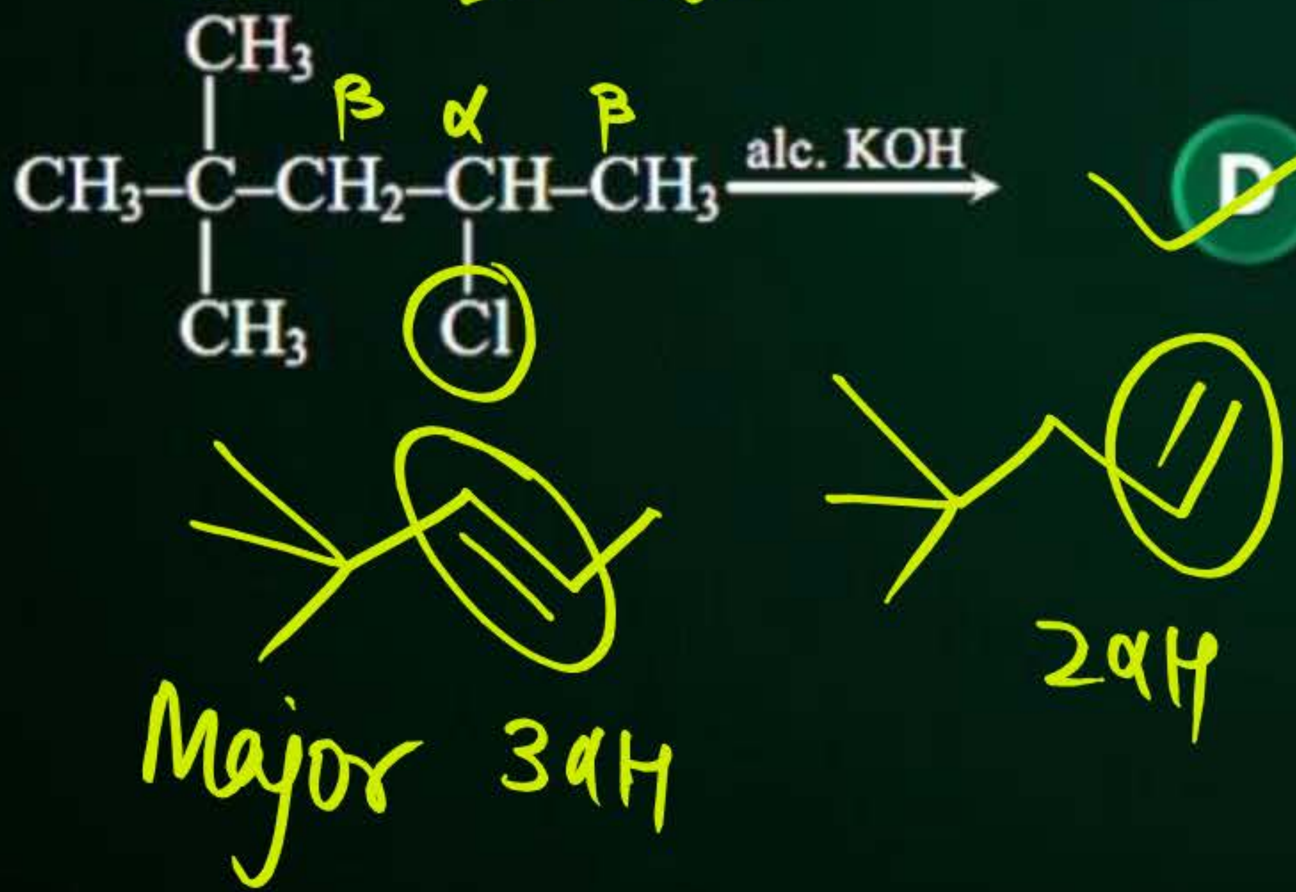
$CH_3-\overset{CH_3}{\underset{Br}{C}}-CH_2-CH_3 \xrightarrow{alc.\ KOH}$

B



$CH_3-\overset{CH_3}{\underset{Cl}{C}}-CH_3 \xrightarrow{alc.\ KOH}$

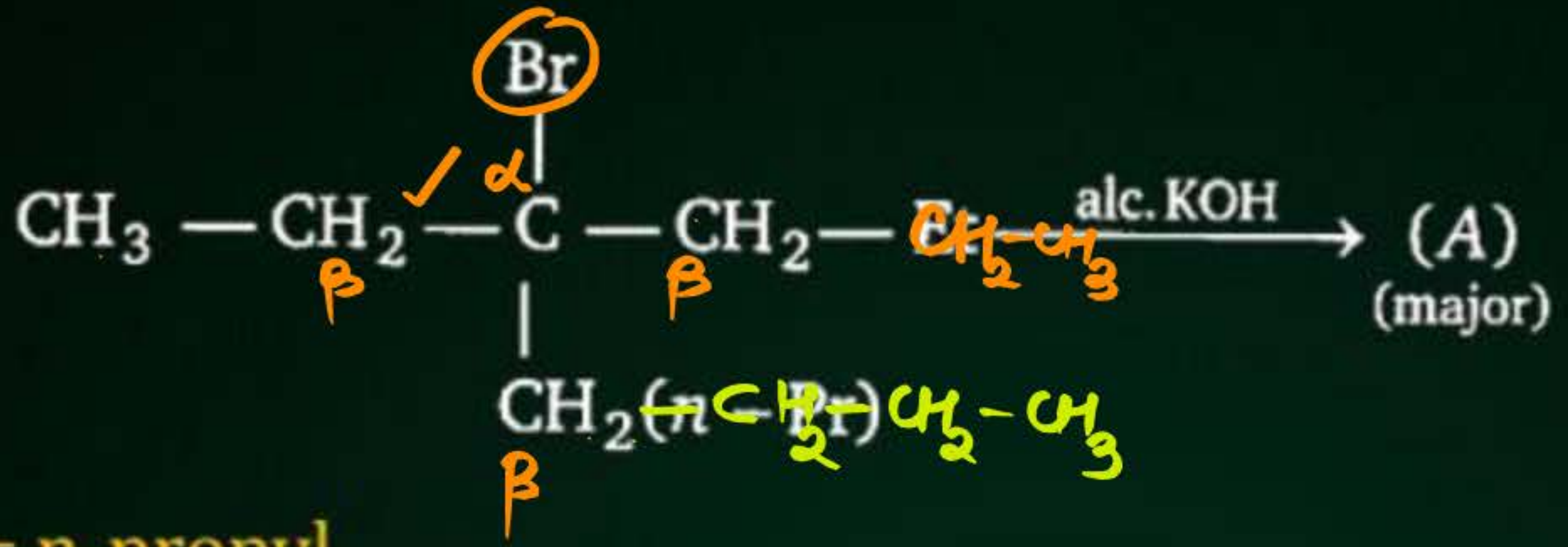
C



$CH_3-\overset{CH_3}{\underset{CH_3}{C}}-CH_2-\underset{Cl}{CH}-CH_3 \xrightarrow{alc.\ KOH}$

D ✓ All the above

QUESTION

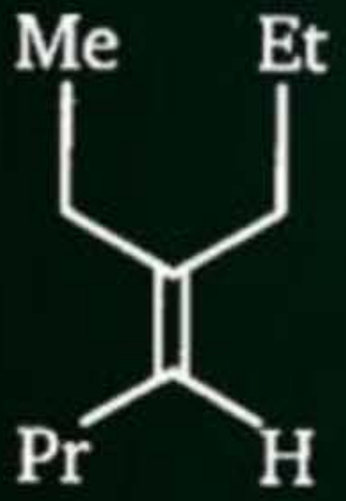


$$CH_3-\underset{\beta}{CH_2}-\overset{\overset{\boxed{Br}}{|}}{\underset{\underset{\underset{\beta}{CH_2(\cancel{n\text{-}Pr})\,CH_2-CH_2-CH_3}}{|}}{\overset{\alpha}{C}}}-\underset{\beta}{CH_2}-\cancel{Et}\,CH_2-CH_3\xrightarrow{\text{alc. KOH}}\underset{\text{(major)}}{(A)}$$

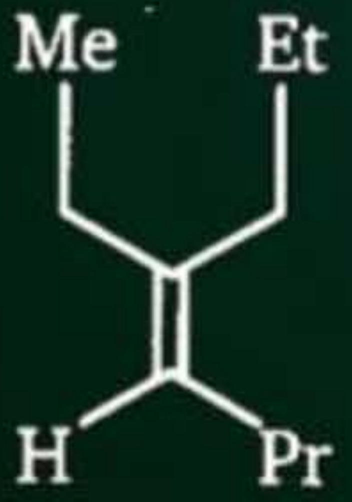
n-Pr = n-propyl

Product (A) is:

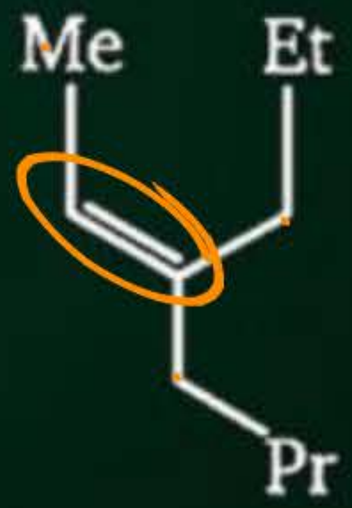
A



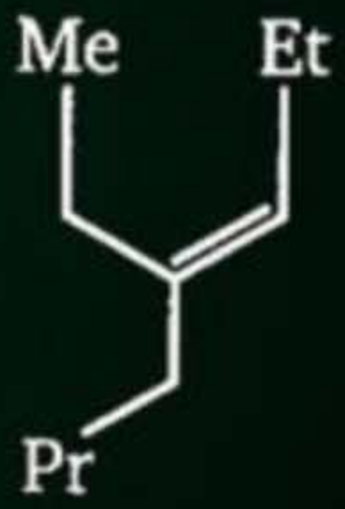
B



C ✓

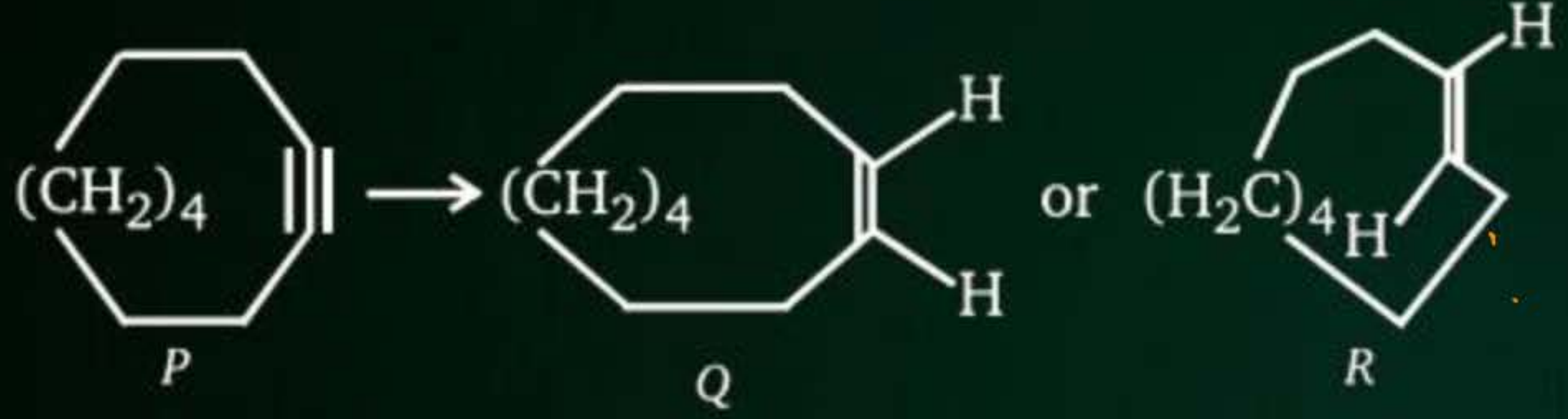


D



QUESTION

Reactant P gives products Q or R.


$(CH_2)_4$
P
$(CH_2)_4$
H
H
Q
or
$(H_2C)_4$
H
H
R

The possible reagents are:

[✓ (I) 2Na/liq. NH_3] (II) [✓ $H_2/Pd/CaCO_3$(quinoline)] (III) $2H_2/Pd/C$

The correct statement with respect to the above conversion is/are:

- (A) Q is obtained on treatment with reagent (I) ✗
- (B) R and Q are obtained on treatment with reagent (II) ✗
- (C) R is obtained on treatment with reagent (I) ✓
- (D) R is obtained on treatment with reagent (II)

Methods of Preparation of Alkenes

Mahaimp ⓔ $E1$

4. From alcohols by acidic dehydration ÷ : Removal of H_2O or formation of carbonium ion

Reagent Conc. H_2SO_4/Δ (H_3PO_4 or)

or

H^+/Δ

Mech

$$\underset{(Nu)}{R-\ddot{O}H} \xrightarrow[\text{Protonation}]{H^+ \text{ (E)}} R-\overset{\oplus}{O}-H \xrightarrow[\text{slow}]{\text{R.D.S}} R^{\oplus} + H_2O$$

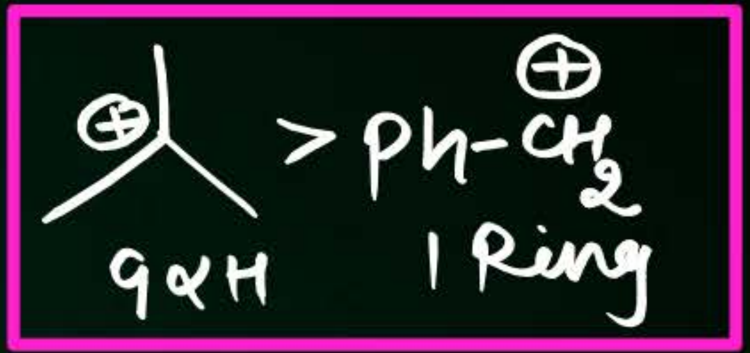
$R-\overset{\oplus}{O}(H)-H$ (Excellent L.G)

Rearrangement if pos

Removal of H^+ or Δ formation of Alkene

$$\boxed{\text{Alkene}} + H^+$$

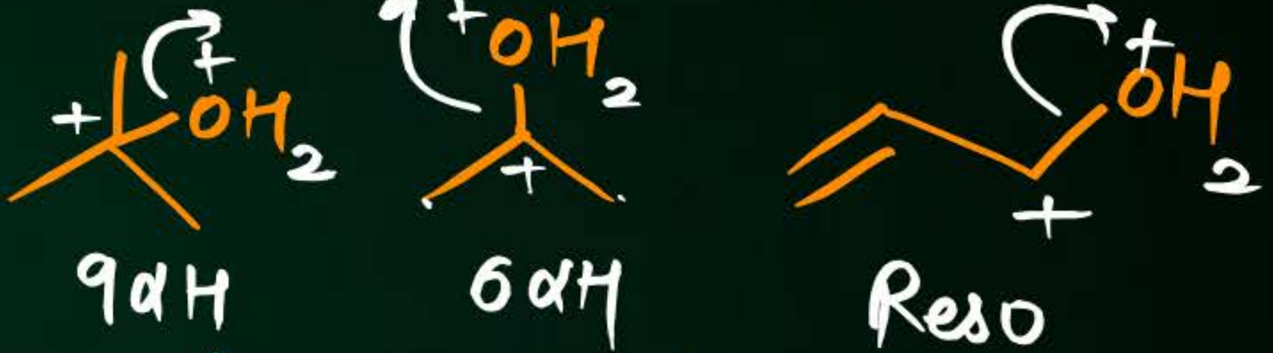
op point


⊕
> Ph-$CH_2^{\oplus}$
9αH
1 Ring

① formation of carbocation

② Rearrange if possible

③ r.o.r ∝ stability of 1^{st} carbocation
or reactivity


+
$\overset{+}{O}H_2$
$\overset{+}{O}H_2$
+
+
$\overset{+}{O}H_2$
9αH
6αH
Reso

$\boxed{1 > 3 > 2}$

④ r.o.r $r = K[R-\overset{+}{O}H_2]^1$

order = 1 Molecularity = 1

⑤ E^1 Mechanism

⑥ More stable alkene is the Major product

Rearrangement in carbocation :-

Q. kyu?

A. To attain stability

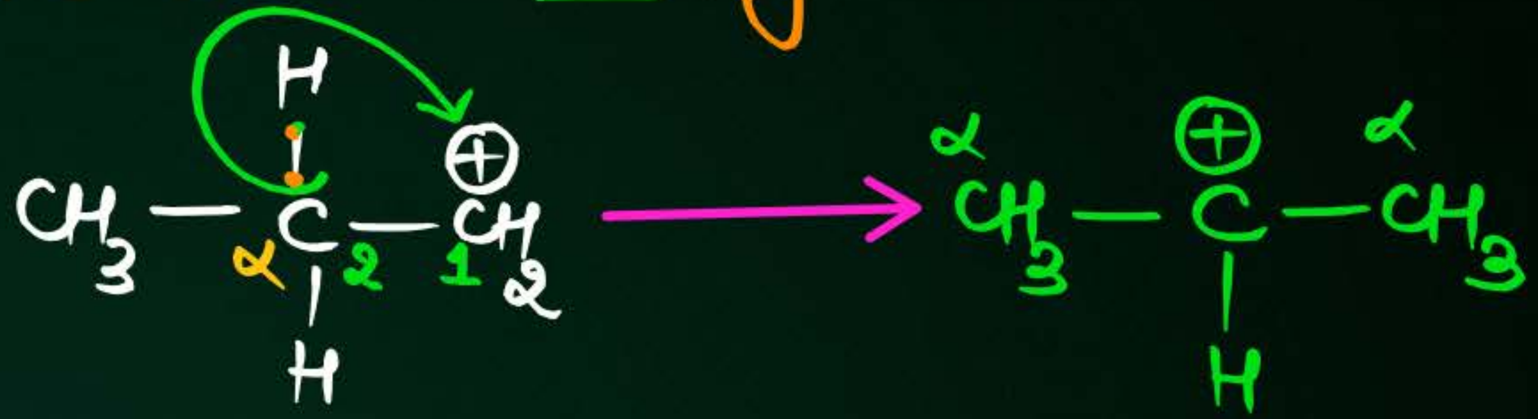
Q. Kitni bar?

A Jab tak hai Jaan
(Jab tak max stable na ho Jaye)

Q Kaise?

A Aao btate hai.

① $H^{\ominus}$ shift or 1,2-hydride shift

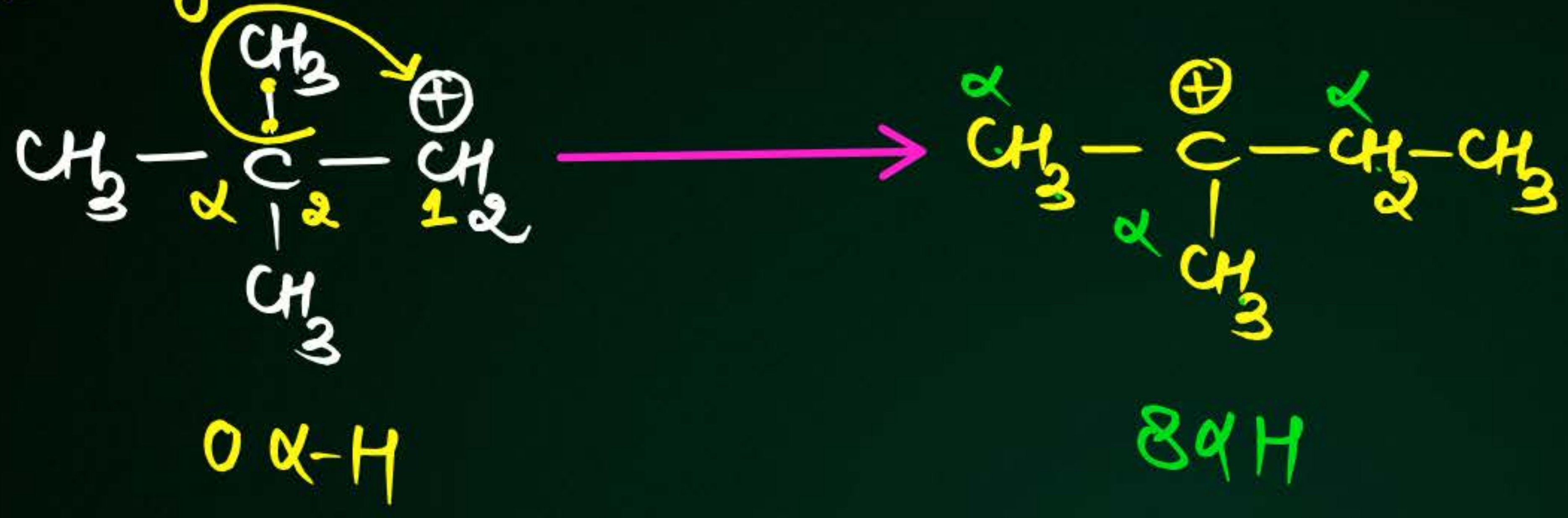


$$CH_3-\underset{H}{\overset{H}{C}}-\overset{\oplus}{C}H_2 \longrightarrow CH_3-\underset{H}{\overset{\oplus}{C}}-CH_3$$

2αH
Less stable

6αH
More stable

② Methyl shift

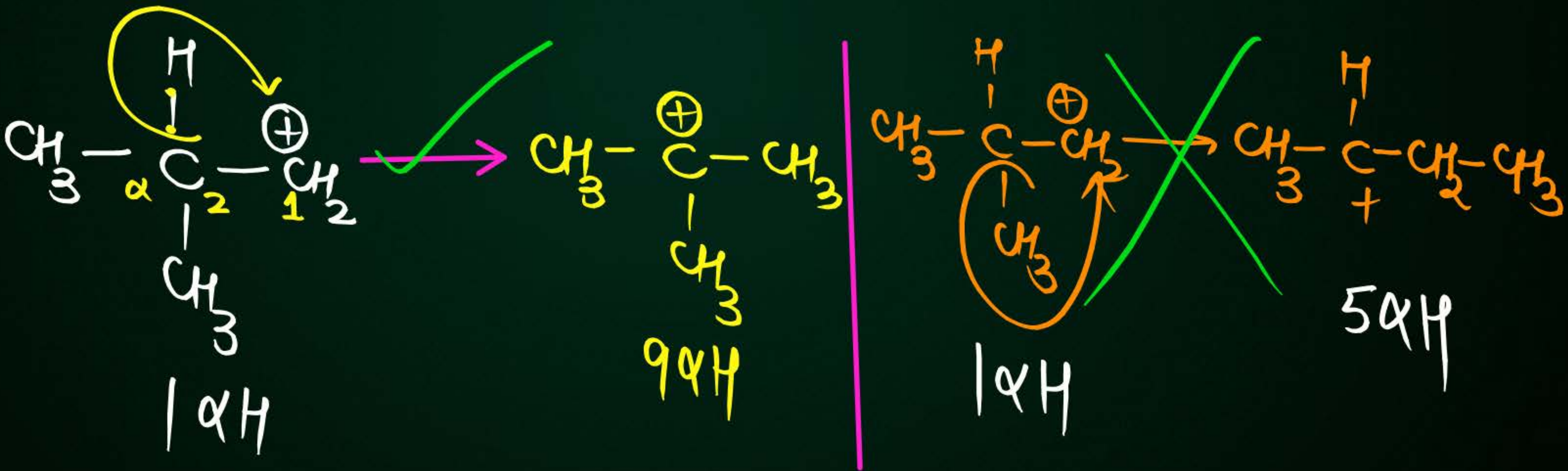


CH3
⊕
CH3–C–CH2
α
2
1
CH3
0 α-H
α
⊕
CH3–C–CH2–CH3
α
α
CH3
8αH

Priority

$H^{\ominus} > Me^{\ominus}$

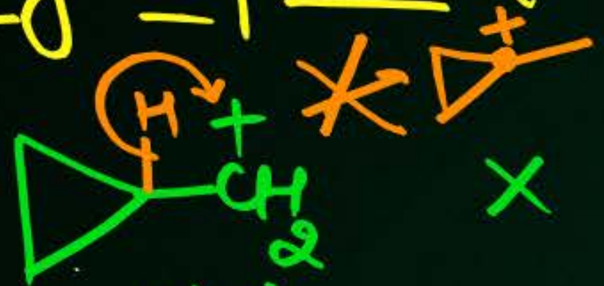
#



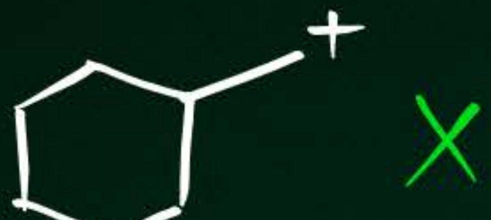
H
⊕
CH3–C–CH2
α
2
1
CH3
1αH
⊕
CH3–C–CH3
CH3
9αH
H
⊕
CH3–C–CH2
CH3
1αH
H
CH3–C–CH2–CH3
+
5αH

③ Ring expansion

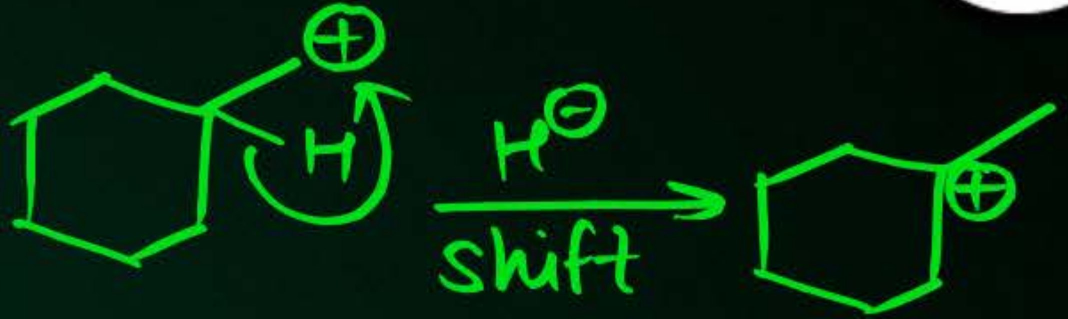
Stability 6 > 5 > 4

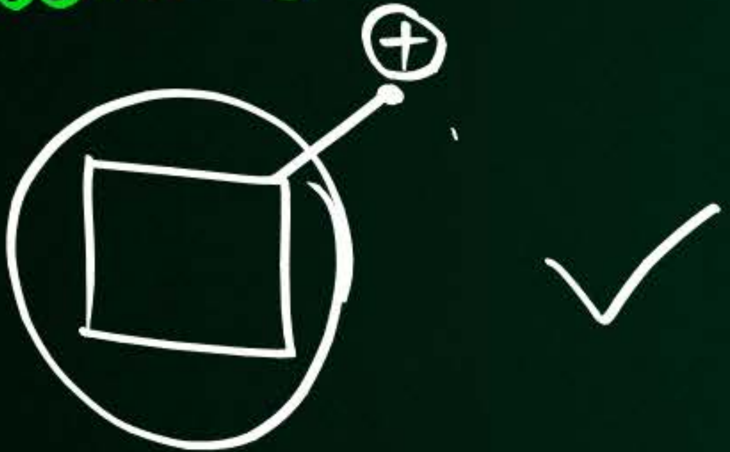


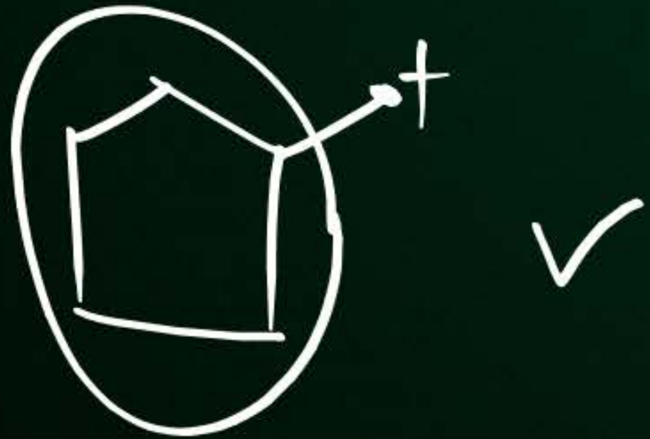
stable due to Bent 'p' overlap
dancing reso

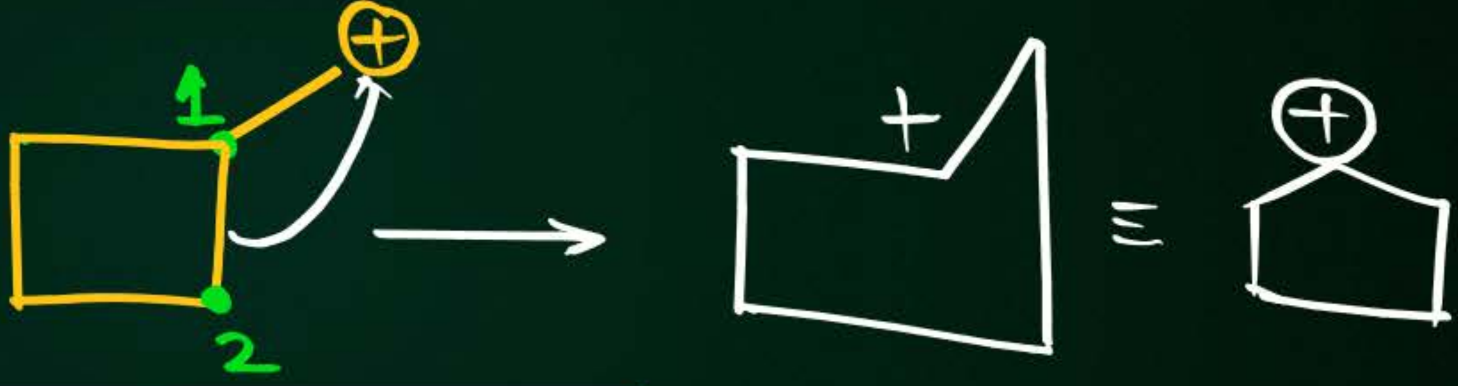


Most stable ring

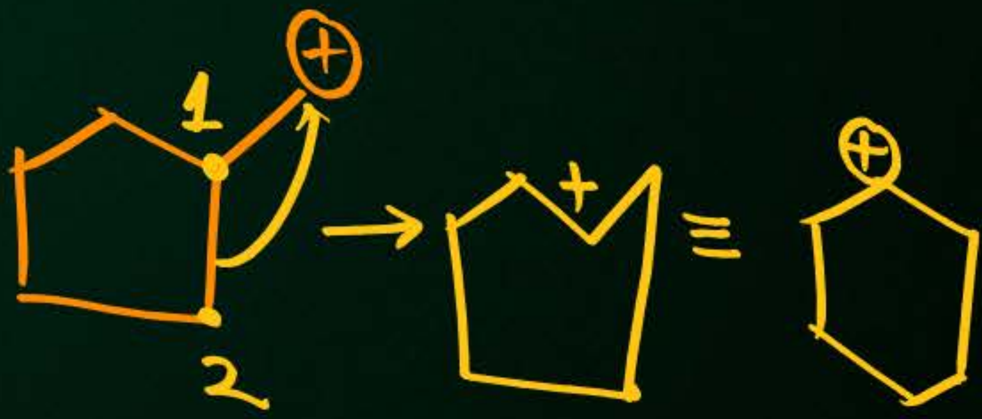




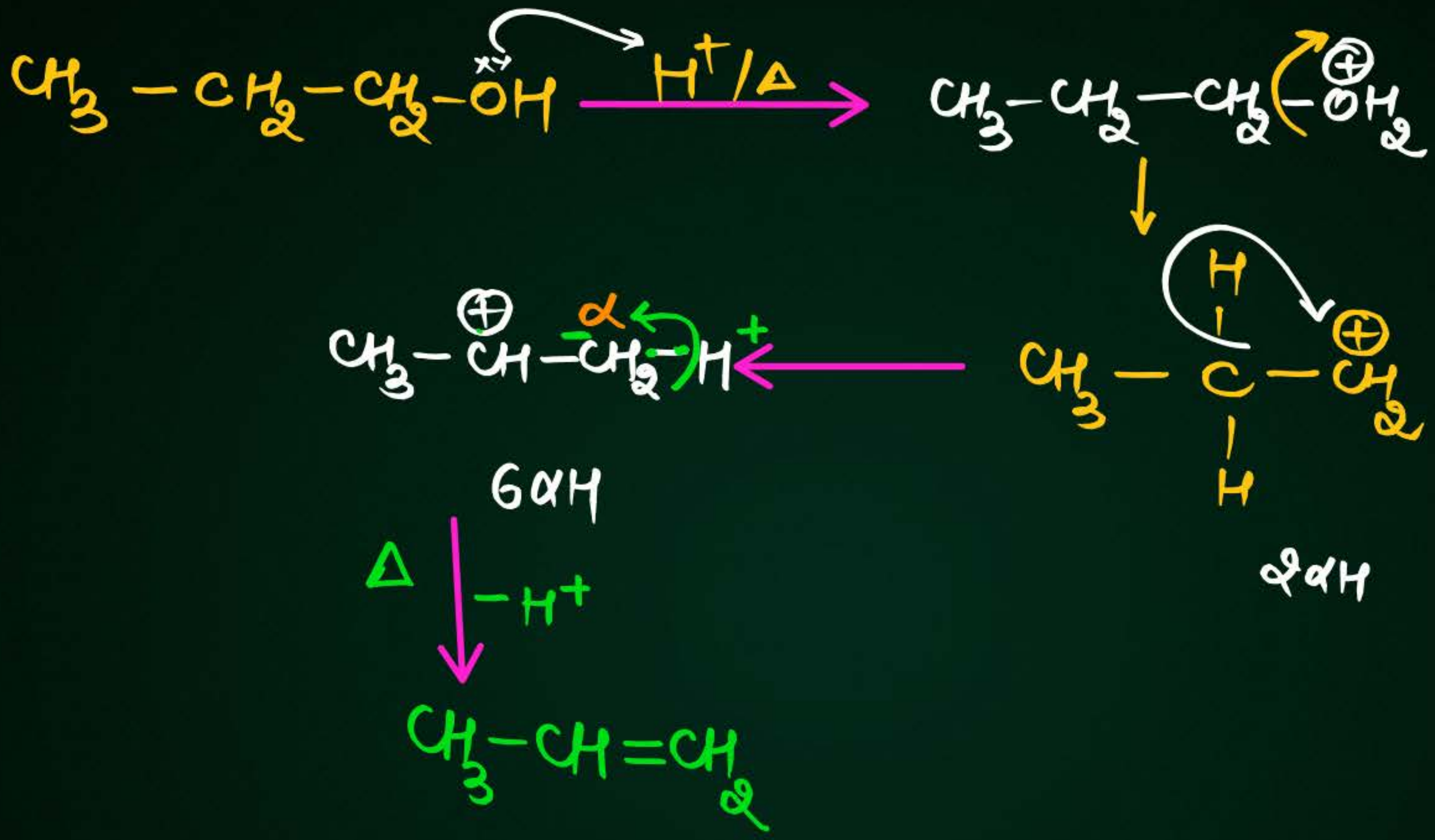




1,2 bond todo
2 ko ⊕ se jodo
1 ko ⊕ dedo



8/ ①



$CH_3-CH_2-CH_2-\ddot{O}H \xrightarrow{H^+/\Delta} CH_3-CH_2-CH_2-\overset{\oplus}{O}H_2$

$\downarrow$

$CH_3-\overset{H}{\underset{H}{C}}-\overset{\oplus}{C}H_2$

2αH

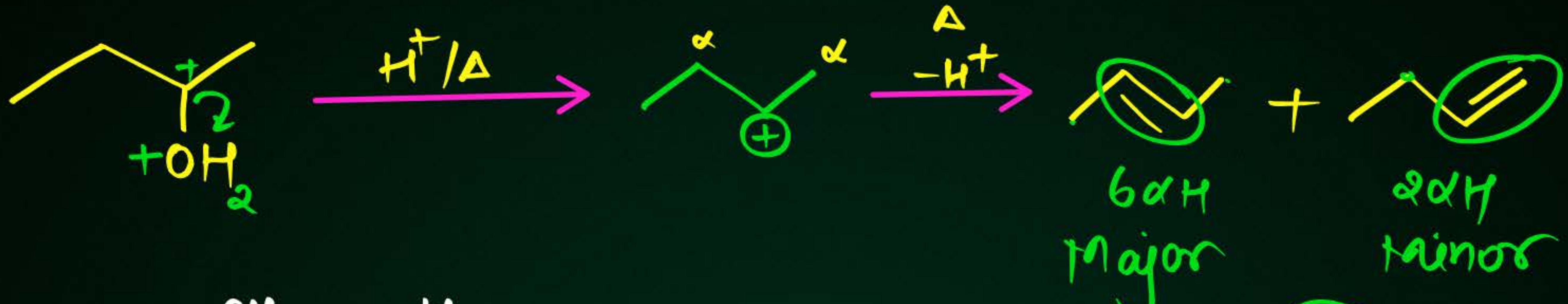
$\longrightarrow CH_3-\overset{\oplus}{C}H-\overset{\alpha}{C}H_2-H^+$

6αH

$\Big\downarrow \Delta \quad -H^+$

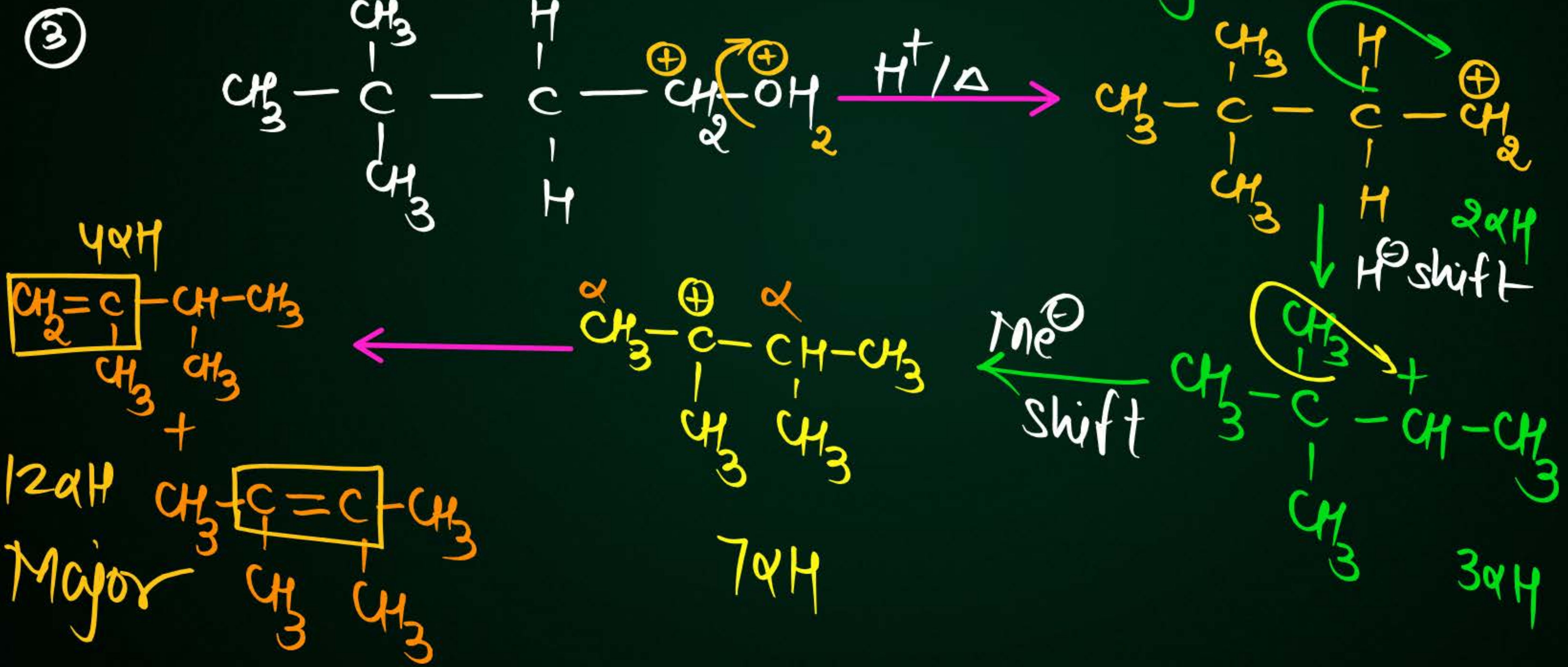
$CH_3-CH=CH_2$

②



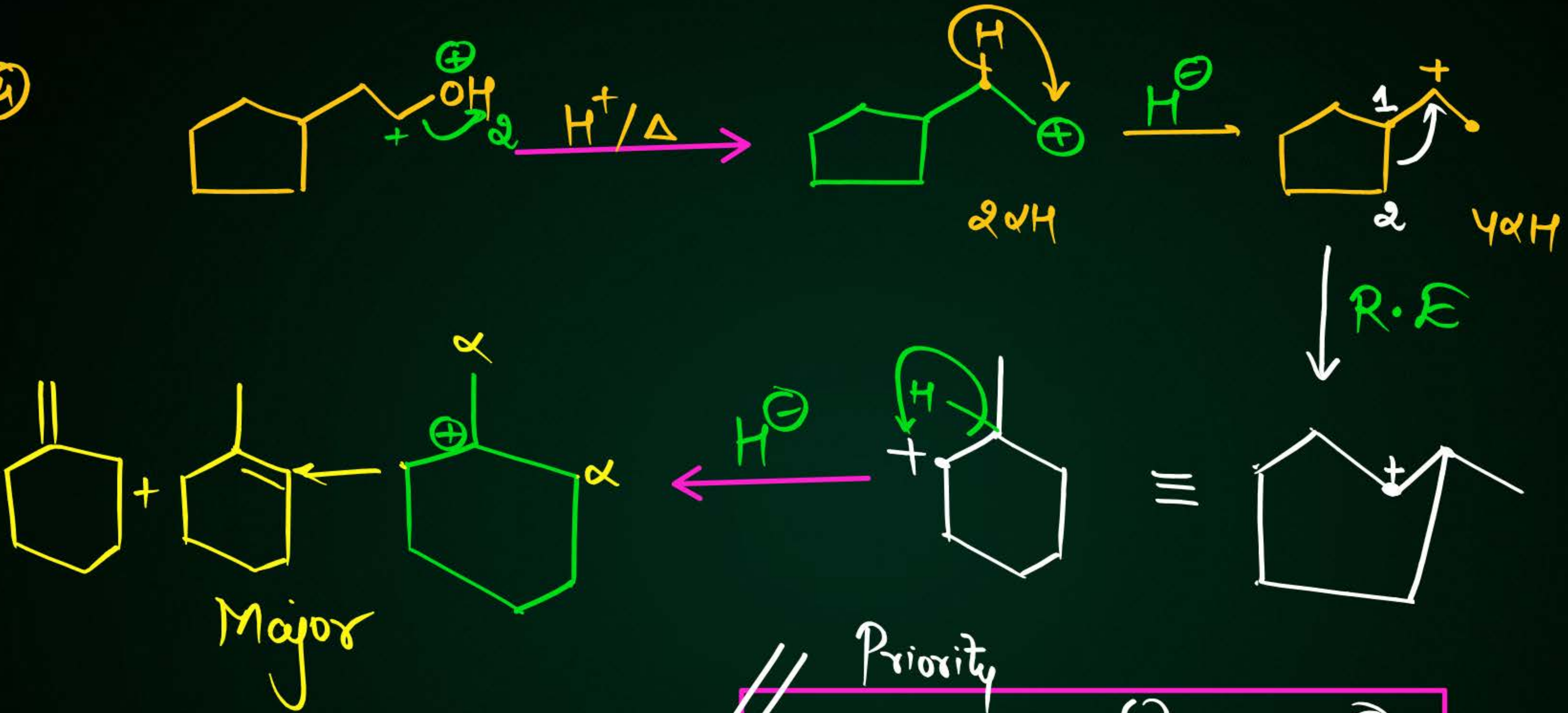
+OH2
H+/Δ
α
α
Δ
−H+
6αH
Major
2αH
minor

③



CH3–C(CH3)2–CH2–CH2–+OH2
H+/Δ
CH3–C(CH3)2–CH2–+CH2
2αH
H⁻ shift
CH3–C(CH3)2–+CH–CH3
3αH
Me⁻ shift
CH3–+C(CH3)–CH(CH3)–CH3
7αH
4αH
CH2=C(CH3)–CH(CH3)–CH3
+
12αH
Major
CH3–C(CH3)=C(CH3)–CH3

④



⊕
OH2
+
2
H+/Δ
H
⊕
2αH
H⊖
+
1
2
4αH
R.E
≡
H
+
H⊖
α
⊕
α
+
Major

Priority

$$\boxed{R.E > H^{\ominus} > Me^{\ominus}}$$

QUESTION

When an organic alcohol undergoes a dehydration reaction under acidic conditions, what functional group is formed?

Ⓐ An aldehyde

Ⓑ [✓ An alkene]

Ⓒ A ketone

Ⓓ An amine

QUESTION

When alcohol reacts with conc. H_2SO_4, intermediate compound formed is:

[✓ Ⓐ carbonium ion]

Ⓑ alkoxy ion

Ⓒ alkyl hydrogen sulphate

Ⓓ none of the above

QUESTION

During dehydration of alcohols to alkenes by heating with conc. H_2SO_4, the initiation step is:

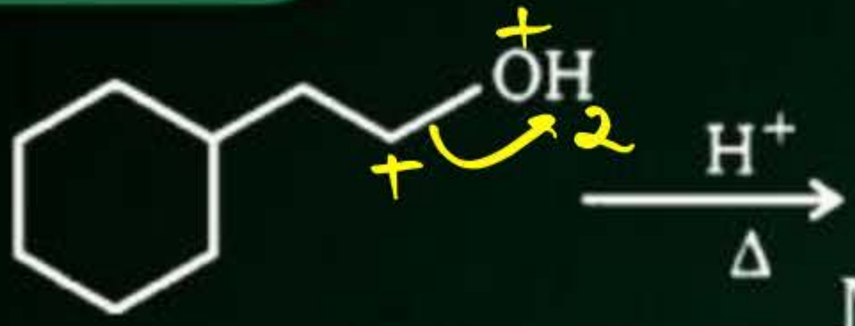
Ⓐ elimination of water

Ⓑ formation of an ester

Ⓒ formation of carbocation

[✓ Ⓓ protonation of alcohol molecule]

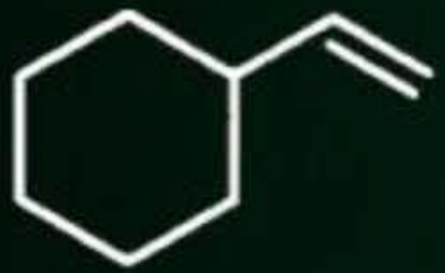
QUESTION



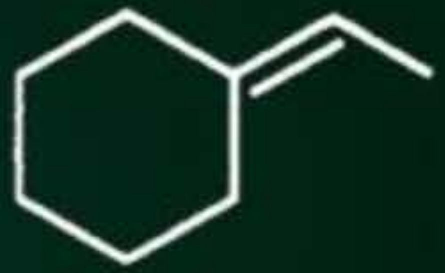
(A) Major-product (A) is:

Major

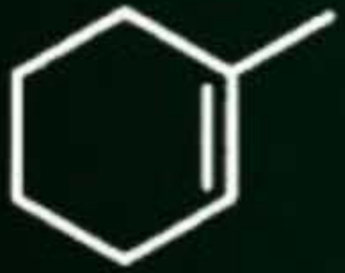
A



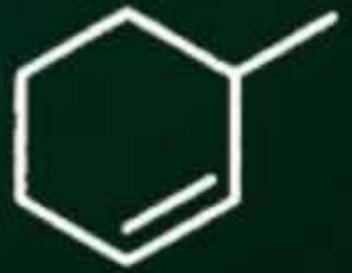
B

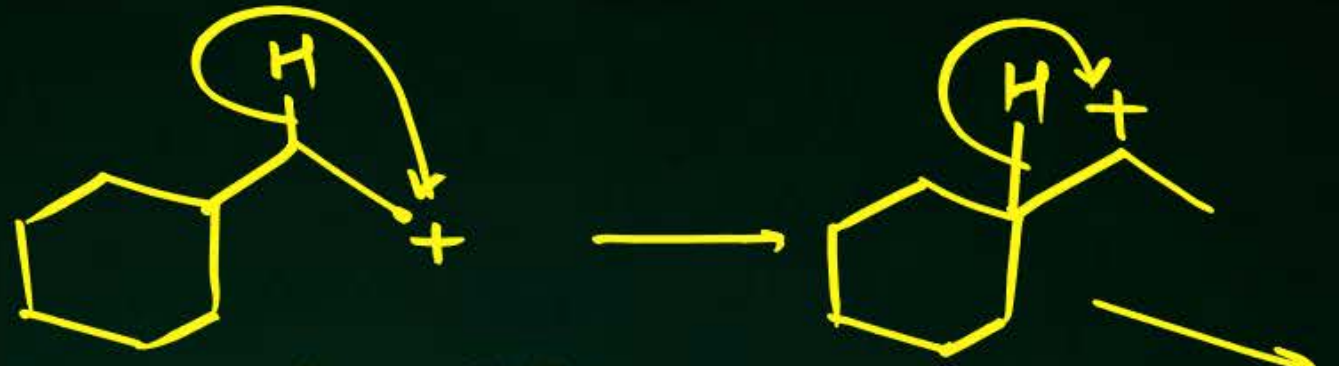


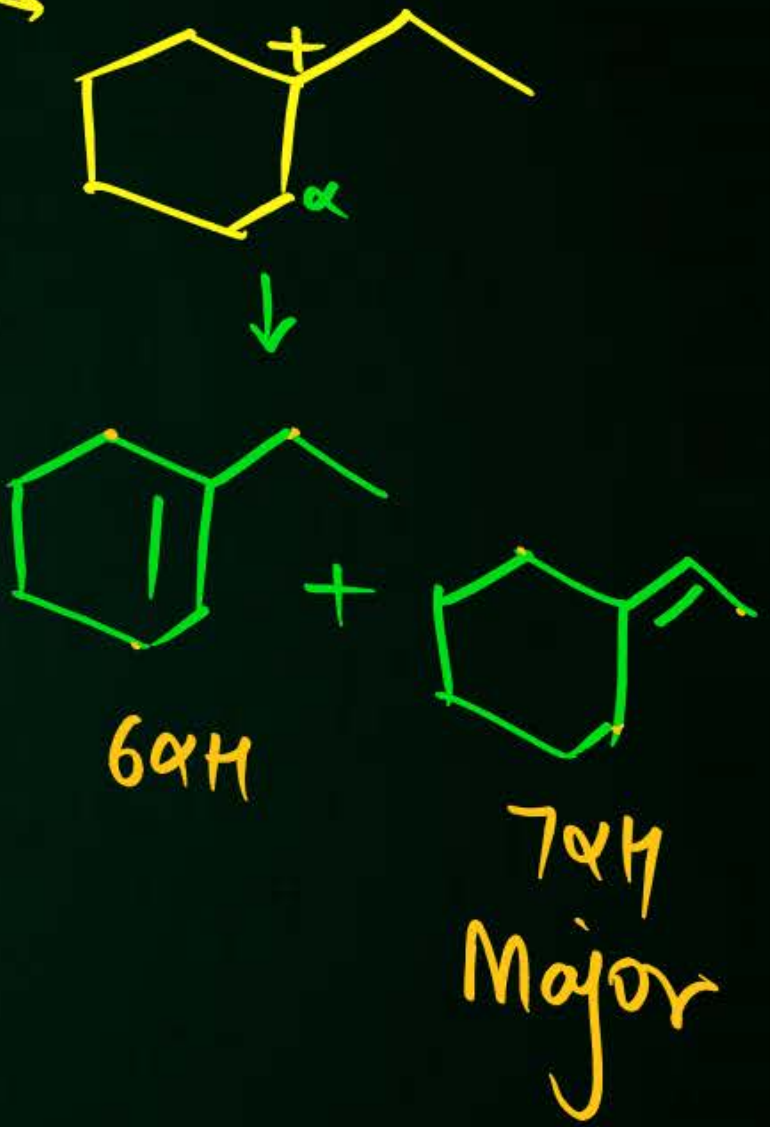
C



D

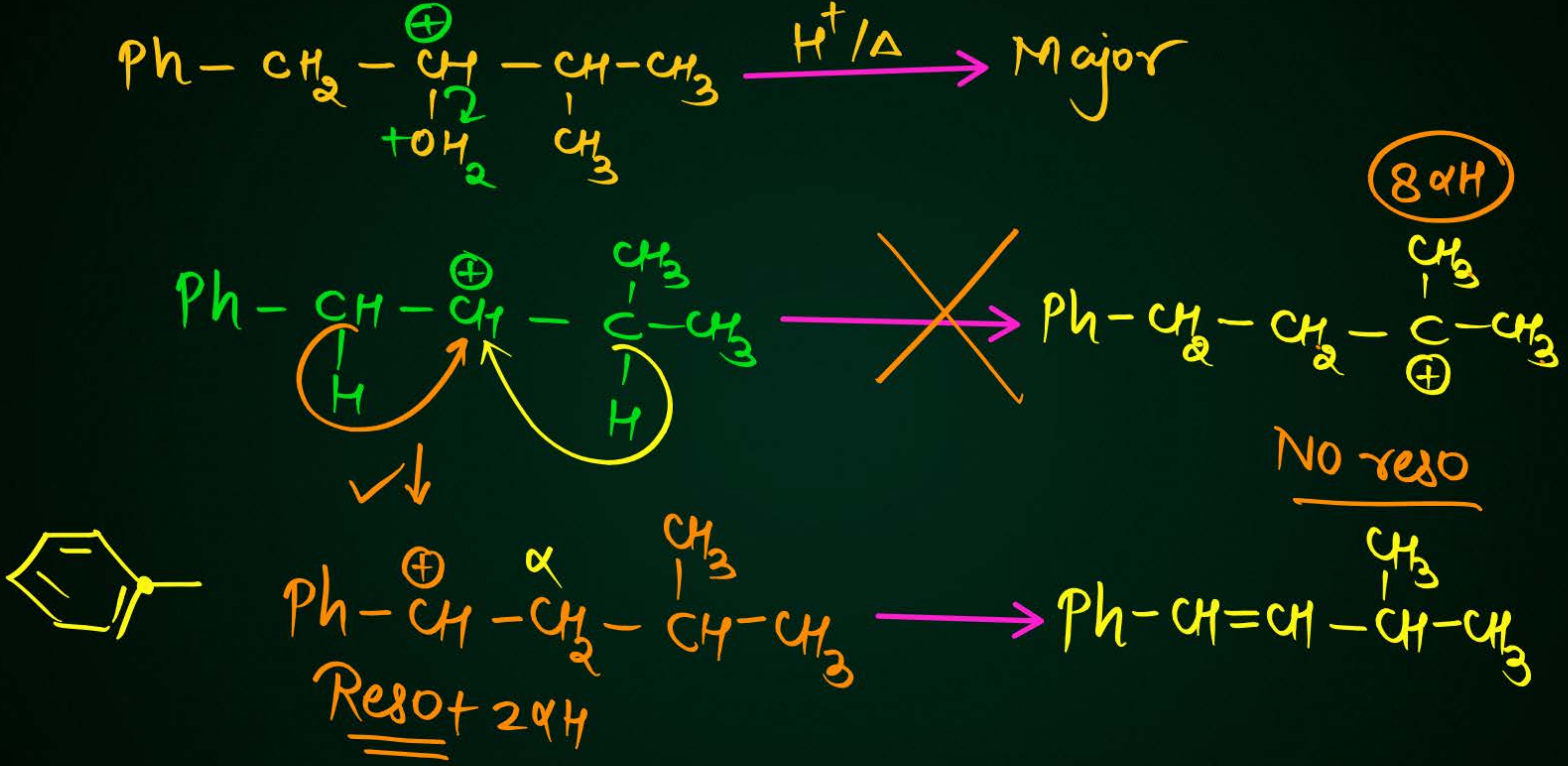






α
+
α
+
6αH
7αH
Major

Q.



$$\mathrm{Ph{-}CH_2{-}\underset{\overset{+}{O}H_2}{\overset{\oplus}{C}H}{-}\underset{CH_3}{CH}{-}CH_3} \xrightarrow{H^+/\Delta} \text{Major}$$

$$\mathrm{Ph{-}\underset{H}{CH}{-}\overset{\oplus}{C}H{-}\overset{CH_3}{\underset{H}{C}}{-}CH_3} \xrightarrow{} \mathrm{Ph{-}CH_2{-}CH_2{-}\overset{CH_3}{\underset{\oplus}{C}}{-}CH_3}$$

8αH

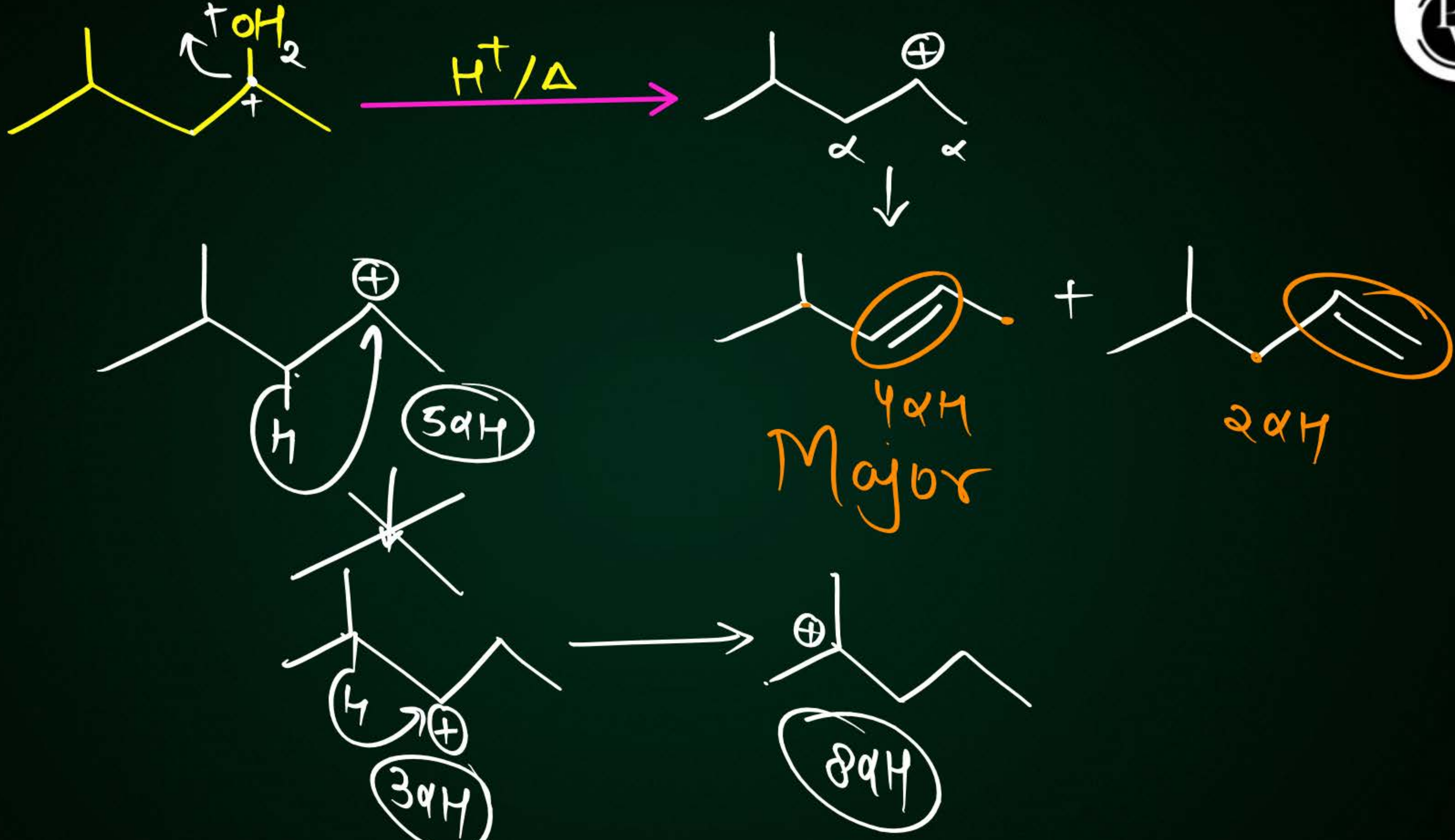
No reso

✓↓

$$\mathrm{Ph{-}\overset{\oplus}{C}H{-}\overset{\alpha}{C}H_2{-}\overset{CH_3}{C}H{-}CH_3} \longrightarrow \mathrm{Ph{-}CH{=}CH{-}\overset{CH_3}{C}H{-}CH_3}$$

Reso + 2αH

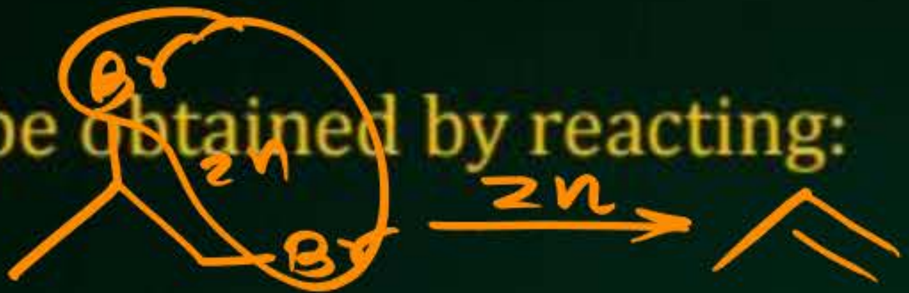
Q.

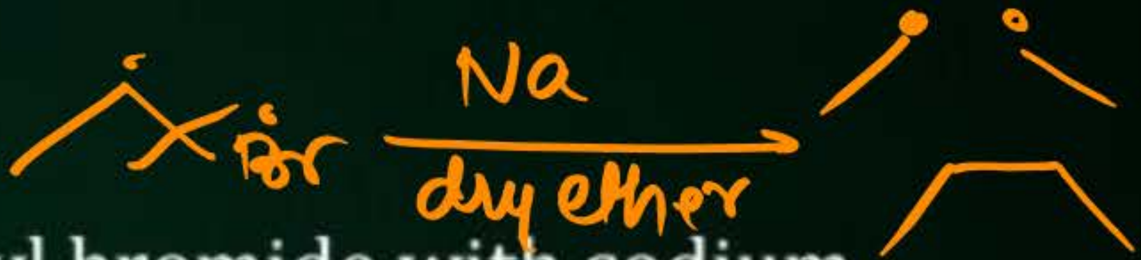


+OH2
+
H+/Δ
⊕
α
α
4αH
Major
+
2αH
⊕
H
5αH
H
⊕
3αH
⊕
8αH

QUESTION

But-2-ene can be obtained by reacting:



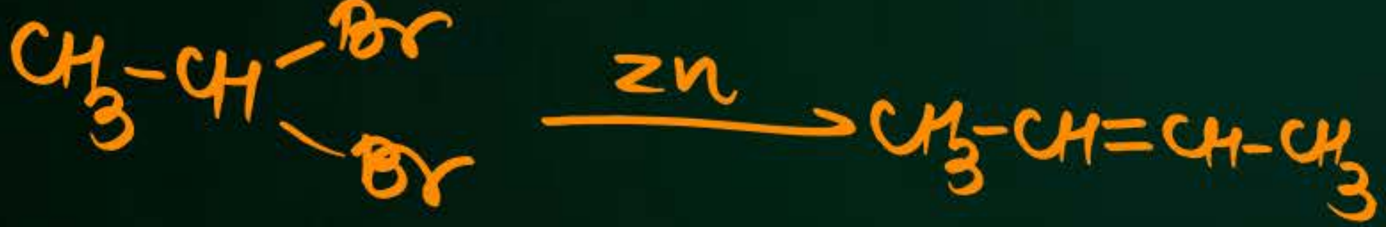


A 1, 2-dibromopropane with zinc

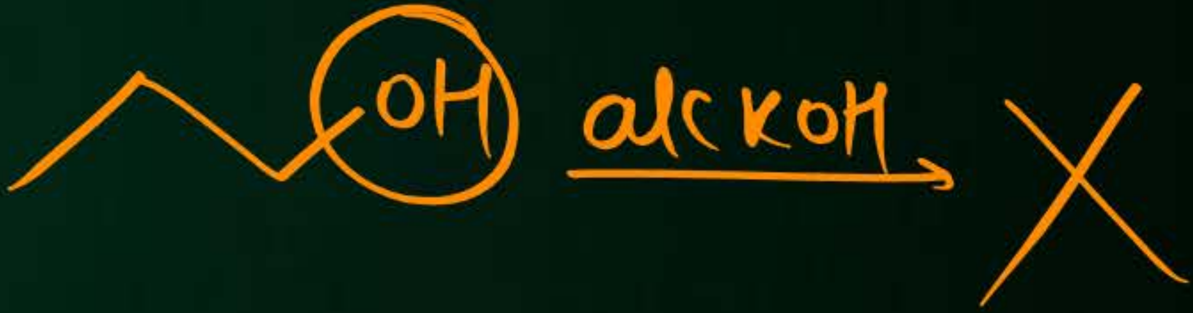
B ethyl bromide with sodium

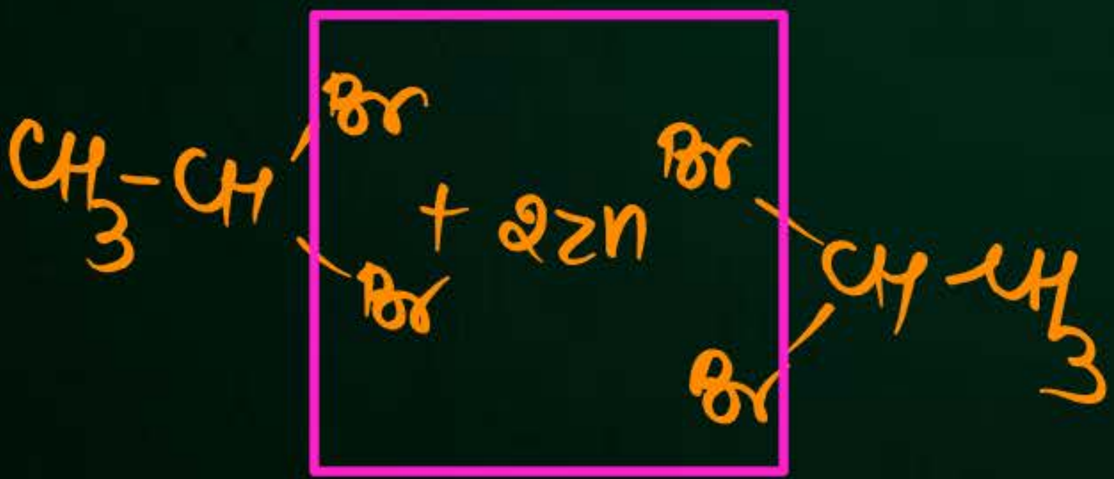
[✓ C] ethylidene bromide with zinc

D n-butyl alcohol with alcoholic KOH



$$CH_3-CH\begin{matrix}Br\\Br\end{matrix} \xrightarrow{Zn} CH_3-CH=CH-CH_3$$



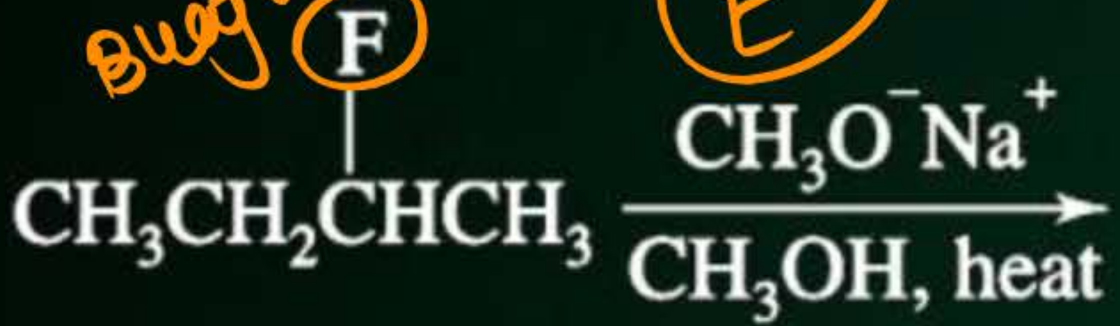


$$CH_3-CH\boxed{\begin{matrix}Br\\Br\end{matrix} + 2Zn \begin{matrix}Br\\Br\end{matrix}}CH-CH_3$$

QUESTION

In the reaction

Bugi $\boxed{E^{2a}}$



$$CH_3CH_2\overset{\overset{\textcircled{F}}{|}}{C}HCH_3 \xrightarrow[CH_3OH,\ heat]{CH_3O^-Na^+}$$

the major product formed is:

- (A) $CH_3CH_2CH(OCH_3)CH_3$
- (B) $CH_3CH=CHCH_3$
- [✓ (C)] $CH_3CH_2CH=CH_2$
- (D) $CH_3CH_2CH_2OCH_3$

QUESTION

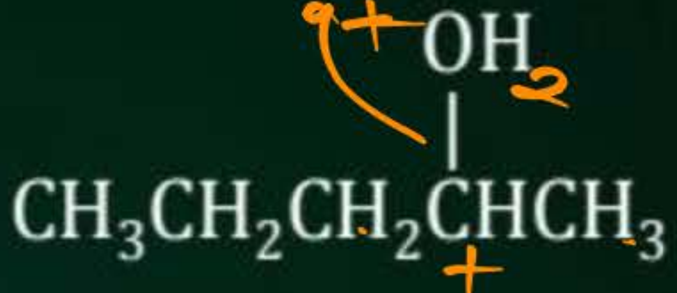
R.O.R ∝ Stability of 1st carbocation

Among the following compounds which can be dehydrated very easily?

(A) $CH_3CH_2CH_2CH_2\overset{+}{C}H_2\overset{+}{O}H_2$

2αH

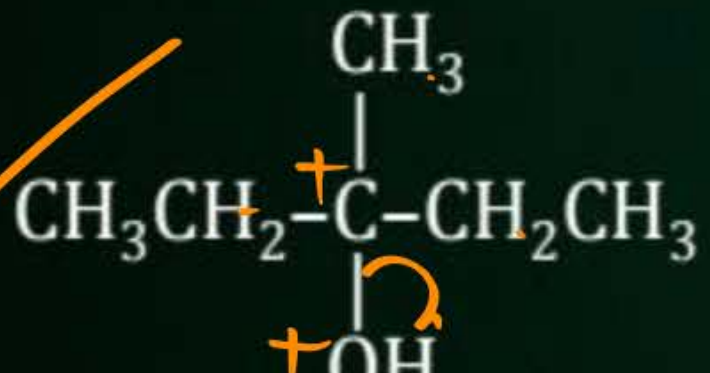
(B)



$CH_3CH_2CH_2\underset{+}{\overset{\overset{+}{O}H_2}{\overset{|}{C}}}HCH_3$

5αH

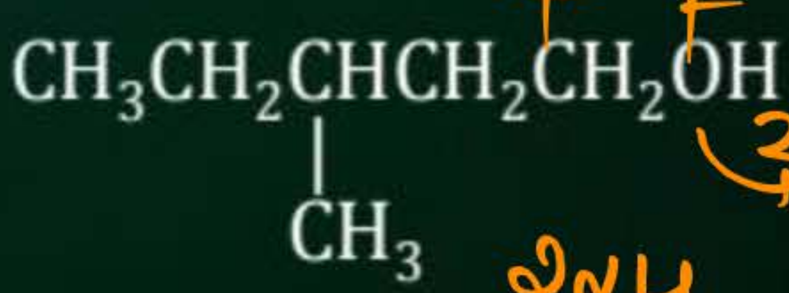
(C) ✓



$CH_3CH_2-\underset{\underset{+OH_2}{|}}{\overset{\overset{CH_3}{|}}{\overset{+}{C}}}-CH_2CH_3$

7αH

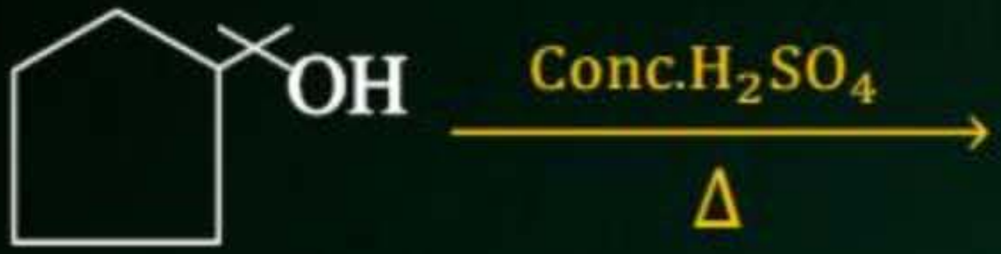
(D)

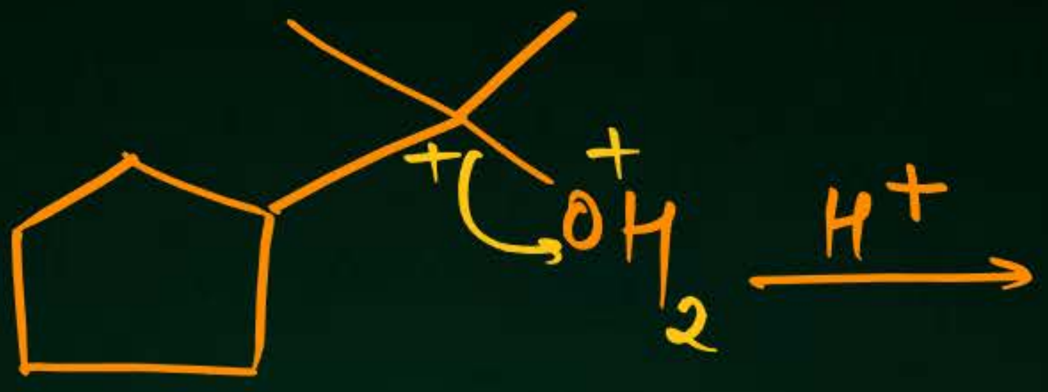


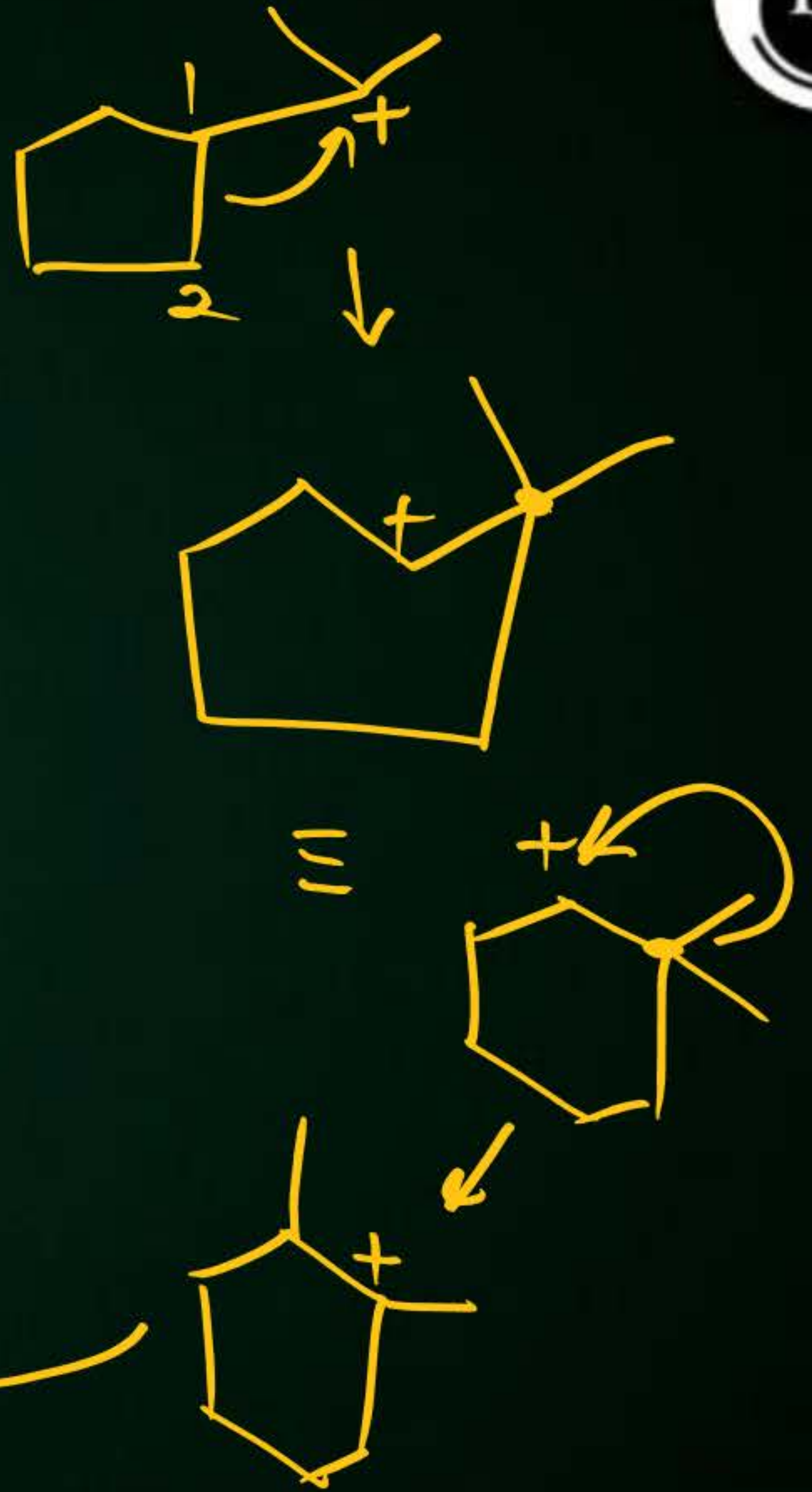
$CH_3CH_2\underset{\underset{CH_3}{|}}{C}HCH_2\overset{+}{C}H_2\overset{+}{O}H_2$

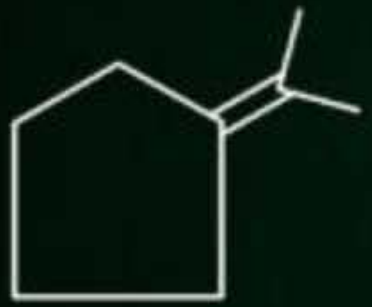
2αH

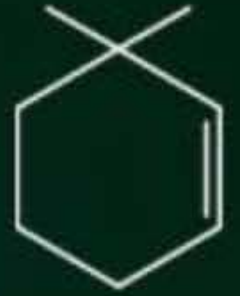
QUESTION

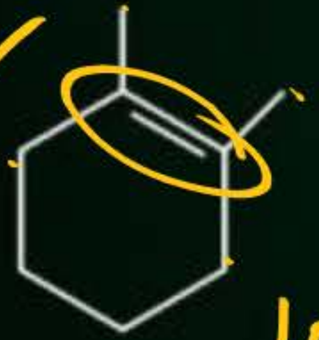

OH
Conc.H_2SO_4
Δ


+
$\overset{+}{O}H_2$
H^+



A


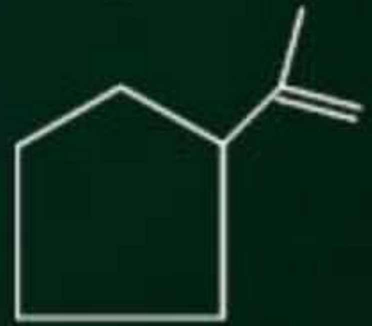
B


[✓ C]


10αH

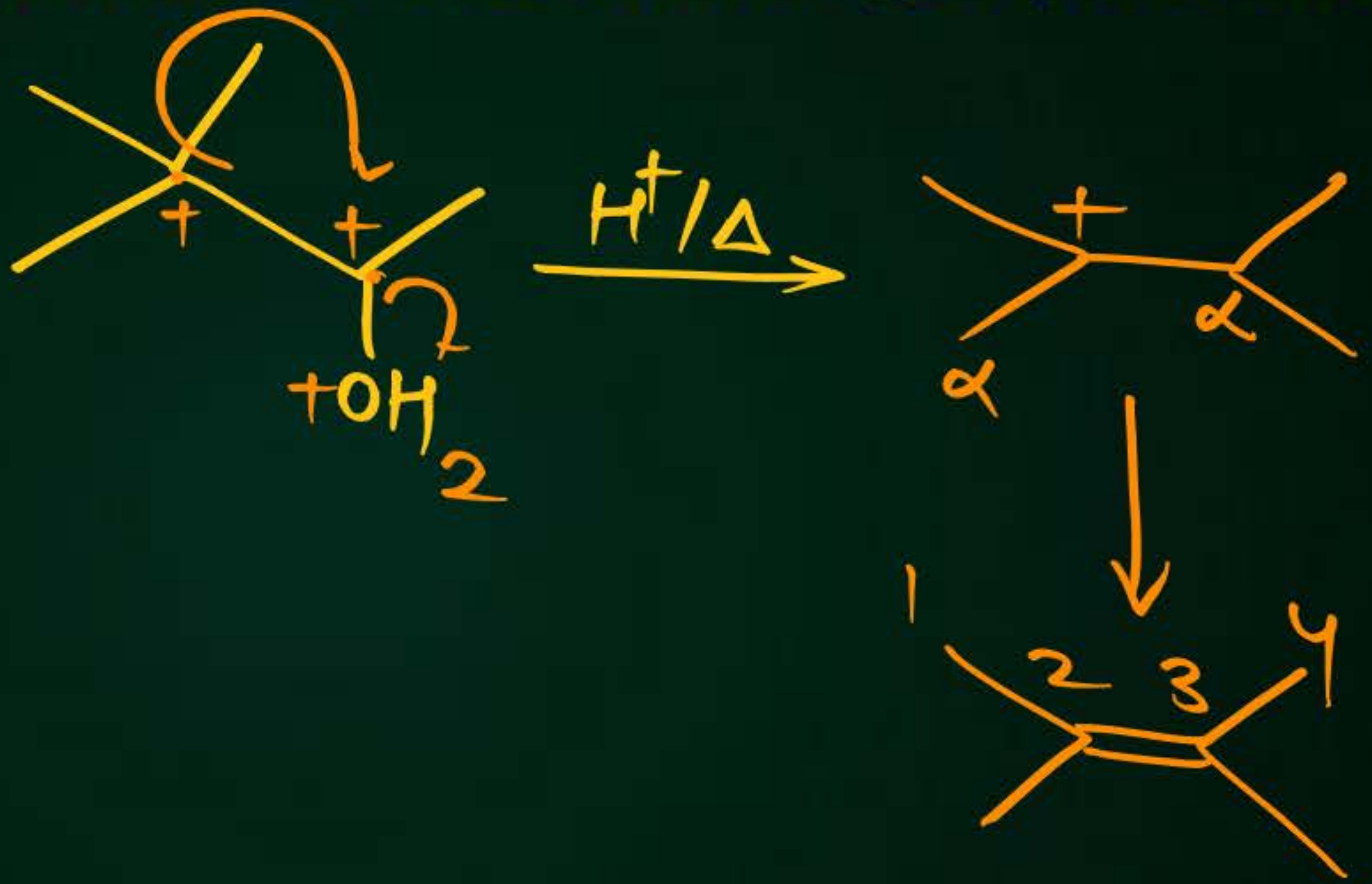
$-H^+$

Δ

D


QUESTION

When 3, 3-dimethyl butan-2-ol is heated with conc. H_2SO_4 the major product obtained is:



A 2, 3-dimethyl but-1-ene

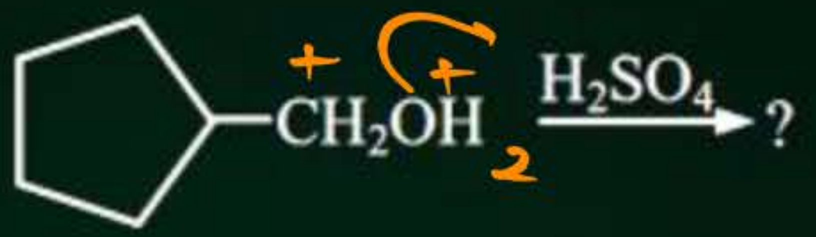
B 3, 3-dimethyl but-1-ene

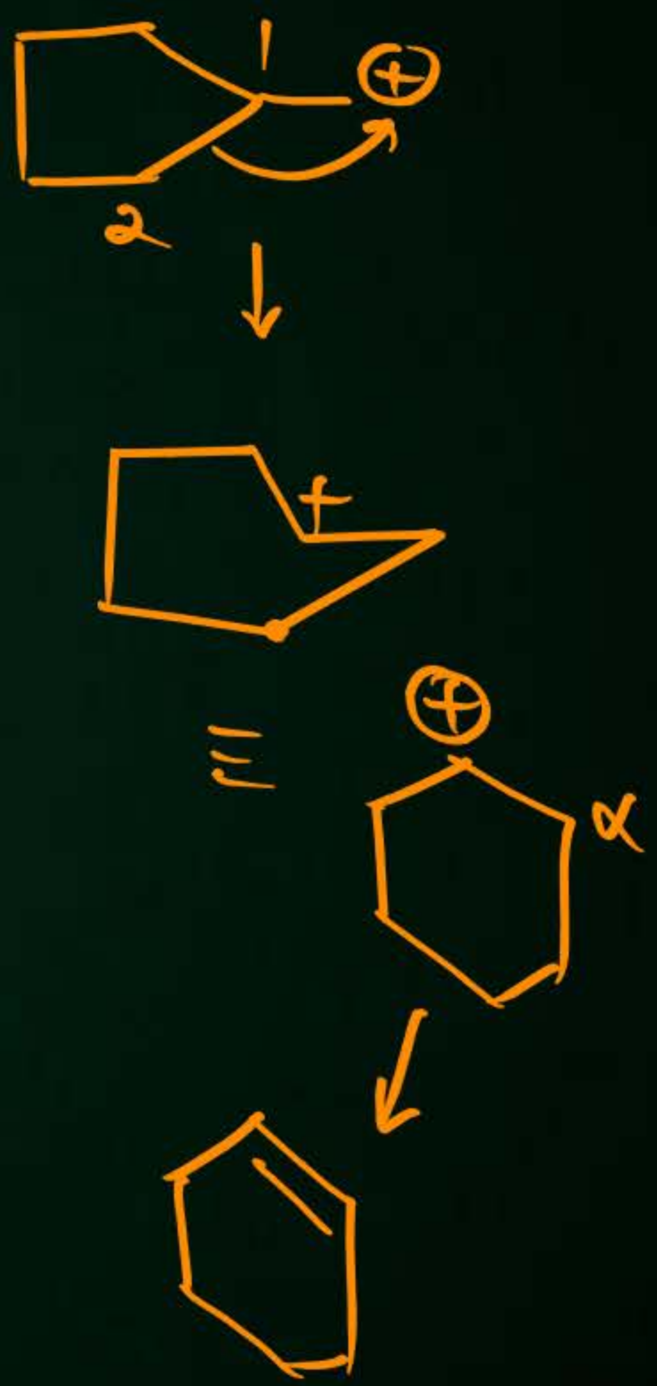
C [✓ 2, 3-dimethyl but-2-ene]

D *cis* and *trans* isomers of 2, 3-dimethyl but-2-ene

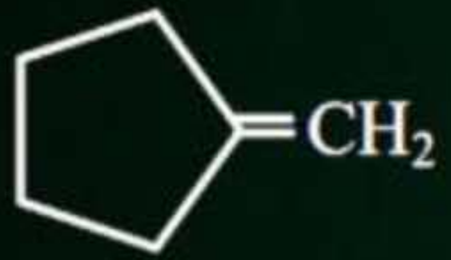
QUESTION

For the reaction the major product is

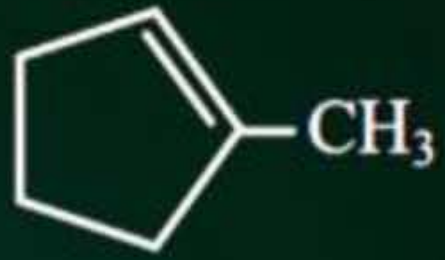

$CH_2\overset{+}{O}H_2$
H_2SO_4
?



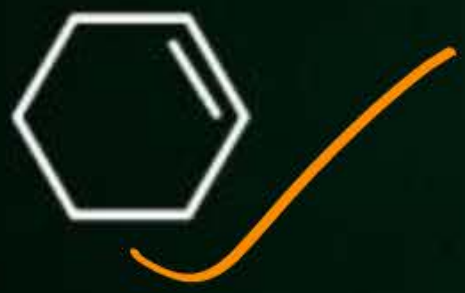
A



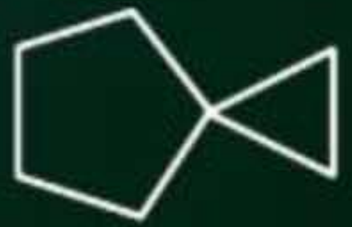
B



C

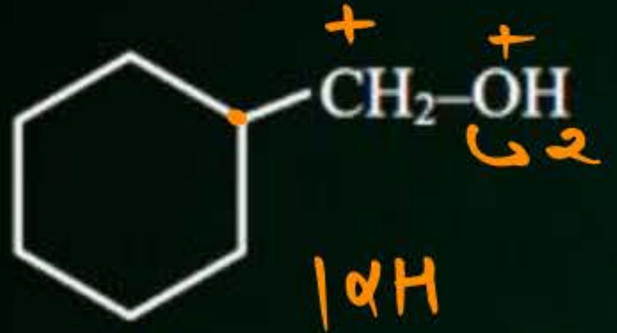


D

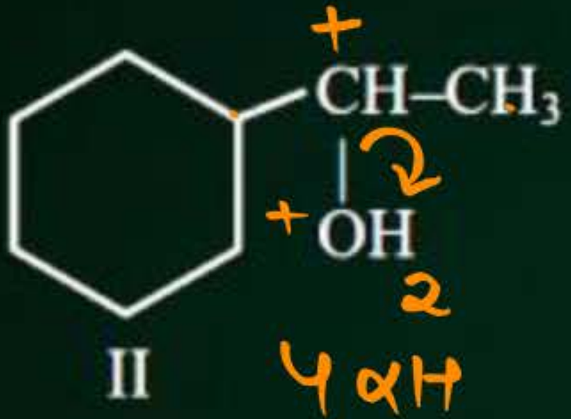


QUESTION

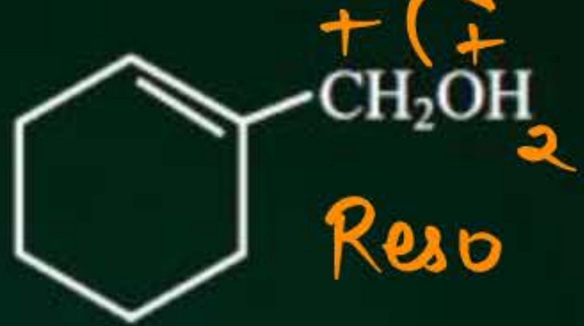
The reactivity order of alcohols towards acid (H_2SO_4) will be:



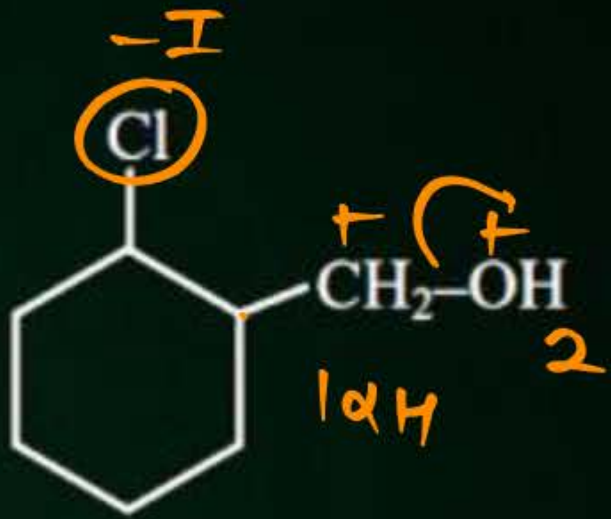
I


CH–CH₃
OH
+
+
2
2
4αH

II


CH₂OH
+
+
2
Reso

III


-I
Cl
CH₂–OH
+
+
2
1αH

IV

A II > I > IV > III

B II > IV > III > I

C III > IV > II > I

[✓ **D**] III > II > I > IV

QUESTION

$$\mathrm{CH_3CH_2CH_2OH} \xrightarrow[\Delta]{\text{conc.}\mathrm{H_2SO_4}} \mathrm{CH_3CH=CH_2 + H_2O}$$

[✓ A] E^1 pathway

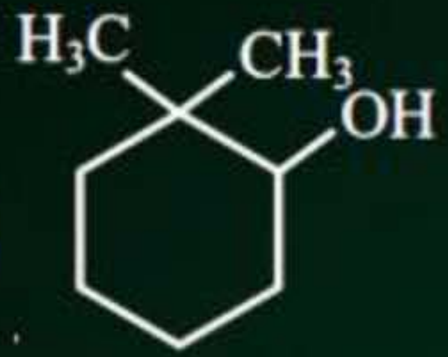
B E^2 pathway

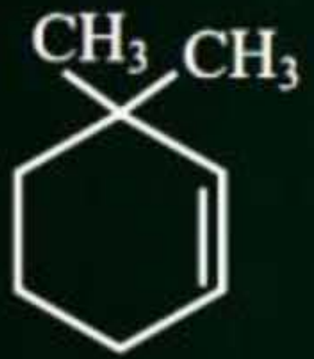
C E^{2a} pathway

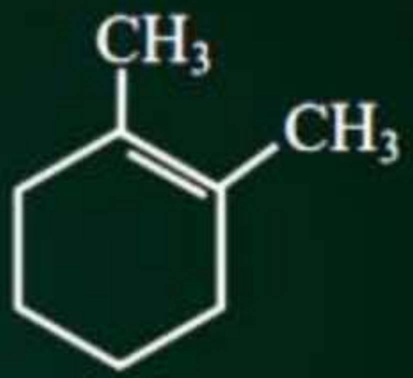
D Unpredictable

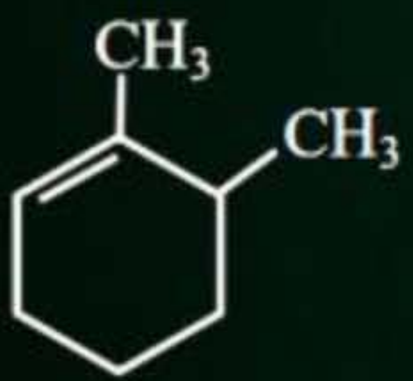
Home Work

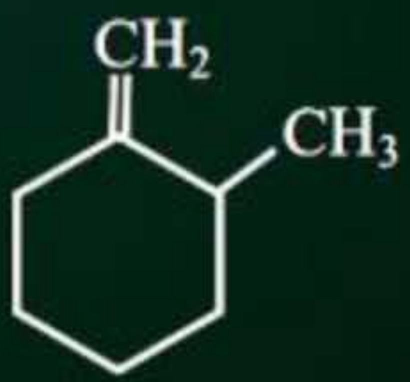
QUESTION 01

Consider the reaction  $\xrightarrow[\text{heat}]{H_2SO_4}$ The alkene formed in major amount is:

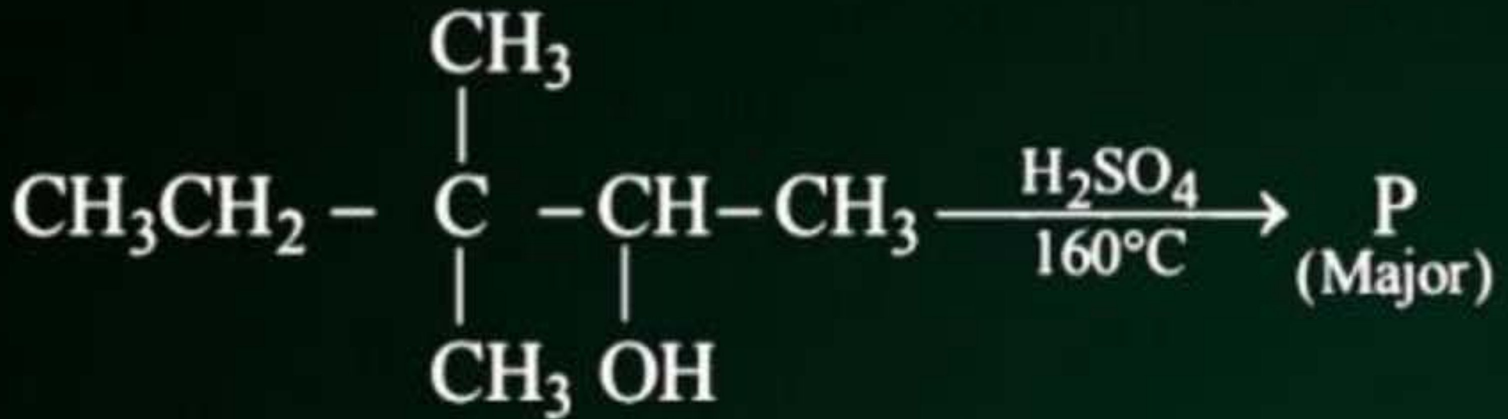
A 

B 

C 

D 

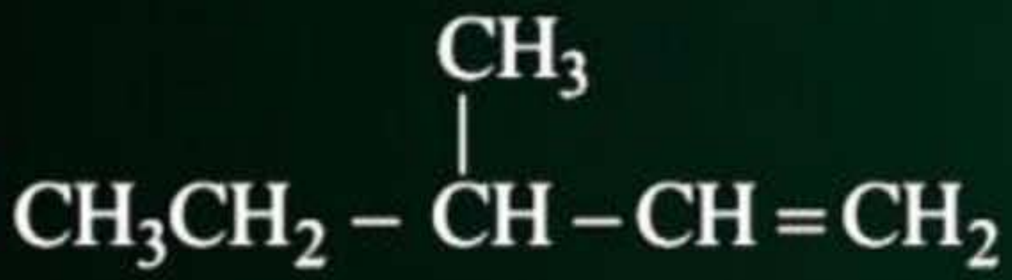
QUESTION 02



$$CH_3CH_2-\underset{CH_3}{\overset{CH_3}{C}}-\underset{OH}{CH}-CH_3 \xrightarrow[160^\circ C]{H_2SO_4} \underset{\text{(Major)}}{P}$$

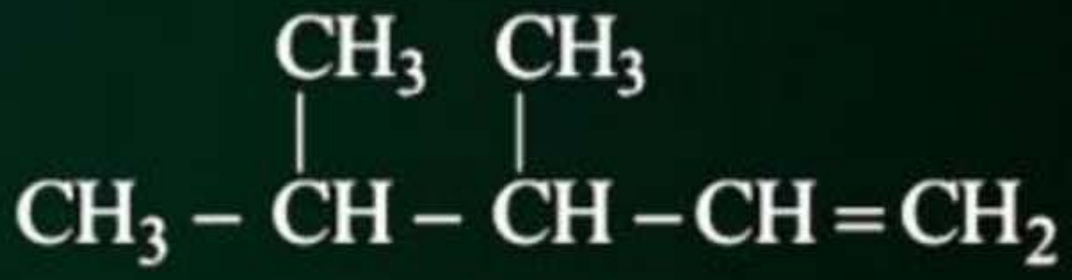
What is the major product P in the above reaction?

A



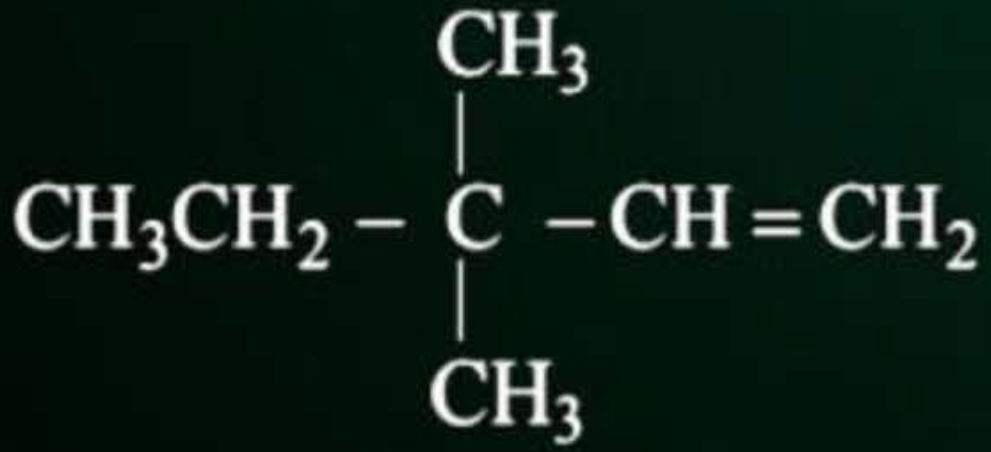
$$CH_3CH_2-\overset{CH_3}{CH}-CH=CH_2$$

B



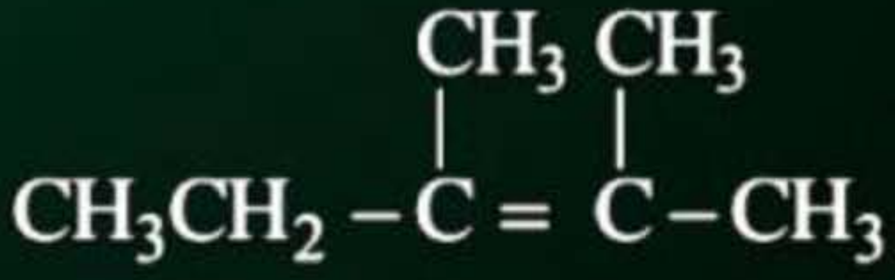
$$CH_3-\overset{CH_3}{CH}-\overset{CH_3}{CH}-CH=CH_2$$

C



$$CH_3CH_2-\underset{CH_3}{\overset{CH_3}{C}}-CH=CH_2$$

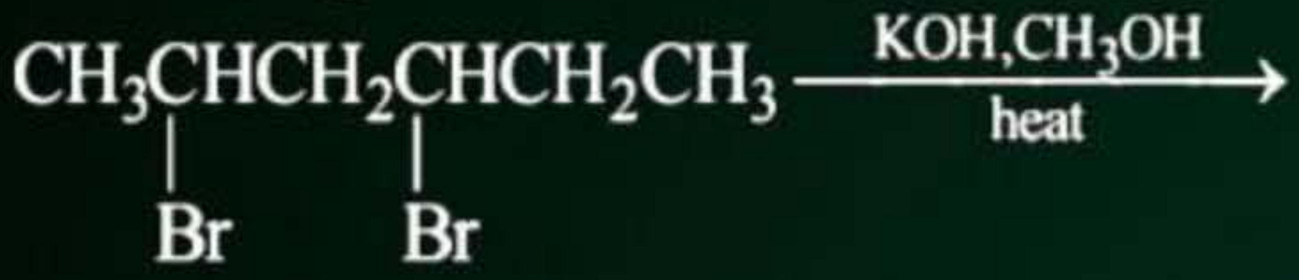
D



$$CH_3CH_2-\overset{CH_3}{C}=\overset{CH_3}{C}-CH_3$$

QUESTION 03

The major product of the following reaction is:



$$CH_3\underset{\underset{Br}{|}}{C}HCH_2\underset{\underset{Br}{|}}{C}HCH_2CH_3 \xrightarrow[\text{heat}]{KOH, CH_3OH}$$

(A) $CH_2=CHCH=CHCH_2CH_3$

(B) $CH_2=CHCH_2CH=CHCH_3$

(C) $CH_3CH=CH-CH=CHCH_3$

(D) $CH_3CH=C=CHCH_2CH_3$

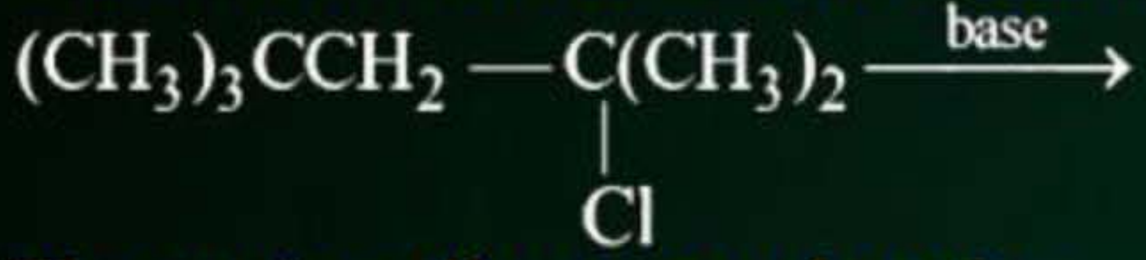
QUESTION 04

Propyl bromide on reaction with alcoholic KOH gives

- (A) Propane
- (B) Propene
- (C) Butane
- (D) Acetylene

QUESTION 05

Consider the following reaction

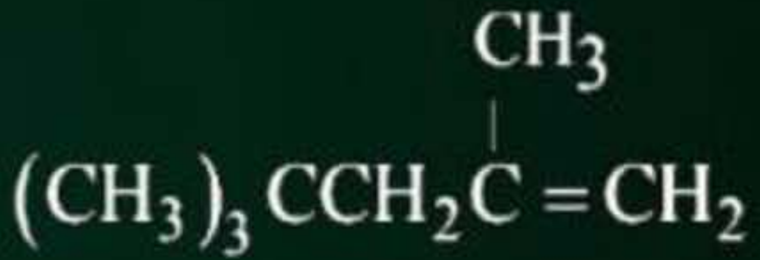


$$(CH_3)_3CCH_2-\underset{\displaystyle Cl}{\underset{|}{C}}(CH_3)_2 \xrightarrow{\text{base}}$$

The major alkene product is:

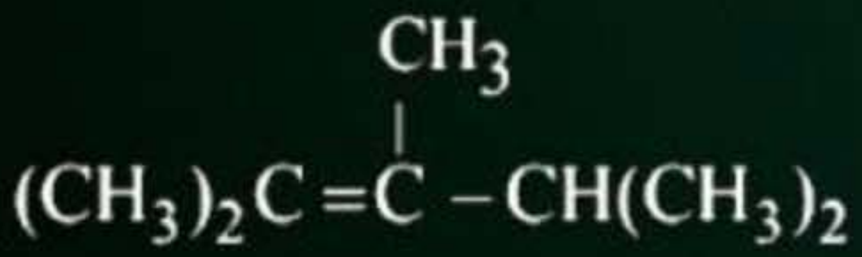
(A) $(CH_3)_3CCH=C(CH_3)_2$

(B)



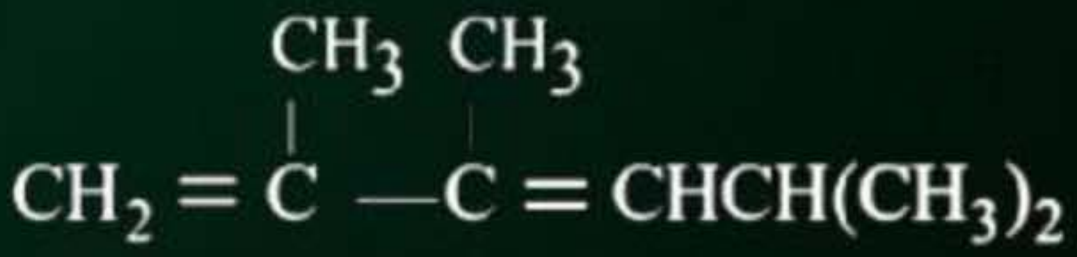
$$(CH_3)_3CCH_2\overset{\displaystyle CH_3}{\overset{|}{C}}=CH_2$$

(C)



$$(CH_3)_2C=\overset{\displaystyle CH_3}{\overset{|}{C}}-CH(CH_3)_2$$

(D)



$$CH_2=\overset{\displaystyle CH_3}{\overset{|}{C}}-\overset{\displaystyle CH_3}{\overset{|}{C}}=CHCH(CH_3)_2$$

QUESTION 06

The structural formula of the compound which yields ethylene upon reaction with zinc

- **A** CH_2Br-CH_2Br
- **B** $CHBr_2-CHBr_2$
- **C** $CHBr=CHBr$
- **D** None

QUESTION 07

Alcohols undergo dehydration in the following sequence

(A) $1° > 2° > 3°$

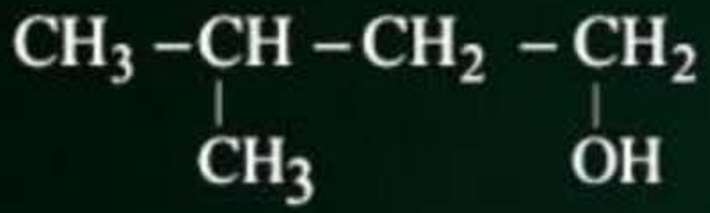
(B) $3° > 2° > 1°$

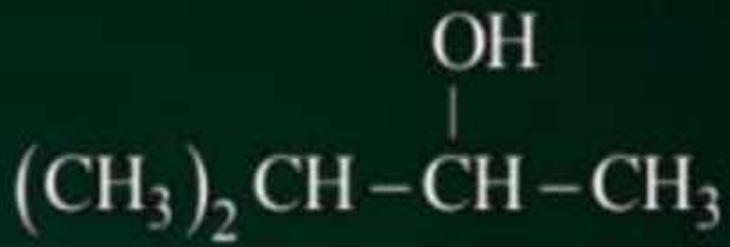
(C) $1° > 3° > 2°$

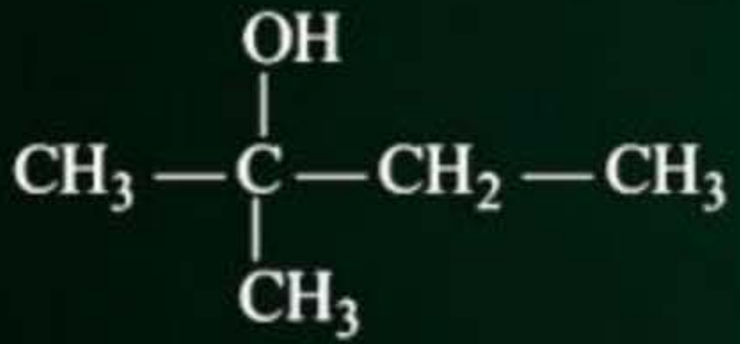
(D) $3° > 1° > 2°$

QUESTION 08

Arrange the following alkanols 1, 2 and 3 in order of their reactivity towards acid catalysed dehydration

(1)

$CH_3-\underset{CH_3}{CH}-CH_2-\underset{OH}{CH_2}$

(3)

$(CH_3)_2CH-\overset{OH}{CH}-CH_3$

(2)

$CH_3-\overset{OH}{\underset{CH_3}{C}}-CH_2-CH_3$

A $1 > 2 > 3$

B $2 > 1 > 3$

C $2 > 3 > 1$

D $3 > 2 > 1$

QUESTION 09

Ethyl chloride on heating with alcoholic potash gives

- A C_2H_4
- B C_2H_2
- C C_2H_6
- D CH_4

QUESTION 10

Which of the following alcohol on dehydration with conc. H_2SO_4 gives but-2-ene?

(A) 2-methylpropan-2-ol

(B) Pentan-1-ol

(C) 2-methyl propan-1-ol

(D) Butan-2-ol

ANSWER KEY

1. B
2. D
3. C
4. B
5. A
6. A
7. B
8. C
9. A
10. D

Home Work From PW Module (Yakeen NEET)

Prarambh: Q 65, 71, 78

Prabal: Q 05

Thank you!!

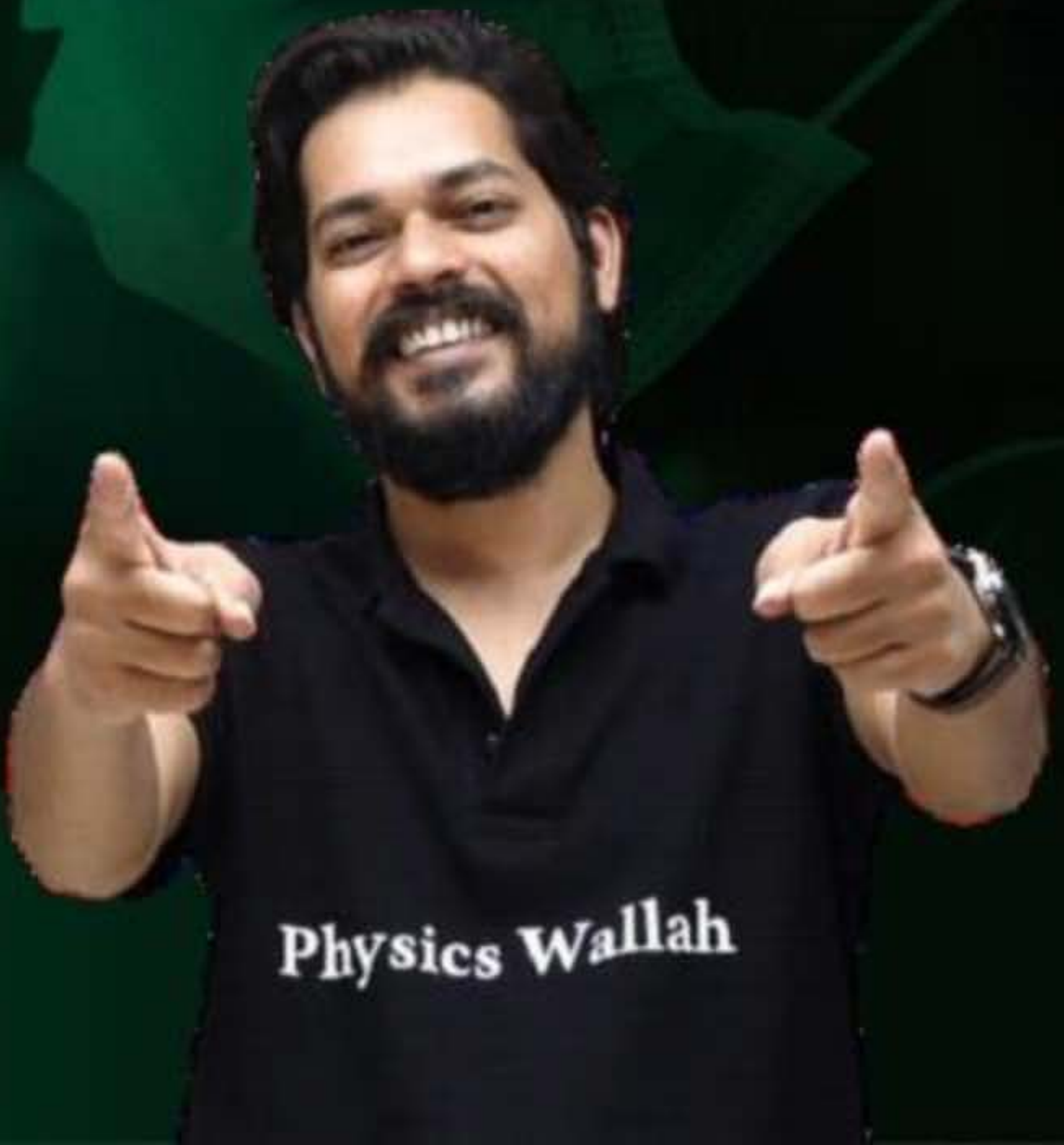
YAKEEN 2.0

FOR NEET 2025

Lecture- 06 **Organic Chemistry**

HYDROCARBONS

By- Pankaj Sir(POPU MAMA)


Physics Wallah

Topics *to be covered*

1. Chemical Properties of Alkenes Part 01 ✓
2. Electrophilic Addition Reactions ✓
3. Practice

Electrophilic Addition Reaction

A. Via Classical Carbocation

1. Hydro-Halogenation (Addition of HX)
2. Hydration (Addition of water in acidic medium)

B. Via Non-Classical Carbocation

1. Addition of Halogen in Inert solvent
2. Addition of Halogen in Non-Invert Solvent like water

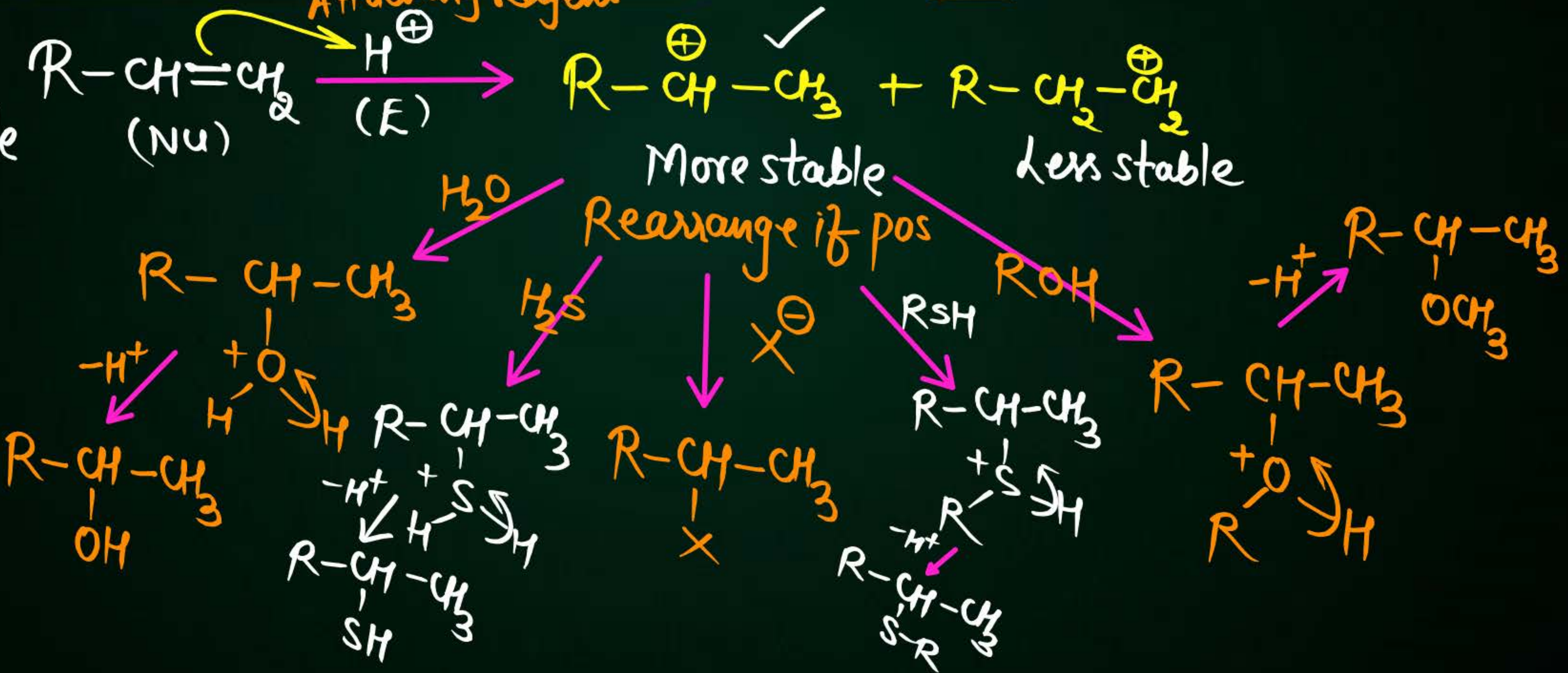
$HX \longrightarrow H^+ + X^\ominus$

Chemical Properties of Alkenes

Electrophile ⟶ $e^\ominus$ loving species (H^+)

Electrophilic Addition Reactions – via classical carbocation (Actual $C^\oplus$)

Nucleophile
L.P
$\pi e^\ominus s$



Attacking reagent
(NU)
(E)
✓
More stable
Less stable
Rearrange if pos
H_2O
H_2S
$X^\ominus$
RSH
ROH
$-H^+$
$-H^+$
$-H^+$
$-H^+$

$$R-CH=CH_2 \xrightarrow[(E)]{H^\oplus} R-\overset{\oplus}{C}H-CH_3 + R-CH_2-\overset{\oplus}{C}H_2$$

$$R-CH(\overset{+}{O}H_2)-CH_3 \xrightarrow{-H^+} R-CH(OH)-CH_3$$

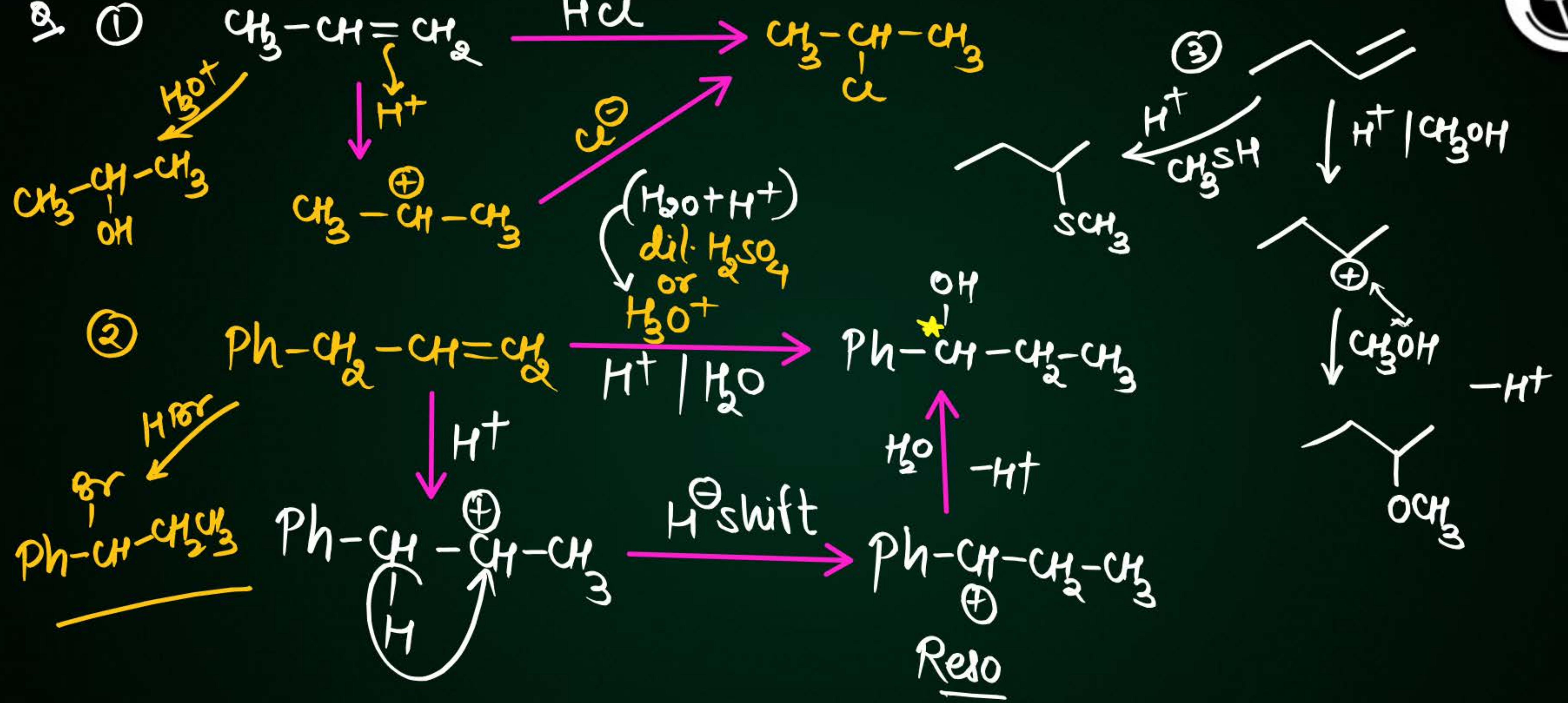
$$R-CH(\overset{+}{S}H_2)-CH_3 \xrightarrow{-H^+} R-CH(SH)-CH_3$$

$$R-CH(X)-CH_3$$

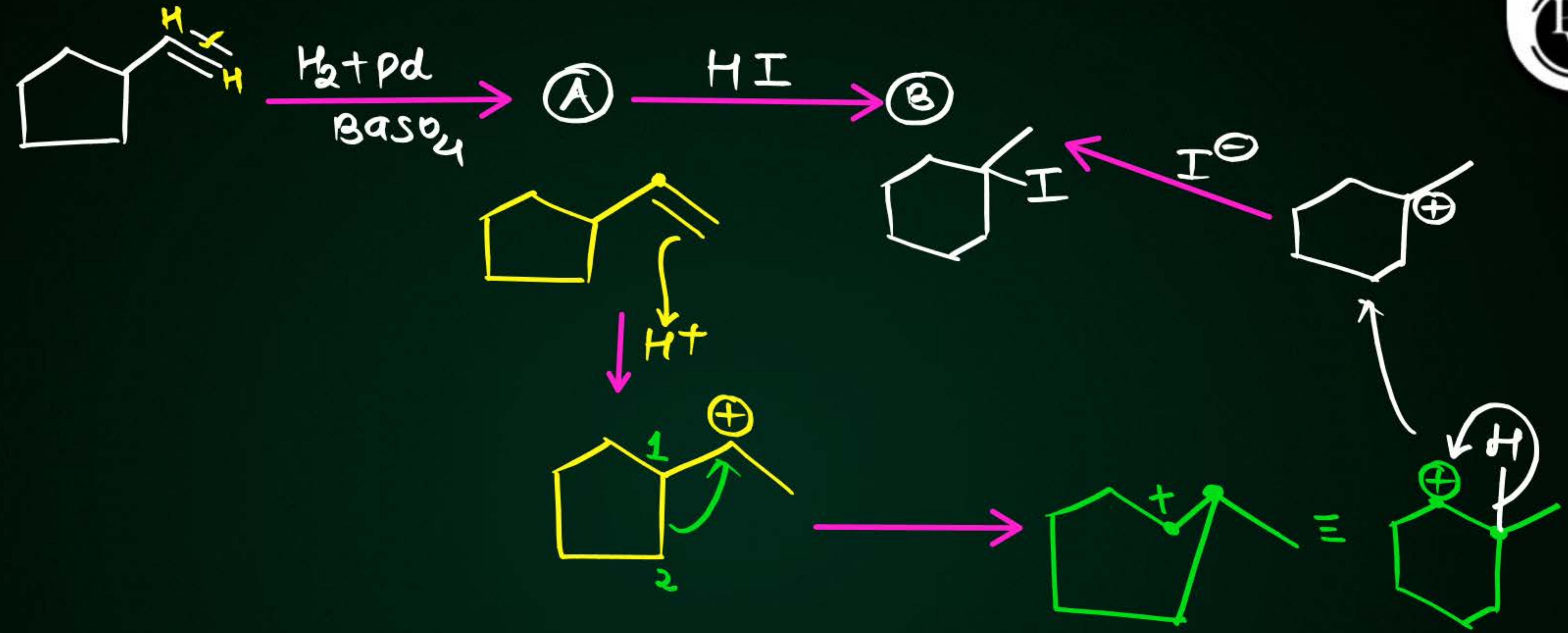
$$R-CH(\overset{+}{S}HR)-CH_3 \xrightarrow{-H^+} R-CH(SR)-CH_3$$

$$R-CH(\overset{+}{O}HR)-CH_3 \xrightarrow{-H^+} R-CH(OCH_3)-CH_3$$

Q.


①
$CH_3-CH=CH_2$
HCl
$CH_3-\underset{Cl}{CH}-CH_3$
H^+
$CH_3-\overset{\oplus}{C}H-CH_3$
$Cl^\ominus$
H_3O^+
$CH_3-\underset{OH}{CH}-CH_3$
②
$Ph-CH_2-CH=CH_2$
(H_2O+H^+)
dil. H_2SO_4
or
H_3O^+
$H^+ | H_2O$
$Ph-\overset{*}{\underset{}{C}}H(OH)-CH_2-CH_3$
HBr
$Ph-\underset{Br}{CH}-CH_2CH_3$
H^+
$Ph-\underset{H}{CH}-\overset{\oplus}{C}H-CH_3$
$H^\ominus$ shift
$Ph-\underset{\oplus}{CH}-CH_2-CH_3$
Reso
H_2O
$-H^+$
③
H^+
CH_3SH
SCH_3
$H^+ | CH_3OH$
$CH_3\ddot{O}H$
$-H^+$
OCH_3

④


H
H
H₂+Pd
BaSO₄
A
HI
B
I
I⊖
⊕
H+
⊕
1
2
+
≡
⊕
H

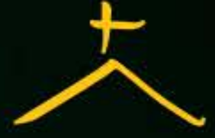
OP Points

1. 1st Carbocation formation is the RDS. ✓
2. ROR α Nucleophilicity of Alkene α Stability of 1st Carbocation ✓

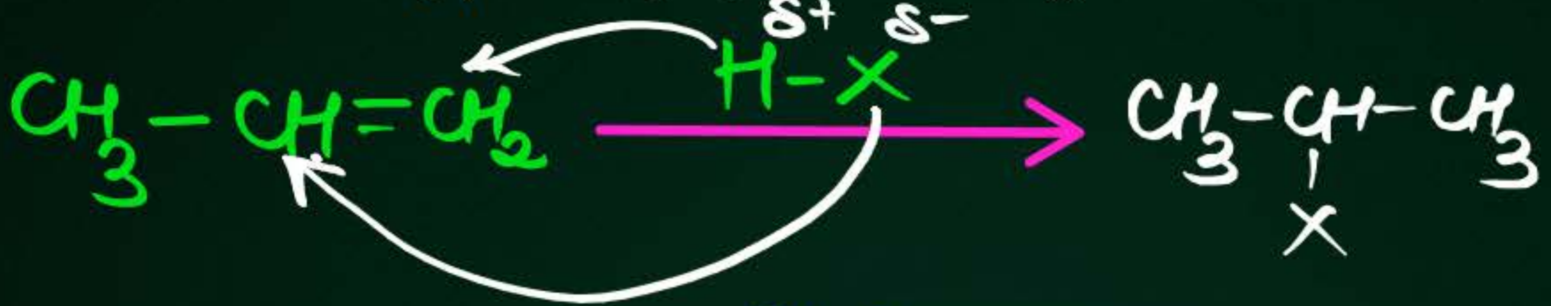
   edg
3. Rearrangement of Carbocation occurs.

$CH_2=CH_2 < \underset{edg}{CH_3} \rightarrow CH=CH_2$

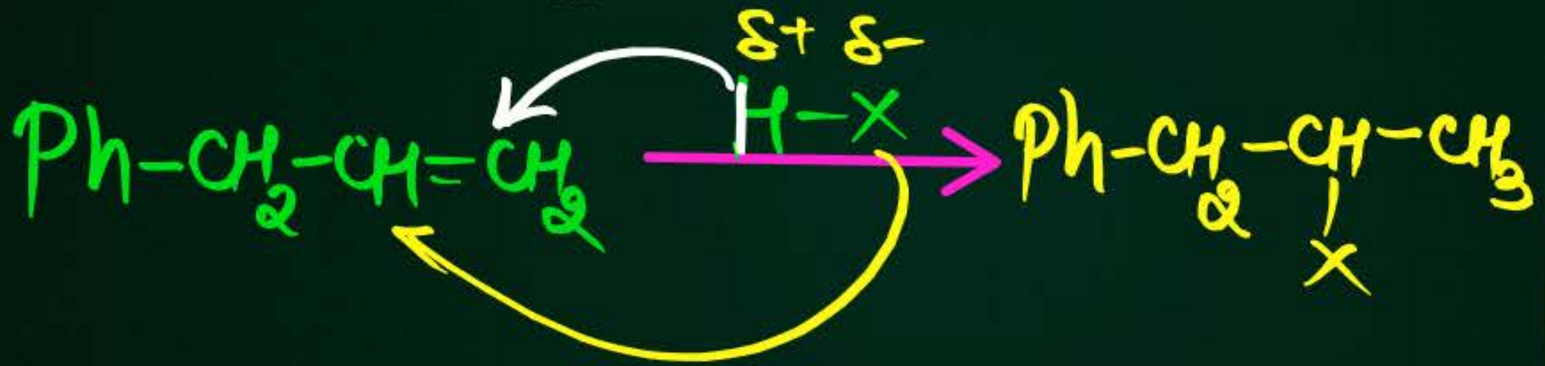
$CH_3-\overset{+}{C}H_2 <$



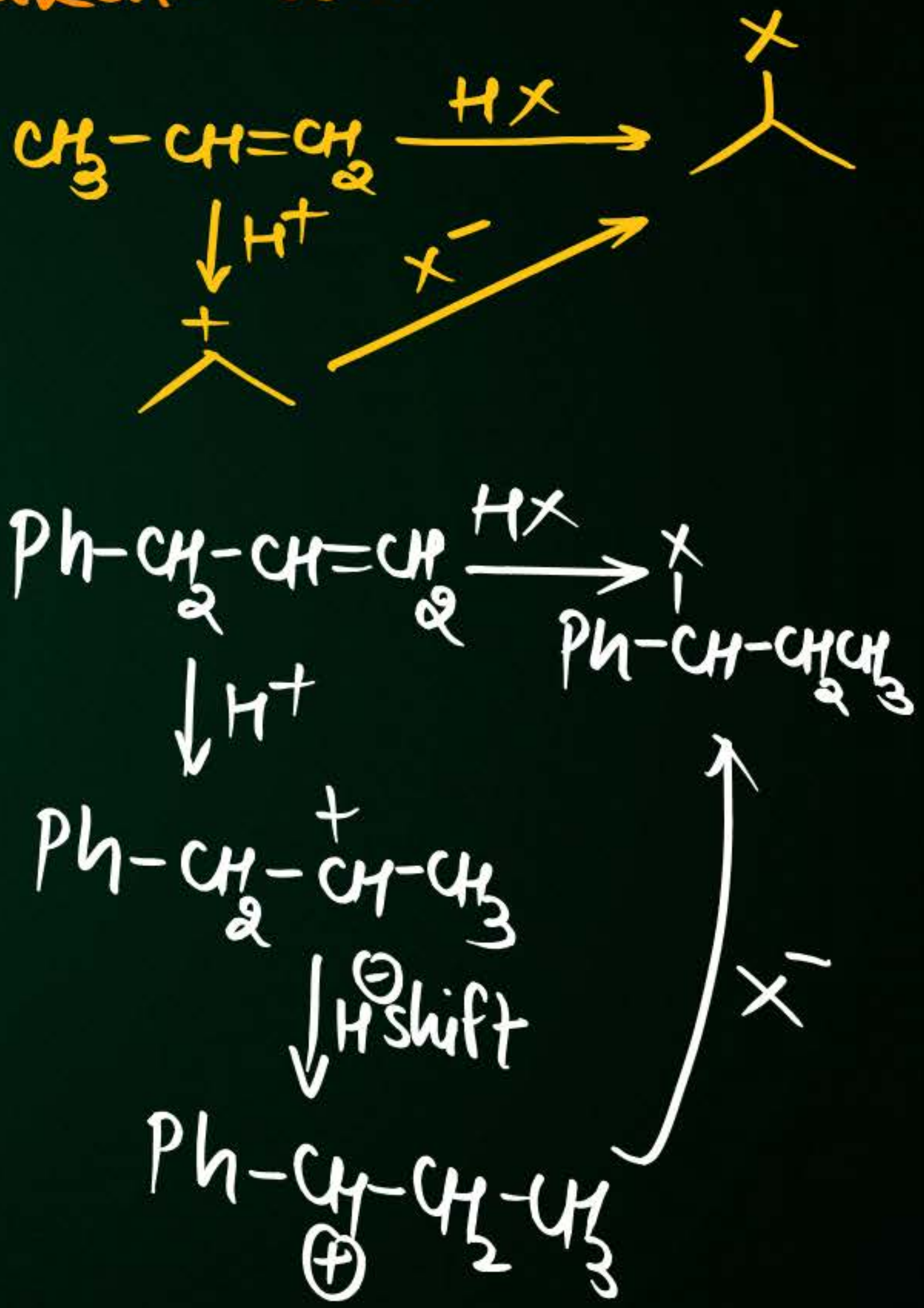
Markovnikov rule :- The -ve part of addendum (Reagent) is added to that 'C' of alkene which has less no. of 'H' atoms.



$$CH_3-CH=CH_2 \xrightarrow{\overset{\delta+}{H}-\overset{\delta-}{X}} CH_3-\underset{\underset{X}{|}}{CH}-CH_3$$



$$Ph-CH_2-CH=CH_2 \xrightarrow{\overset{\delta+}{H}-\overset{\delta-}{X}} Ph-CH_2-\underset{\underset{X}{|}}{CH}-CH_3$$



$$CH_3-CH=CH_2 \xrightarrow{HX}$$

$$\downarrow H^+ \qquad \nearrow X^-$$

$$Ph-CH_2-CH=CH_2 \xrightarrow{HX} Ph-\overset{\overset{X}{|}}{CH}-CH_2CH_3$$

$$\downarrow H^+$$

$$Ph-CH_2-\overset{+}{CH}-CH_3$$

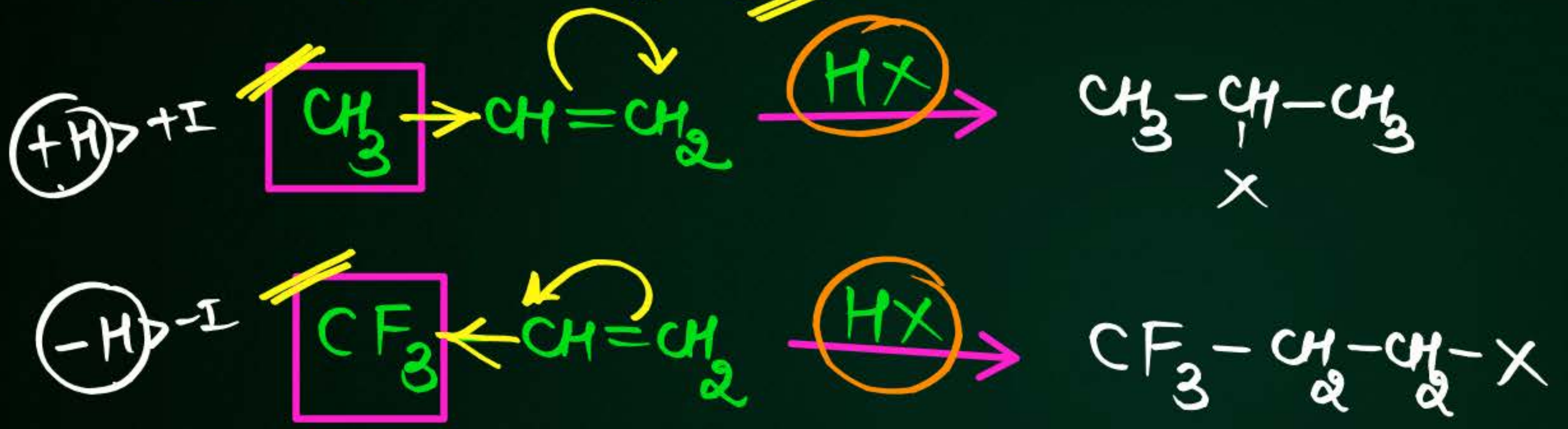
$$\downarrow \overset{\ominus}{H} \text{ shift}$$

$$Ph-\underset{\oplus}{CH}-CH_2-CH_3 \xrightarrow{X^-}$$

Electromeric effect :- (Temporary)

$\underbrace{+E \text{ effect}}$

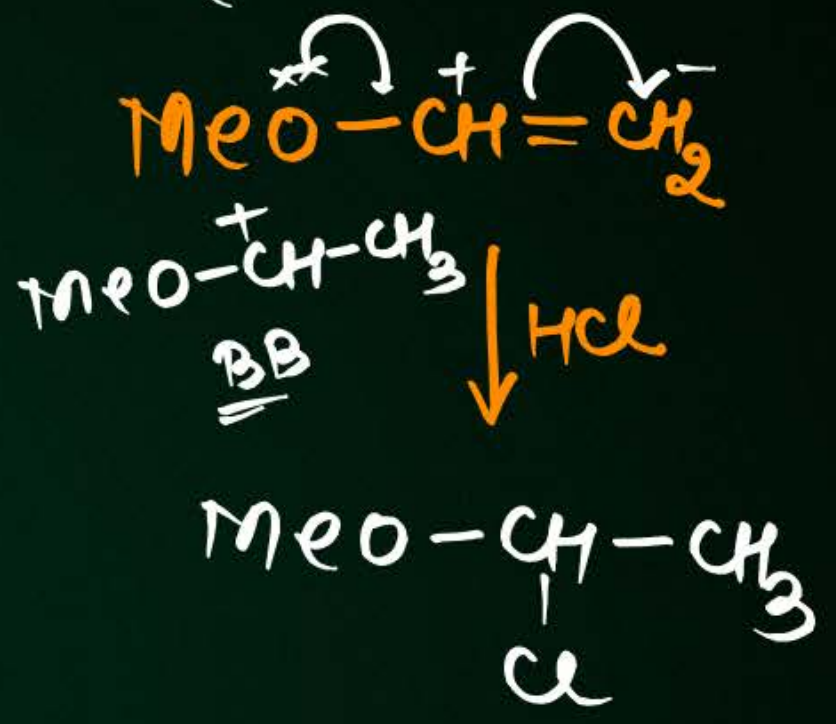
Electromeric shift



$(+H) > +I \quad \boxed{CH_3} \rightarrow CH{=}CH_2 \xrightarrow{HX} CH_3-\underset{X}{CH}-CH_3$

$(-H) > -I \quad \boxed{CF_3} \leftarrow CH{=}CH_2 \xrightarrow{HX} CF_3-CH_2-CH_2-X$

$(+M > -I)$



$Me\ddot{O}-\overset{+}{C}H=\overset{-}{C}H_2$

$MeO-\overset{+}{C}H-CH_3$

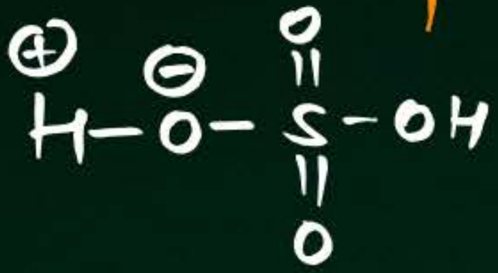
BB

$\downarrow HCl$

$MeO-\underset{Cl}{CH}-CH_3$

Rxn of alkene with cold conc-H_2SO_4

via Classi $C^{\oplus}$

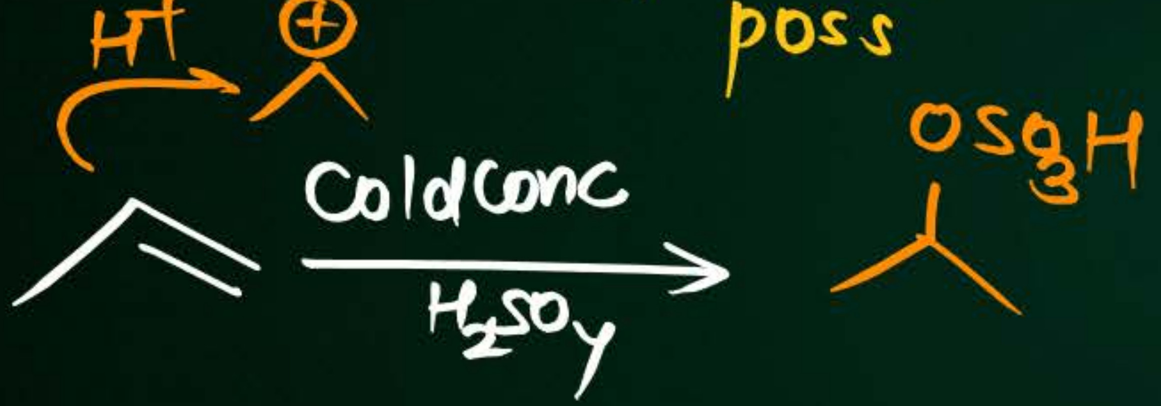

$$\overset{\oplus}{H}-\overset{\ominus}{O}-\underset{\underset{O}{\|}}{\overset{\overset{O}{\|}}{S}}-OH$$

$$R-CH=CH_2 \xrightarrow{H^+} R-\overset{+}{C}H-CH_3 \xrightarrow{^-OSO_3H} R-\underset{OSO_3H}{\underset{|}{C}H}-CH_3$$

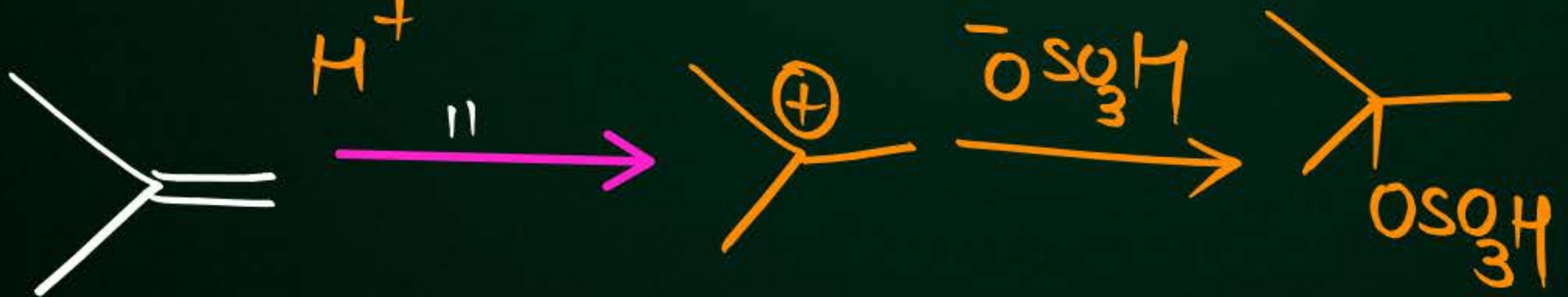
Rearr ib
poss

- $H^+ + X^-$ ✓
- $H^+ + \bar{O}H$ ✓
- $H^+ + \bar{O}R$ ✓
- $H^+ + \bar{S}R$ ✓
- $H^+ + \bar{S}H$ ✓
- $H^+ + \bar{O}SO_3H$ ✓

Q ①


H^+
⊕
Cold conc
H_2SO_4
OSO_3H

②


H^+
"
⊕
$\bar{O}SO_3H$
OSO_3H

QUESTION (NCERT Exemplar)

Arrange the following hydrogen halides in order of their decreasing reactivity with propene.

$\overset{+}{H}Cl < \overset{+}{H}Br < \overset{+}{H}I$ BE↓ ROR↑

A HCl > HBr > HI

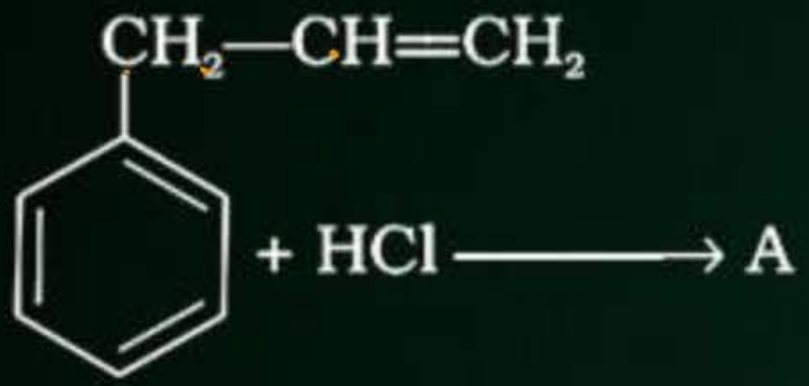
B HBr > HI > HCl

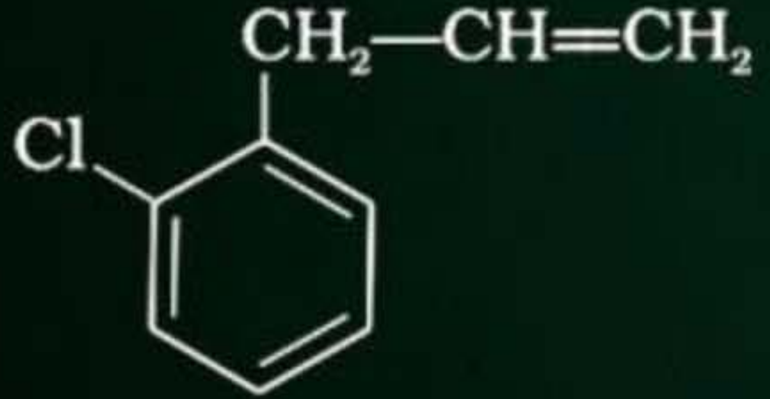
[✓ C] HI > HBr > HCl

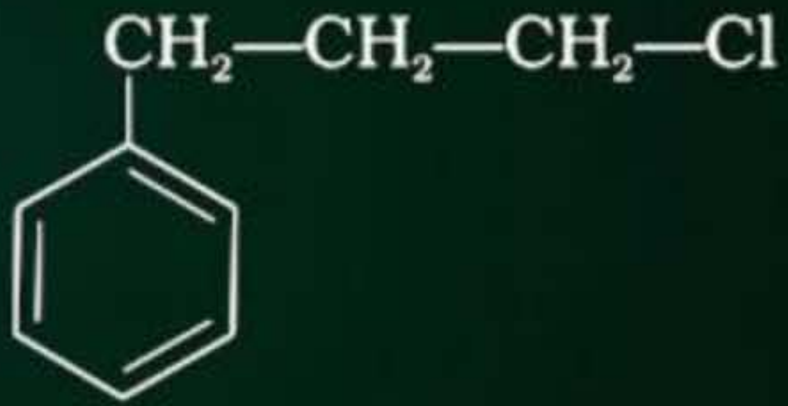
D HCl > HI > HBr

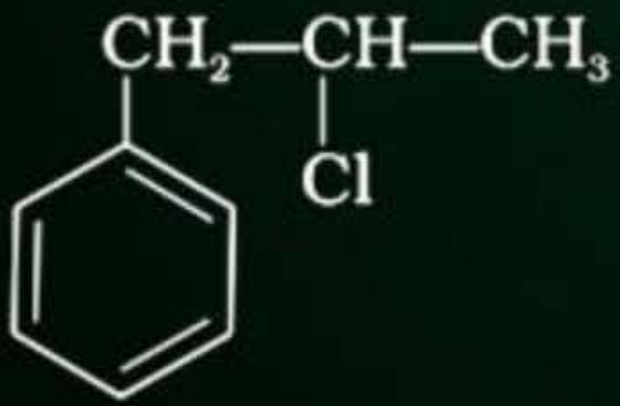
QUESTION (NCERT Exemplar)

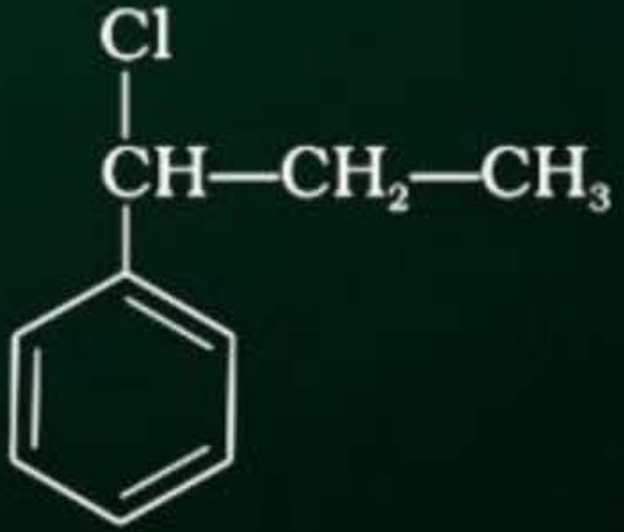
What is 'A' in the following reaction?


CH2—CH=CH2
+ HCl
A

A

CH2—CH=CH2
Cl

B

CH2—CH2—CH2—Cl

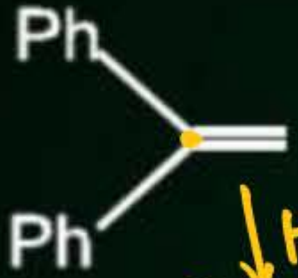
C

CH2—CH—CH3
Cl

[✓ D]

Cl
CH—CH2—CH3

QUESTION

Order of rate of electrophilic addition reaction with HBr will be:

Stability ∝ R.O.R of 1st $C^{\oplus}$

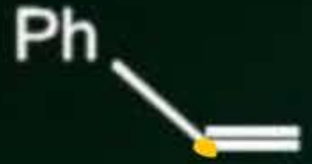


(I)

$\downarrow H^+$

$Ph_2\overset{+}{C}-CH_3$

2 Ring reso

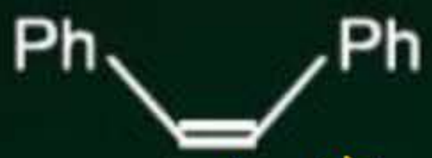


(II)

$\downarrow H^+$

$Ph-\overset{\oplus}{C}H-\overset{\alpha}{C}H_3$

1 Ring + 3αH Reso

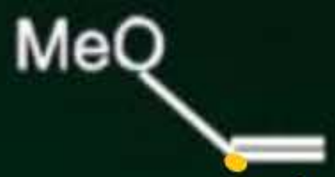


(III)

H^+

$Ph-\overset{+}{C}H-\overset{\alpha}{C}H_2-Ph$

1 Ring + 2αH reso



(IV)

$\downarrow H^+$

$Me\ddot{O}-\overset{+}{C}H-CH_3$

BB

(A) IV > I > III > II

(B) I > II > III > IV

(C) I > III > II > IV

(D) IV > I > II > III

Ans.

QUESTION

$CH_3\ddot{O}-\overset{+}{C}H-CH_2-F \Big\} CH_3-O-CH_2-\overset{\oplus}{C}H-F$

H^+

In the addition reaction

$CH_3OCH = CHF + HCl \longrightarrow$

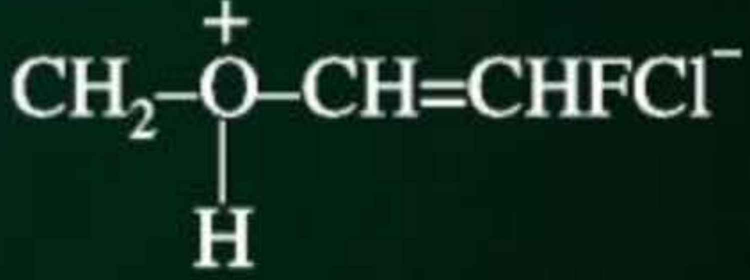
the major product obtained is:

A CH_3OCH_2CHClF

[✓ **B**] $CH_3OCH(Cl)CH_2F$

C $ClCH = CHF$

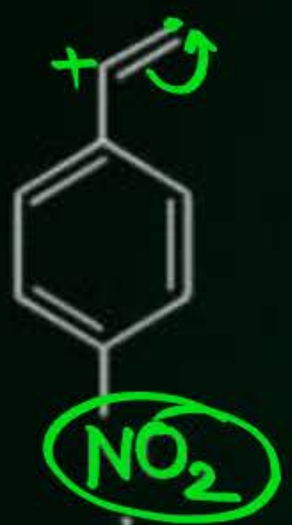
D



$CH_2-\underset{H}{\overset{+}{O}}-CH=CHFCl^-$

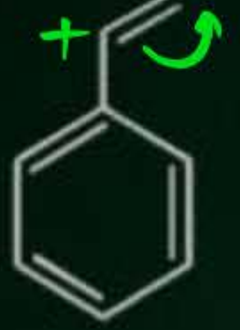
QUESTION

Arrange the following in decreasing order of reactivity with HBr:



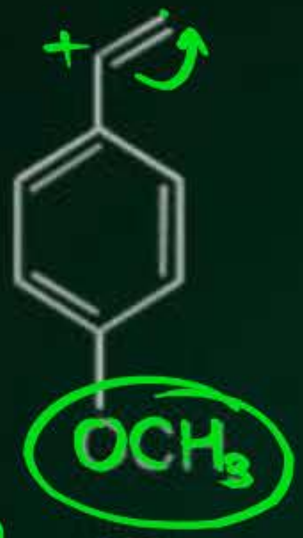
I

−M

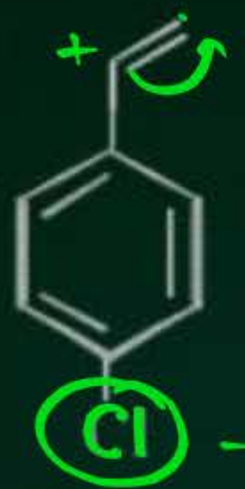


II

+M



III



−I

IV

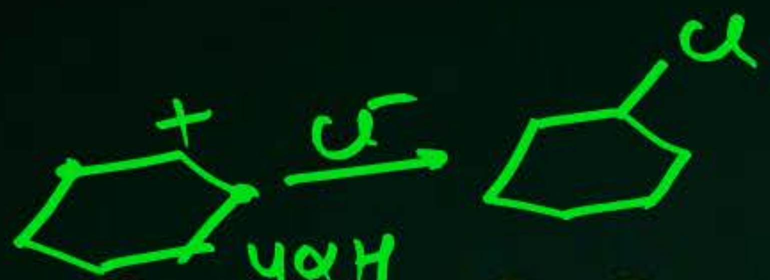
A IV > II > III > I

[✓ **B**] III > II > IV > I

C III > I > IV > II

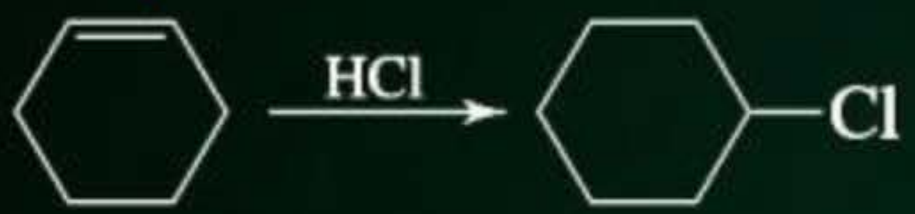
D I > II > III > IV

QUESTION

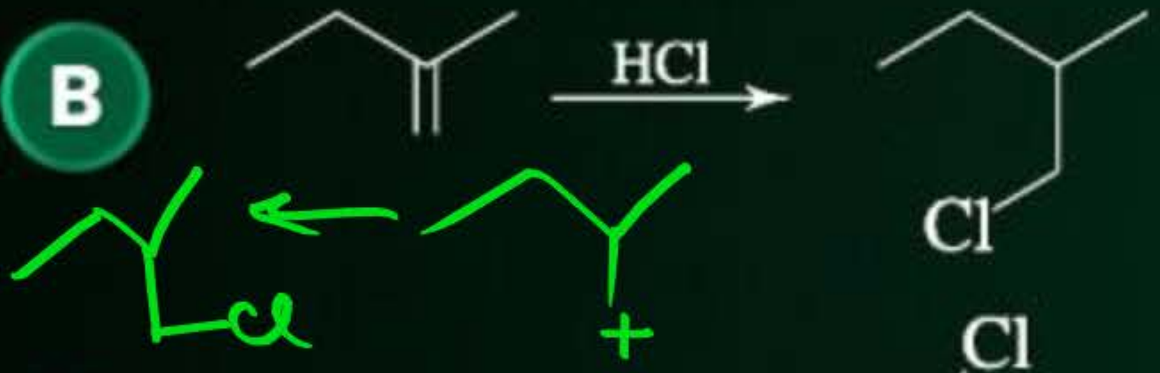


Which reaction will occur at the fastest rate?

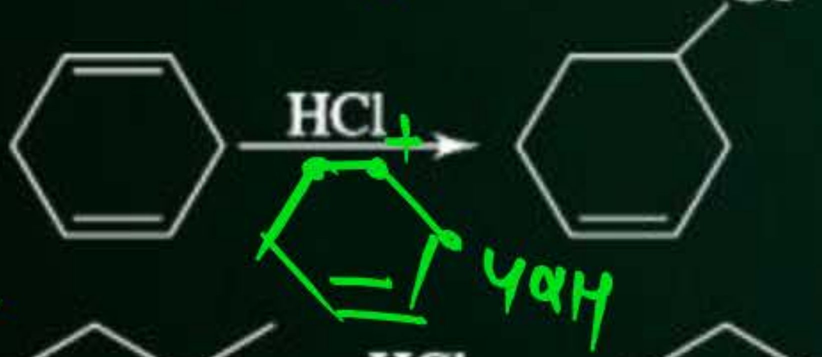
A



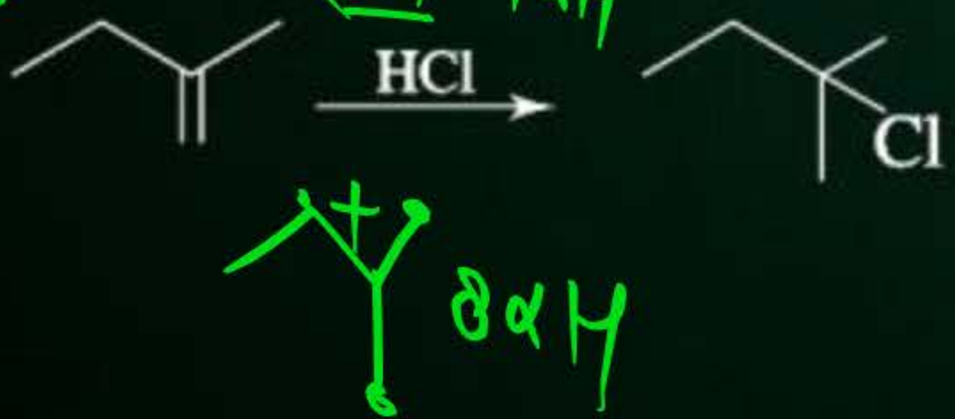
B



C



D ✓



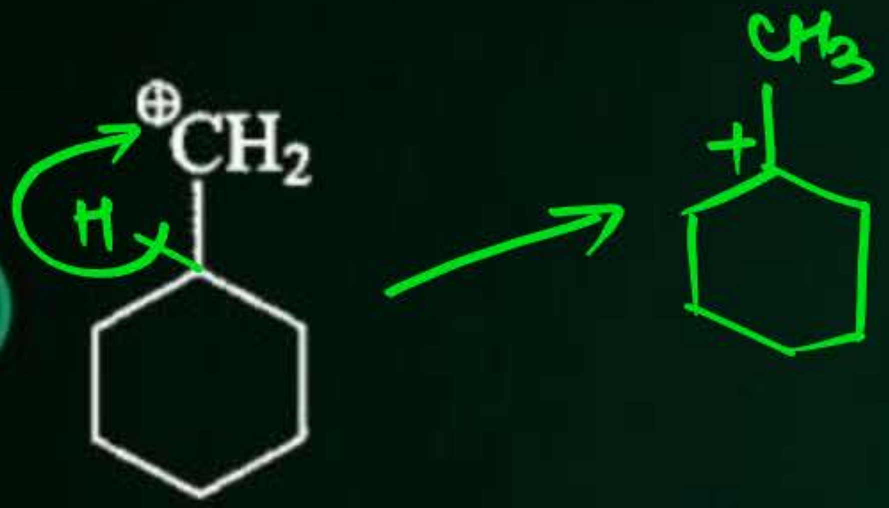
1st $C^{\oplus}$ He

Rate determine hota hai

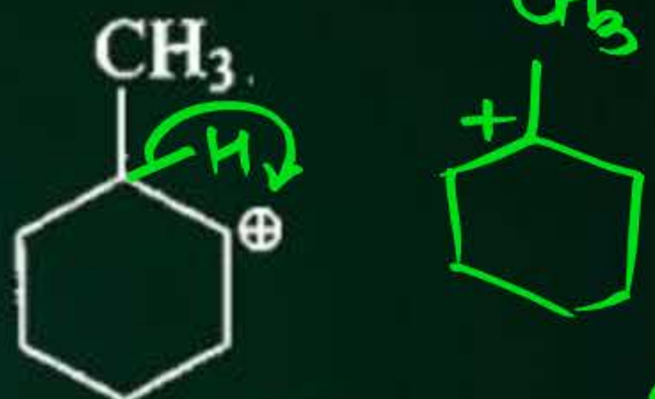
QUESTION

Which of the following carbocations would you do not expect to rearrange?

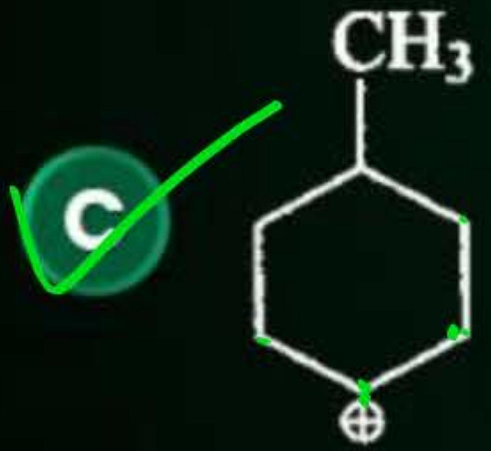
A



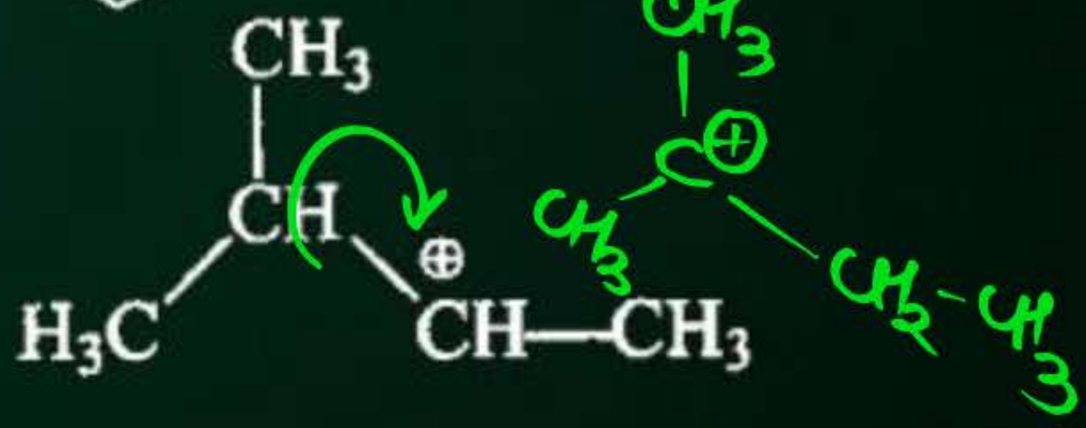
B



C



D



CH3
CH
H3C
⊕
CH—CH3
CH3
C⊕
CH3
CH2-CH3

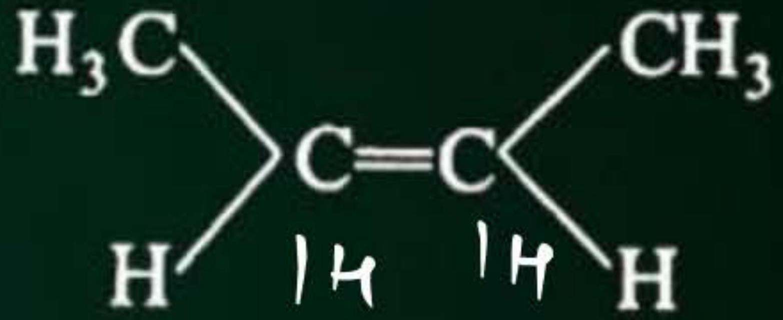
QUESTION

The compound which reacts with HBr obeying Markownikoff's rule is:

Ⓐ $H_2C{=}CH_2$

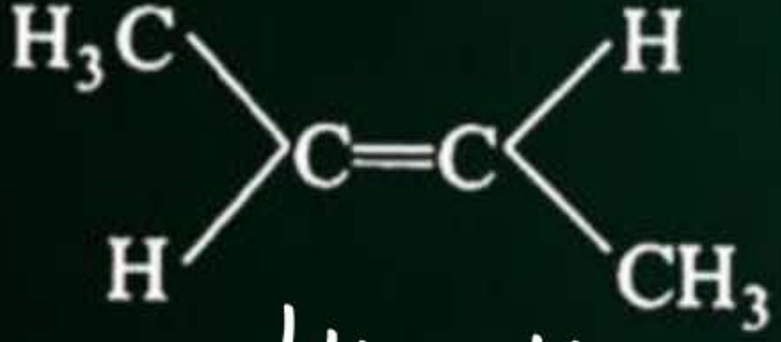
2H 2H

Ⓑ



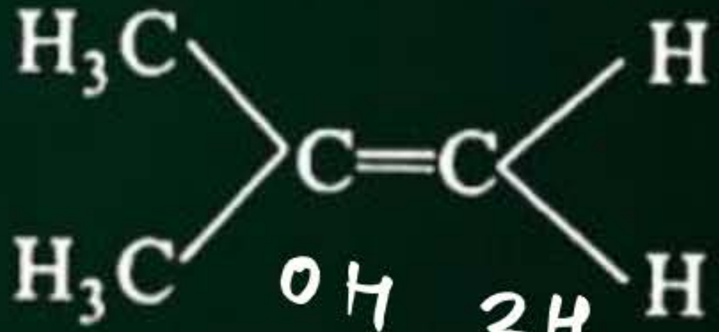
1H 1H

Ⓒ



1H 1H

[✓ Ⓓ]

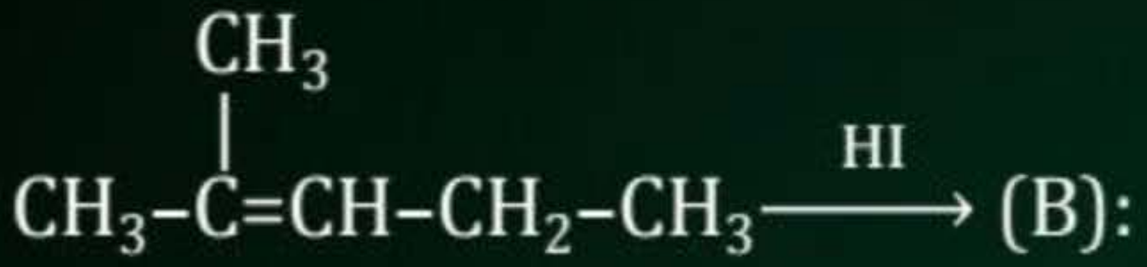


0H 2H

Home Work

QUESTION 01

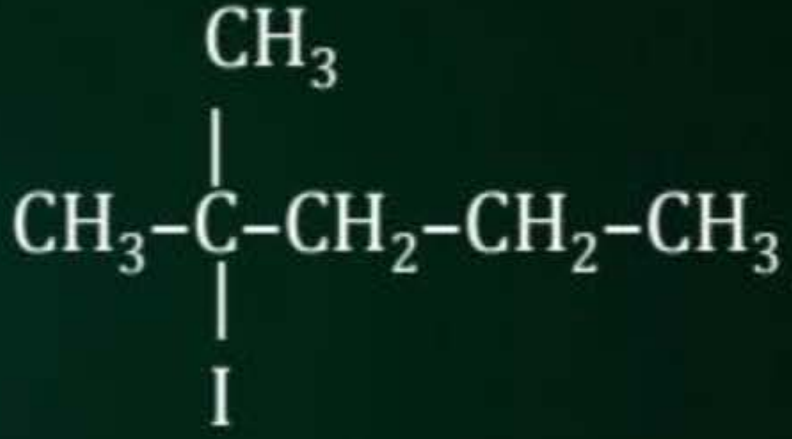
What will be the major product?



$$CH_3-\overset{\overset{CH_3}{|}}{C}=CH-CH_2-CH_3 \xrightarrow{HI} (B):$$

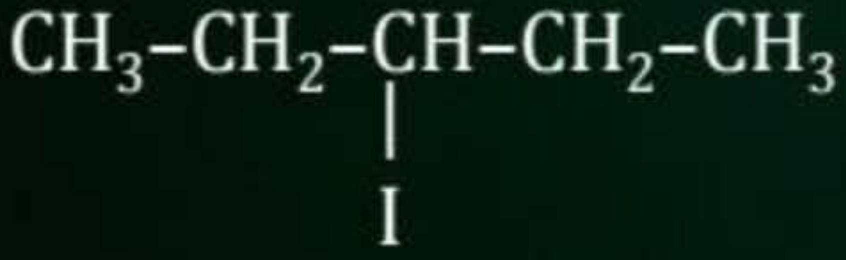
Ⓐ $CH_3-CH_2-CH_2-CH_2-CH_2I$

Ⓑ



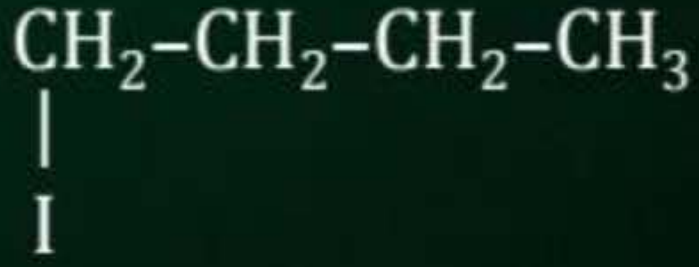
$$CH_3-\underset{\underset{I}{|}}{\overset{\overset{CH_3}{|}}{C}}-CH_2-CH_2-CH_3$$

Ⓒ



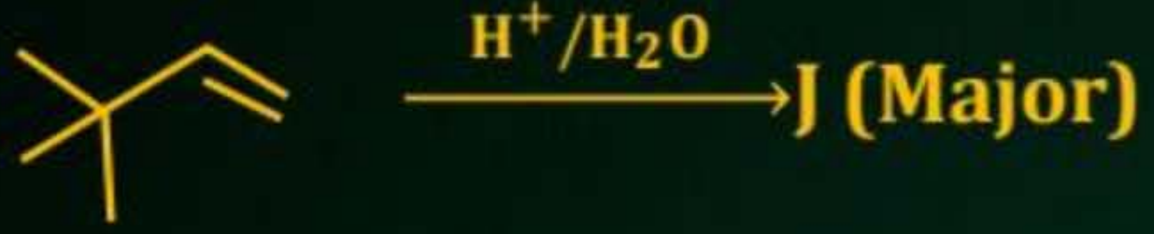
$$CH_3-CH_2-\underset{\underset{I}{|}}{CH}-CH_2-CH_3$$

Ⓓ



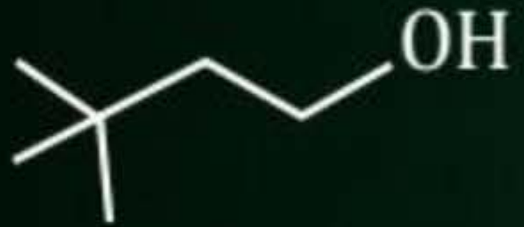
$$\underset{\underset{I}{|}}{CH_2}-CH_2-CH_2-CH_3$$

QUESTION 02

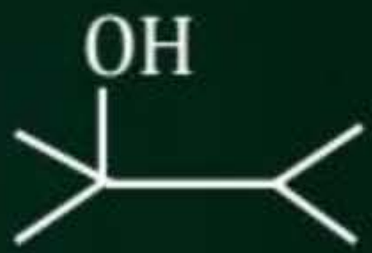

H^+/H_2O
J (Major)

J is:

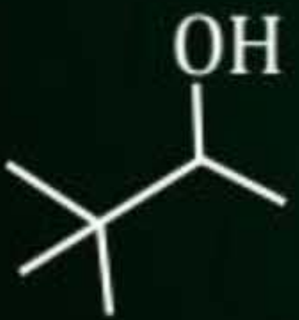
A



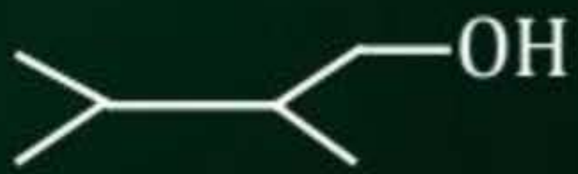
B



C



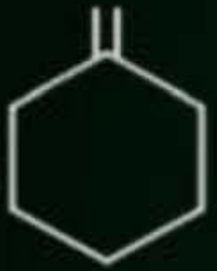
D



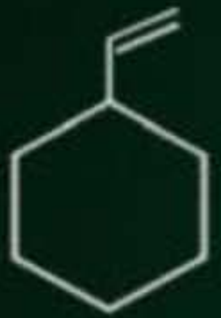
QUESTION 03

What is the correct reactivity order of electrophilic addition reactions in the following compounds?

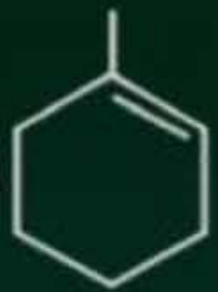
(I)



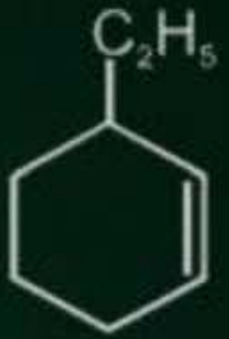
(II)



(III)



(IV)



A II > IV > I > III

B IV > III > II > I

C III > I > IV > II

D I > II > III > IV

QUESTION 04

Hydration of 3-phenyl but-1-ene in dil. H_2SO_4 will give mainly:

- (A) 3-Phenyl butan-1-ol
- (B) 3-Phenyl butan-2-ol
- (C) 2-Phenyl butan-2-ol
- (D) 2-Phenyl butan-1-ol

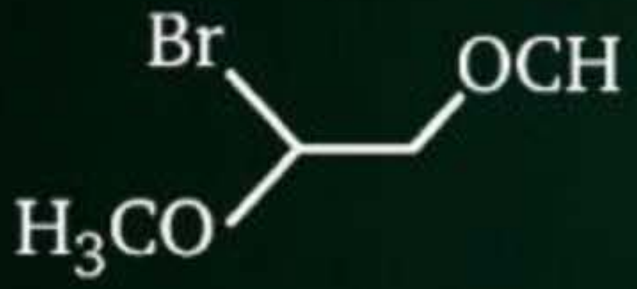
QUESTION 05

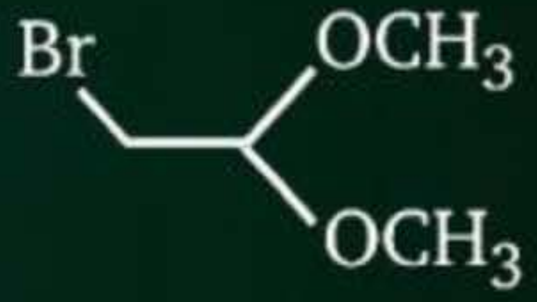
3-Phenyl Propene on reaction with HBr gives (as a major product):

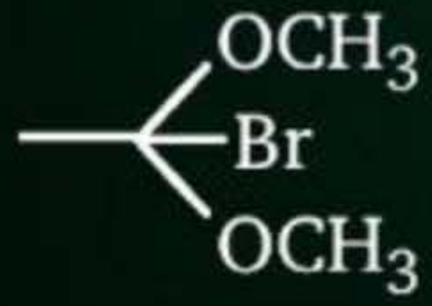
- (A) $C_6H_5CH_2CH(Br)CH_3$
- (B) $C_6H_5CH(Br)CH_2CH_3$
- (C) $C_6H_5CH_2CH_2CH_2Br$
- (D) $C_6H_5CH(Br)CH=CH_2$

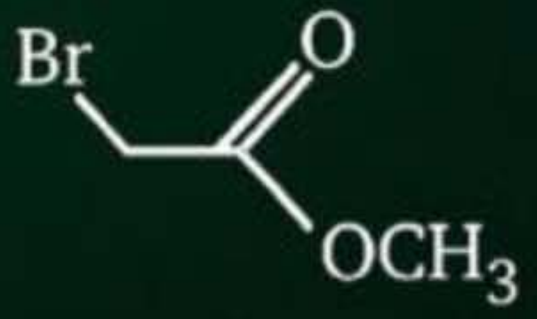
QUESTION 06

Methyl vinyl ether $H_2C = CH - OCH_3$ reacts with Br_2/CH_3OH. If methanol is reacting as water would, and if this reaction follows a typical mechanism of electrophilic addition. What would be expected product?

A


B

Br
OCH₃
OCH₃

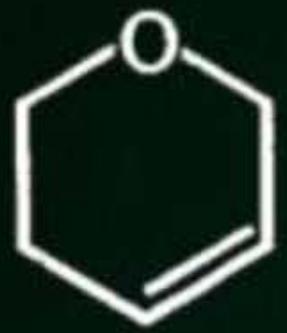
C

OCH₃
Br
OCH₃

D


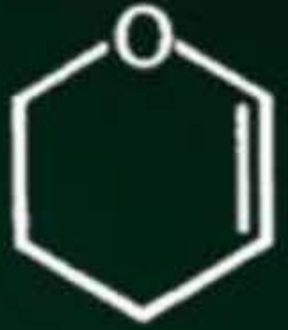
QUESTION 07

Which of the following is most reactive toward Markovnikov addition?

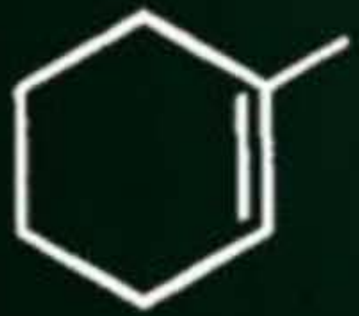
(A)



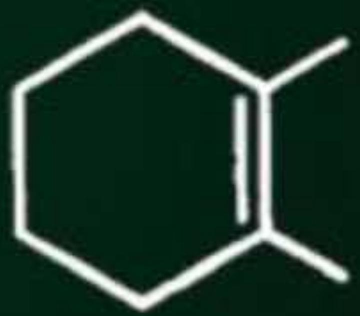
(B)



(C)



(D)



QUESTION 08

Consider the following compounds.

$Ph_2C=CH_2$

1

$(CH_3)_2C=CH_2$

2

$Ph_2C=CHCF_3$

3

Correct order of rate of electrophilic addition reaction is:

A $1 > 2 > 3$

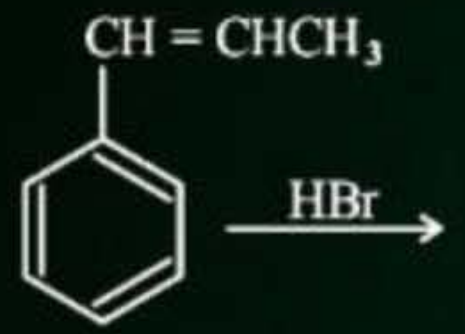
B $3 > 2 > 1$

C $1 > 3 > 2$

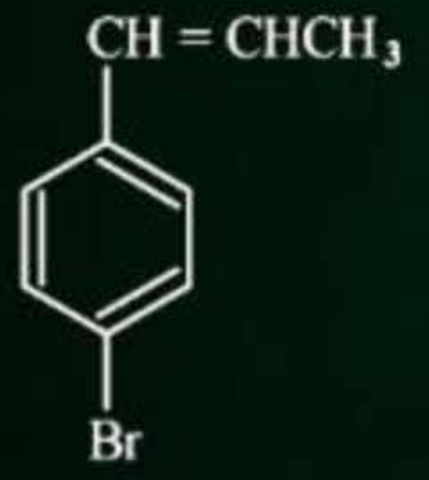
D $3 > 1 > 2$

QUESTION 09

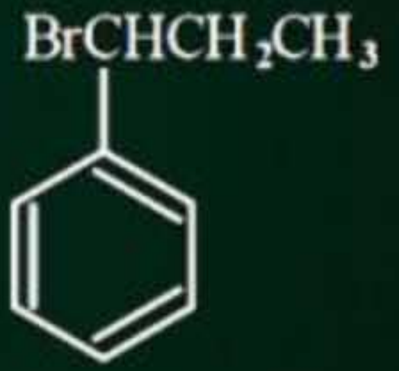
The major product of the following reaction is:


CH = CHCH$_3$
HBr

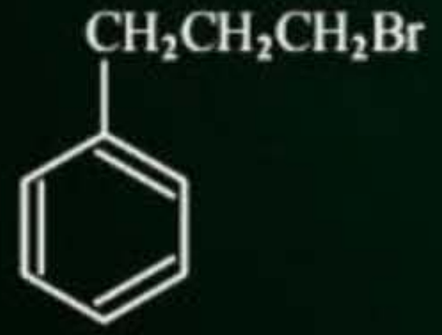
A



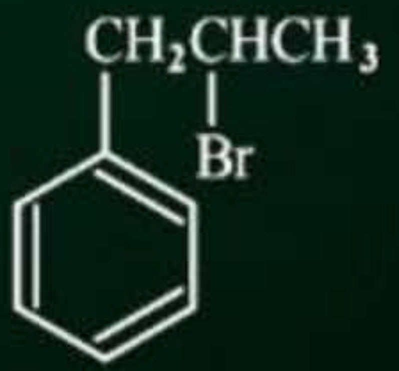
B


BrCHCH$_2$CH$_3$

C


CH$_2$CH$_2$CH$_2$Br

D


CH$_2$CHCH$_3$
Br

QUESTION 10

Markovnikov's rule provides guidance of addition of HBr on

Ⓐ $CH_2 = CH_2$

Ⓑ $CH_3\text{-}CH_2\text{-}CH_3$

Ⓒ $CH_3CH{=}CHCH_3$

Ⓓ $CH_2 = CHBr$

ANSWER KEY

1. B
2. B
3. C
4. C
5. B
6. B
7. B
8. C
9. B
10. D

Home Work

Discussion of L-02

QUESTION 01

$CH_3-\boxed{COONa} \xrightarrow[CaO/\Delta]{NaOH} CH_4$

When sodium acetate is heated with soda lime, the reaction is called:

- A Dehydration
- [✓ B] Decarboxylation
- C Dehydrogenation
- D Dehydrohalogenation

QUESTION 02

The gases liberated at anode in the Kolbe's electrolysis of sodium acetate are:

- A CO_2 & H_2
- [✓ B] C_2H_6 & CO_2
- C H_2 & C_2H_6
- D H_2 & O_2

$\dot{C}H_3 \} \dot{C}O\bar{O}Na^+$

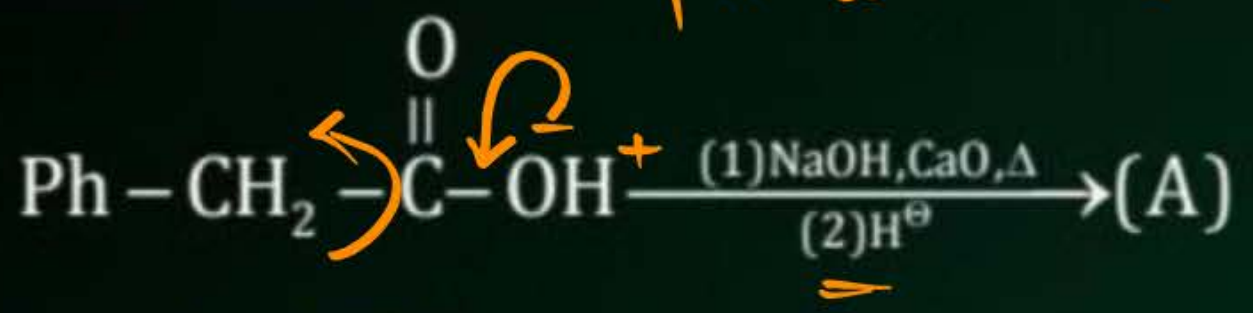
$\dot{C}H_3 + \dot{C}H_3 \longrightarrow CH_3-CH_3$ ✓

$+$

CO_2

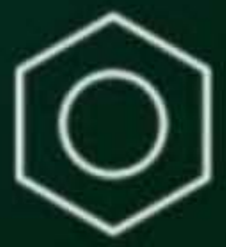
QUESTION 03

$Ph\overset{\ominus}{C}H_2 \xrightarrow{H^+} \underline{PhCH_3}$

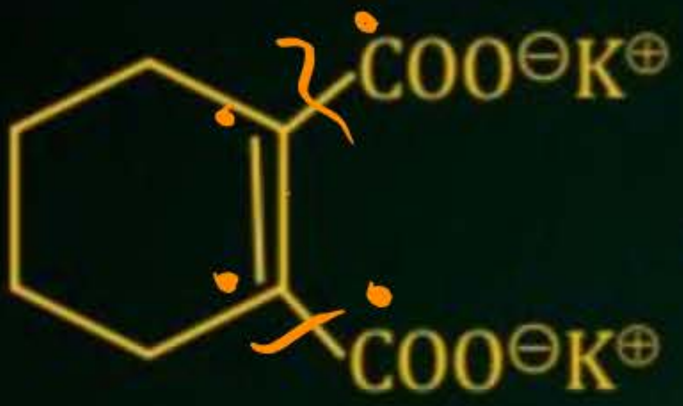


$$Ph-CH_2-\overset{\overset{O}{\|}}{C}-OH \xrightarrow[(2)H^{\ominus}]{(1)NaOH,CaO,\Delta} (A)$$

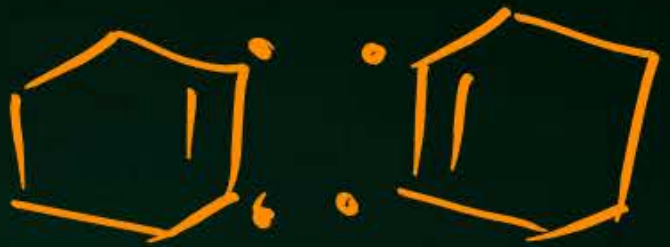
Product (A) is:

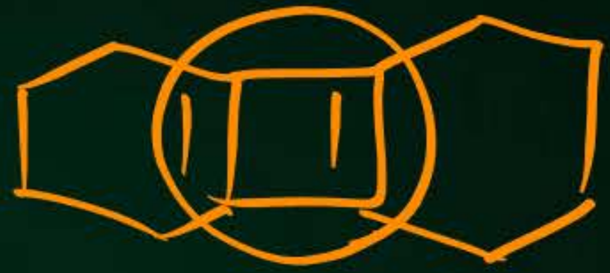
- A $Ph-CO_2H$
- B $Ph-CH_2-OH$
- [✓ C] $Ph-CH_3$
- D 

QUESTION 04

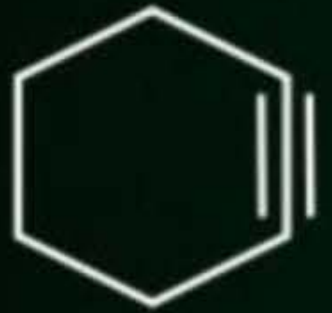


Electrolysis → product:

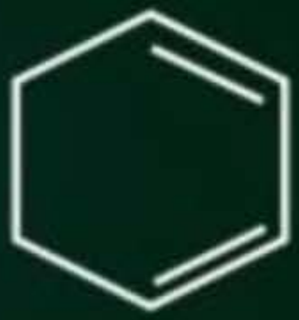




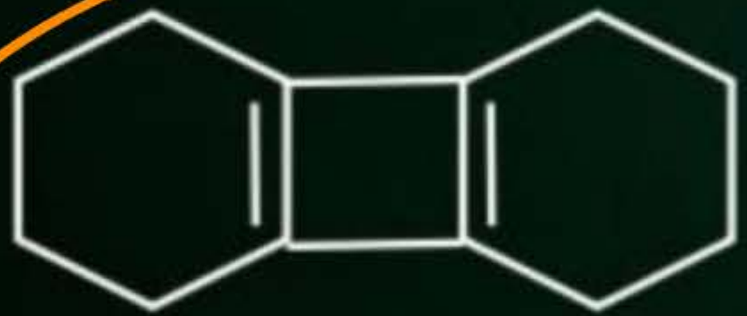
(A)



(B)

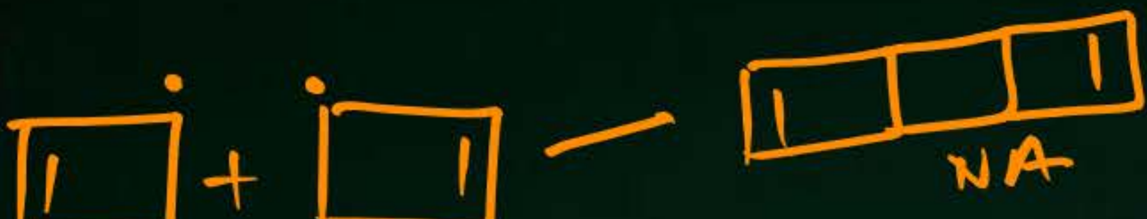


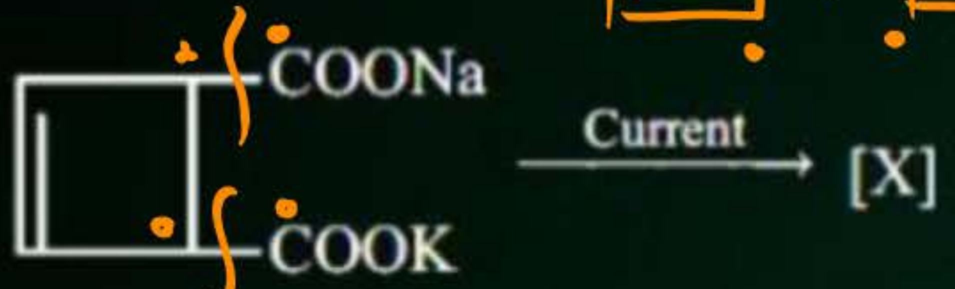
(C) ✓

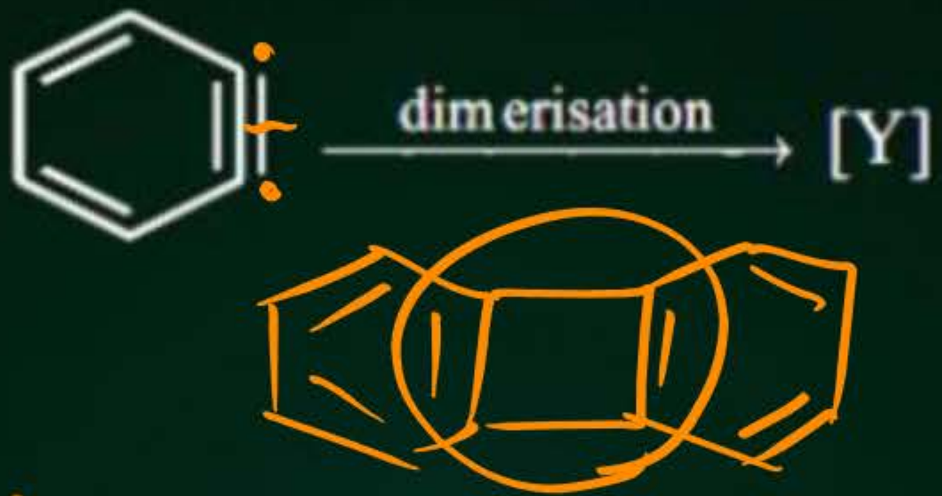


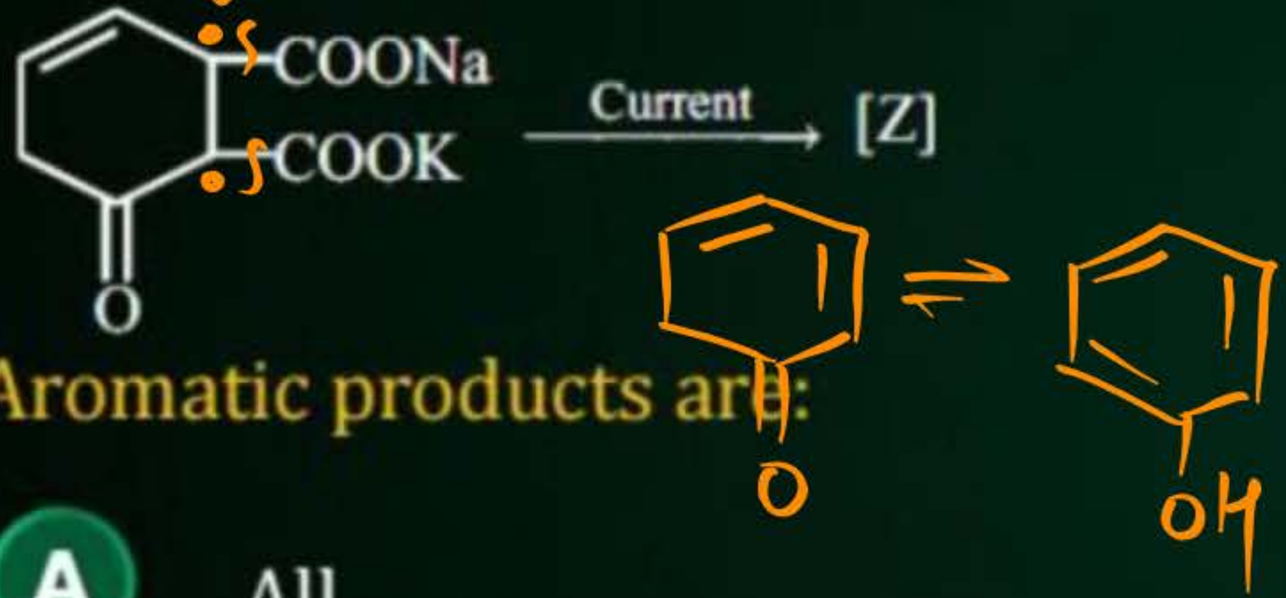
(D) None of these

QUESTION 05




COONa
COOK
Current
[X]


dimerisation
[Y]


COONa
COOK
O
Current
[Z]
O
OH

Aromatic products are:

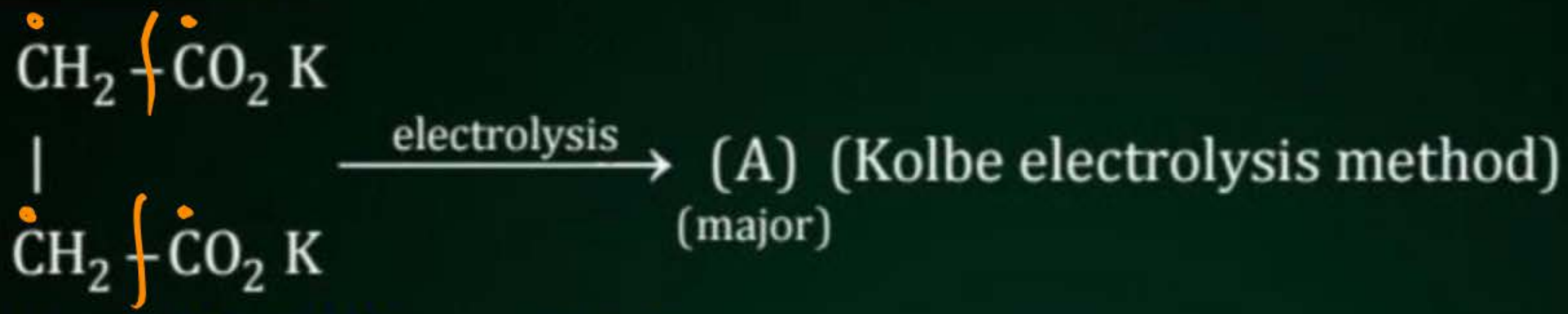
- **A** All
- **B** Y & Z
- **C** X & Y
- [✓ **D**] Z

QUESTION 06

Pure methane can be prepared by:

- (A) Wurtz reaction
- (B) Kolbe electrolysis method
- [✓ (C) soda-lime de-carboxylation]
- (D) reduction with H_2

QUESTION 07



$$\begin{matrix}\dot{C}H_2 - \dot{C}O_2K \\ | \\ \dot{C}H_2 - \dot{C}O_2K\end{matrix} \xrightarrow{\text{electrolysis}} \underset{\text{(major)}}{(A)} \text{ (Kolbe electrolysis method)}$$

Product (A) of the reaction is:

A $CH_3 - CH_3$

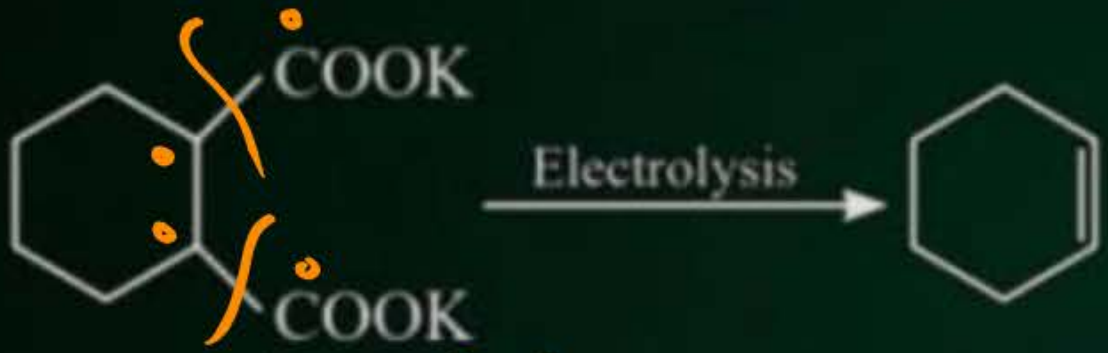
[✓ B] $CH_2 = CH_2$

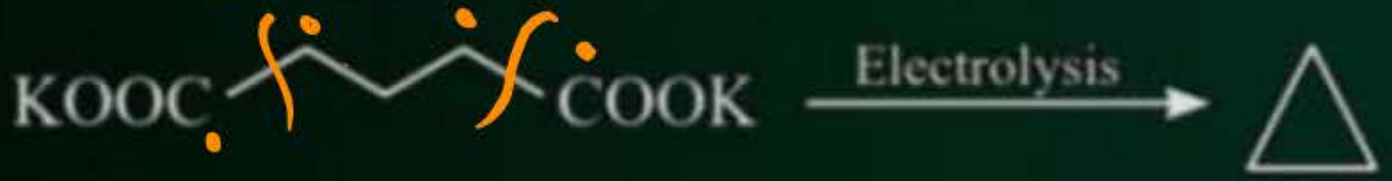
C $CH_3 - CH = CH_2$

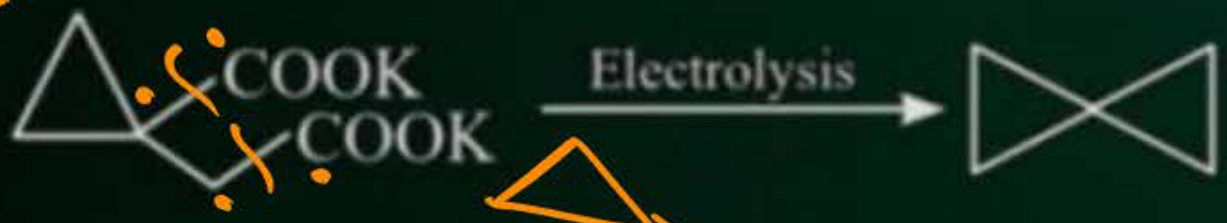
D None of these

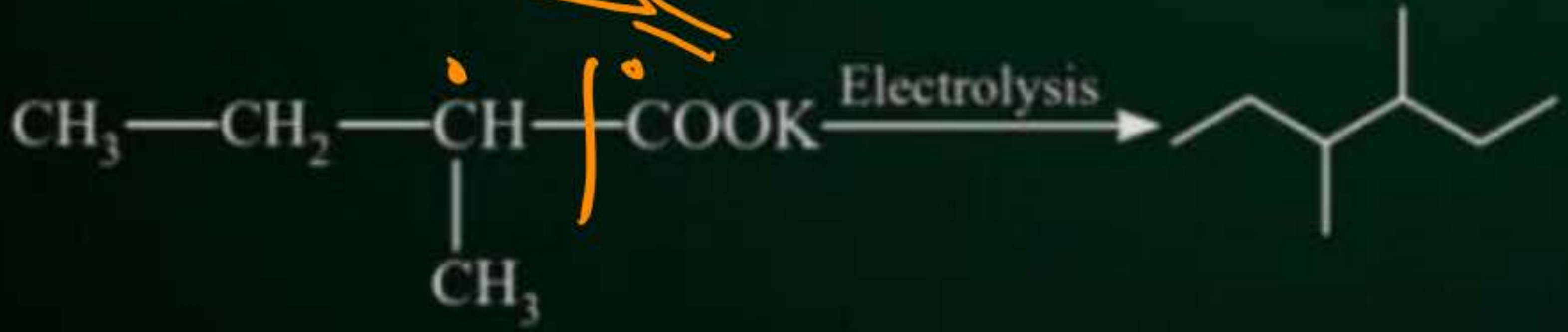
QUESTION 08

In which of the following reaction, the Kolbe's electrolysis product is incorrectly mentioned?

(A)

COOK
COOK
Electrolysis

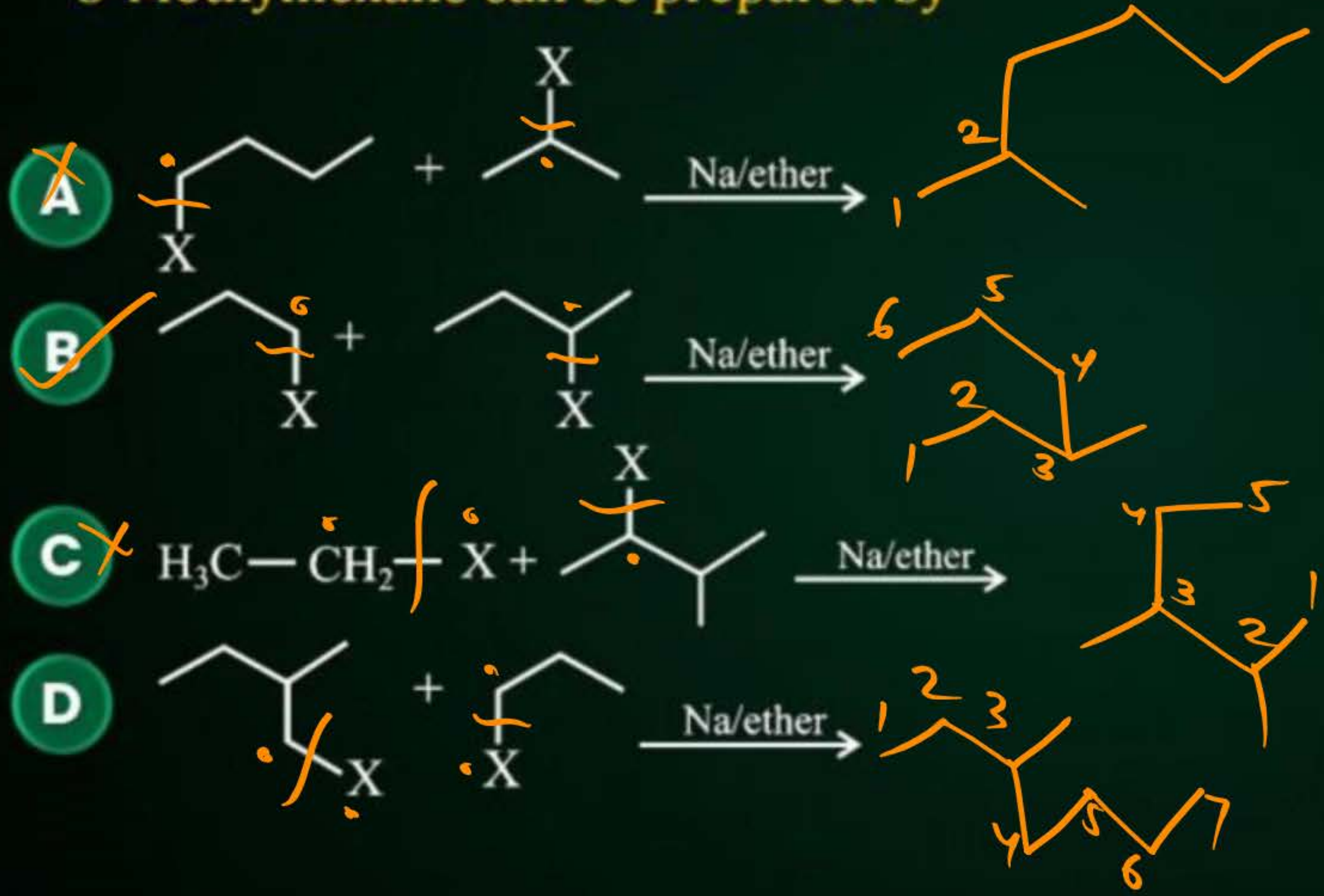
(B)

KOOC
COOK
Electrolysis

[✓ (C)]

COOK
COOK
Electrolysis

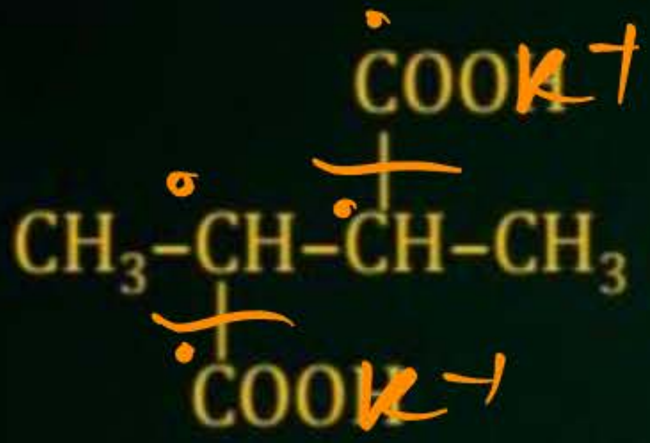
(D)

CH₃—CH₂—CH—COOK
CH₃
Electrolysis

QUESTION 09

3-Methylhexane can be prepared by

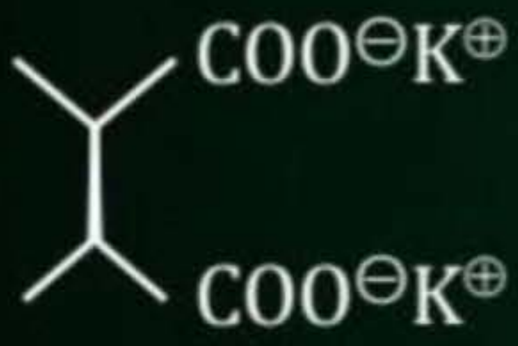

A
X
+
X
Na/ether
2
1
B
X
+
X
Na/ether
6
5
4
2
1
3
C
H_3C-CH_2-X +
X
Na/ether
4
5
3
1
2
D
+
X
X
Na/ether
1
2
3
4
5
6
7

QUESTION 10

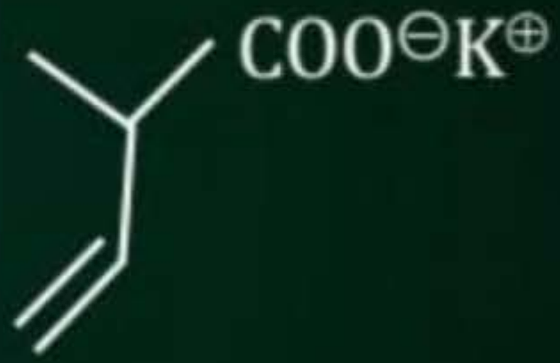


$$\underset{\text{COOK}^{+}}{\mathrm{CH_3-\overset{}{C}H}}-\overset{\text{COOK}^{+}}{\mathrm{CH}}-\mathrm{CH_3} \xrightarrow[\text{Electrolysis}]{\text{KOH}} \text{Product:}$$

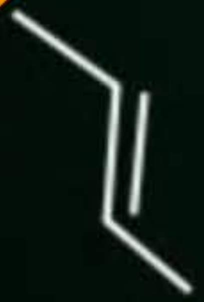
A



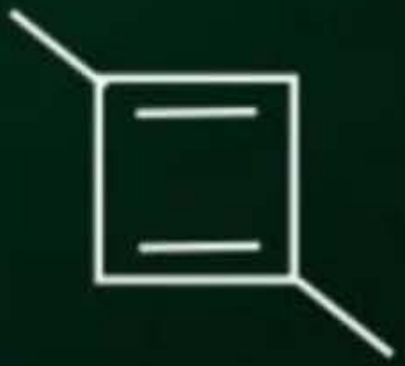
B



[✓ **C**]



D



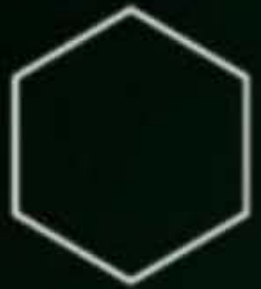
ANSWER KEY

1. B
2. B
3. C
4. C
5. D
6. C
7. B
8. C
9. B
10. C

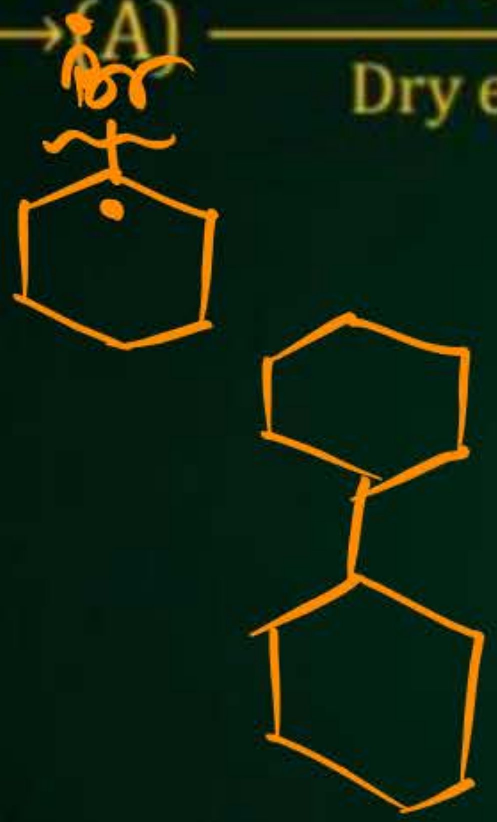
Home Work

Discussion of L-03

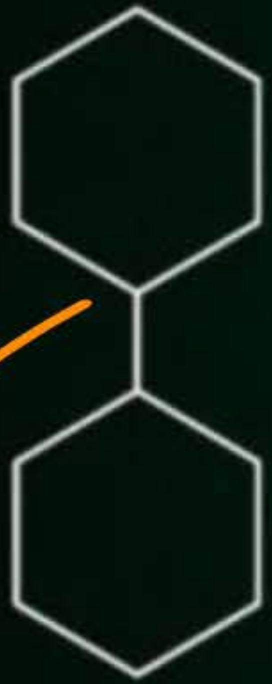
QUESTION 01



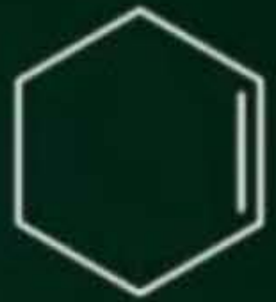
$\xrightarrow{Br_2}$ (A) $\xrightarrow[\text{Dry ether}]{Na}$ (B) Product B is:



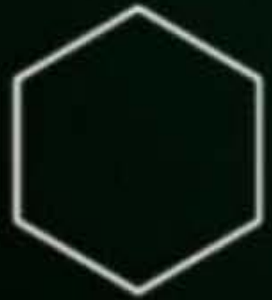
Ⓐ



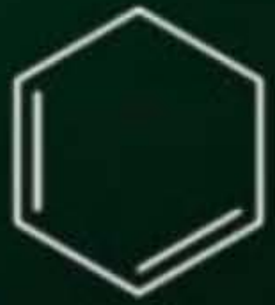
Ⓑ



Ⓒ

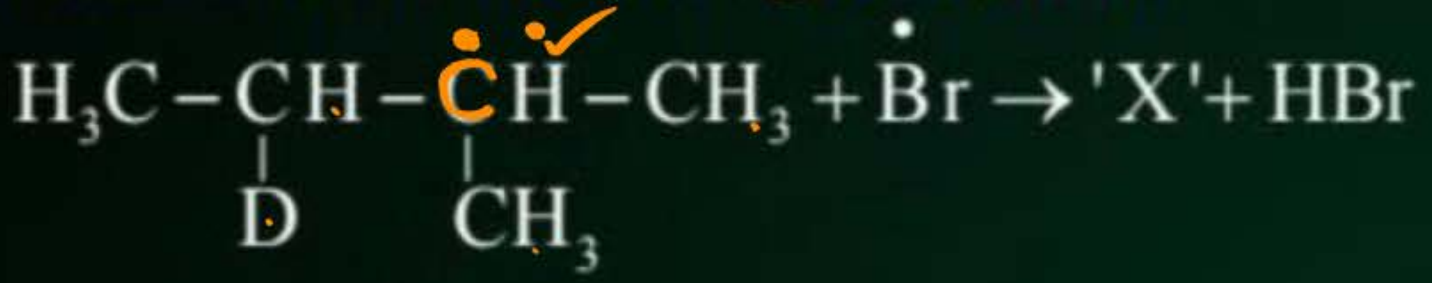


Ⓓ



QUESTION 02

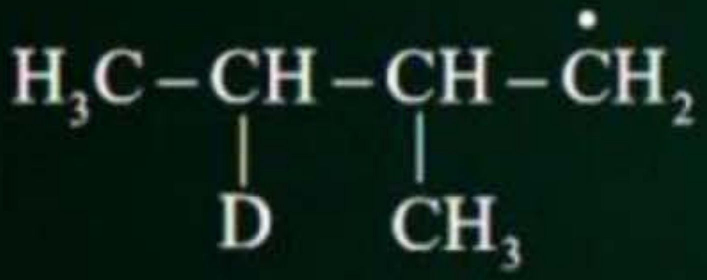
Consider the following reactions



$$\mathrm{H_3C-\underset{D}{\underset{|}{C}}H-\underset{CH_3}{\underset{|}{C}}H-CH_3+\dot{B}r\rightarrow 'X'+HBr}$$

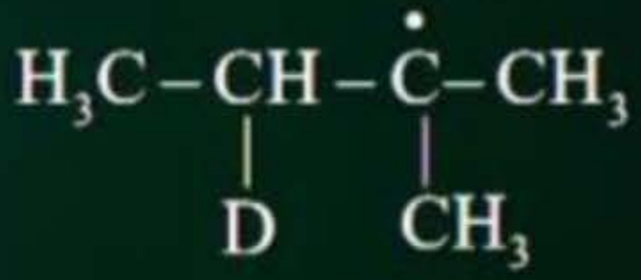
Identify the structure of the major product 'X'

(A)



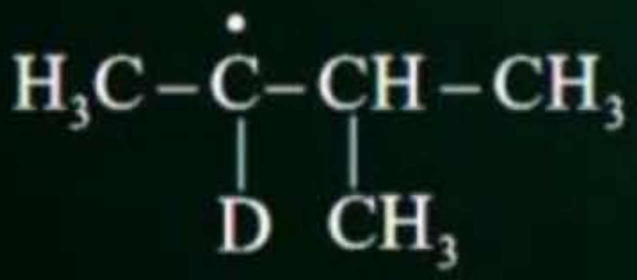
$$\mathrm{H_3C-\underset{D}{\underset{|}{C}}H-\underset{CH_3}{\underset{|}{C}}H-\dot{C}H_2}$$

[✓ (B)]



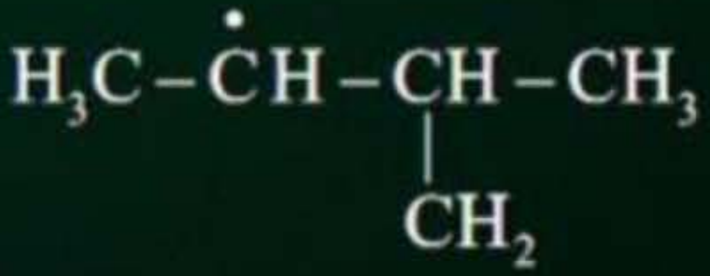
$$\mathrm{H_3C-\underset{D}{\underset{|}{C}}H-\underset{CH_3}{\underset{|}{\dot{C}}}-CH_3}$$

(C)



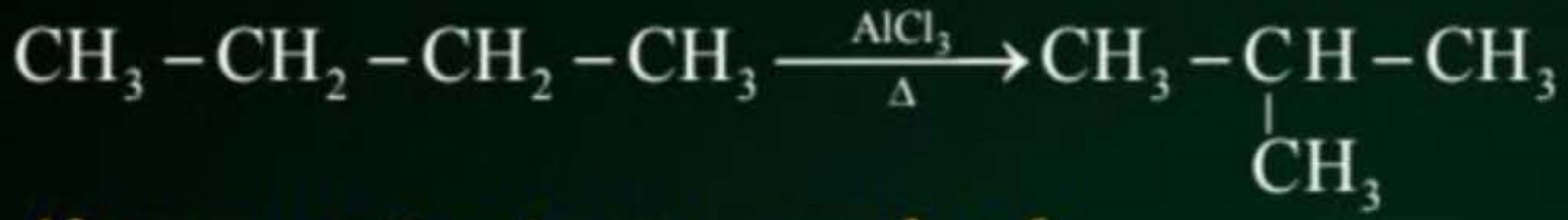
$$\mathrm{H_3C-\underset{D}{\underset{|}{\dot{C}}}-\underset{CH_3}{\underset{|}{C}}H-CH_3}$$

(D)



$$\mathrm{H_3C-\dot{C}H-\underset{CH_2}{\underset{|}{C}}H-CH_3}$$

QUESTION 03



$$CH_3-CH_2-CH_2-CH_3 \xrightarrow[\Delta]{AlCl_3} CH_3-\underset{\displaystyle CH_3}{\underset{|}{C}}H-CH_3$$

Above reaction is an example of:

Ⓐ [✓ Isomerization]

Ⓑ polymerization

Ⓒ cracking

Ⓓ de-hydrogenation

QUESTION 04

How much volume of oxygen will be needed for complete combustion of 10 lit. of ethane:

(A) 135 lit.

[✓ (B) 35 lit.]

(C) 175 lit.

(D) 205 lit.

$$C_2H_6 + \frac{7}{2}O_2 \longrightarrow 2CO_2 + 3H_2O$$

$$\frac{10\times7}{2}$$

QUESTION 05

C.I $Cl-Cl \longrightarrow \dot{Cl} + \dot{Cl}$

C.P $CH_3-H + \dot{Cl} \longrightarrow \dot{C}H_3 + H-Cl$

$\dot{C}H_3 + Cl-Cl \longrightarrow CH_3-Cl + \dot{Cl}$

Select the chain propagation steps in the free-radical chlorination of methane.

(1) $Cl_2 \longrightarrow 2Cl^\bullet$

(2) $Cl^\bullet + CH_4 \longrightarrow CH_3Cl + H^\bullet$

(3) $Cl^\bullet + CH_4 \longrightarrow CH_3^\bullet + HCl$

(4) $H^\bullet + Cl_2 \longrightarrow HCl + Cl^\bullet$

(5) $CH_3^\bullet + Cl_2 \longrightarrow CH_3Cl + Cl^\bullet$

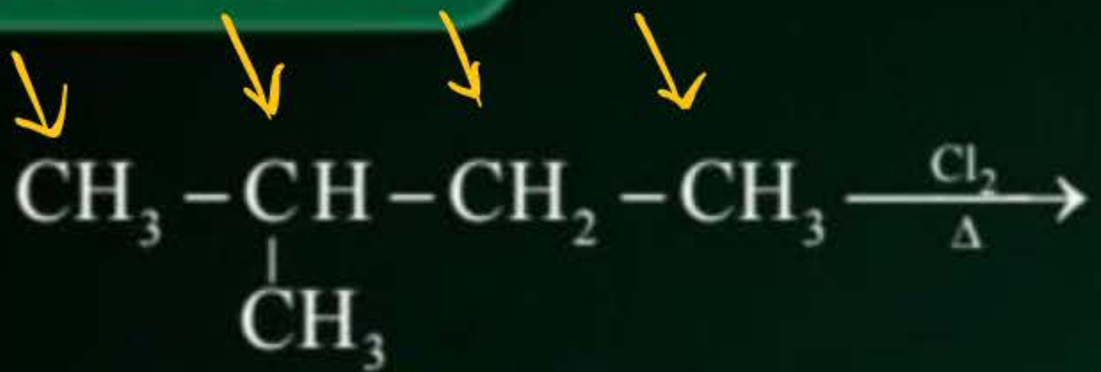
A 2, 3, 5

B 1, 3, 6

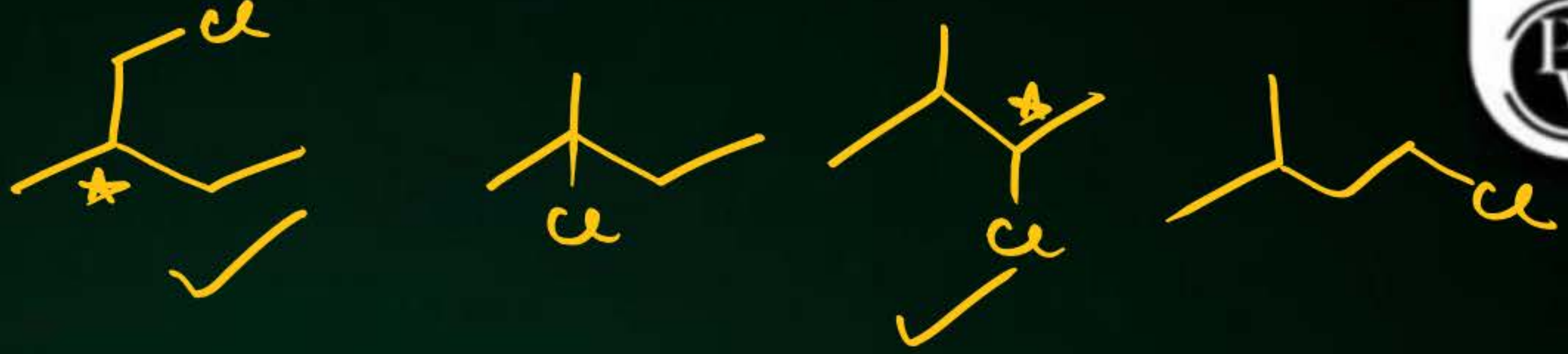
C [✓ 3, 5]

D 2, 3, 4

QUESTION 06



$$CH_3-\underset{\displaystyle CH_3}{\underset{|}{C}}H-CH_2-CH_3\xrightarrow[\Delta]{Cl_2}$$



Number of chiral centers generated during monochlorination in the above reaction:

A 1

[✓ **B**] 2

C 3

D 4

QUESTION 07

Which statement is incorrect about free radical halogenation of alkanes?

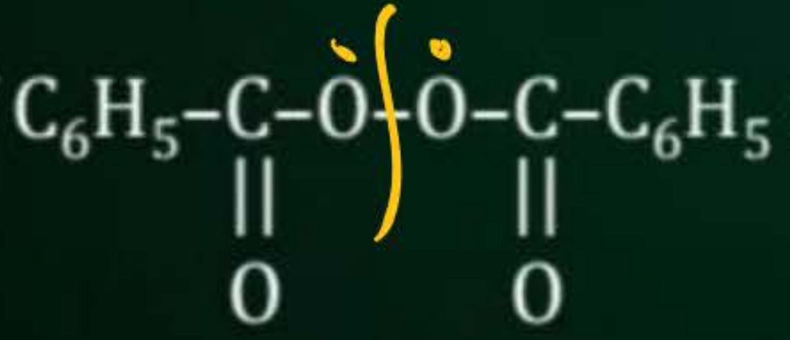
(A) The number of product molecules formed by one photon is very high.

[✓ (B)] If O_2 is added, initially the rate of reaction decreases, then increases.

$R^{\bullet}$ $\dot{O} \pm \dot{O}$ $R-O-O^{\bullet}$

(C) Inhibitors combine with free radical and terminate the chain reaction.

(D) Presence of

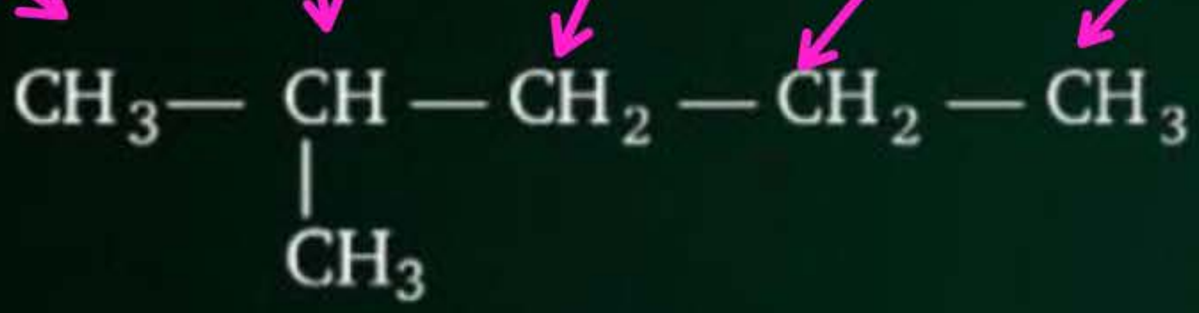


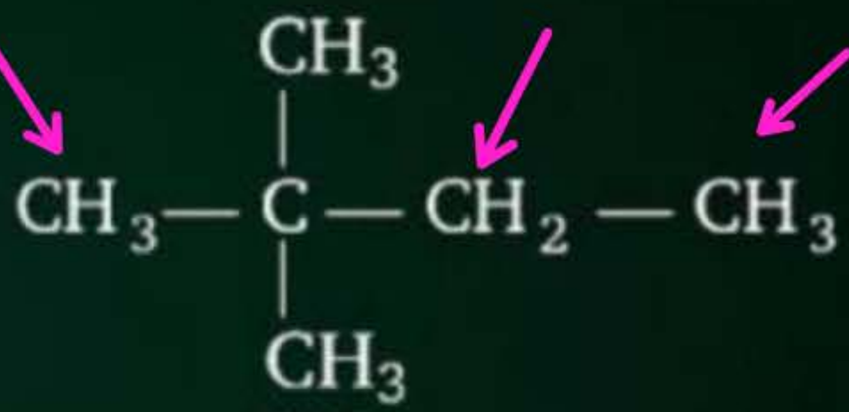
$C_6H_5-\underset{\underset{O}{\|}}{C}-\dot{O}-\dot{O}-\underset{\underset{O}{\|}}{C}-C_6H_5$

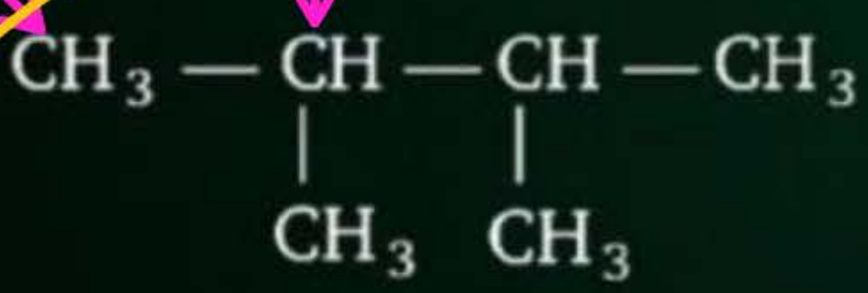
inhibits the free radical reaction.

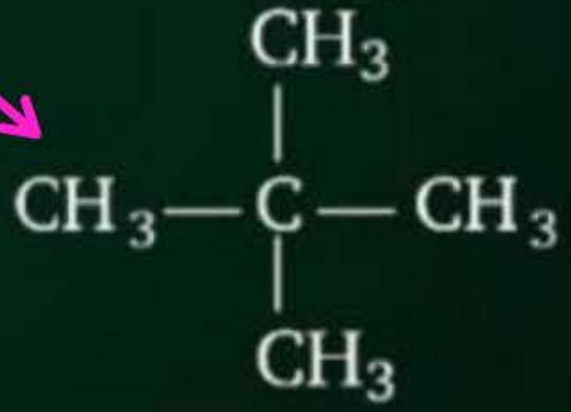
QUESTION 08

An alkane (mol. wt. = 86) on bromination gives only two monobromo derivatives (excluding stereoisomers). The alkane is:

(A)

$CH_3-\underset{\underset{CH_3}{|}}{CH}-CH_2-CH_2-CH_3$

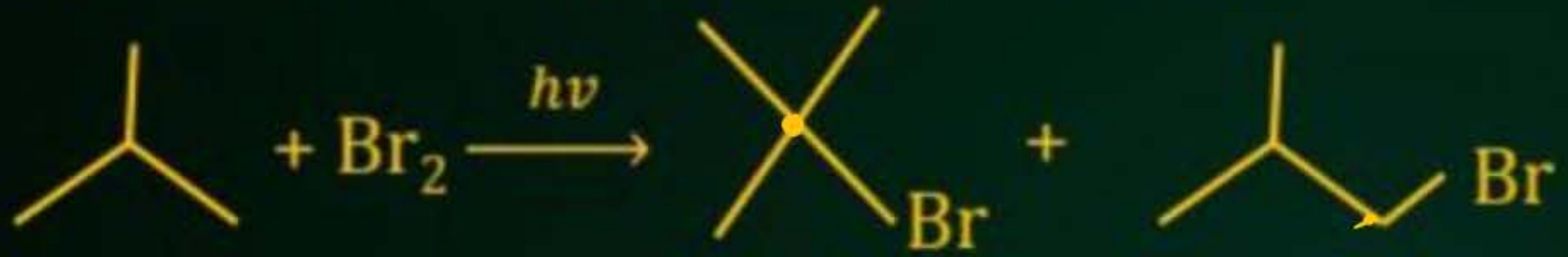
(B)

$CH_3-\overset{\overset{CH_3}{|}}{\underset{\underset{CH_3}{|}}{C}}-CH_2-CH_3$

(C)

$CH_3-\underset{\underset{CH_3}{|}}{CH}-\underset{\underset{CH_3}{|}}{CH}-CH_3$

(D)

$CH_3-\overset{\overset{CH_3}{|}}{\underset{\underset{CH_3}{|}}{C}}-CH_3$

QUESTION 09

The relative reactivity of 1°H, 2°H and 3°H in bromination reaction has been found to be 1 : 82 : 1600 respectively. In the reaction,



(A) (B)

The percentage yield of (A) and (B) are expected to be:

Ⓐ [✓ 99.4%, 0.6%]

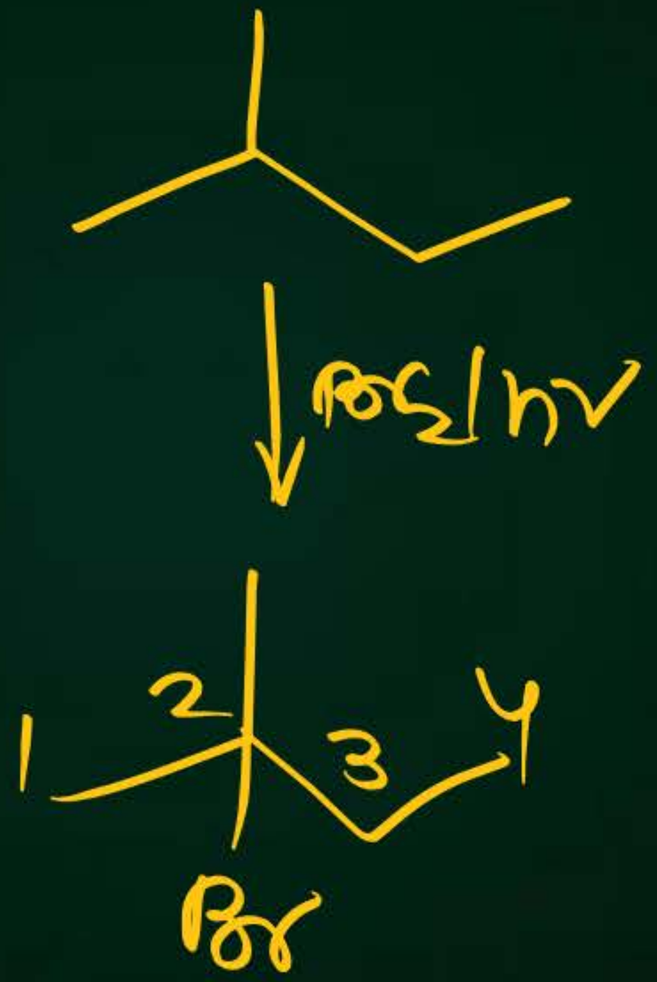
Ⓑ 50%, 50%

Ⓒ 0.6%, 99.4%

Ⓓ 80%, 20%

QUESTION 10

2-methyl butane on reacting with bromine in the presence of sunlight gives maximum content of



A 1-bromo-3-methyl butane

B 2-bromo-3-methylbutane

[✓ **C**] 2-bromo-2-methyl butane

D 1-bromo-2-methyl butane

ANSWER KEY

1. A
2. B
3. A
4. B
5. C
6. B
7. B
8. C
9. A
10. C

Home Work

discussion 2-04

QUESTION 01

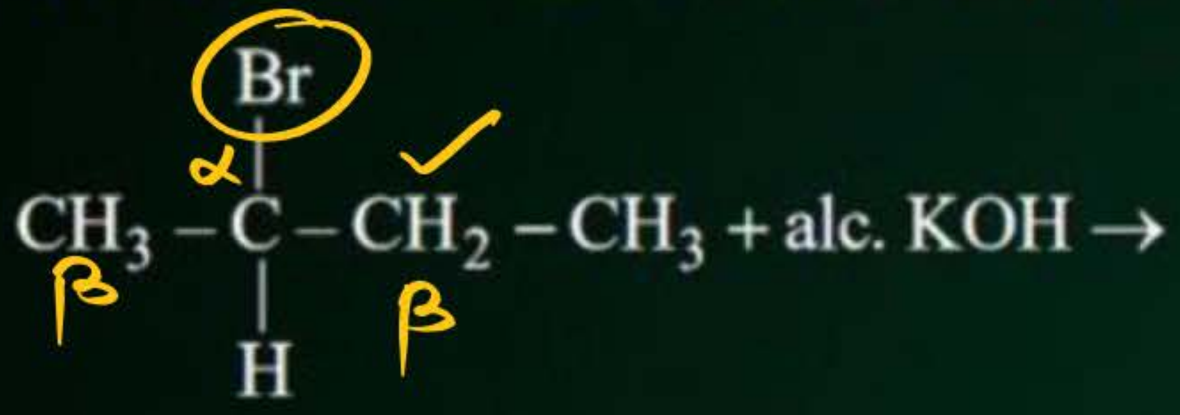
$$B \xleftarrow[\text{Catalyst}]{\text{Lindlar's}} R-C\equiv C-R \xrightarrow{Na/NH_3} A$$

A and B are geometrical isomers (R - CH = CH - R) of which type:

- **A** [✓ A is trans, B is cis]
- **B** A and B both are cis
- **C** A and B both are trans
- **D** A is cis, B is trans

QUESTION 02

Major product of the following reaction is:



$$\underset{\beta}{CH_3}-\overset{\alpha}{\underset{H}{\overset{Br}{C}}}-\underset{\beta}{\overset{\checkmark}{CH_2}}-CH_3+\text{alc. KOH}\rightarrow$$

A 1-Butene

[✓ B] 2-Butene

C Butane

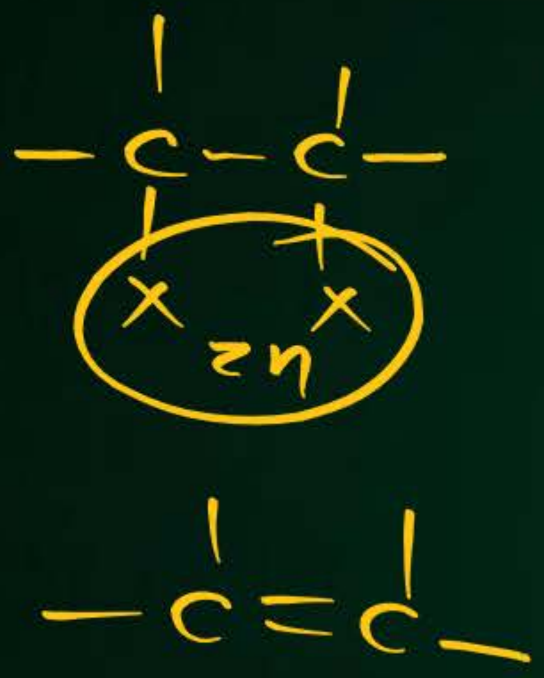
D 1-Butyne

QUESTION 03

Dehalogenation of vicinal dihalides with Zn. Mainly produces

(A) Alcohol

[✓ (B)] Alkene

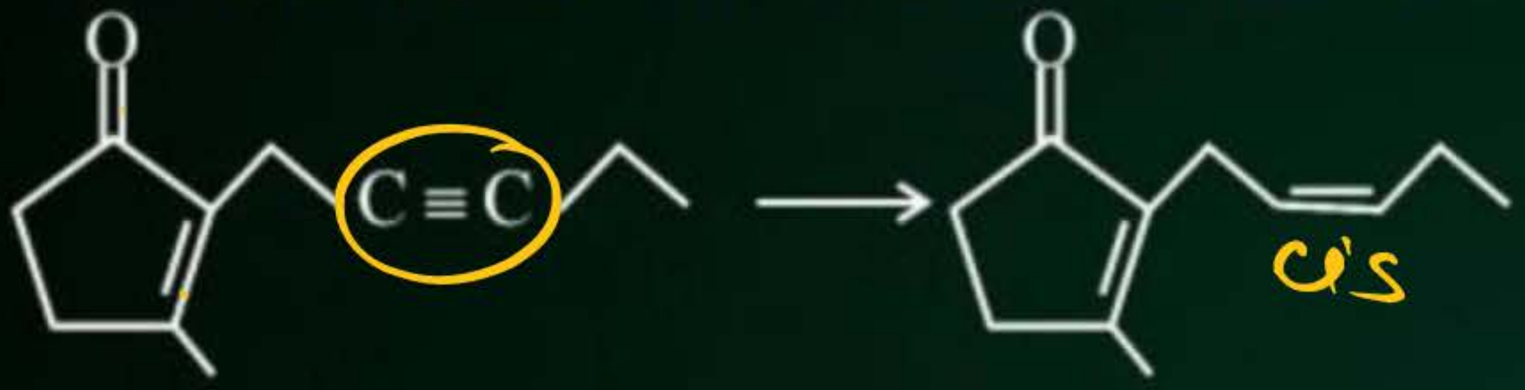


(C) Alkyne

(D) Alkane

QUESTION 04

Which reagent will be used for the above conversion?



A Na/Liq. NH_3

[✓ B] H_2, Pd – $CaCO_3$

C Li, $PhNH_2$

D H_2/Pt

QUESTION 05

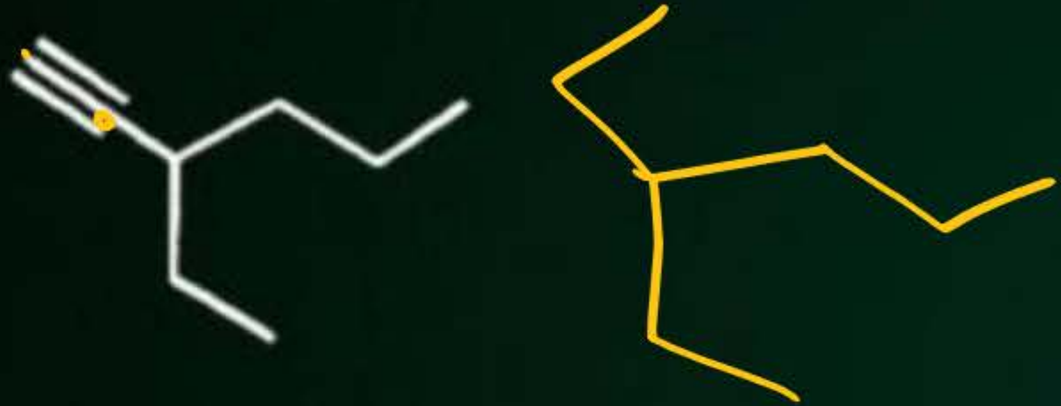
Assertion(A): Reduction of but-2-yne by Na/liq. NH_3 gives 'trans' but-2-ene.
Reason(R): It is an example of 'anti' addition.

- [✓ A] If both (A) and (R) are correct and (R) is the correct explanation for (A)
- B If both (A) and (R) are correct but (R) is not the correct explanation for (A)
- C If (A) is correct but (A) is incorrect.
- D If (A) is incorrect but (R) is correct.

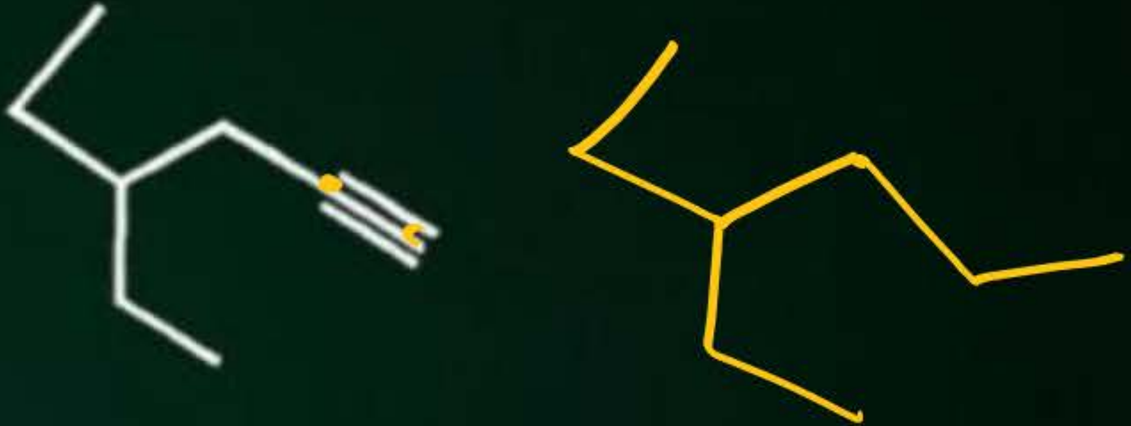
QUESTION⑥

Which alkyne will give 3-ethylhexane on catalytic hydrogenation?

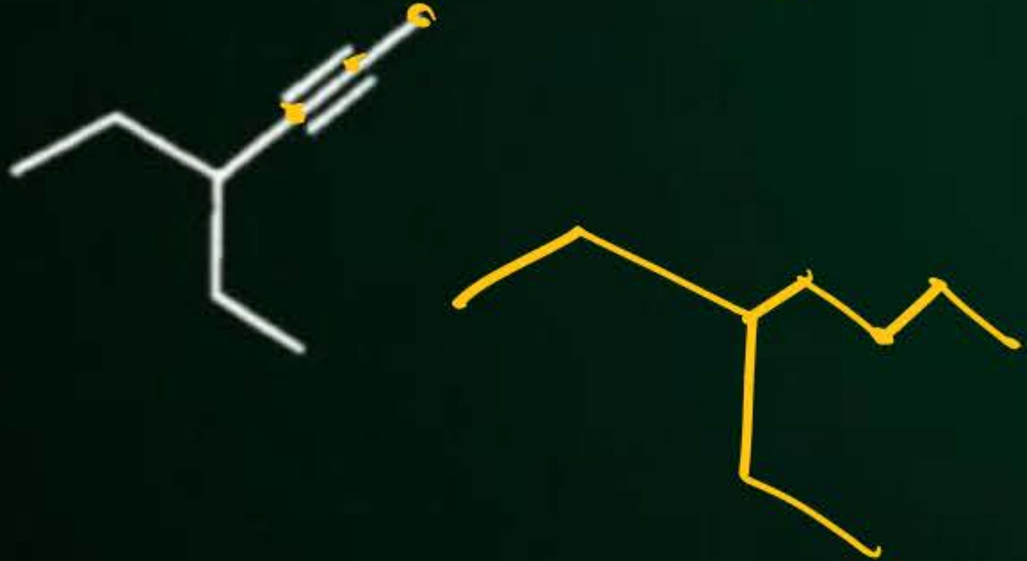
A



B



C



[✓ **D**] All of these

QUESTION 07

When 2-butyne is treated with H_2/Pd-$BaSO_4$; the product formed will be:

[✓ A cis-2-butene]

B trans-2-butene

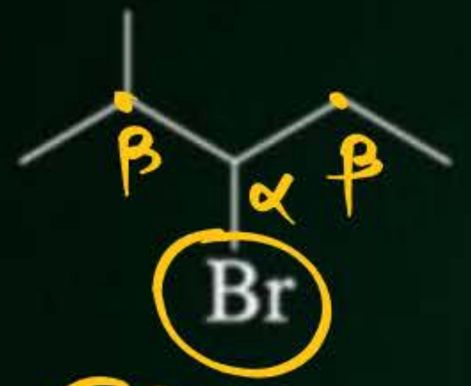
C 1-butene

D 2-hydroxy butane

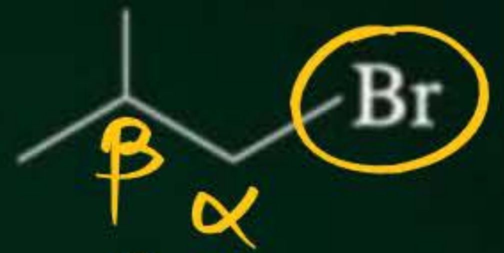
QUESTION 08

Which alkyl bromide will yield only one alkene upon E_2 elimination?

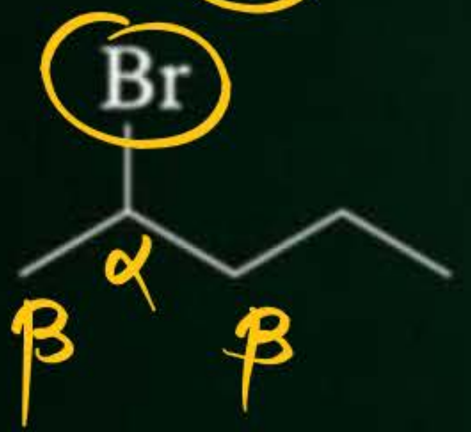
(A) ✗



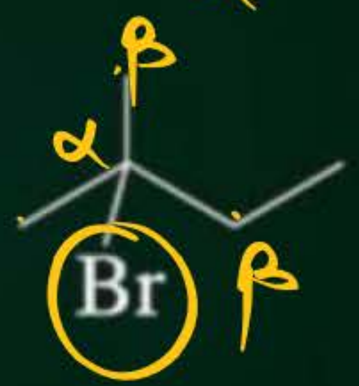
[✓ (B)]



(C) ✗



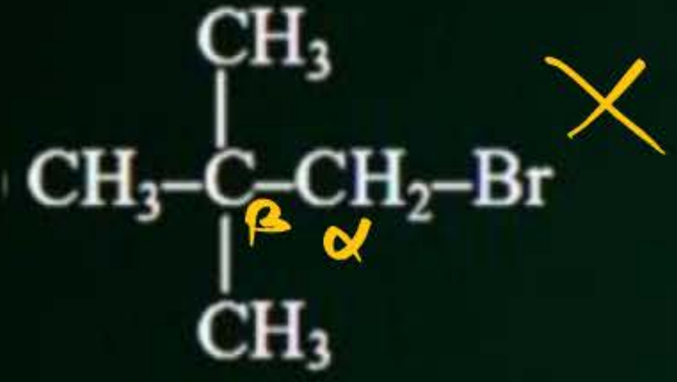
(D)



QUESTION 09

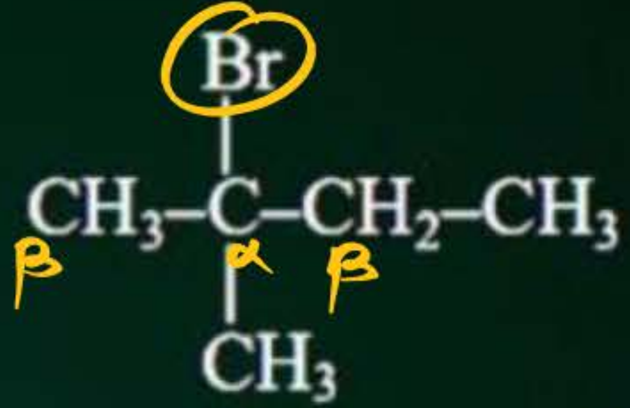
Which is most reactive towards E^2 -reactions:

(A)



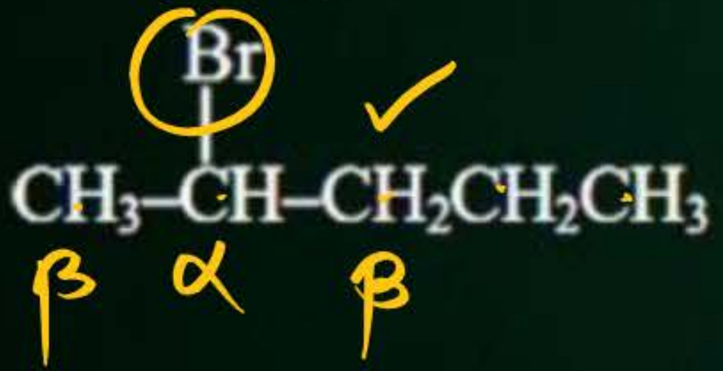
$CH_3-\overset{CH_3}{\underset{CH_3}{C}}-CH_2-Br$

[✓ (B)]



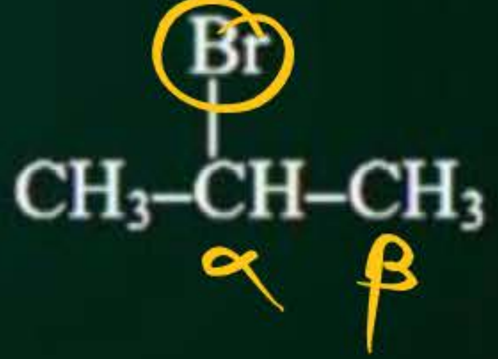
$CH_3-\overset{Br}{\underset{CH_3}{C}}-CH_2-CH_3$

(C)

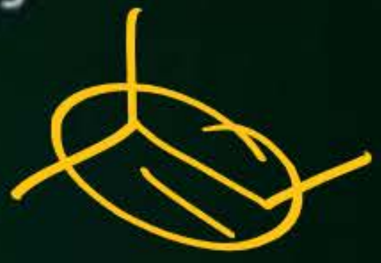


$CH_3-\overset{Br}{CH}-CH_2CH_2CH_3$

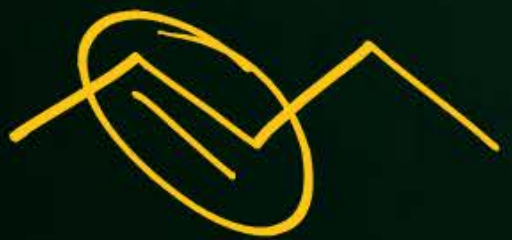
(D)



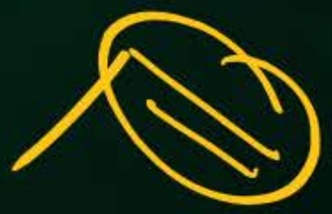
$CH_3-\overset{Br}{CH}-CH_3$



9αH

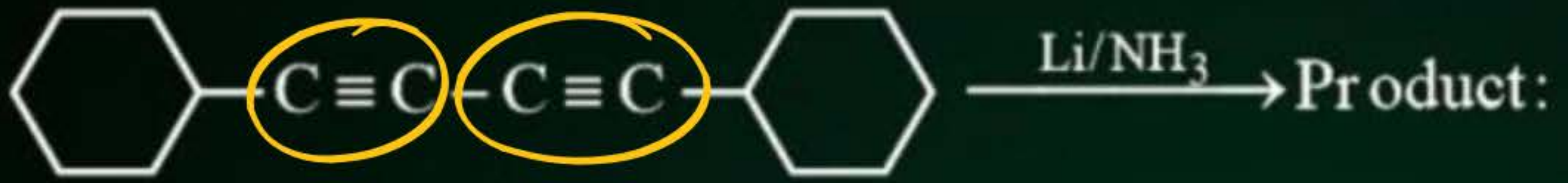


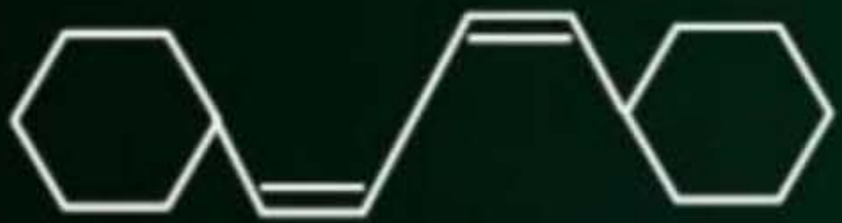
5αH

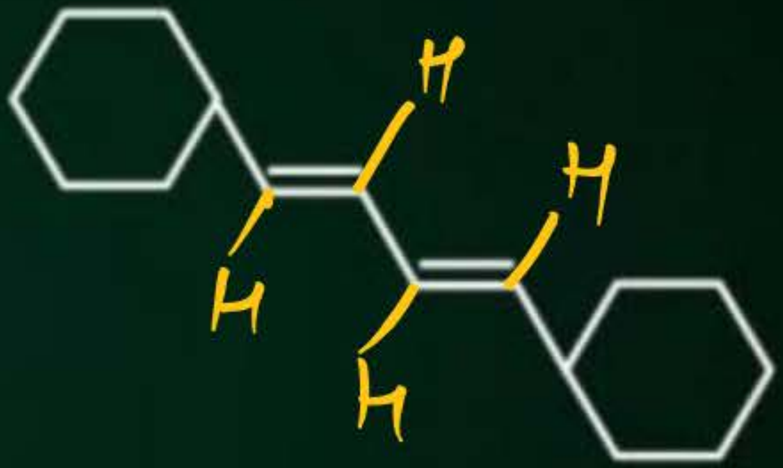


3αH

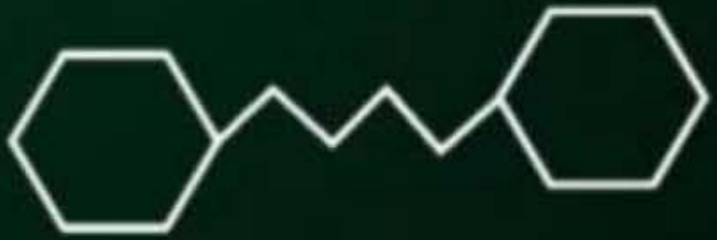
QUESTION 10


C≡C–C≡C
Li/NH3
Product:

A


[✓ B]


C Both (A) and (B)

D


ANSWER KEY

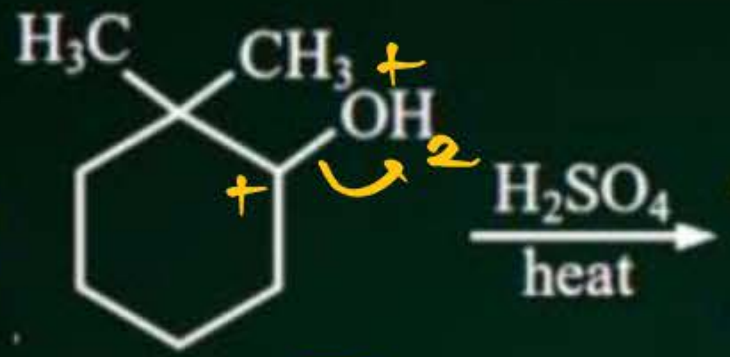
1. A
2. B
3. B
4. B
5. A
6. D
7. A
8. B
9. B
10. B

Home Work

Discussion of L-05

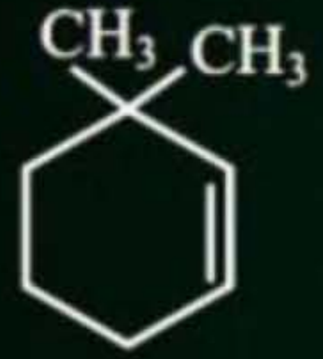
QUESTION 01

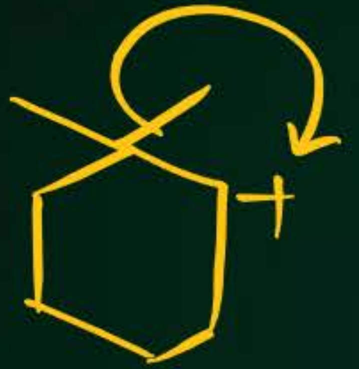
Consider the reaction


H$_3$C
CH$_3$
+
OH
2
+
H$_2$SO$_4$
heat

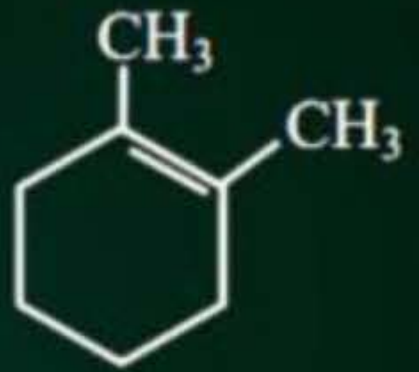
The alkene formed in major amount is:

A

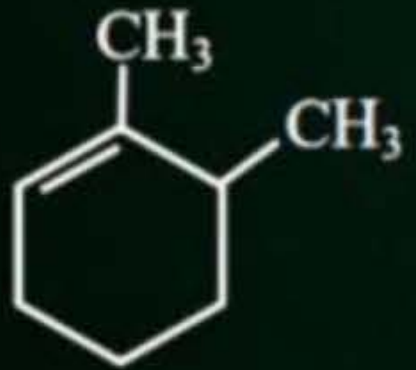


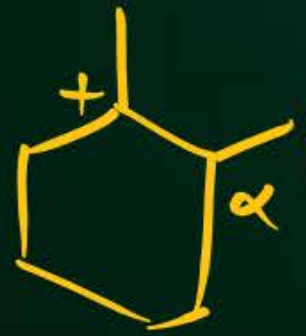


[✓ **B**]

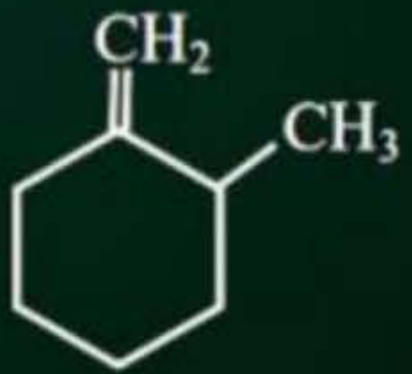


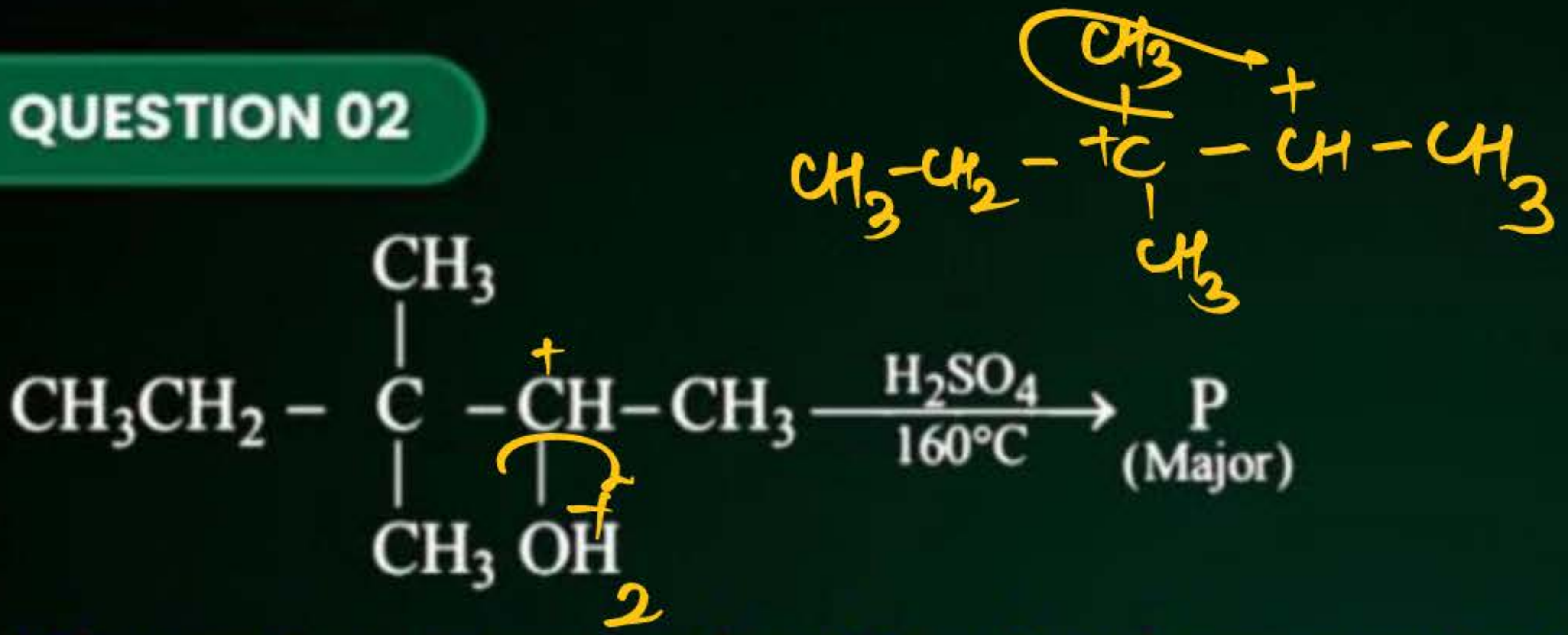
C





D



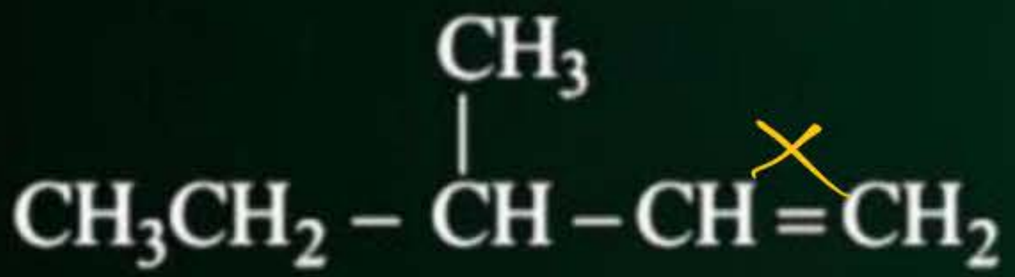


$$CH_3-CH_2-\underset{CH_3}{\overset{\overset{CH_3}{+}}{\overset{+}{C}}}-\overset{+}{C}H-CH_3$$

$$CH_3CH_2-\underset{CH_3}{\overset{CH_3}{C}}-\underset{O\overset{+}{H}_2}{\overset{+}{C}H}-CH_3 \xrightarrow[160°C]{H_2SO_4} \underset{\text{(Major)}}{P}$$

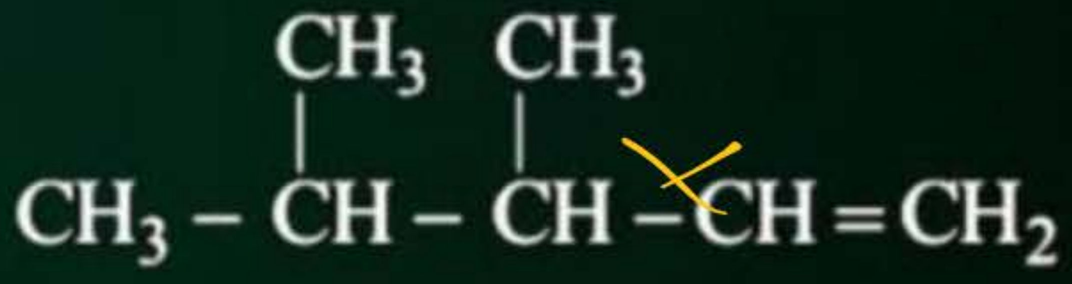
What is the major product P in the above reaction?

(A)



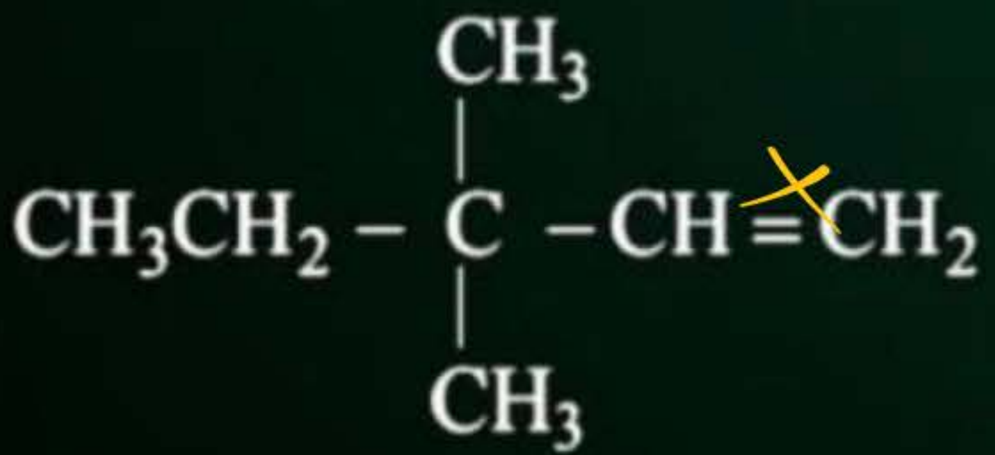
$$CH_3CH_2-\overset{CH_3}{CH}-CH\overset{\times}{=}CH_2$$

(B)



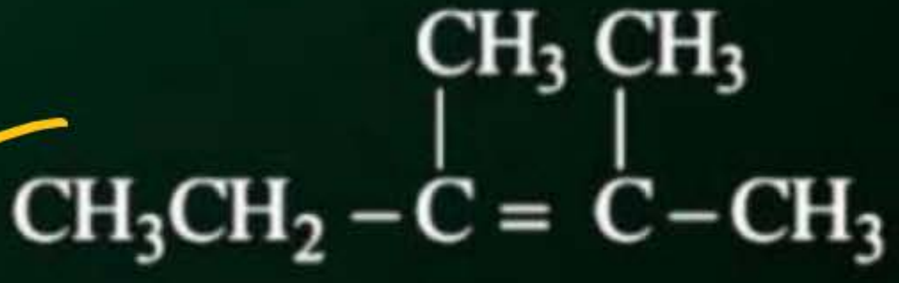
$$CH_3-\overset{CH_3}{CH}-\overset{CH_3}{CH}\overset{\times}{-}CH=CH_2$$

(C)



$$CH_3CH_2-\underset{CH_3}{\overset{CH_3}{C}}-CH\overset{\times}{=}CH_2$$

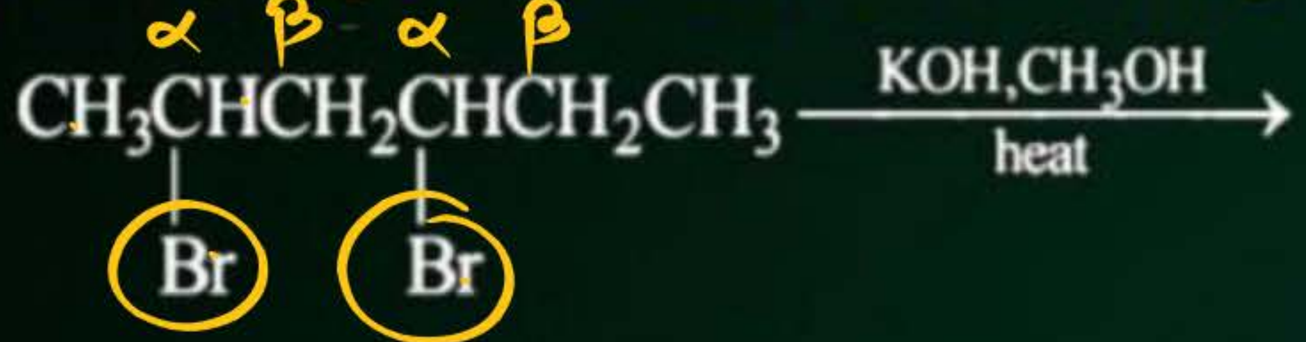
(D) ✓



$$CH_3CH_2-\overset{CH_3}{C}=\overset{CH_3}{C}-CH_3$$

QUESTION 03

The major product of the following reaction is:



$$CH_3\overset{\alpha}{\underset{\underset{Br}{|}}{C}}H\overset{\beta}{C}H_2\overset{\alpha}{\underset{\underset{Br}{|}}{C}}H\overset{\beta}{C}H_2CH_3 \xrightarrow[\text{heat}]{KOH, CH_3OH}$$

(A) $CH_2 = CHCH = CHCH_2CH_3$

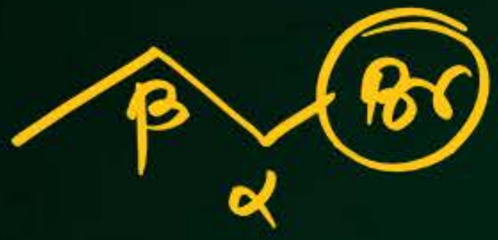
(B) $CH_2 = CHCH_2CH = CHCH_3$

[✓ (C)] $CH_3CH = CH - CH = CHCH_3$

(D) $CH_3CH = C = CHCH_2CH_3$

QUESTION 04

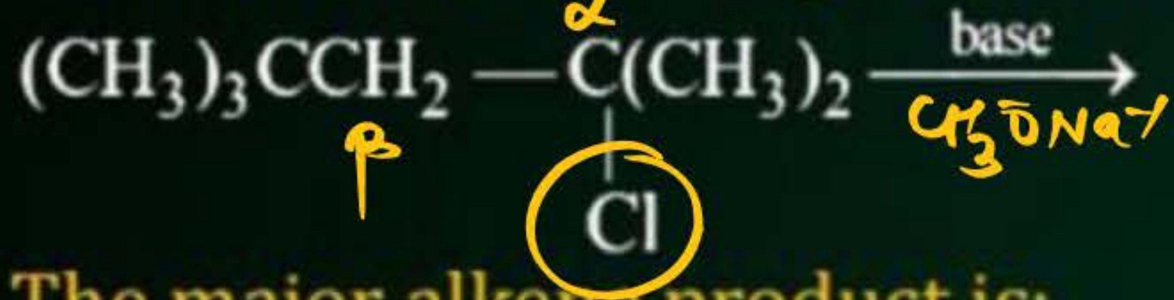
Propyl bromide on reaction with alcoholic KOH gives



- A Propane
- [✓ B Propene]
- C Butane
- D Acetylene

QUESTION 05

Consider the following reaction

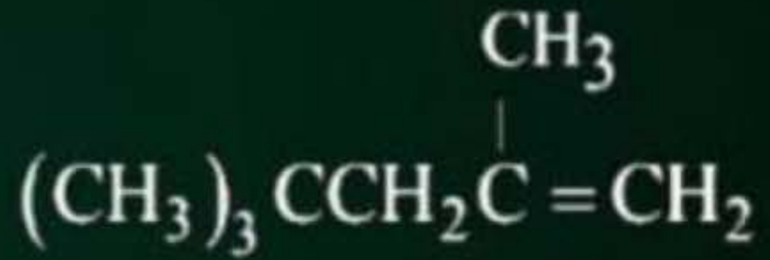


$$(CH_3)_3C\underset{\beta}{CH_2}-\overset{\alpha}{\underset{Cl}{C}}(CH_3)_2 \xrightarrow[CH_3O^-Na^+]{\text{base}}$$

The major alkene product is:

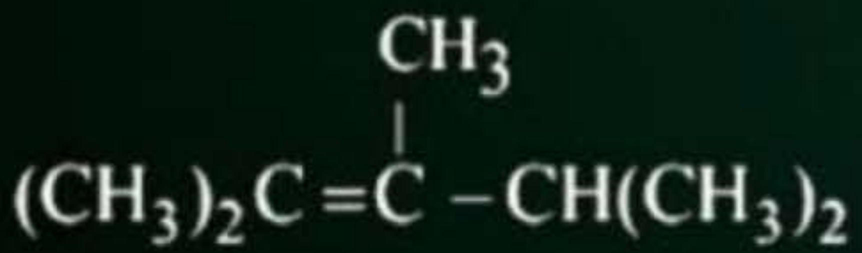
[✓ A] $(CH_3)_3CCH=C(CH_3)_2$

B



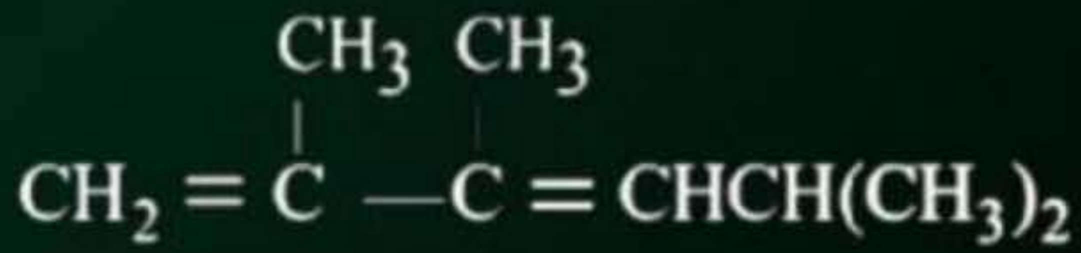
$$(CH_3)_3CCH_2\overset{CH_3}{\overset{|}{C}}=CH_2$$

C



$$(CH_3)_2C=\overset{CH_3}{\overset{|}{C}}-CH(CH_3)_2$$

D



$$CH_2=\overset{CH_3}{\overset{|}{C}}-\overset{CH_3}{\overset{|}{C}}=CHCH(CH_3)_2$$

QUESTION 06

The structural formula of the compound which yields ethylene upon reaction with zinc

[✓ A] $CH_2\overset{Zn}{Br} - CH_2Br \longrightarrow CH_2 = CH_2$

B $CHBr_2 - CHBr_2$

C $CHBr = CHBr$

D None

QUESTION 07

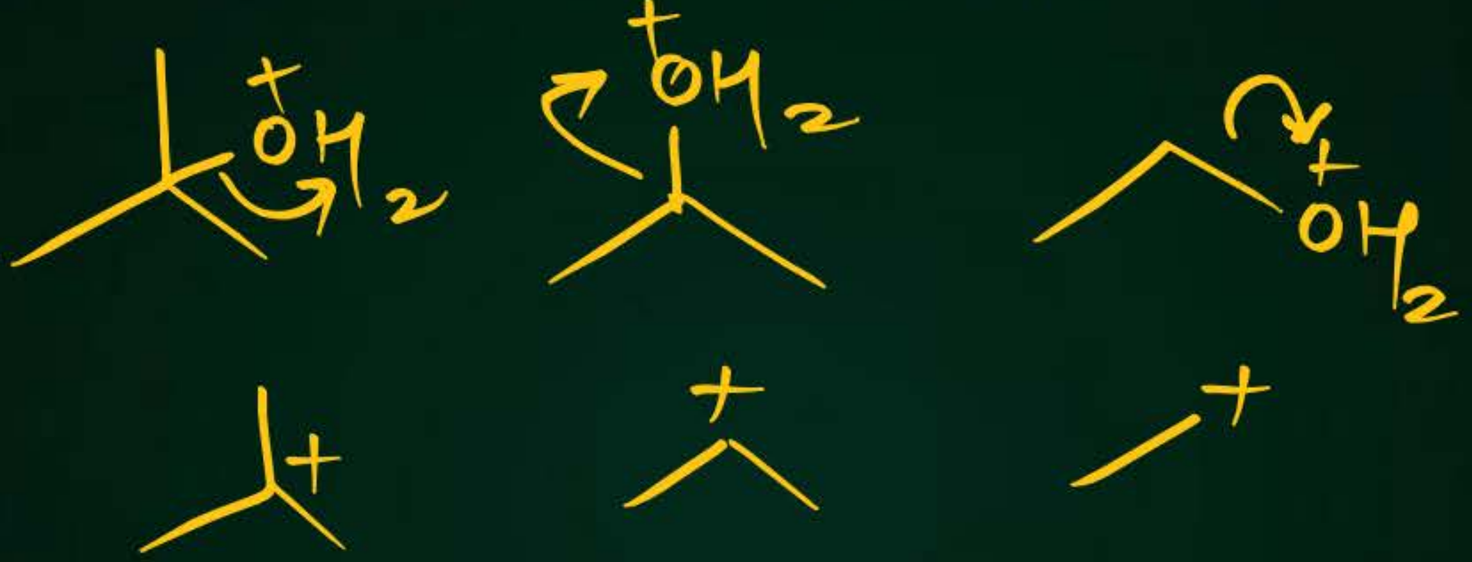
Alcohols undergo dehydration in the following sequence

A 1° > 2° > 3°

[✓ B] 3° > 2° > 1°

C 1° > 3° > 2°

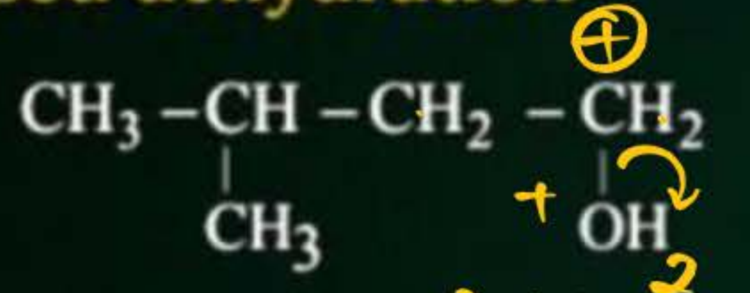
D 3° > 1° > 2°



$\overset{+}{O}H_2$
$\overset{+}{O}H_2$
$\overset{+}{O}H_2$
+
+
+

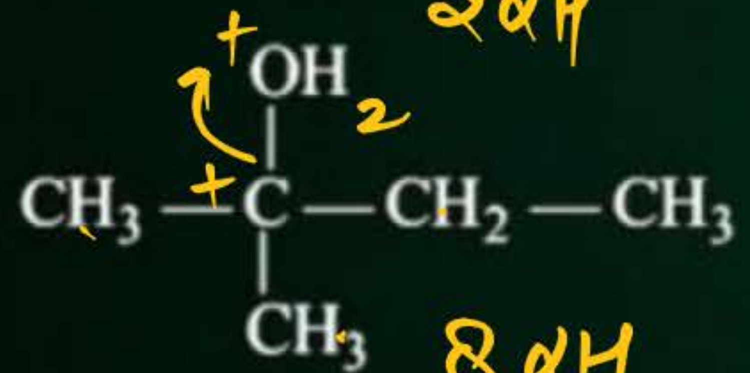
QUESTION 08

Arrange the following alkanols 1, 2 and 3 in order of their reactivity towards acid catalysed dehydration

(1) 

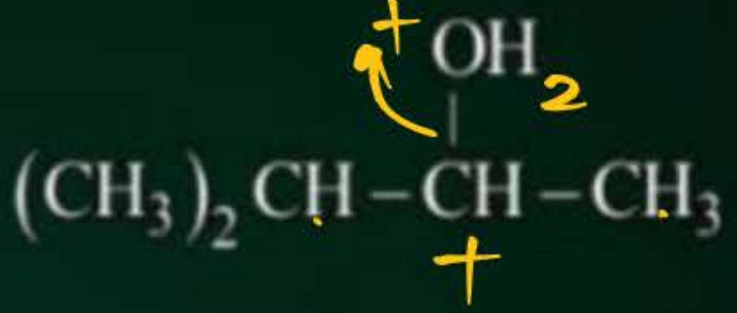
$CH_3-\underset{CH_3}{\underset{|}{CH}}-CH_2-\underset{\overset{+}{OH_2}}{\underset{|}{\overset{\oplus}{CH_2}}}$

2αH

(2) 

$CH_3-\overset{\overset{+}{OH_2}}{\overset{|}{\underset{\underset{CH_3}{|}}{\overset{+}{C}}}}-CH_2-CH_3$

8αH

(3) 

$(CH_3)_2CH-\underset{+}{\overset{\overset{+}{OH_2}}{\overset{|}{CH}}}-CH_3$

4αH

A $1 > 2 > 3$

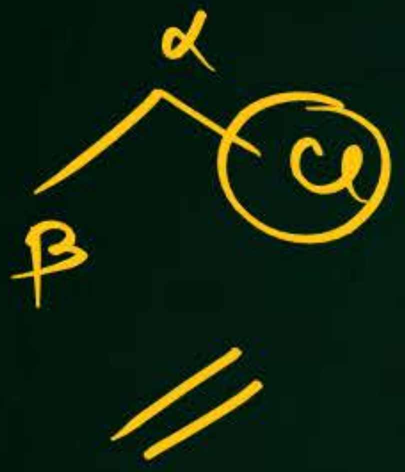
B $2 > 1 > 3$

C [✓ $2 > 3 > 1$]

D $3 > 2 > 1$

QUESTION 09

Ethyl chloride on heating with alcoholic potash gives



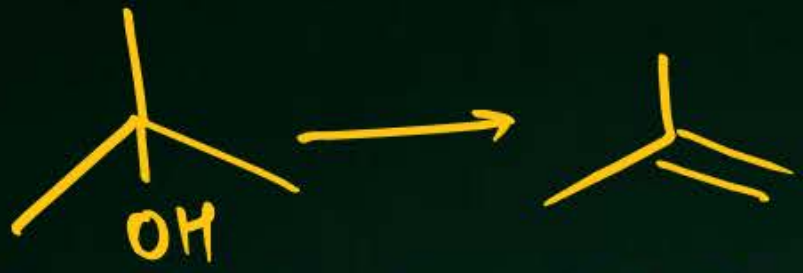
[✓ A] C_2H_4

B C_2H_2

C C_2H_6

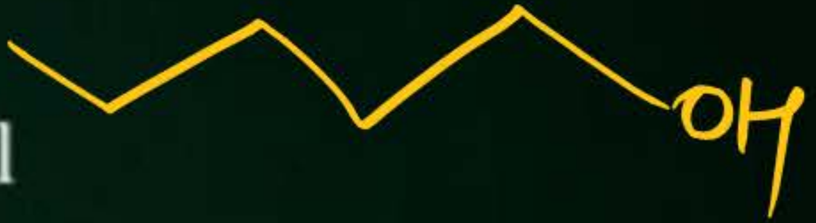
D CH_4

QUESTION 10

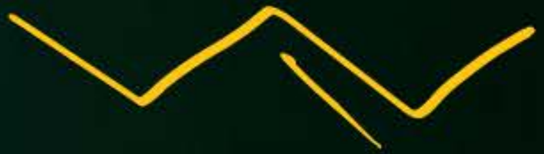


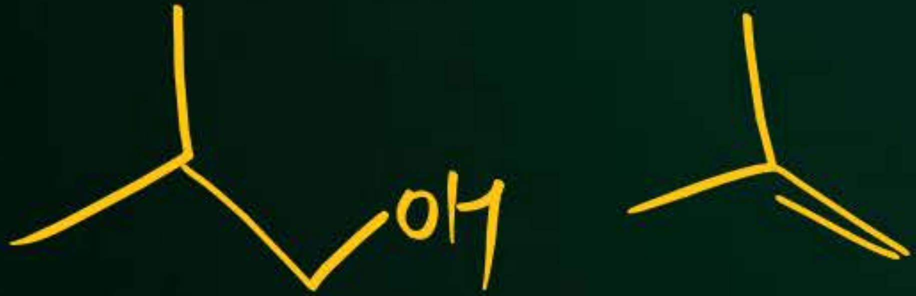
Which of the following alcohol on dehydration with conc. H_2SO_4 gives but-2-ene?

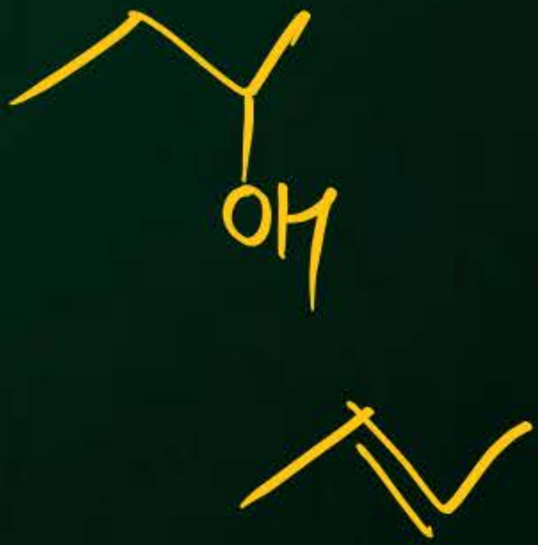
- (A) 2-methylpropan-2-ol
- (B) Pentan-1-ol



- (C) 2-methyl propan-1-ol
- [✓ (D)] Butan-2-ol







ANSWER KEY

1. B
2. D
3. C
4. B
5. A
6. A
7. B
8. C
9. A
10. D

Thankyou!!

$\overset{\oplus}{C}$ $\leftarrow$ G.O.C $\boxed{2X}$

Pankaj sir one shot

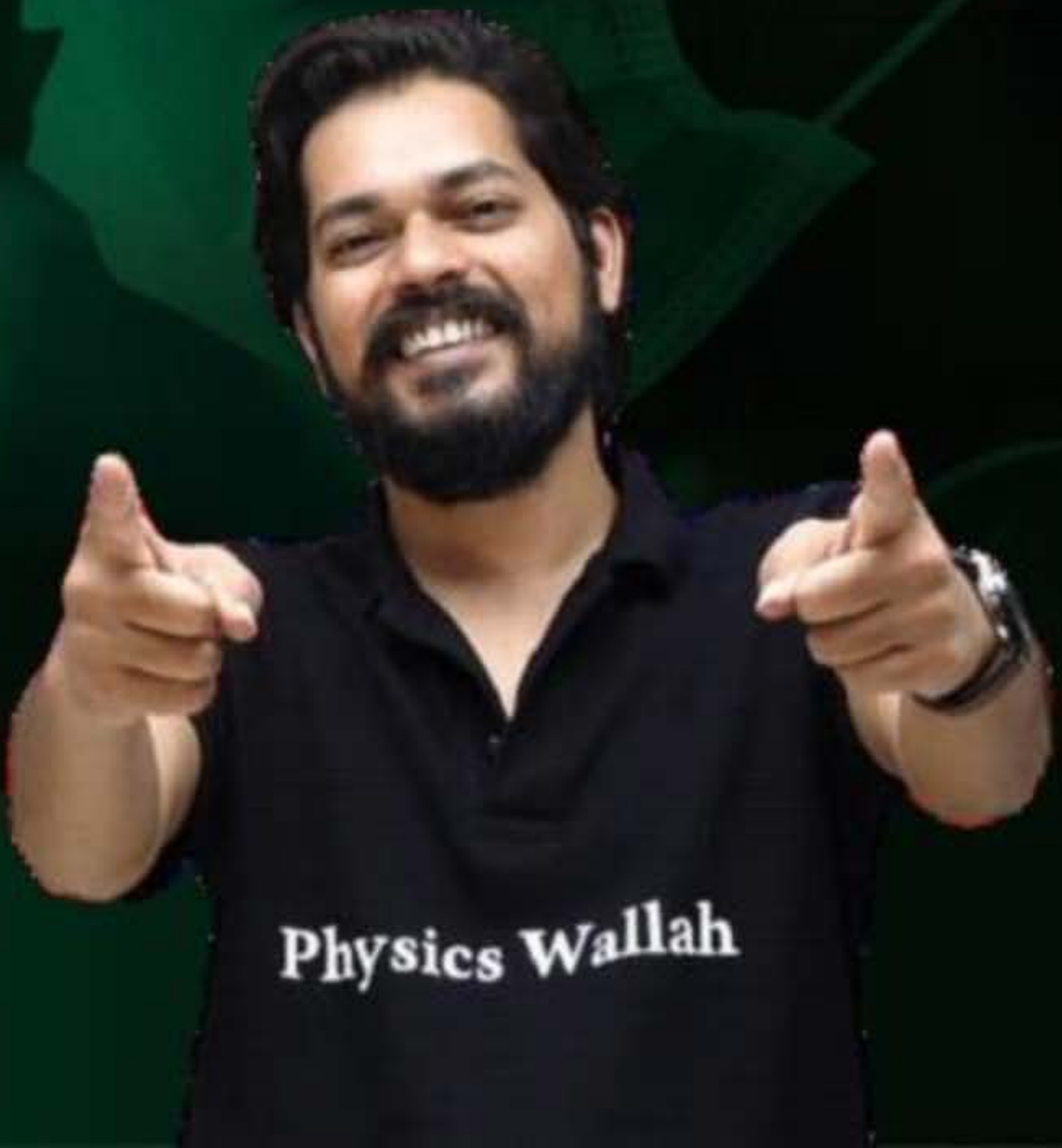
YAKEEN 2.0

FOR NEET 2025

Lecture- 07 Organic Chemistry

HYDROCARBONS

By- Pankaj Sir(POPU MAMA)

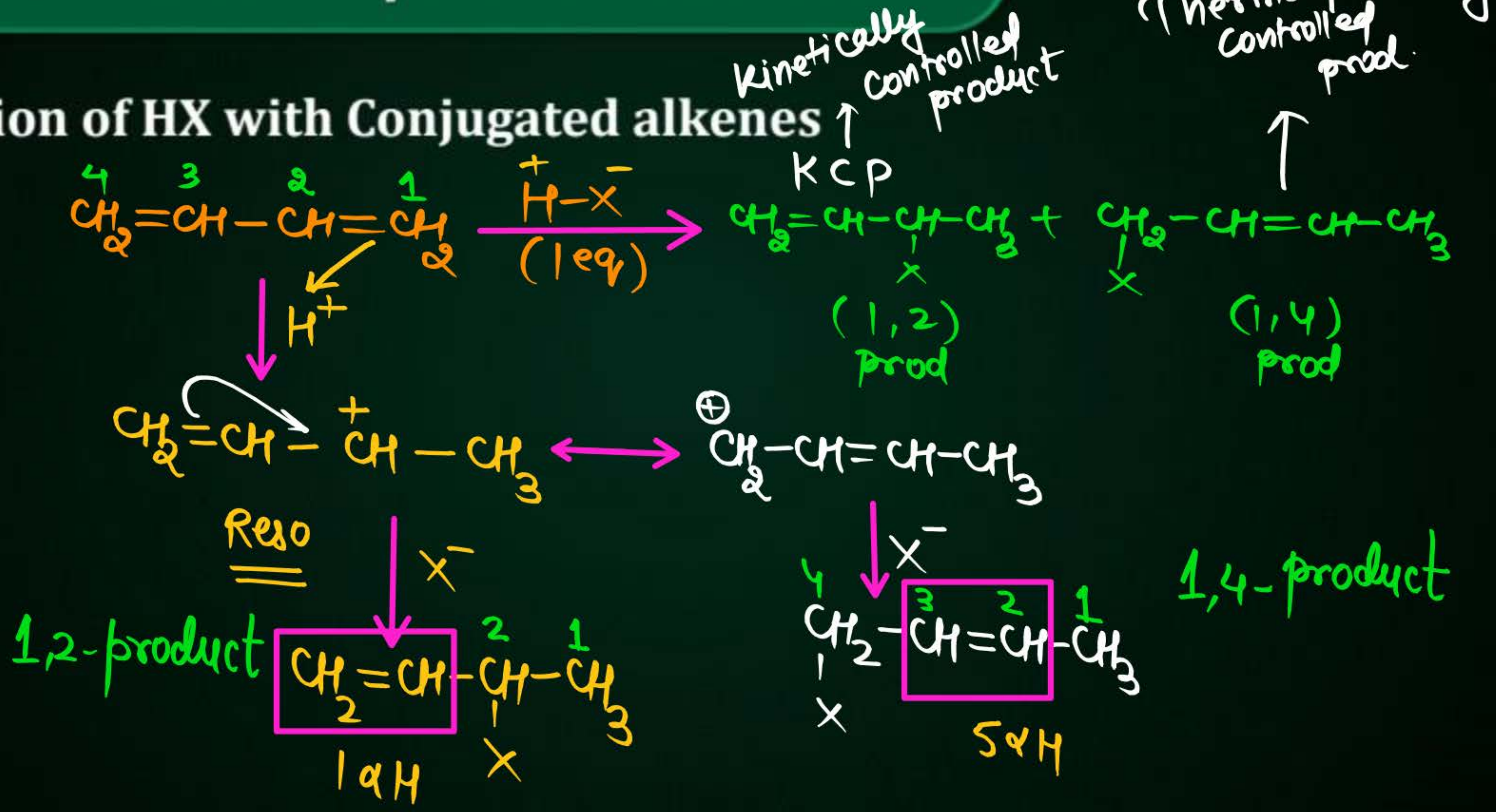

Physics Wallah

Topics *to be covered*

1. Chemical Properties of Alkenes Part 02 ✓
2. Electrophilic Addition Reactions ✓ → non classical carbocation
3. Practice

Chemical Properties of Alkenes

Reaction of HX with Conjugated alkenes



Kinetically controlled product
KCP
Thermodynamically controlled prod.
4 3 2 1
$CH_2=CH-CH=CH_2$
$\overset{+}{H}-\overset{-}{X}$
(1eq)
$CH_2=CH-CH(X)-CH_3$ + $CH_2(X)-CH=CH-CH_3$
(1,2) prod
(1,4) prod
H^+
$CH_2=CH-\overset{+}{C}H-CH_3$ ⟷ $\overset{\oplus}{C}H_2-CH=CH-CH_3$
Reso
X^-
1,2-product
$CH_2=CH-CH(X)-CH_3$
2 1
1αH
X^-
4 3 2 1
$CH_2(X)-CH=CH-CH_3$
5αH
1,4-product

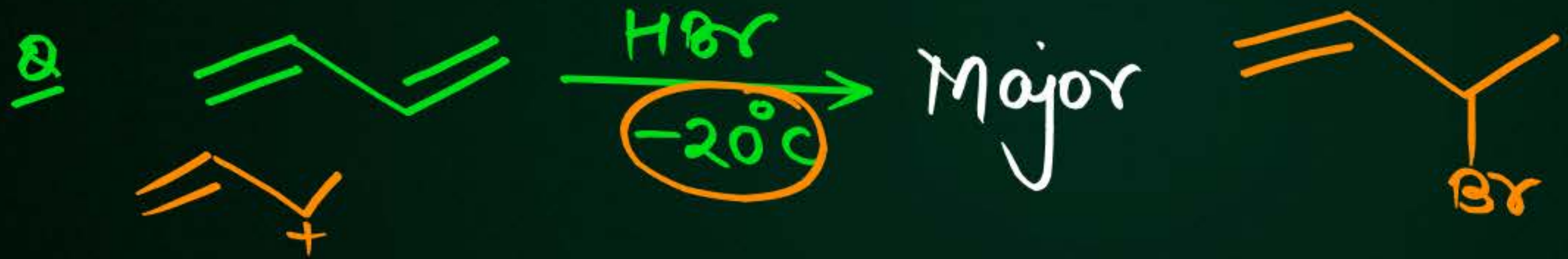
op point

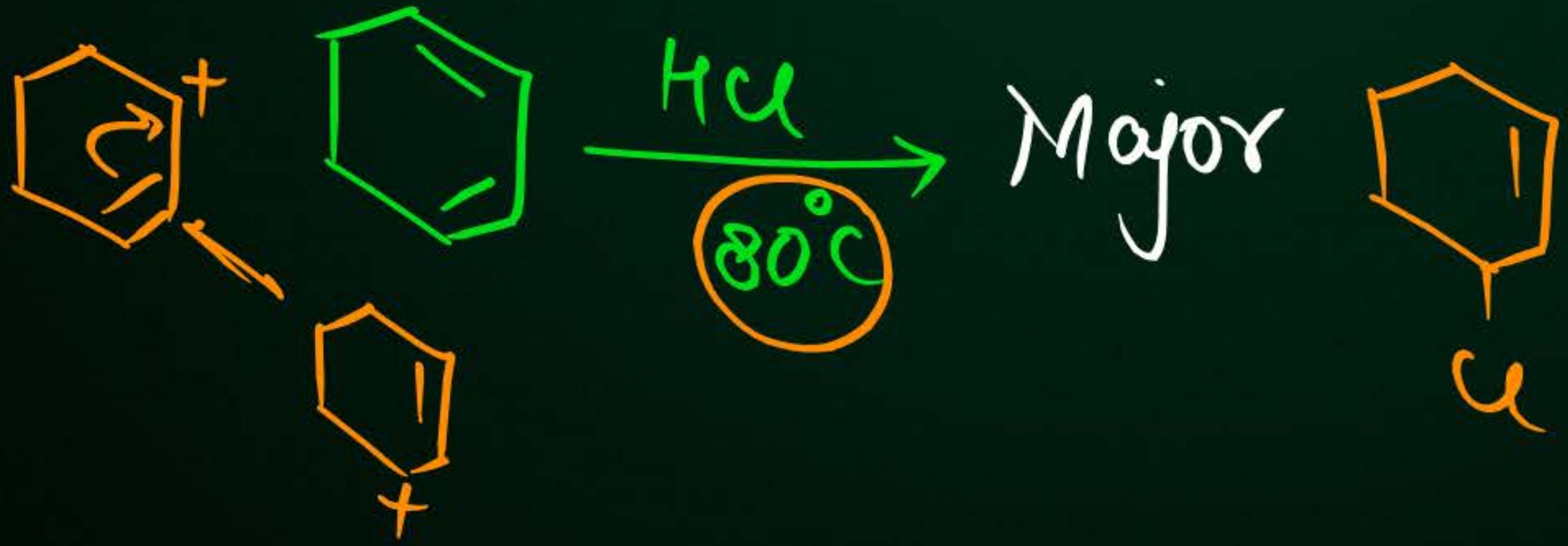
① At Low temp (0°, -20°c etc) KCP Major (Tez)

② At high temp (40°, 80°c etc) TCP Major (stable)

③ Agar kuch na Likha ho, toh More stable (TCP) Major.

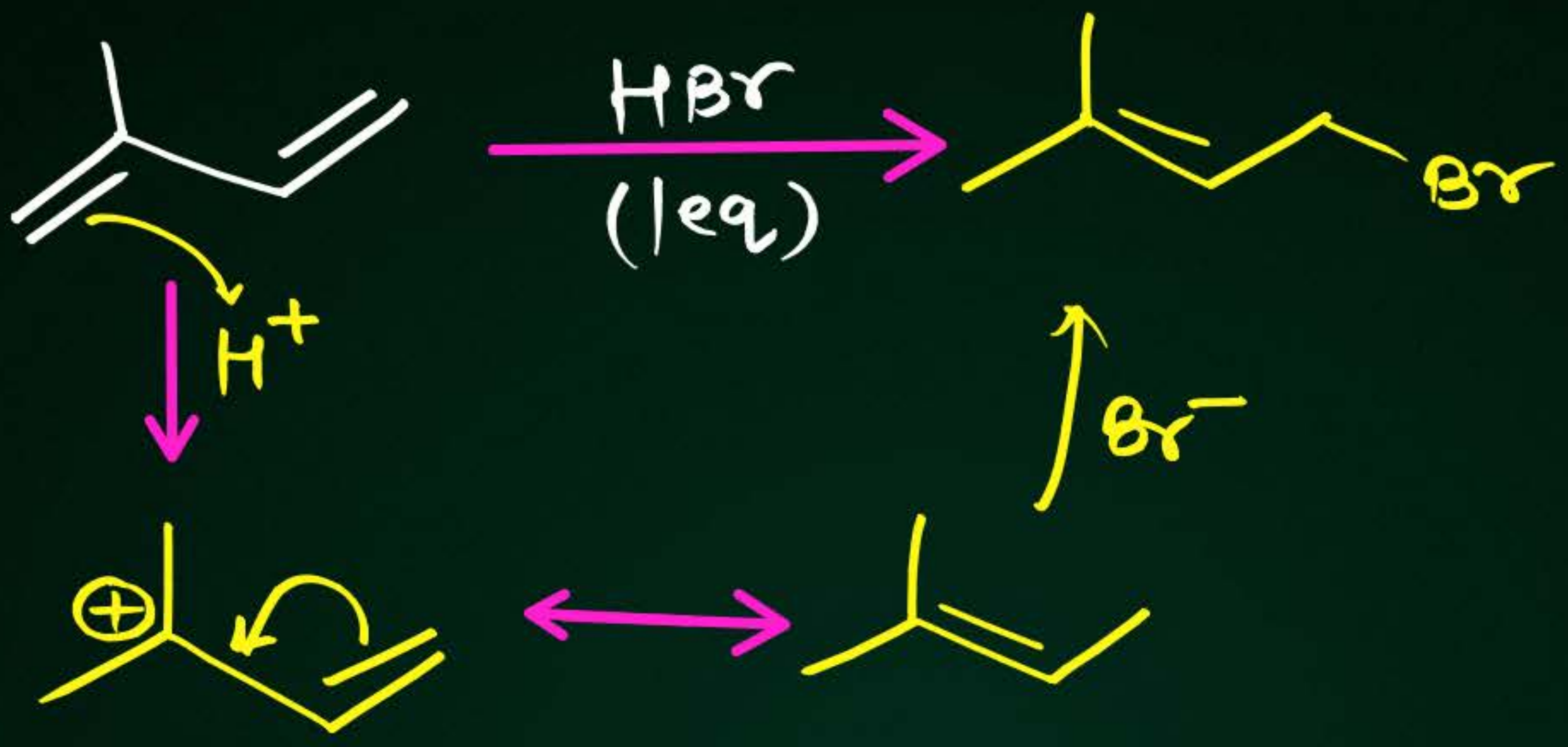
Q


HBr
-20°C
Major
Br
+


+
HCl
80°C
Major
Cl
+

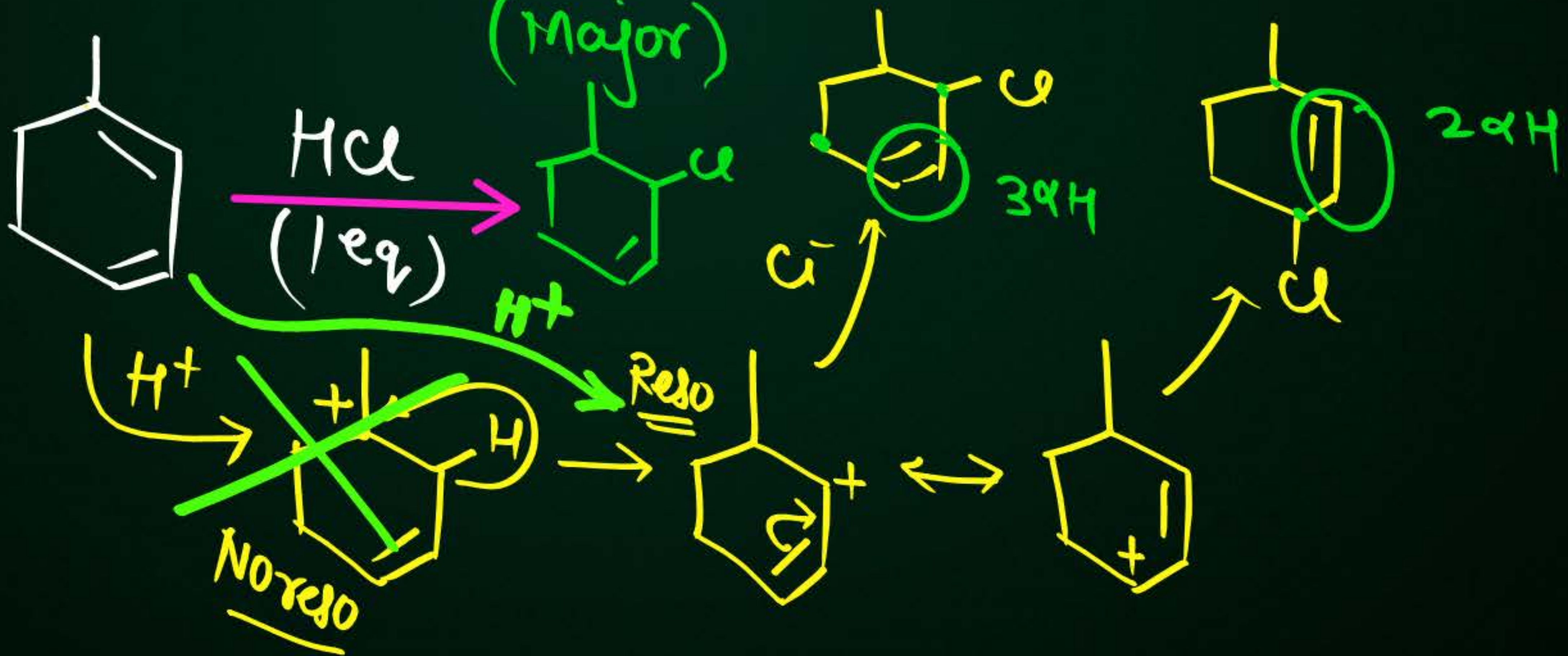
JEEAdv 2015

Q



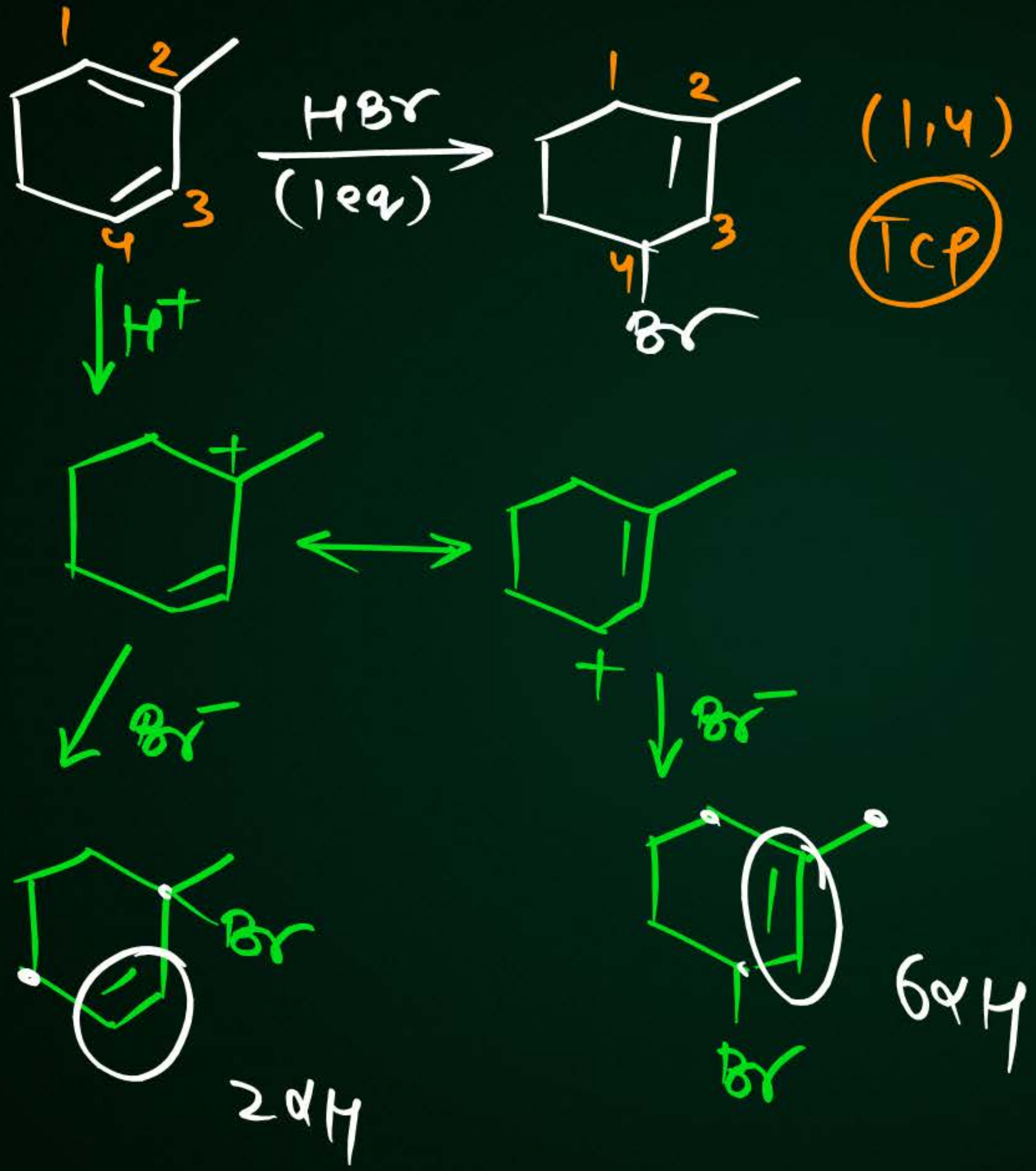
HBr
(1eq)
Br
H+
Br⁻

Q



HCl
(1eq)
(Major)
Cl
Cl⁻
3αH
2αH
Cl
H+
H+
H
Reso
No reso

Q.


1
2
3
4
HBr
(1eq)
(1,4)
TCP
H⁺
Br⁻
Br⁻
Br
Br
Br
2αH
6αH

① stable C^+

② more stable alkene

Electrophilic Addition Reaction

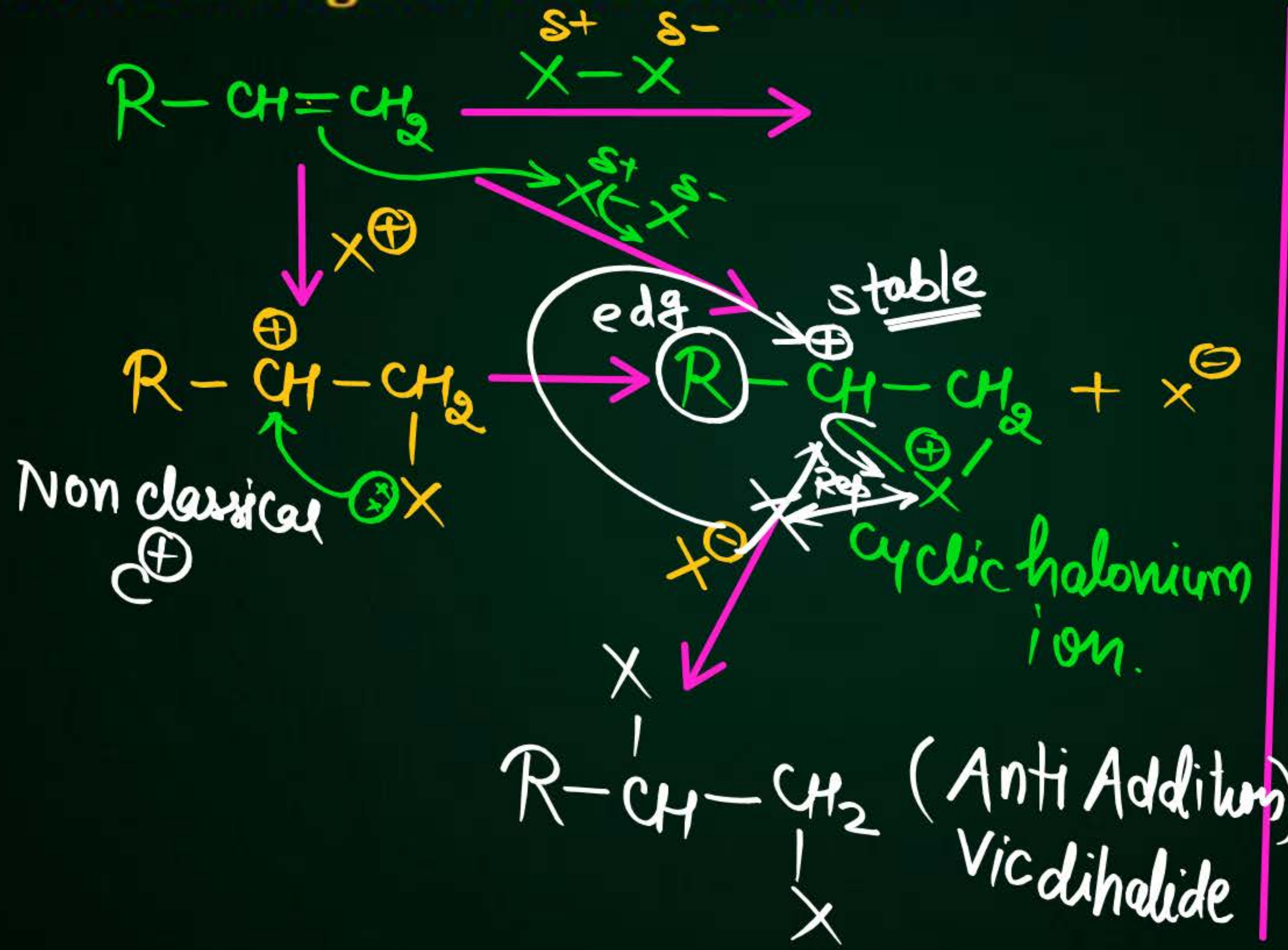
B. Via Non-Classical Carbocation

1. Addition of Halogen in Inert solvent
2. Addition of Halogen in Non-Inert Solvent like water
3. Addition of Interhalogen compounds

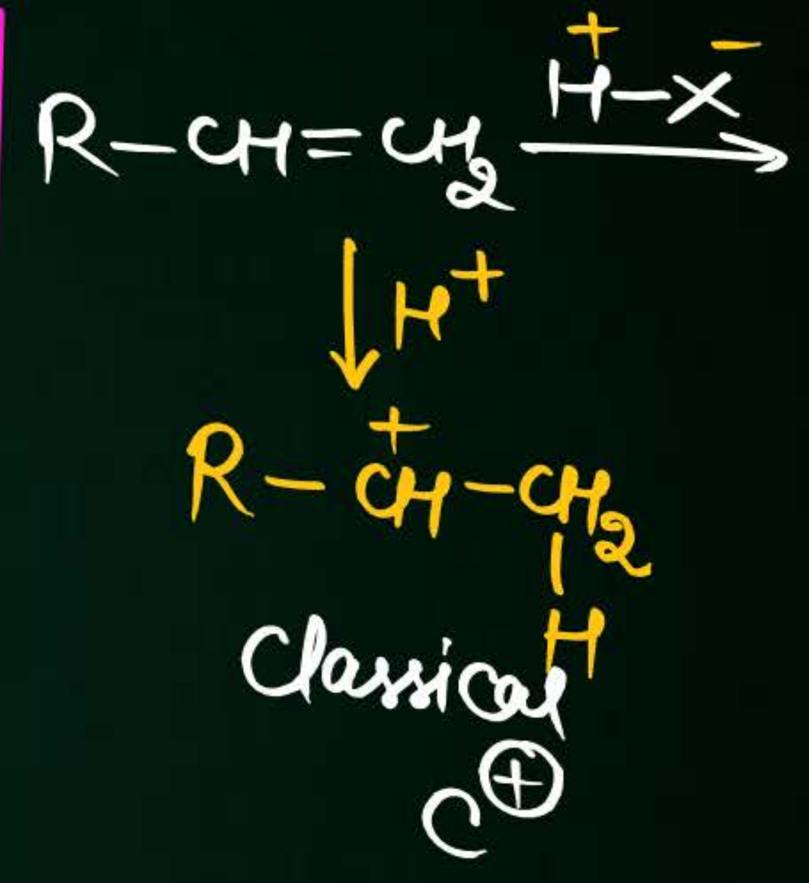
B. Via Non-Classical Carbocation

1. Addition of Halogen in Inert Solvent

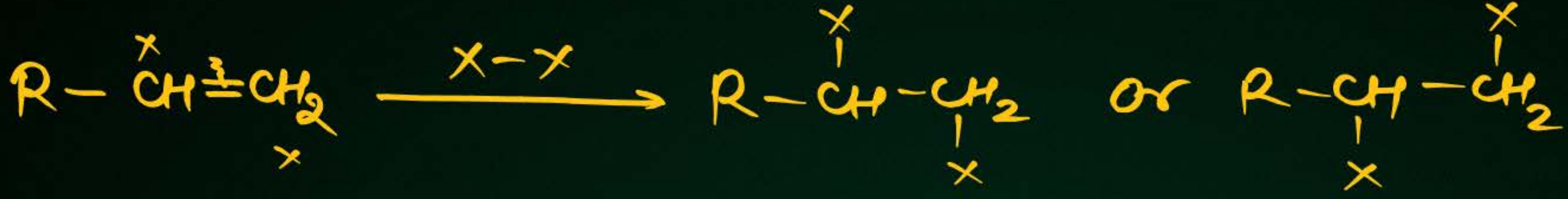
→ CS_2, CCl_4, $CHCl_3$, CH_2Cl_2 etc



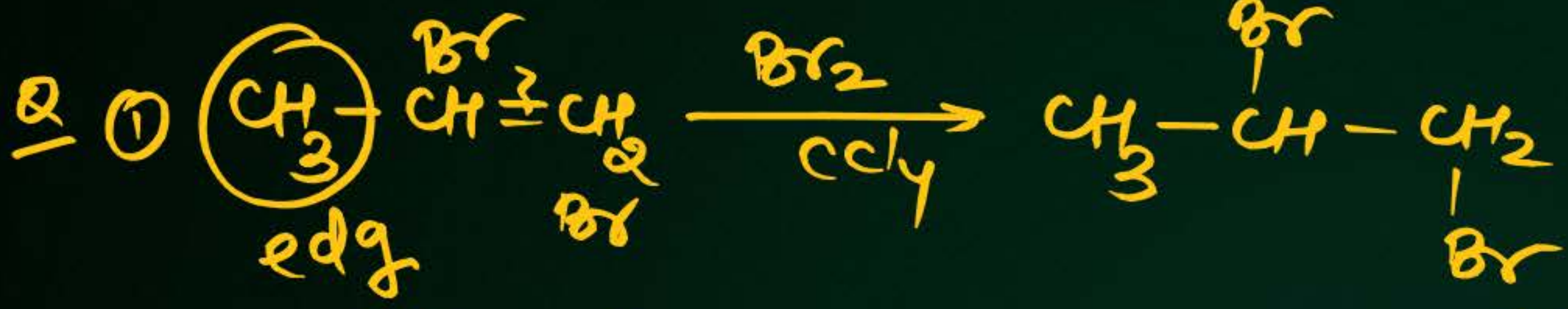
R–CH=CH2
δ+ δ–
X–X
X⊕
R–CH–CH2
Non classical C⊕
edg
stable
R–CH–CH2 + X⊖
Rep
cyclic halonium ion.
X⊖
R–CH(X)–CH2X
(Anti Addition)
Vic dihalide



R–CH=CH2
H–X
H+
R–CH(+)–CH2–H
Classical C⊕

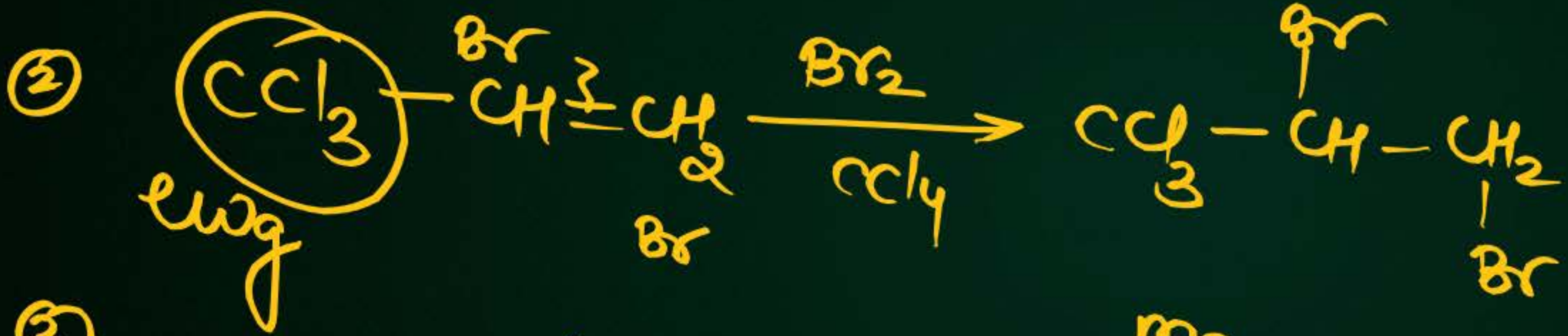


$$R-\overset{X}{C}H\overset{\vdots}{=}\underset{X}{CH_2} \xrightarrow{X-X} R-\overset{X}{CH}-\underset{X}{CH_2} \text{ or } R-\underset{X}{CH}-\overset{X}{CH_2}$$



Q ①

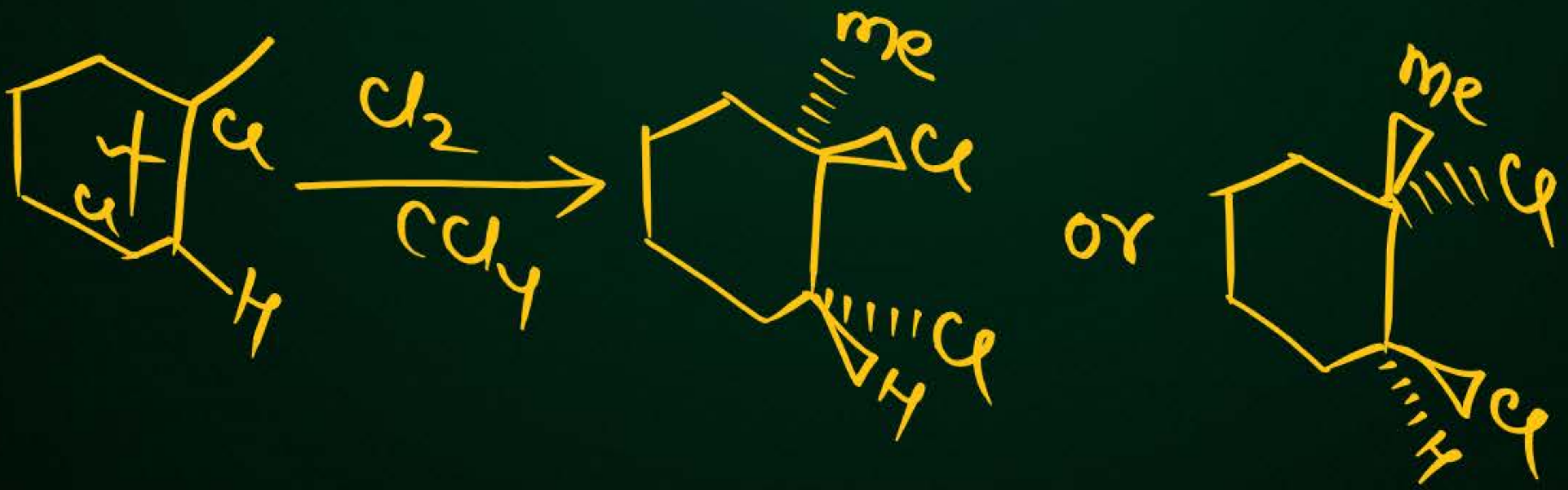
$$\underset{edg}{\boxed{CH_3}}-\overset{Br}{C}H\overset{\vdots}{=}\underset{Br}{CH_2} \xrightarrow[CCl_4]{Br_2} CH_3-\overset{Br}{CH}-\underset{Br}{CH_2}$$



②

$$\underset{ewg}{\boxed{CCl_3}}-\overset{Br}{C}H\overset{\vdots}{=}\underset{Br}{CH_2} \xrightarrow[CCl_4]{Br_2} CCl_3-\overset{Br}{CH}-\underset{Br}{CH_2}$$

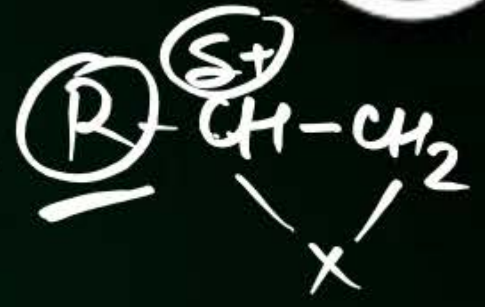
③



OP Points

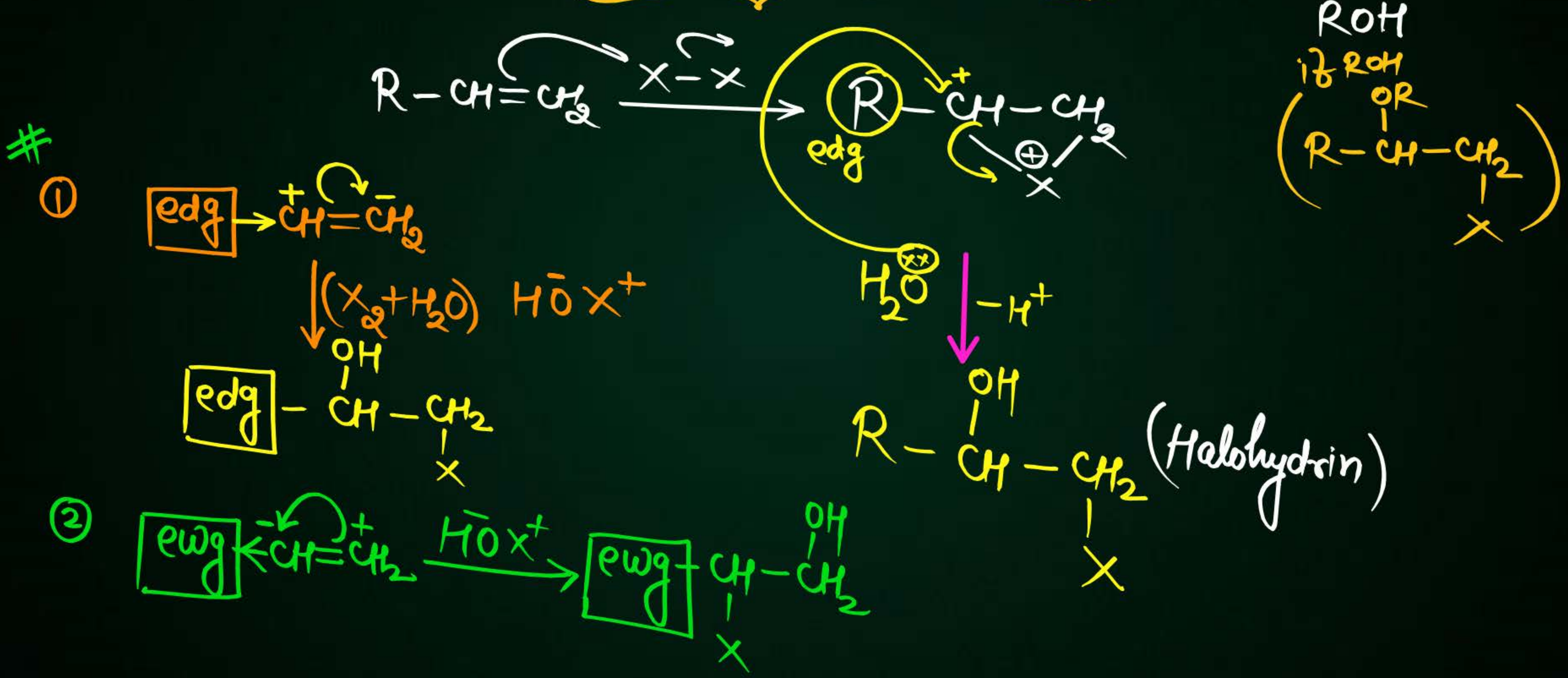
1. Non Classical Carbocation formation is the RDS. ✓
2. ROR α Nucleophilicity of Alkene α Stability of partial positive C.
3. No Rearrangement occurs. ✓
4. Cyclic Halonium ion formation. ✓
5. CCl_4 or CH_2Cl_2 can be used as inert solvent. ✓
6. Anti Addition ✓

C^{+ve} ✓



B. Via Non-Classical Carbocation

2. Addition of Halogen in Non ~~Inert~~ (Reactive) Solvent like water ($X_2 + H_2O$)


ROH
R–CH=CH₂
X–X
R
edg
CH–CH₂
⊕
X
H₂O
–H⁺
OH
R–CH–CH₂
X
(Halohydrin)
if ROH
OR
R–CH–CH₂
X
#
①
edg
CH=CH₂
(X₂+H₂O) HO⁻X⁺
OH
edg – CH – CH₂
X
②
ewg
CH=CH₂
HO⁻X⁺
ewg – CH – CH₂
OH
X

B. Via Non-Classical Carbocation

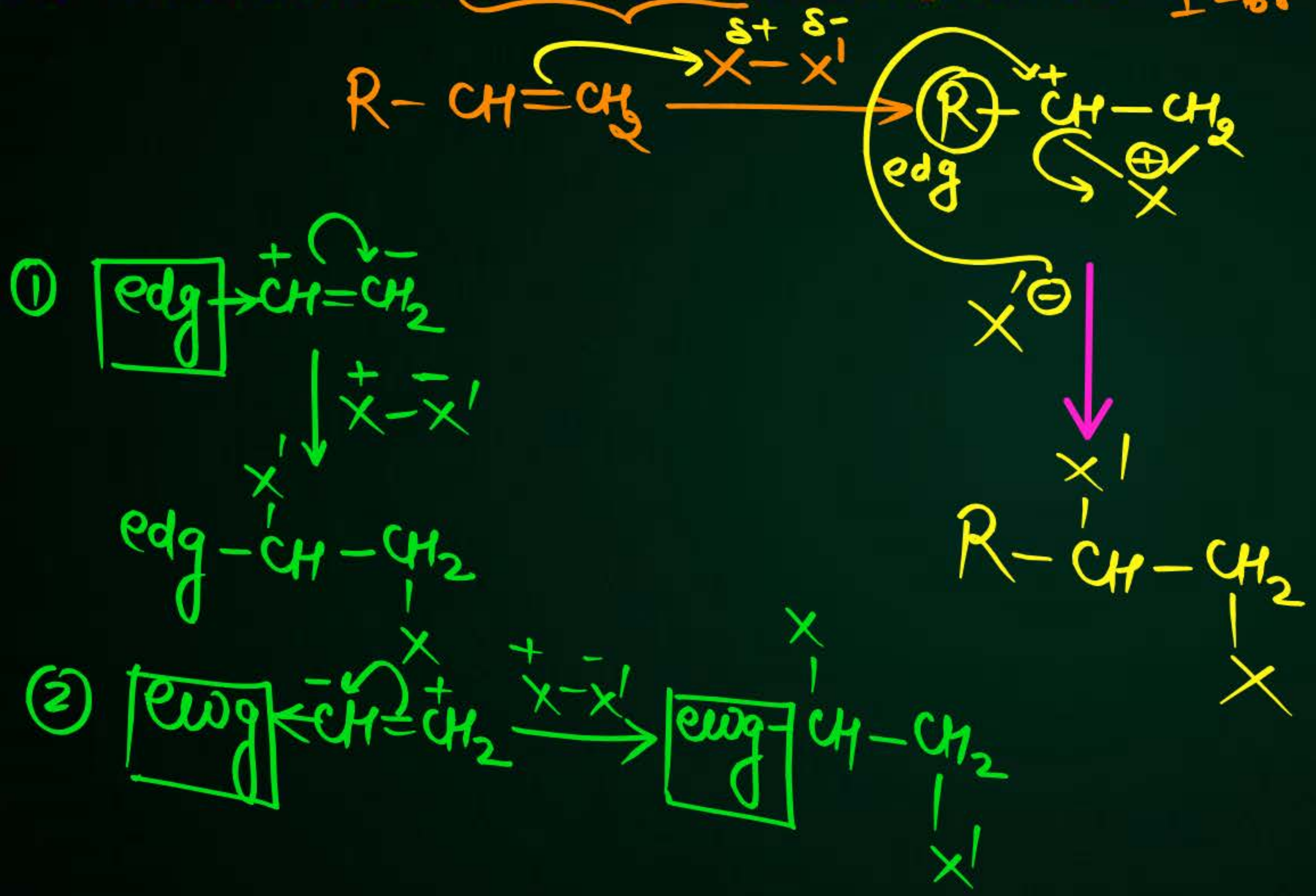
3. Addition of Interhalogen compounds

$X-X'$ $\underline{E.N}$ $X < X'$

$I-Cl$

$I-Br$

$Br-Cl$



$R-CH=CH_2 \xrightarrow{\overset{\delta+}{X}-\overset{\delta-}{X'}} \underset{edg}{\boxed{R}}-\overset{+}{C}H-CH_2$, $\overset{\oplus}{X}$, $X'^{\ominus}$

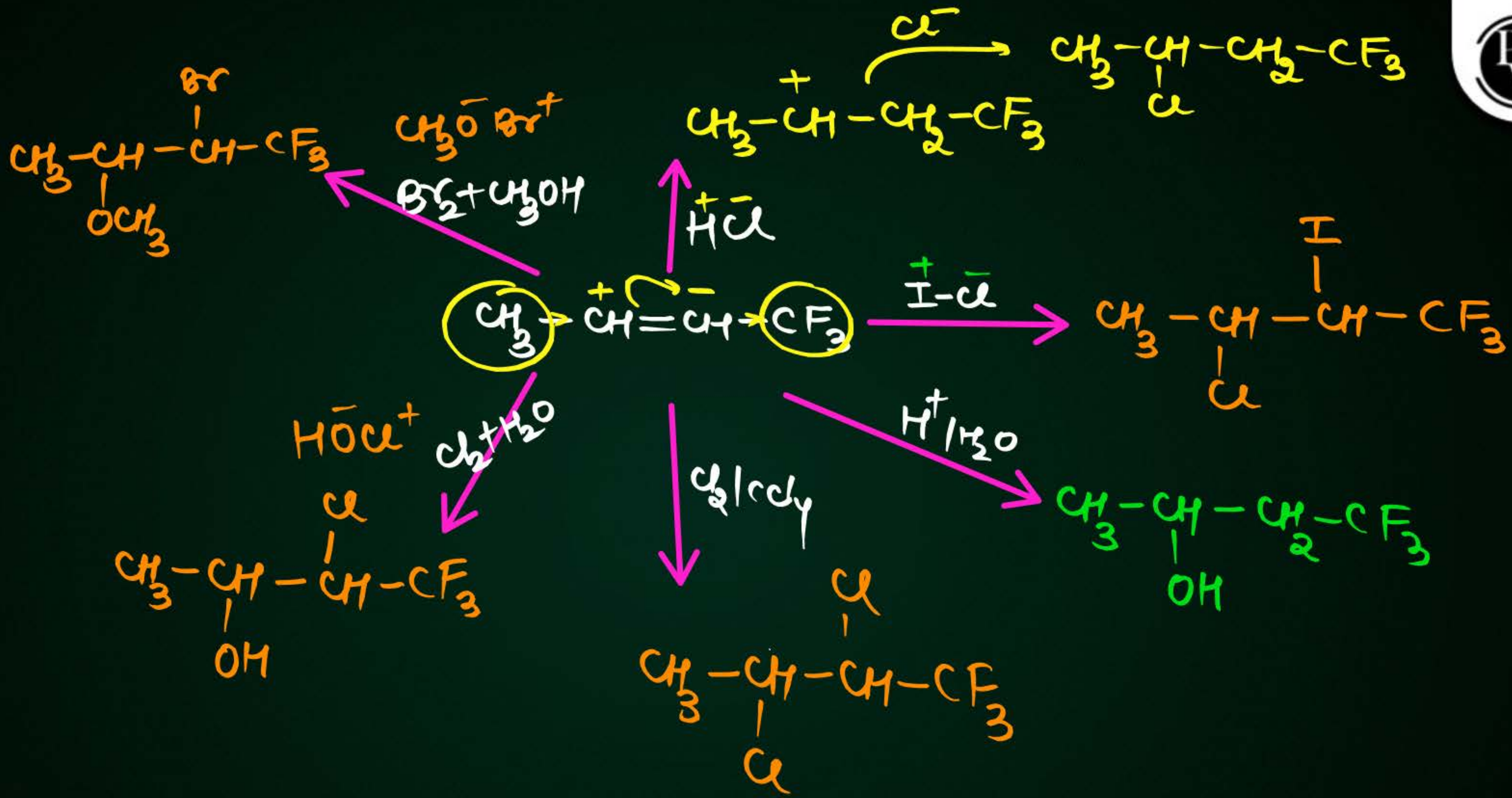
$\downarrow$

$R-\overset{X'}{CH}-\underset{X}{CH_2}$

① $\boxed{edg} \rightarrow \overset{+}{C}H=\overset{-}{C}H_2 \xrightarrow{\overset{+}{X}-\overset{-}{X'}} edg-\overset{X'}{CH}-\underset{X}{CH_2}$

② $\boxed{ewg} \leftarrow \overset{-}{C}H=\overset{+}{C}H_2 \xrightarrow{\overset{+}{X}-\overset{-}{X'}} \boxed{ewg}-\overset{X}{CH}-\underset{X'}{CH_2}$

Q



$$CH_3-\overset{+}{C}H=\overset{-}{C}H-CF_3 \xrightarrow{\overset{+}{H}\overset{-}{Cl}} CH_3-\overset{+}{C}H-CH_2-CF_3 \xrightarrow{Cl^-} CH_3-\underset{Cl}{\underset{|}{C}H}-CH_2-CF_3$$

$$CH_3-CH=CH-CF_3 \xrightarrow{\overset{+}{I}-\overset{-}{Cl}} CH_3-\underset{Cl}{\underset{|}{C}H}-\overset{I}{\overset{|}{C}H}-CF_3$$

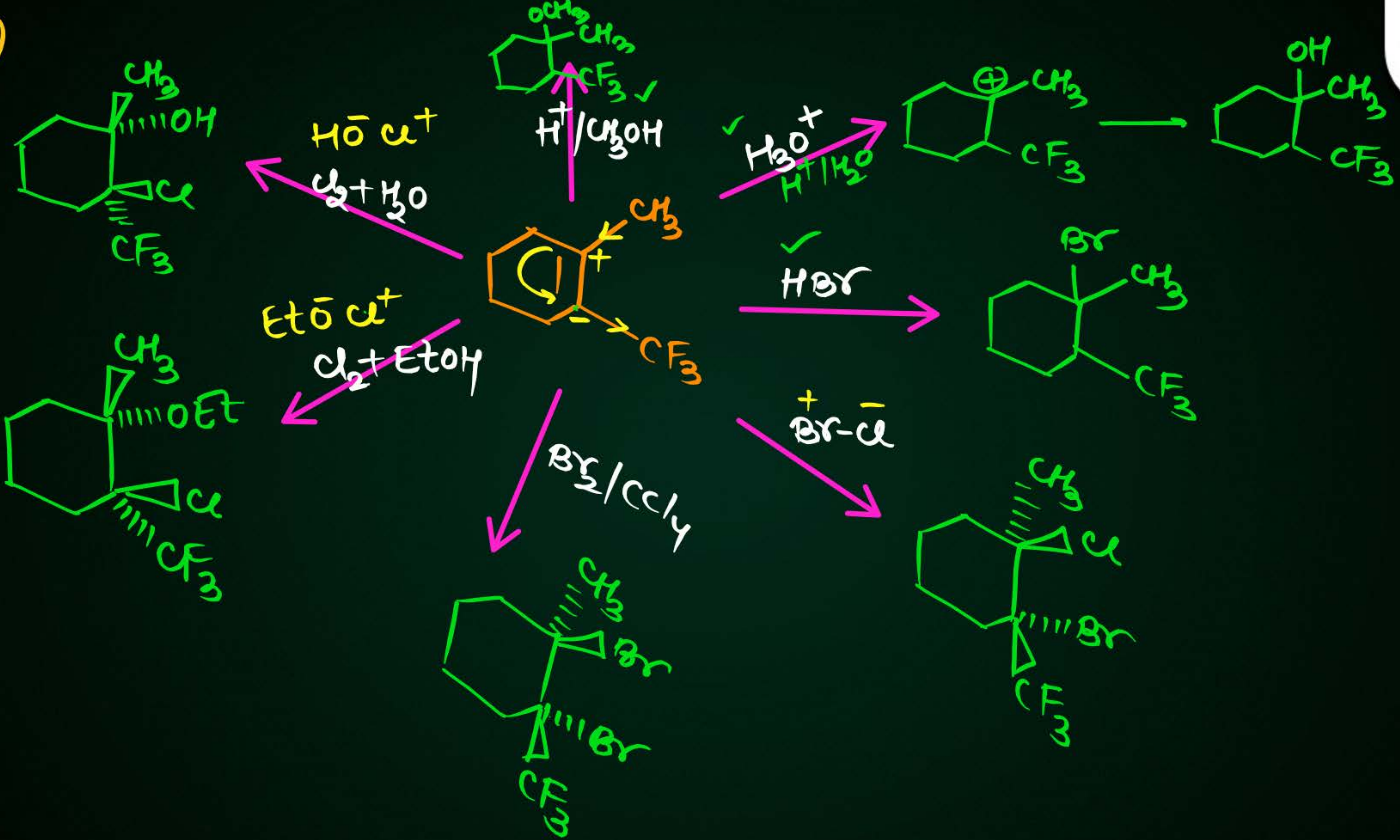
$$CH_3-CH=CH-CF_3 \xrightarrow{H^+/H_2O} CH_3-\underset{OH}{\underset{|}{C}H}-CH_2-CF_3$$

$$CH_3-CH=CH-CF_3 \xrightarrow{Cl_2/CCl_4} CH_3-\underset{Cl}{\underset{|}{C}H}-\overset{Cl}{\overset{|}{C}H}-CF_3$$

$$CH_3-CH=CH-CF_3 \xrightarrow[H\overset{-}{O}Cl^+]{Cl_2+H_2O} CH_3-\underset{OH}{\underset{|}{C}H}-\overset{Cl}{\overset{|}{C}H}-CF_3$$

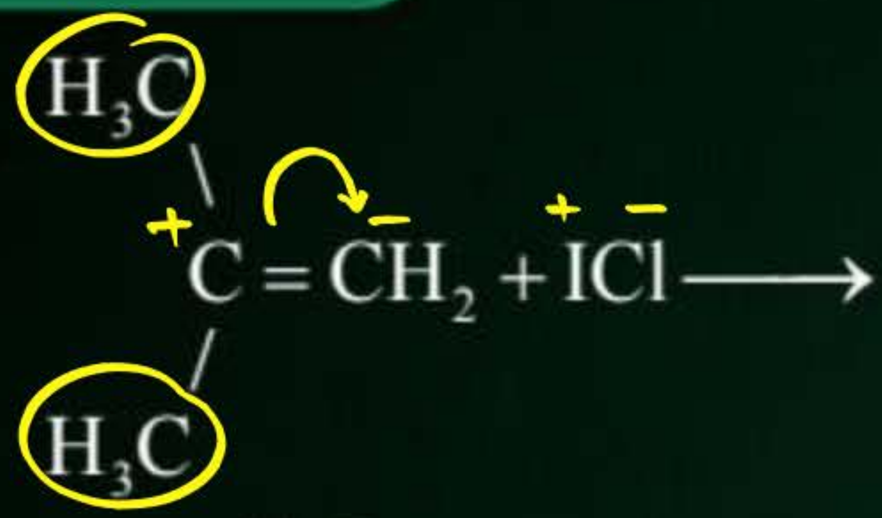
$$CH_3-CH=CH-CF_3 \xrightarrow[CH_3\overset{-}{O}\,Br^+]{Br_2+CH_3OH} CH_3-\underset{OCH_3}{\underset{|}{C}H}-\overset{Br}{\overset{|}{C}H}-CF_3$$

PSS



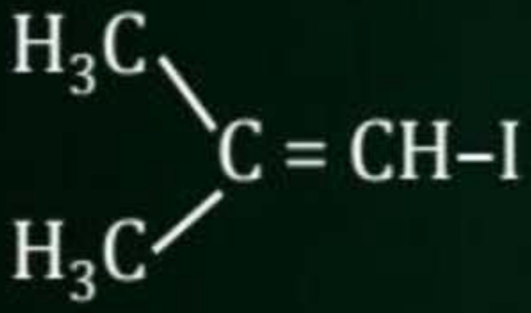
HŌ Cl⁺
Cl₂ + H₂O
H⁺/CH₃OH
H₃O⁺
H⁺/H₂O
HBr
Br⁺–Cl⁻
Br₂/CCl₄
EtŌ Cl⁺
Cl₂ + EtOH
CH₃
CF₃
OH
Cl
OEt
Br
OCH₃
+
−

QUESTION



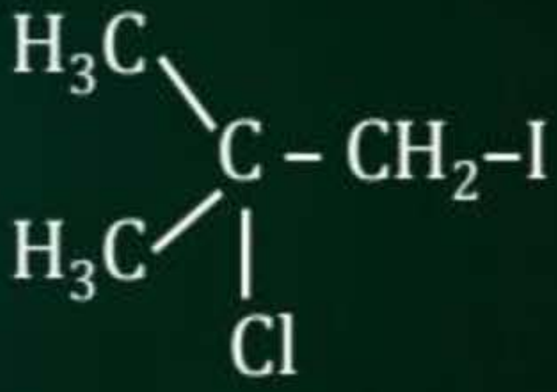
$(H_3C)_2\overset{+}{C}=\overset{-}{C}H_2 + \overset{+}{I}\overset{-}{Cl} \longrightarrow$ P (major product), Here 'P' is:

(A)



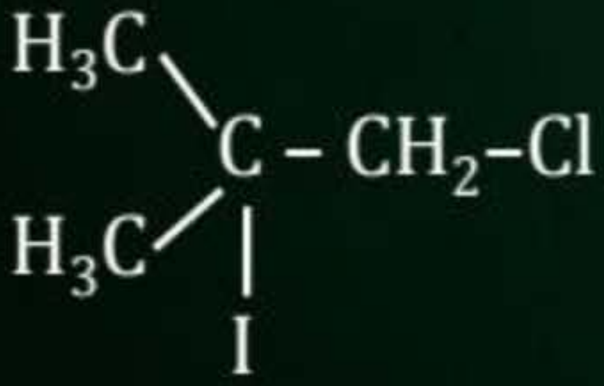
$(H_3C)_2C=CH-I$

(B)



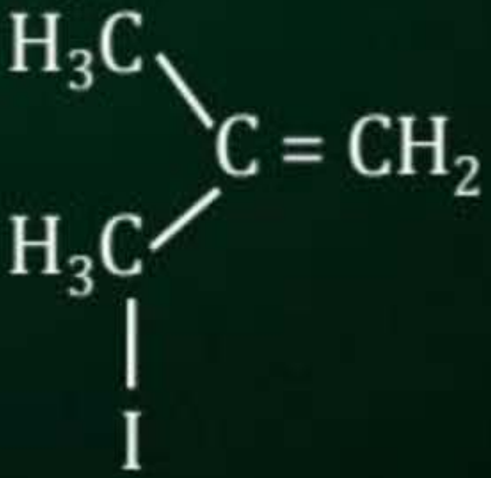
$(H_3C)_2C(Cl)-CH_2-I$

(C)



$(H_3C)_2C(I)-CH_2-Cl$

(D)



$(H_3C)(ICH_2)C=CH_2$

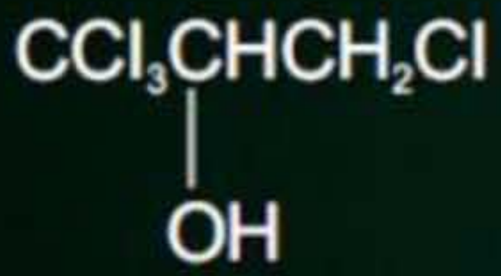
QUESTION

$H\bar{O}Cl^{+}$

ewg $\underbrace{CCl_3}\overset{-}{CH} = \overset{+}{CH_2} \xrightarrow{Cl_2+H_2O} P$

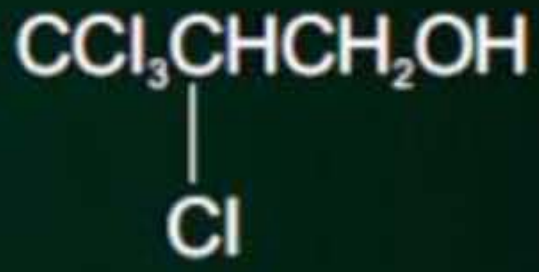
Identify major product 'P'

A



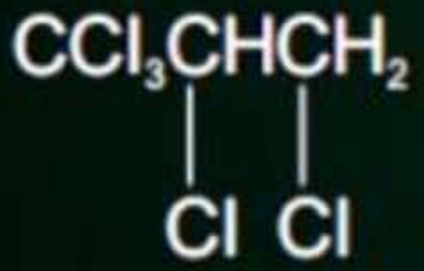
$CCl_3\underset{\substack{|\\ OH}}{CH}CH_2Cl$

✓ **B**



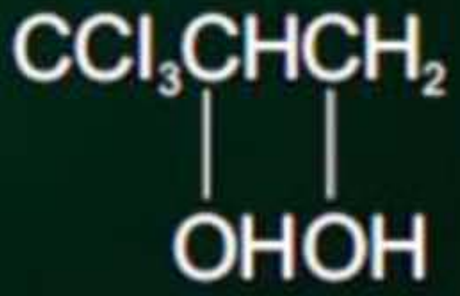
$CCl_3\underset{\substack{|\\ Cl}}{CH}CH_2OH$

C



$CCl_3\underset{\substack{|\\ Cl}}{CH}\underset{\substack{|\\ Cl}}{CH_2}$

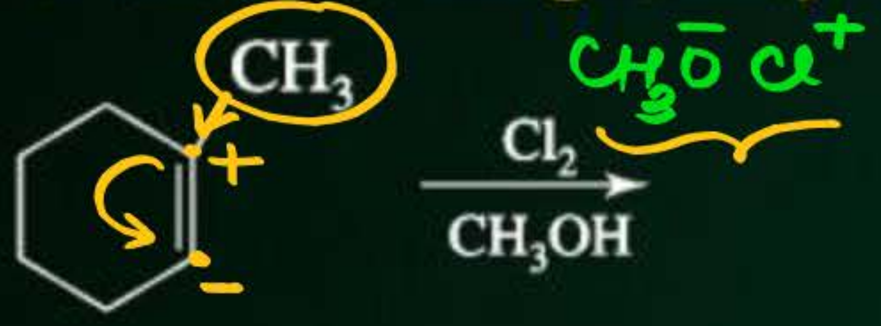
D



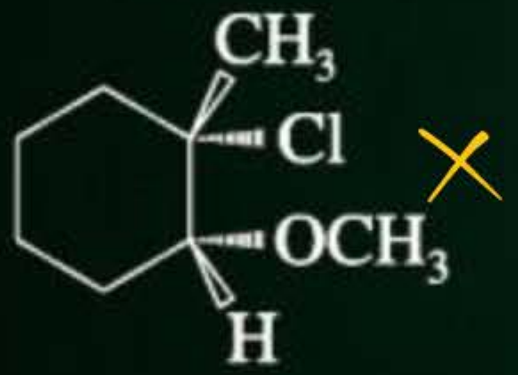
$CCl_3\underset{\substack{|\\ OH}}{CH}\underset{\substack{|\\ OH}}{CH_2}$

QUESTION

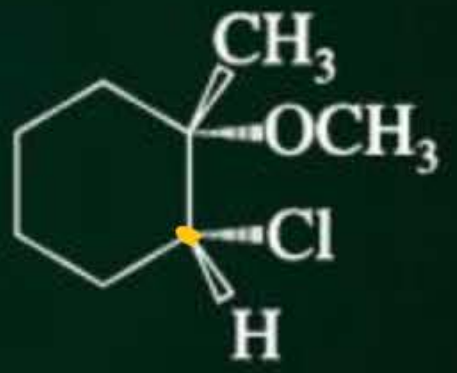
Which of the following is major product of reaction shown below?


CH$_3$
+
−
Cl$_2$
CH$_3$OH
CH$_3\bar{O}$ Cl$^+$

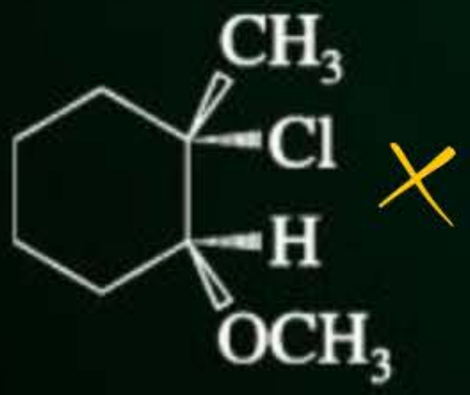
A


CH$_3$
Cl
OCH$_3$
H

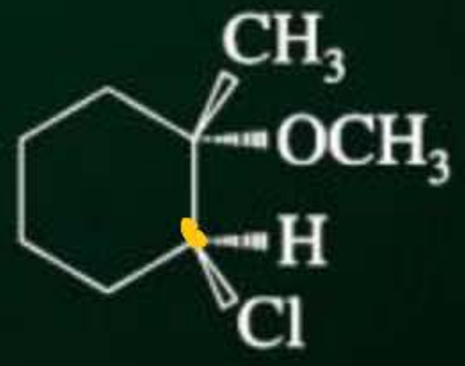
B


CH$_3$
OCH$_3$
Cl
H

C


CH$_3$
Cl
H
OCH$_3$

[✓ D]

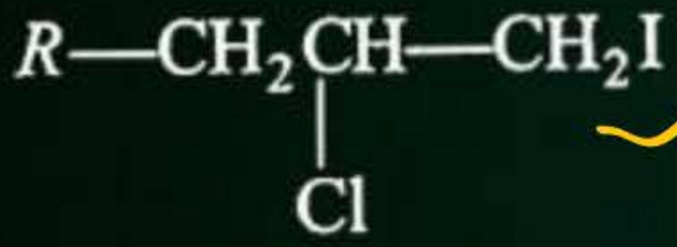

CH$_3$
OCH$_3$
H
Cl

QUESTION

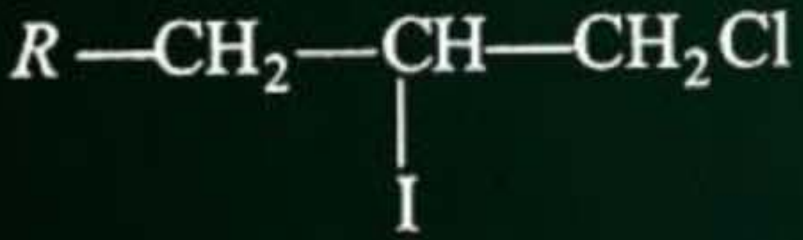
In the following reaction,

$R-CH_2CH=CH_2+\overset{+}{I}\overset{-}{Cl}\longrightarrow(A)$

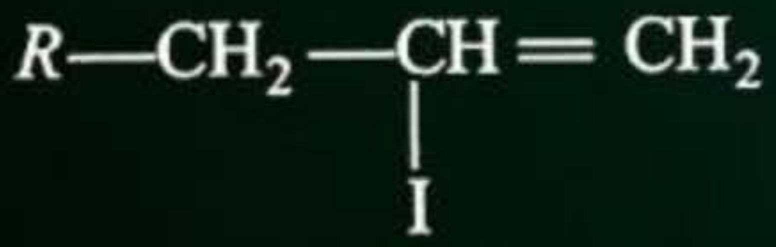
Markownikoff's product (A) is:

A 

$R-CH_2-\underset{\displaystyle Cl}{\underset{|}{CH}}-CH_2I$ ✓

B 

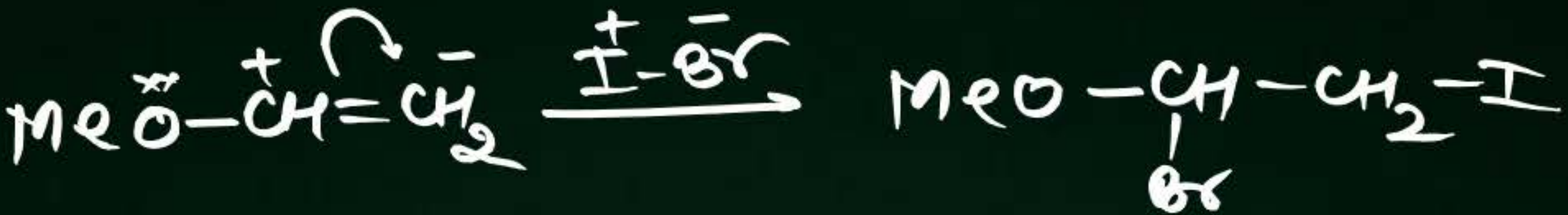
$R-CH_2-\underset{\displaystyle I}{\underset{|}{CH}}-CH_2Cl$

C 

$R-CH_2-\underset{\displaystyle I}{\underset{|}{CH}}=CH_2$

D $R-CH=CHCH_2I$

QUESTION



$\mathrm{Me\ddot{O}-\overset{+}{C}H=\overset{-}{C}H_2 \xrightarrow{\overset{+}{I}-\overset{-}{Br}} MeO-\underset{Br}{\underset{|}{C}H}-CH_2-I}$

The major product in the reaction $\overset{-}{\mathrm{C}}\mathrm{H_2}=\overset{+}{\mathrm{C}}\mathrm{H}\ddot{\mathrm{Cl}} + \mathrm{H}\overset{-}{\mathrm{O}}\overset{+}{\mathrm{Cl}} \longrightarrow$ is:

(A) $HOCH_2-CHCl_2$

[✓ (B)] $\underline{CH_2Cl}-CH(Cl)OH$

(C) CH_2ClCHO

(D) $ClOCH_2-CH_2Cl$

Home Work

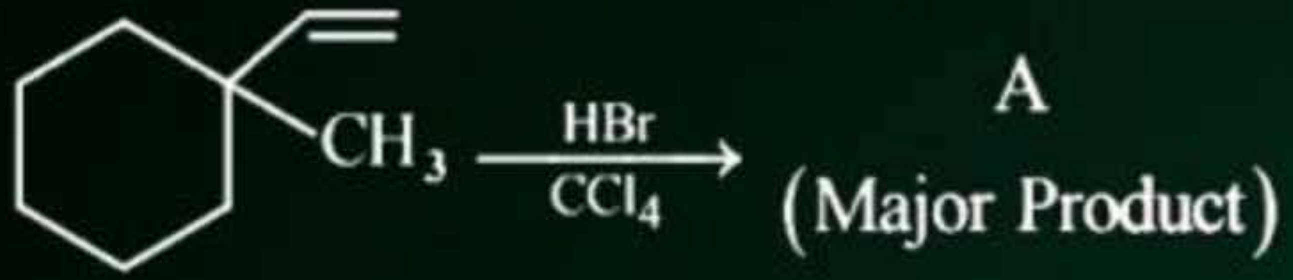
QUESTION 01

Assertion(A): Propene is more reactive than ethene towards electrophilic addition reactions.

Reason(R): Electron density of double bond increases due to hyperconjugation of methyl group.

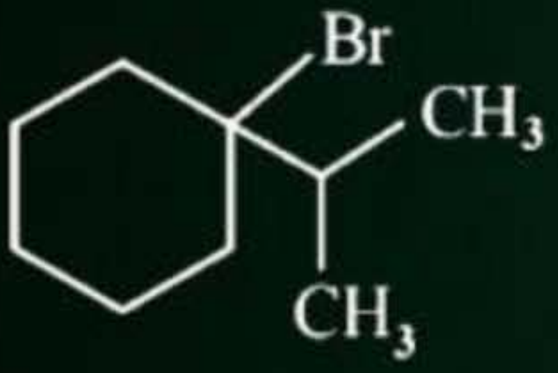
- A If both (A) and (R) are correct and (R) is the correct explanation for (A).
- B If both (A) and (R) are correct but (R) is not the correct explanation for (A).
- C If (A) is correct but (R) is incorrect.
- D If (A) is incorrect but (R) is correct.

QUESTION ⑨

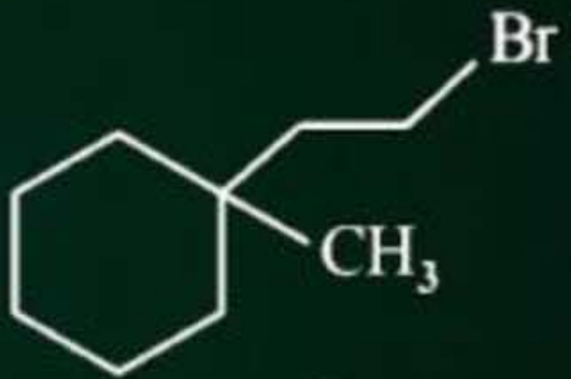

CH$_3$
HBr
CCl$_4$
A
(Major Product)

Product 'A' in the above chemical reaction is:

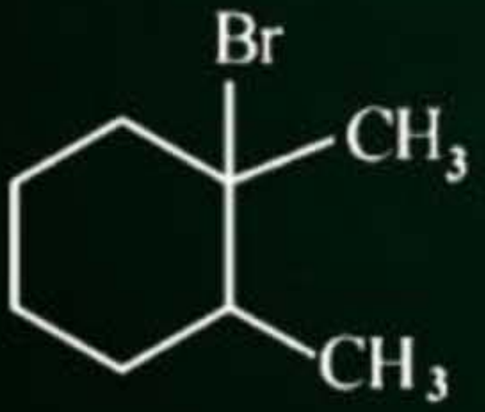
(A)



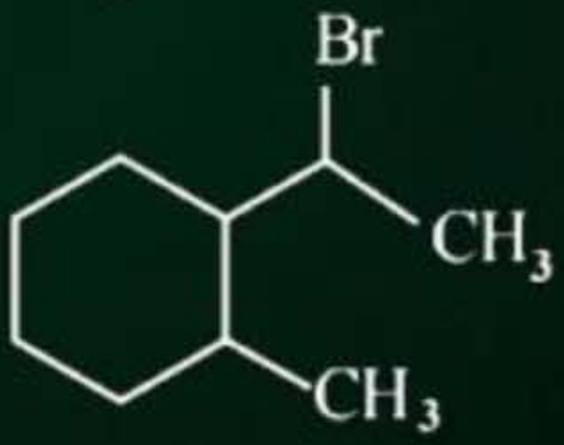
(B)



(C)



(D)

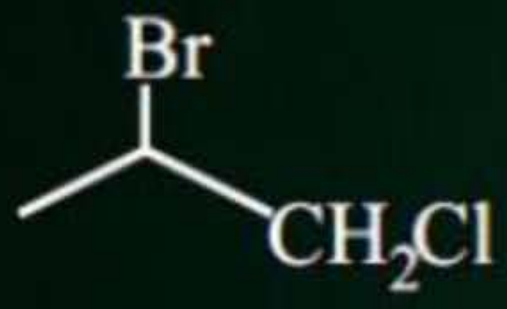


QUESTION 03

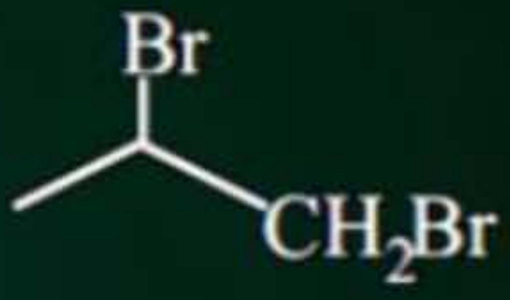
$CH_3-CH=CH_2+Br_2 \xrightarrow{\text{in NaCl}} \text{Products}$

The product, not expected in this reaction is:

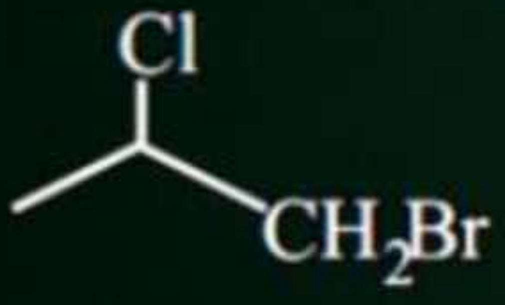
A



B



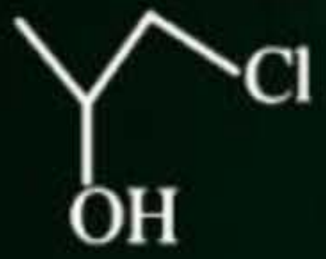
C

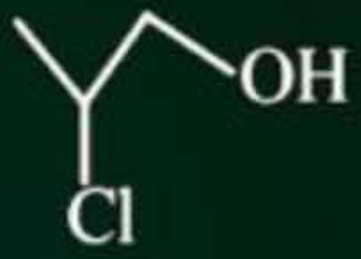


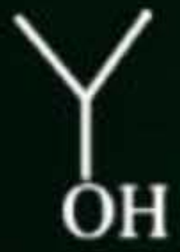
D All of these

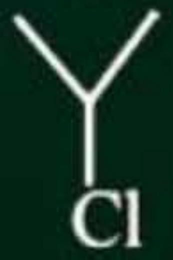
QUESTION 04

Propene on reaction with chlorine water gives

A


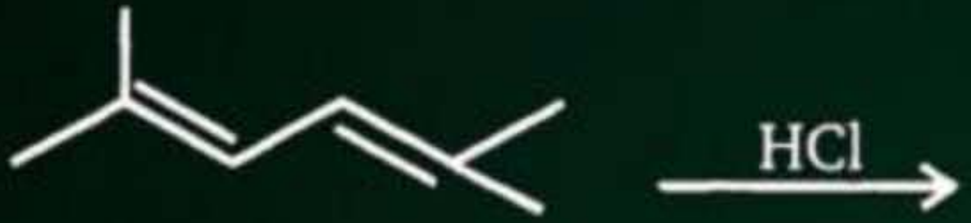
B


C


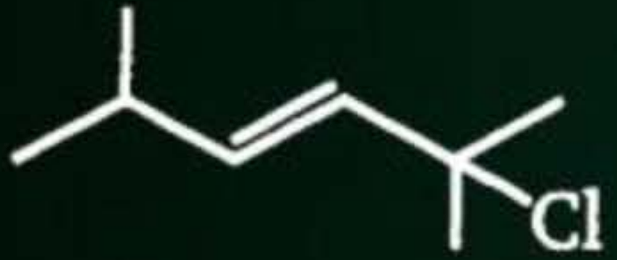
D


QUESTION ⑤

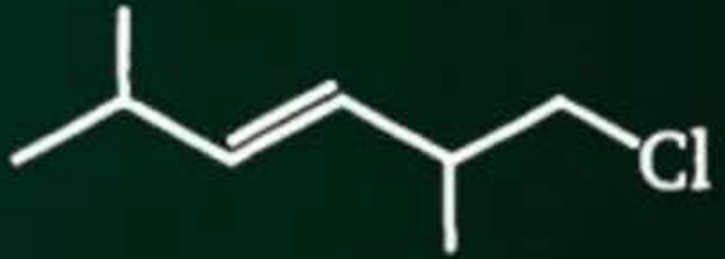
What is the product of 1, 4-addition in the reaction shown below?



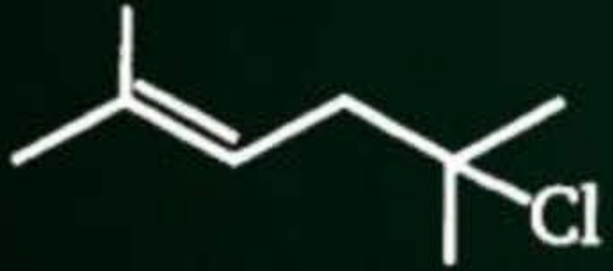
(A)



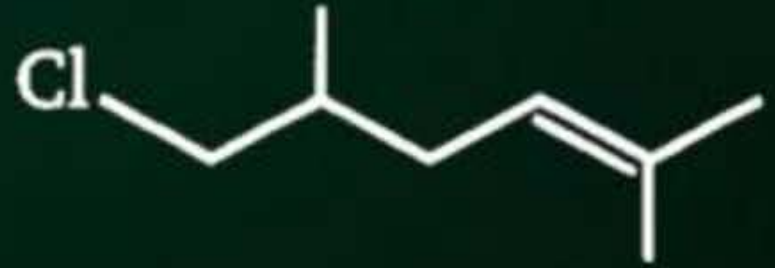
(B)



(C)



(D)

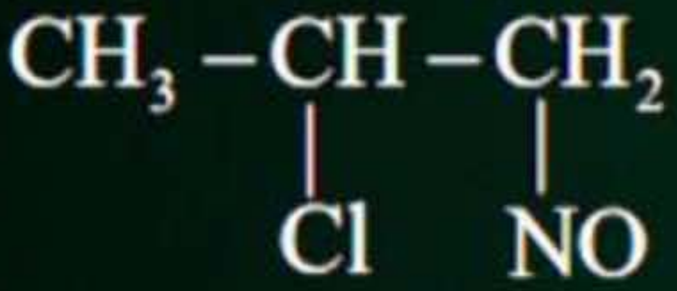


QUESTION 06

$CH_3-CH=CH_2+\underset{\text{Tilden reagent}}{\overset{+}{N}O\overset{-}{Cl}}\longrightarrow$ **Major product:**

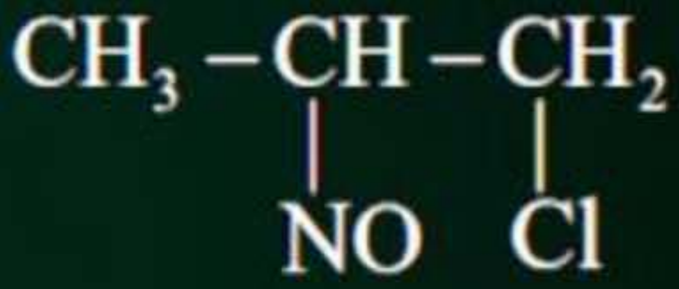
Identify the product.

(A)



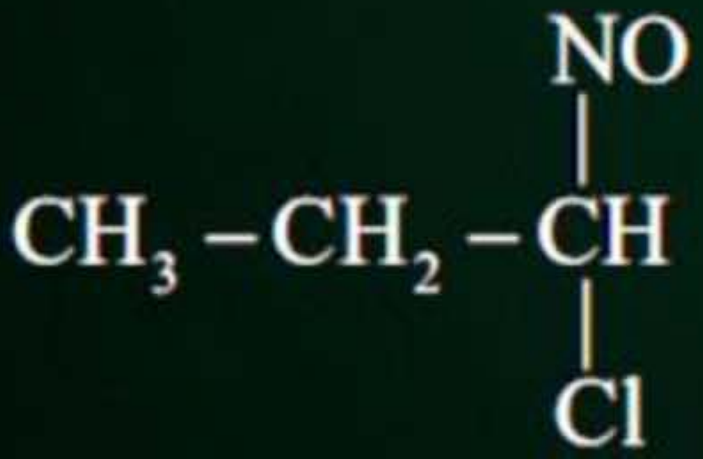
$$CH_3-\underset{\underset{\displaystyle Cl}{|}}{CH}-\underset{\underset{\displaystyle NO}{|}}{CH_2}$$

(B)



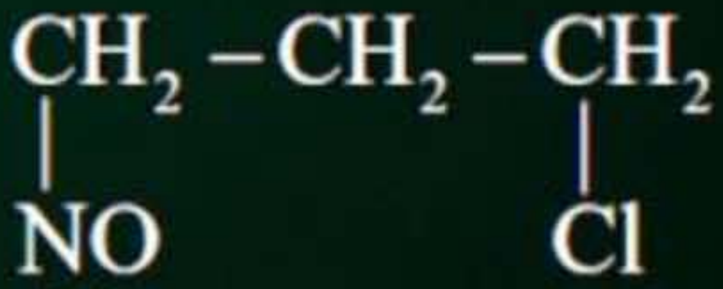
$$CH_3-\underset{\underset{\displaystyle NO}{|}}{CH}-\underset{\underset{\displaystyle Cl}{|}}{CH_2}$$

(C)



$$CH_3-CH_2-\overset{\overset{\displaystyle NO}{|}}{\underset{\underset{\displaystyle Cl}{|}}{CH}}$$

(D)

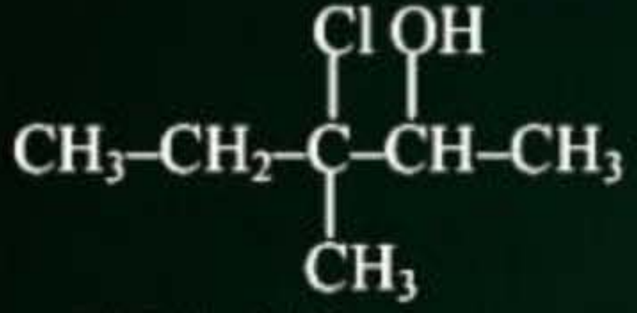


$$\underset{\underset{\displaystyle NO}{|}}{CH_2}-CH_2-\underset{\underset{\displaystyle Cl}{|}}{CH_2}$$

QUESTION 07

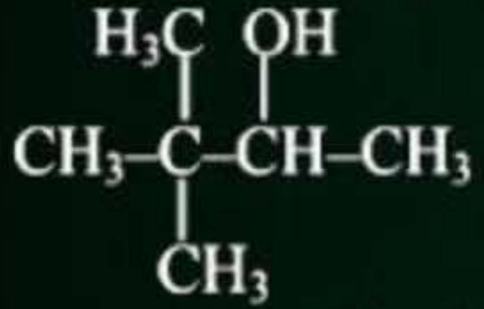
3–Methyl–2–pentene on reaction with HOCl gives:

A



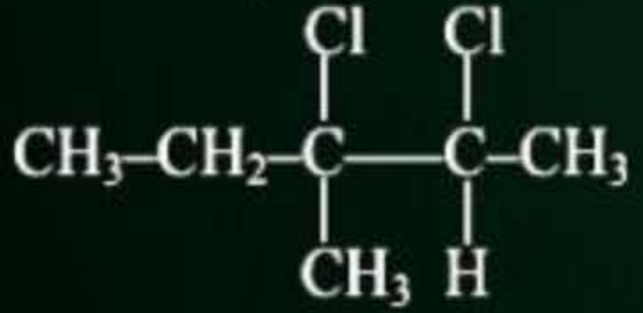
$$CH_3-CH_2-\underset{CH_3}{\overset{Cl}{C}}-\overset{OH}{CH}-CH_3$$

B



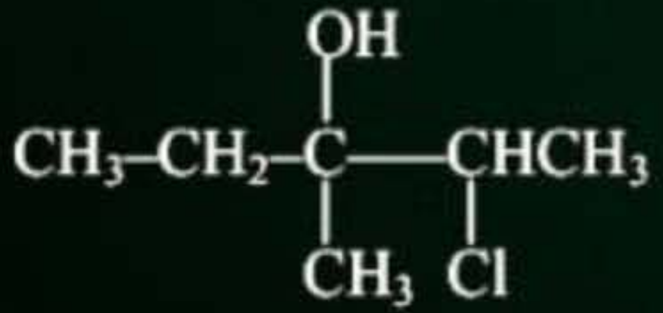
$$CH_3-\underset{CH_3}{\overset{H_3C}{C}}-\overset{OH}{CH}-CH_3$$

C



$$CH_3-CH_2-\underset{CH_3}{\overset{Cl}{C}}-\underset{H}{\overset{Cl}{C}}-CH_3$$

D



$$CH_3-CH_2-\underset{CH_3}{\overset{OH}{C}}-\underset{Cl}{CH}CH_3$$

QUESTION ⑧

Assertion: Alkenes undergo electrophilic addition reaction at carbon-carbon double bond.

Reason: Electrophilic addition at double bond produces carbocation intermediate.

- (A) Both assertion and reason are correct and the reason is the correct explanation for assertion.
- (B) Both assertion and reason are correct but reason is not the correct explanation for assertion.
- (C) Assertion is correct but reason is incorrect.
- (D) Both assertion and reason are incorrect.

QUESTION 09

The reaction of propene with HOCl proceeds via the addition of:

A H^+ in first step

B Cl^+ in first step

C OH^- in first step

D Cl^+ and OH^- in single step

QUESTION 10

Ethylene on reaction with Br_2 in methanol forms

A 1,2-dimethoxyethane

B 1-bromo-2-methoxyethane

C 1, 2-dibromoethane

D a mixture of (B) and (C)

ANSWER KEY

1. A
2. A
3. A
4. A
5. A
6. A
7. D
8. A
9. B
10. D

Home Work From PW Module (Yakeen NEET)

Prarambh: Q 46, 48, 72, 73, 83

Prabal: Q 08, 12, 17,

Parikshit: Q 06, 25, 28

MARK THE DATE 4th May, 2025

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Thankyou!!

YAKEEN 2.0

FOR NEET 2025

Lecture- 08 **Organic Chemistry**

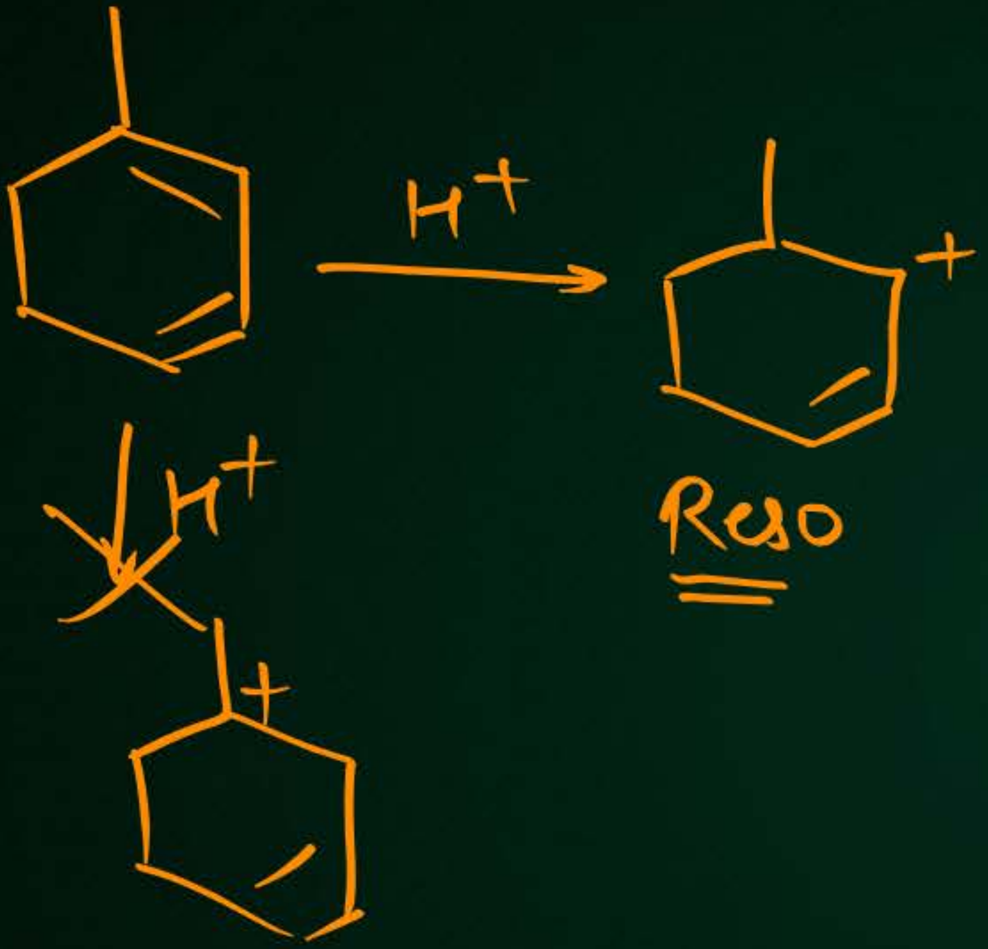
HYDROCARBONS

By- Pankaj Sir(POPU MAMA)

Physics Wallah

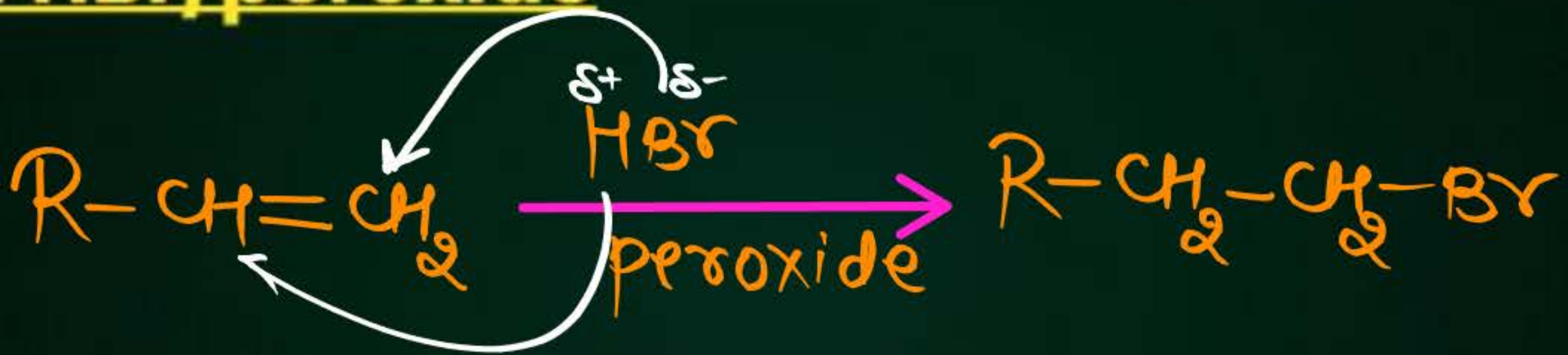
Topics *to be covered*

1. Chemical Properties of Alkenes Part 03 ✓
2. Peroxide effect ,Oxidation, Ozonolysis
3. Practice


H+
H+
+
+
Reso

Chemical Properties of Alkenes

2. Addition of HBr/peroxide



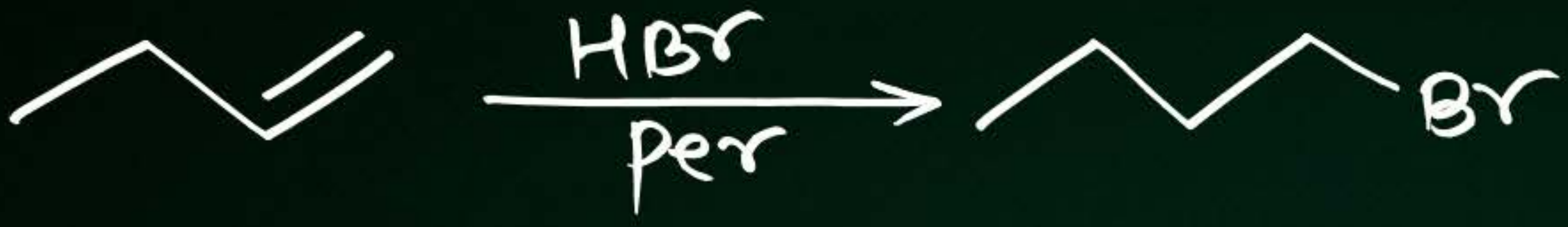
$$R-CH=CH_2 \xrightarrow[\text{peroxide}]{\overset{\delta+\ \delta-}{HBr}} R-CH_2-CH_2-Br$$

Antimar → opposite to mar

Kharasch effect

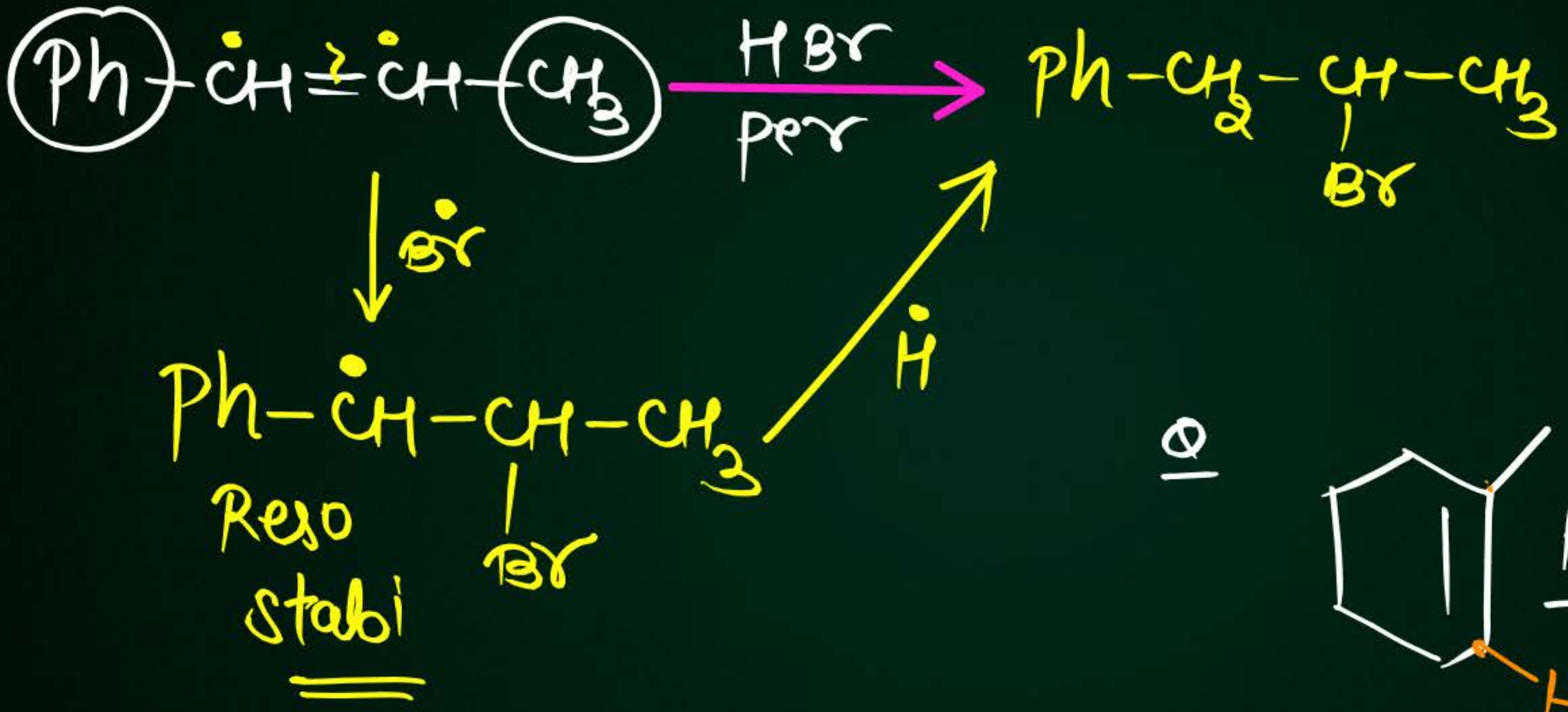
peroxide effect

①



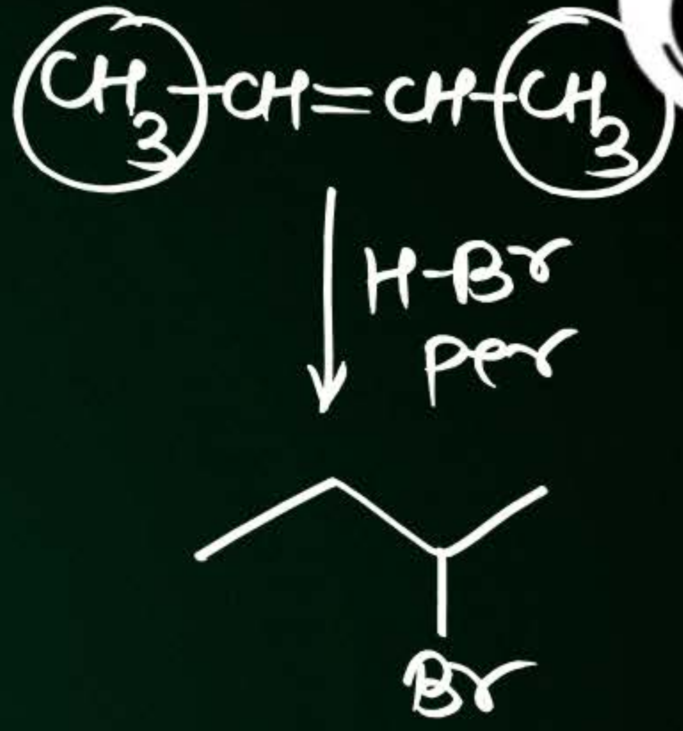
HBr
Per
Br

②



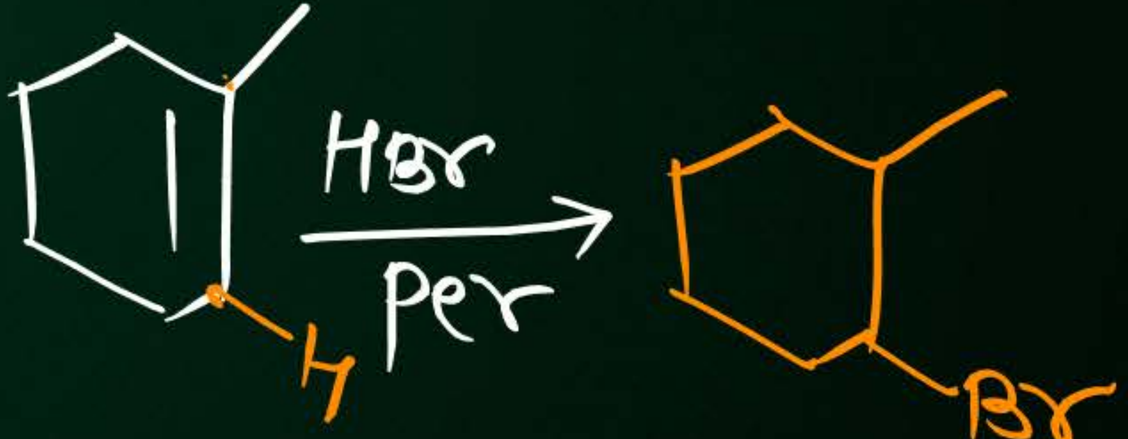
Ph-ĊH=ĊH-CH3
HBr
Per
Ph-CH2-CH-CH3
Br
Ḃr
Ph-ĊH-CH-CH3
Br
Ḣ
Reso
stabi

③



CH3-CH=CH-CH3
H-Br
Per
Br

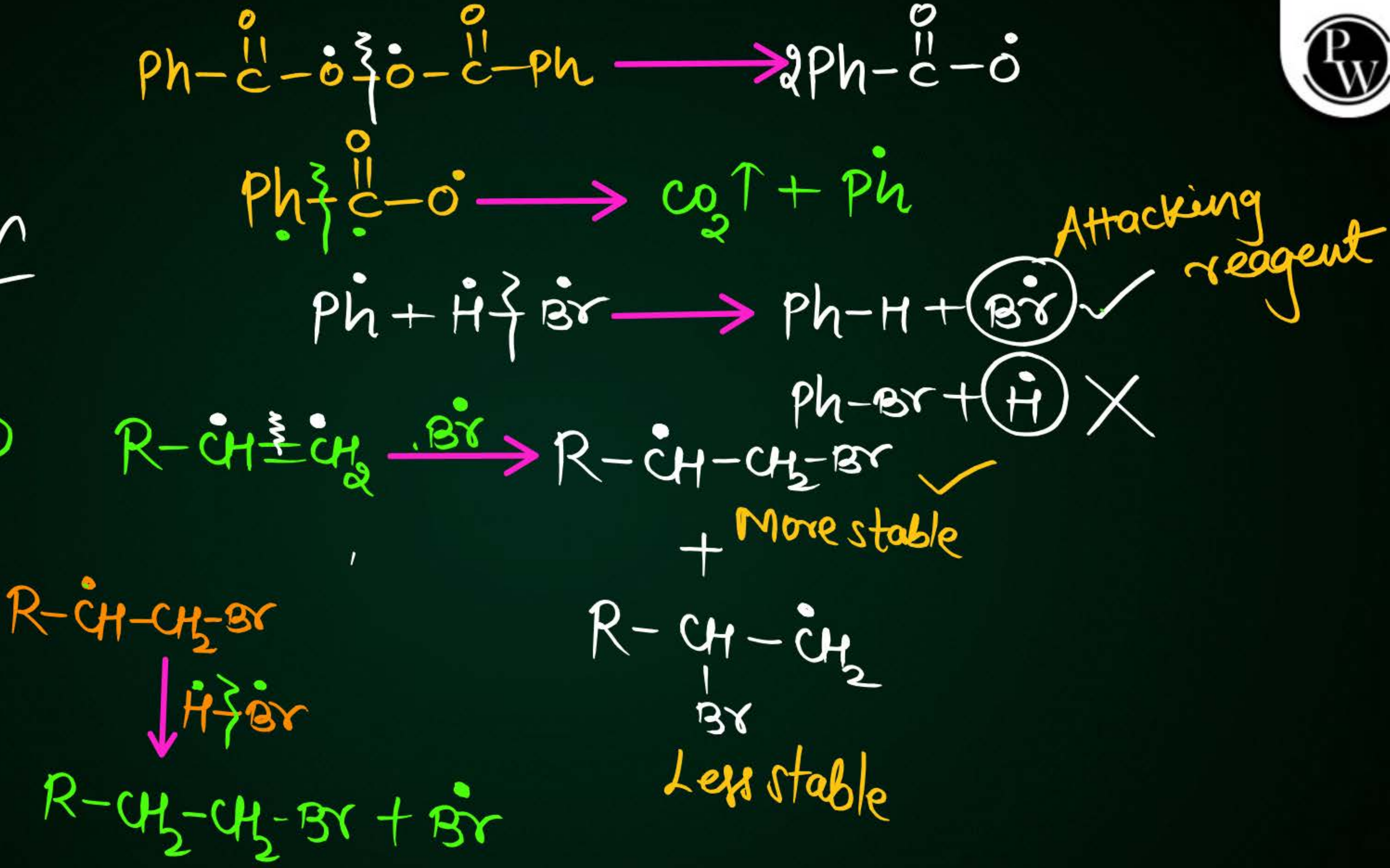
Q



H
HBr
Per
Br

Mechanism:-

FRAR
free radical addition rxn



$$Ph-\overset{\overset{O}{\|}}{C}-\dot{O}\wr\dot{O}-\overset{\overset{O}{\|}}{C}-Ph \longrightarrow 2Ph-\overset{\overset{O}{\|}}{C}-\dot{O}$$

$$Ph\wr\overset{\overset{O}{\|}}{C}-\dot{O} \longrightarrow CO_2\uparrow + \dot{Ph}$$

$$\dot{Ph} + \dot{H}\wr\dot{Br} \longrightarrow Ph-H + \boxed{\dot{Br}}$$ ✓ Attacking reagent

$$Ph-Br + \boxed{\dot{H}}$$ ✗

✓ Step ①

$$R-\dot{C}H\wr=\dot{C}H_2 \xrightarrow{\dot{Br}} R-\dot{C}H-CH_2-Br$$ ✓ More stable

$$+$$

$$R-\underset{Br}{\underset{|}{CH}}-\dot{C}H_2$$

Less stable

✓ Step ②

$$R-\dot{C}H-CH_2-Br \xrightarrow{\dot{H}\wr\dot{Br}} R-CH_2-CH_2-Br + \dot{Br}$$

op point ÷ peroxide effect is not obs in HCl & HI

$$R-CH=CH_2 \xrightarrow[\text{Per}]{\overset{+}{H}\overset{-}{Cl}} R-\overset{+}{C}H-CH_3 \xrightarrow{\overset{-}{Cl}} R-\underset{Cl}{\underset{|}{CH}}-CH_3$$

Rearr if pos

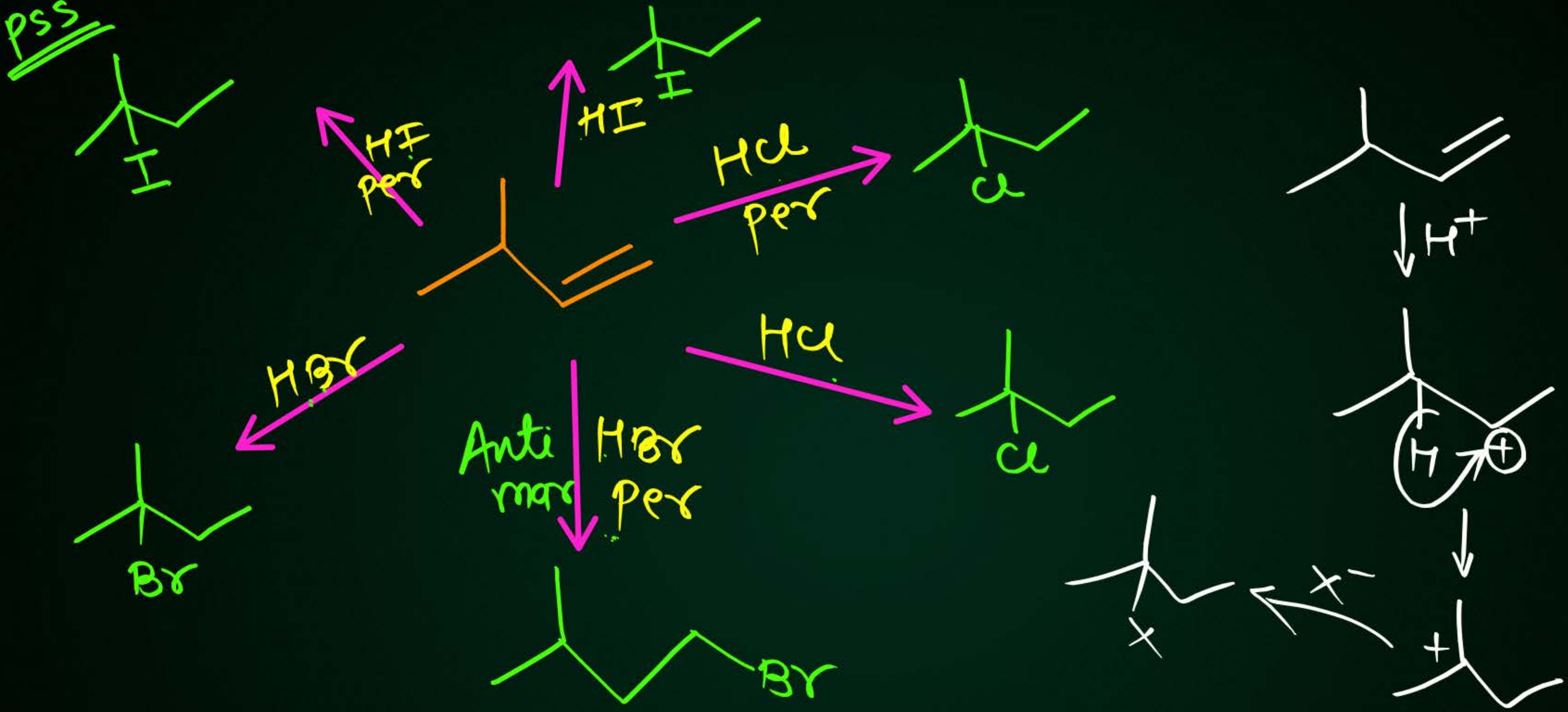
HCl ↓ BE high

HI ↓ BE low

$(\dot{I}+\dot{I} \rightarrow I_2)$

(one of the step is endothermic)

HCl & HI peroxide se bat he nahi karte


PSS
I
HF
per
HI
I
HCl
per
Cl
HBr
Br
Anti
mar
HBr
Per
Br
HCl
Cl
H⁺
H
+
+
X⁻
X

Chemical Properties of Alkenes

3. Ozonolysis:

Reductive ozonolysis

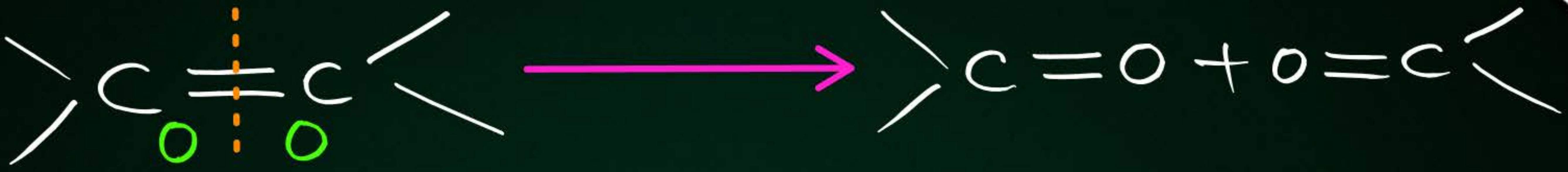
Reagent:
1) $\frac{O_3+CCl_4}{Zn}$
2) $\frac{O_3+CCl_4}{Zn+H_2O}$
3) $\frac{O_3+CCl_4}{Me_2S}$

Oxidative ozonolysis

Reagents
① $\frac{O_3+CCl_4}{H_2O}$
② $\frac{O_3+CCl_4}{H_2O_2}$ or Ag_2O

other reagent
strong oxidizing agent
Alk $KMnO_4 / \Delta, H^+$
Hot $KMnO_4, H^+$
$KMnO_4 / H^+$
($K_2Cr_2O_7$)

Reductive ozono



$$>C=C< \longrightarrow >C=O + O=C<$$

(O,O go)

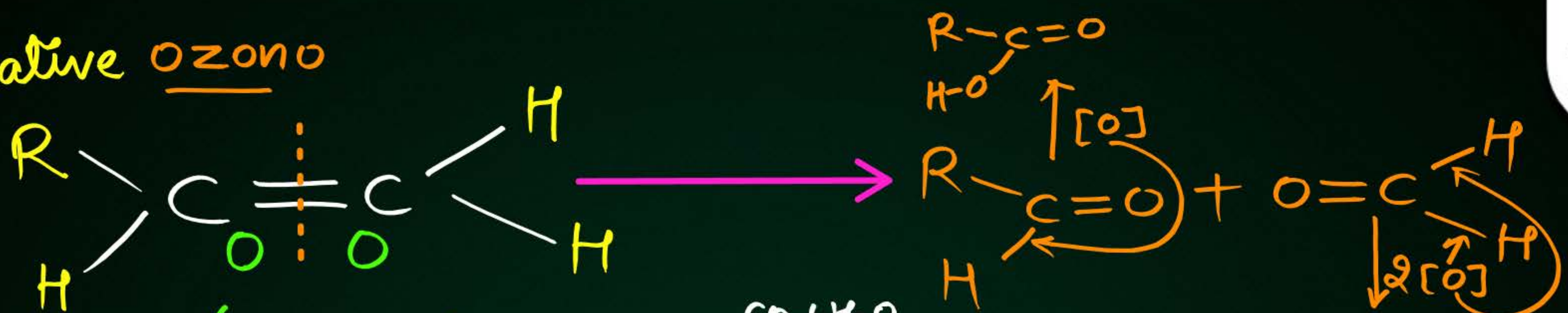
Q 1) $\overset{O}{C}H_2 = \overset{O}{C}H_2 \xrightarrow[Zn]{O_3 + CCl_4} CH_2=O + O=CH_2$

(2 HCHO)

2) $CH_3-\overset{O}{C}H = \overset{O}{C}H_2 \xrightarrow[Me_2S]{O_3 + CCl_4} CH_3-CH=O + O=CH_2$

$(CH_3CHO) + (HCHO)$

oxidative ozono



$CO_2+H_2O \leftarrow O=C(O-H)(O-H)$

(0,0 go)

Q 1) $\overset{O}{CH_2}=\overset{O}{CH_2} \xrightarrow[H_2O]{O_3+CCl_4} CH_2=O + O=CH_2$

(2 HCHO)

$CH_2=O \rightarrow \boxed{H_2CO_3} \rightarrow CO_2+H_2O$

$O=CH_2 \rightarrow \boxed{H_2CO_3}\ CO_2+H_2O$

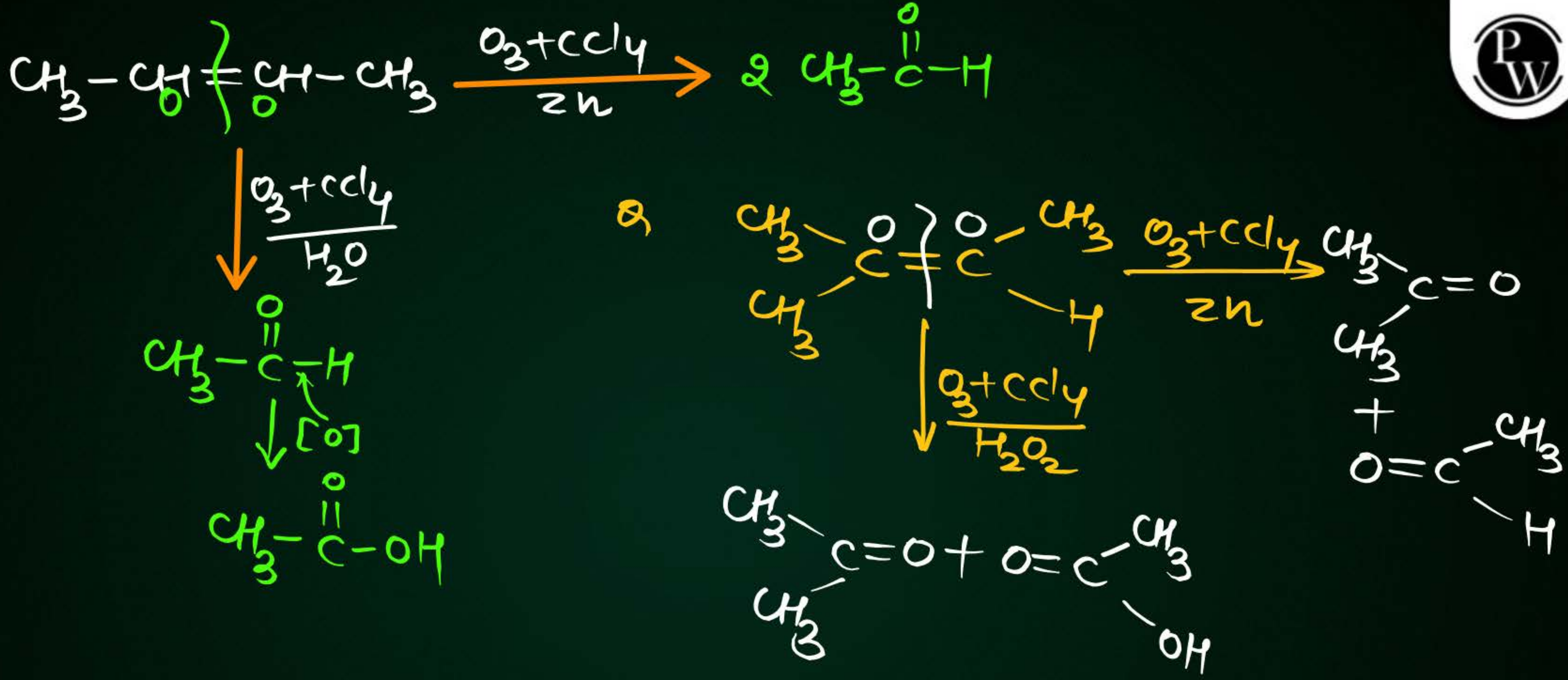
2) $CH_3-\overset{O}{CH}=\overset{O}{CH_2} \xrightarrow[H_2O_2]{O_3+CCl_4} CH_3-CH=O + O=CH_2$

$(CH_3CHO) + (HCHO)$

$CH_3CHO \rightarrow CH_3COOH$

$O=CH_2 \rightarrow CO_2+H_2O$

Q.



$$CH_3-CH=CH-CH_3 \xrightarrow[Zn]{O_3+CCl_4} 2\,CH_3-\overset{O}{\overset{\|}{C}}-H$$

$$CH_3-CH=CH-CH_3 \xrightarrow[H_2O]{O_3+CCl_4} CH_3-\overset{O}{\overset{\|}{C}}-H \xrightarrow{[O]} CH_3-\overset{O}{\overset{\|}{C}}-OH$$

Q

$$(CH_3)_2C=C(CH_3)H \xrightarrow[Zn]{O_3+CCl_4} (CH_3)_2C=O + O=C(CH_3)H$$

$$(CH_3)_2C=C(CH_3)H \xrightarrow[H_2O_2]{O_3+CCl_4} (CH_3)_2C=O + O=C(CH_3)OH$$

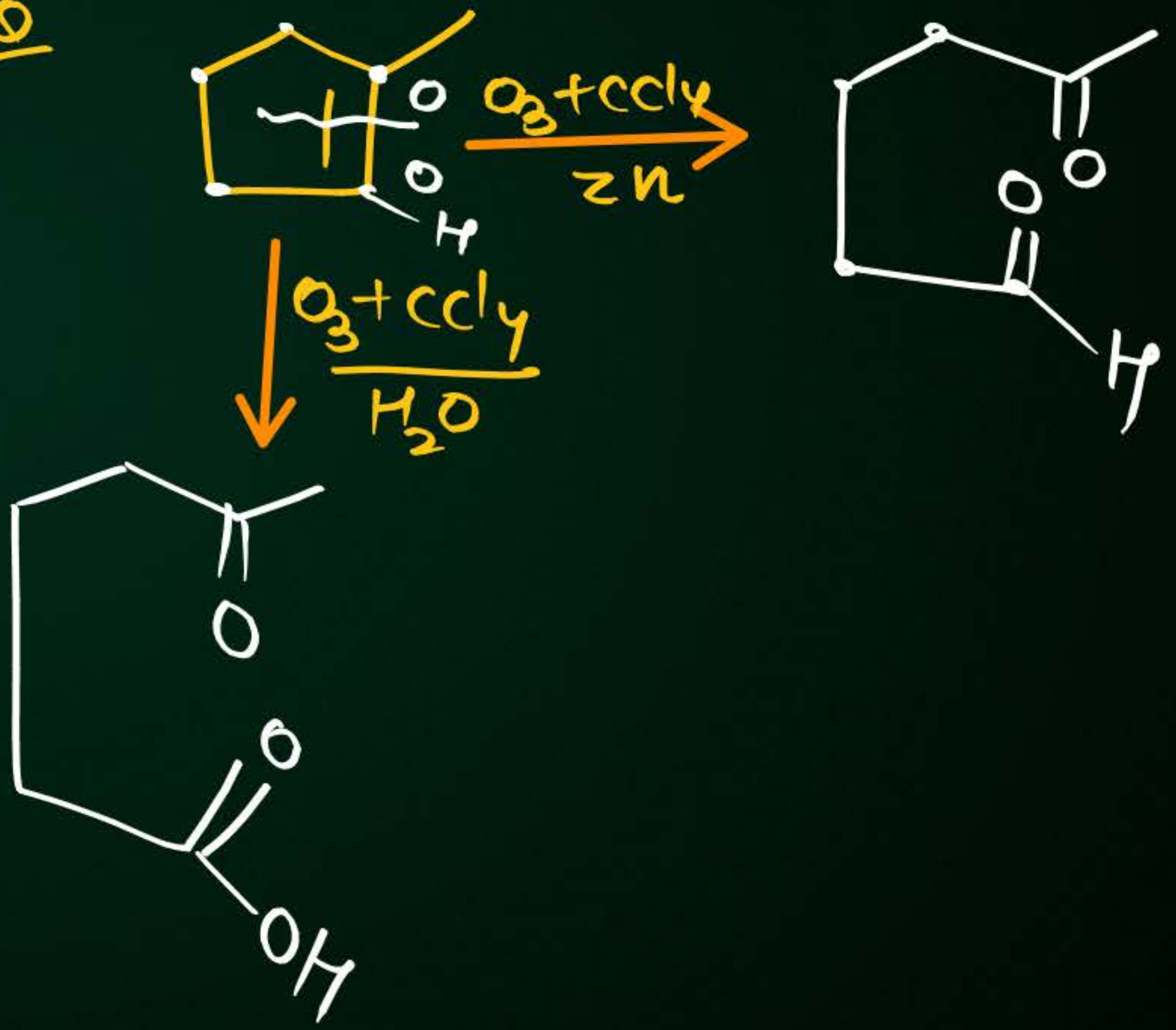
Q/ $\overset{O}{CH_2}=\overset{O}{CH}-\overset{O}{CH}=\overset{O}{CH_2} \xrightarrow[Zn]{O_3+CCl_4} CH_2=O + O=CH-CH=O + O=CH_2$

$2HCHO + \begin{array}{c}CHO\\|\\CHO\end{array}$

$\downarrow \frac{O_3+CCl_4}{H_2O}$

$2CO_2+2H_2O + \begin{array}{c}COOH\\|\\COOH\end{array}$

Q



$$R-\overset{O}{\overset{\|}{C}}-H \xrightarrow{[O]} R-\overset{O}{\overset{\|}{C}}-OH$$

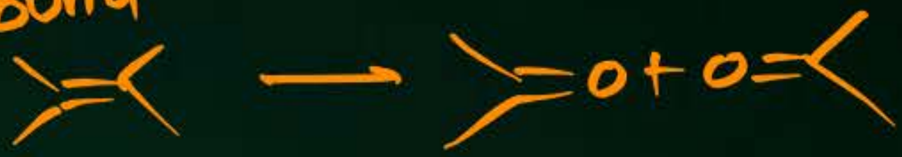
$$H-\overset{O}{\overset{\|}{C}}-H \xrightarrow{2[O]} HO-\overset{O}{\overset{\|}{C}}-OH \rightarrow CO_2+H_2O$$

$$R-\overset{O}{\overset{\|}{C}}-R \xrightarrow{[O]} \times$$

OP Points

1. Used for detection of olefins. ✓
2. ROR α Nucleophilicity of Alkene

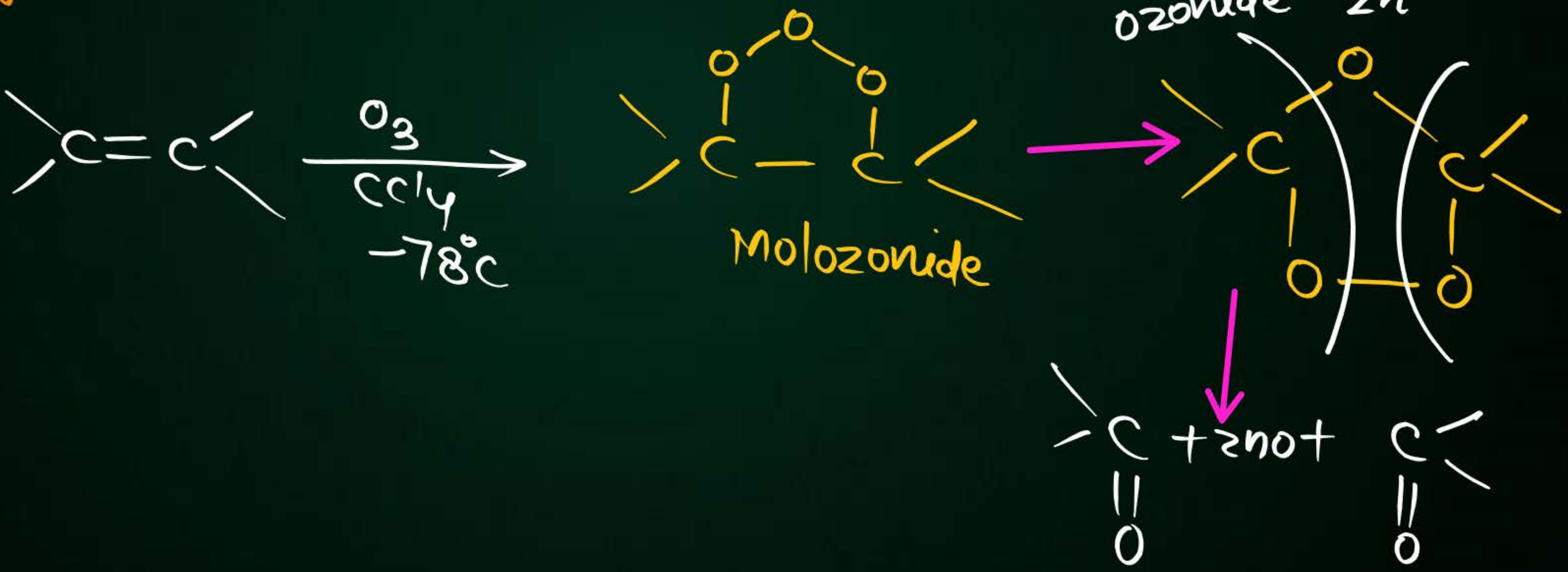
1 double bond → 2 product



α edg

$\alpha \frac{1}{ewg}$ $CH_3-CH=CH-CH_3 > CH_3-CH=CH_2 > CH_2=CH_2$

Mech

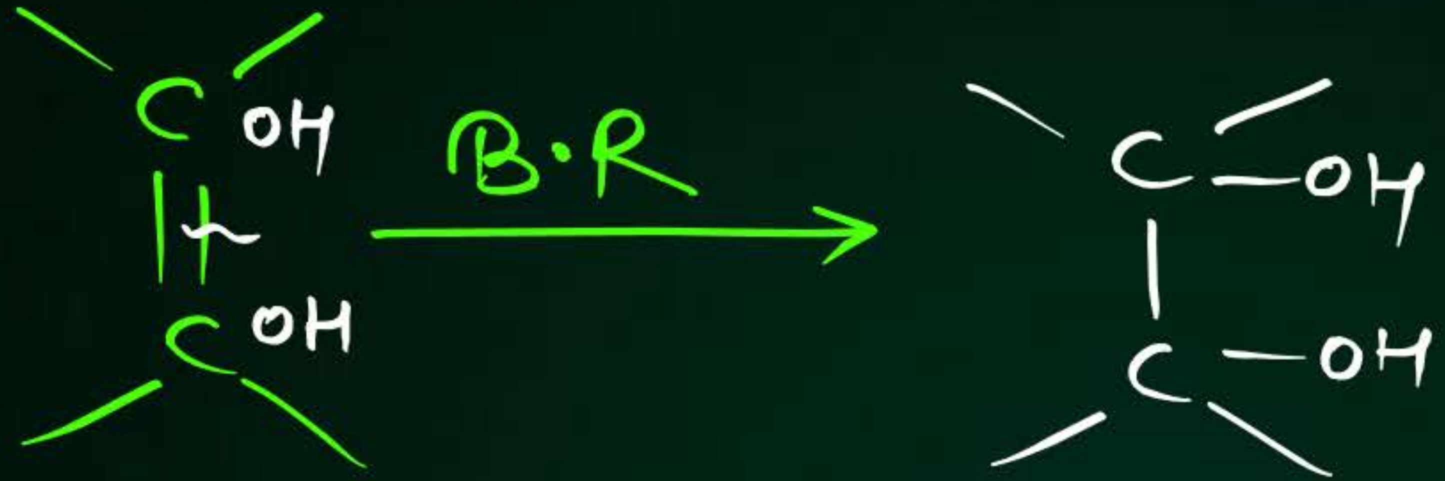


O_3
CCl_4
$-78°C$
Molozonide
ozonide
Zn
+ZnO+

4. Hydroxylation (Baeyer's Reagent):

÷ Syn hydroxylation

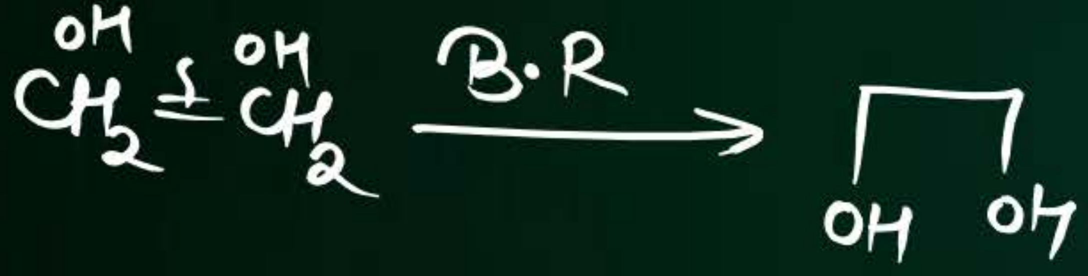
cold dil $KMnO_4$



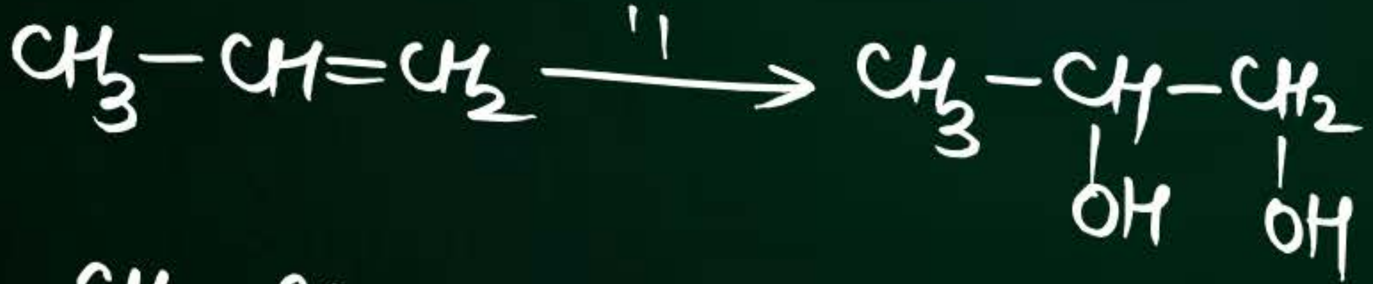
C
OH
C
OH
B·R
C—OH
C—OH

OsO_4/aq $NaHSO_3$
Same as Baeyer's reagent

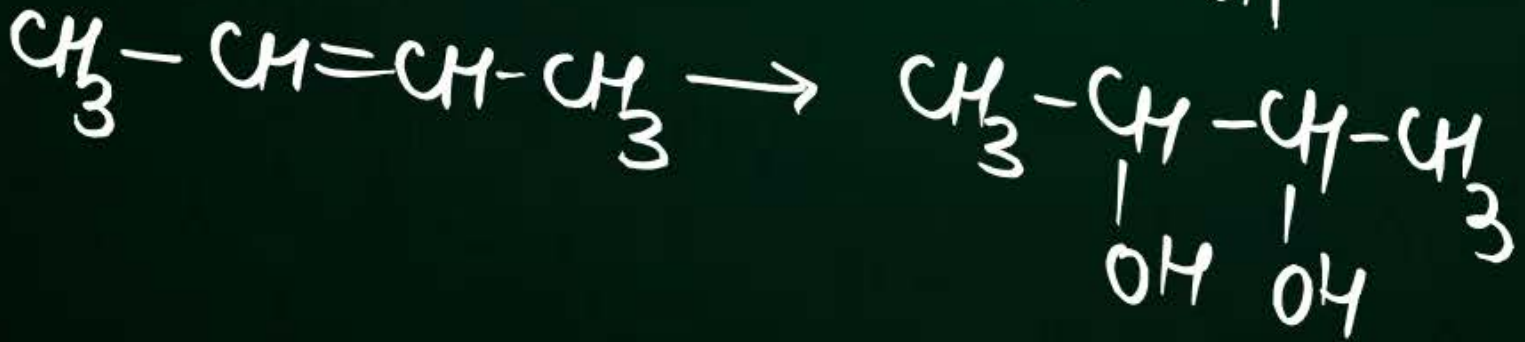
Q 1)


$\overset{OH}{CH_2}=\overset{OH}{CH_2} \xrightarrow{B\cdot R}$

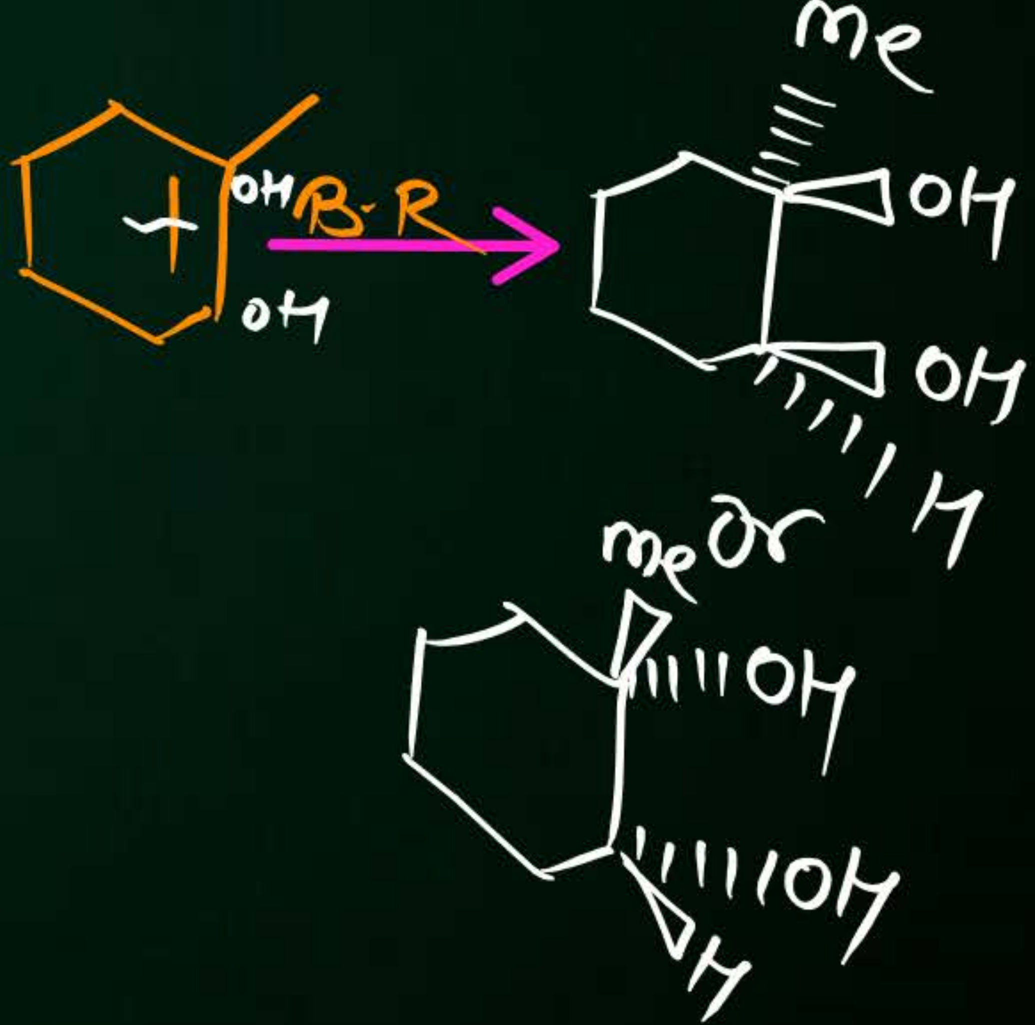
2)


$CH_3-CH=CH_2 \xrightarrow{''} CH_3-\underset{OH}{CH}-\underset{OH}{CH_2}$

3)

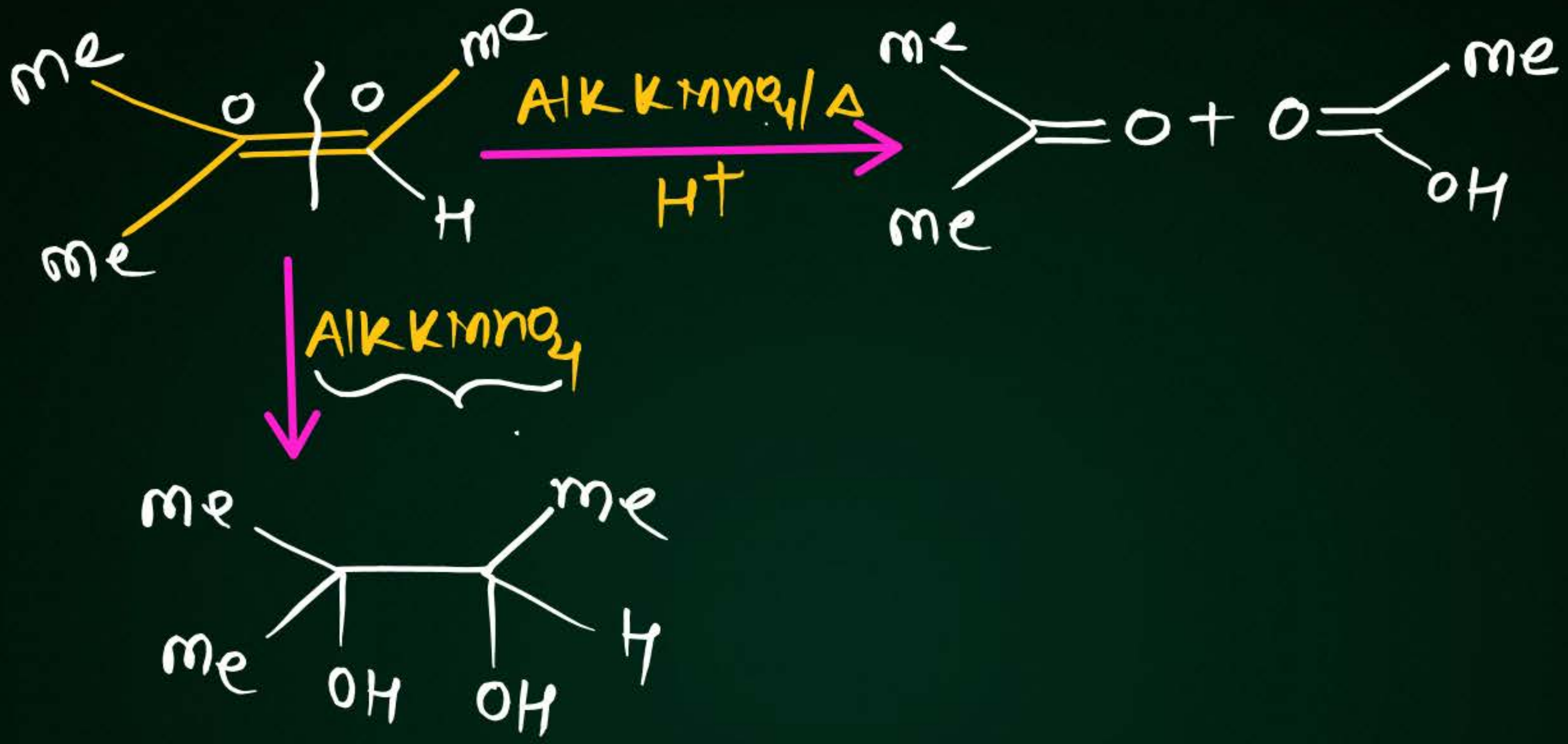

$CH_3-CH=CH-CH_3 \rightarrow CH_3-\underset{OH}{CH}-\underset{OH}{CH}-CH_3$

4)



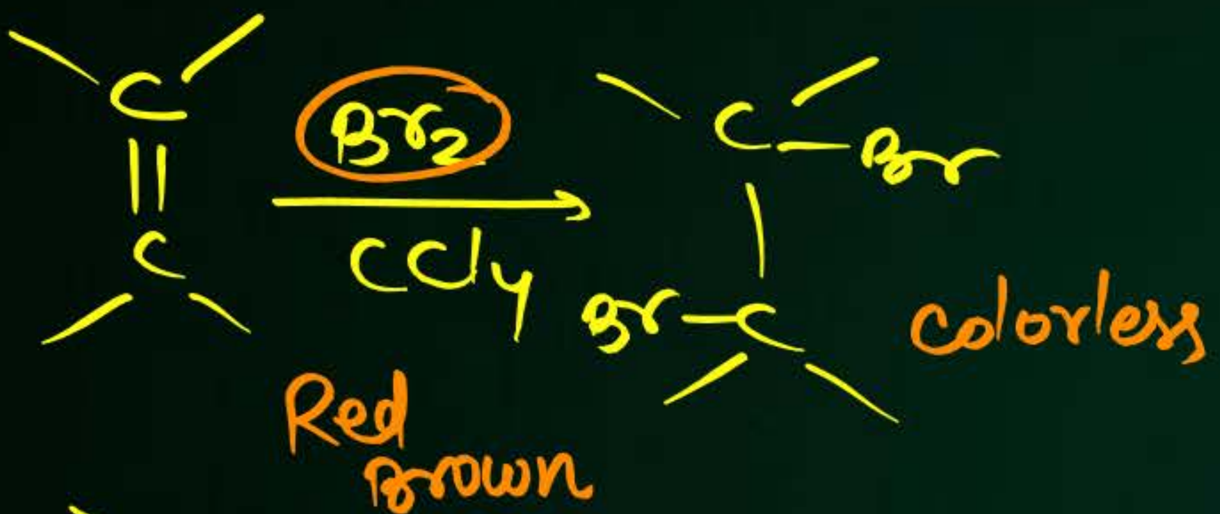
OH
OH
B·R
Me
OH
OH
H
Or
Me
OH
OH
H

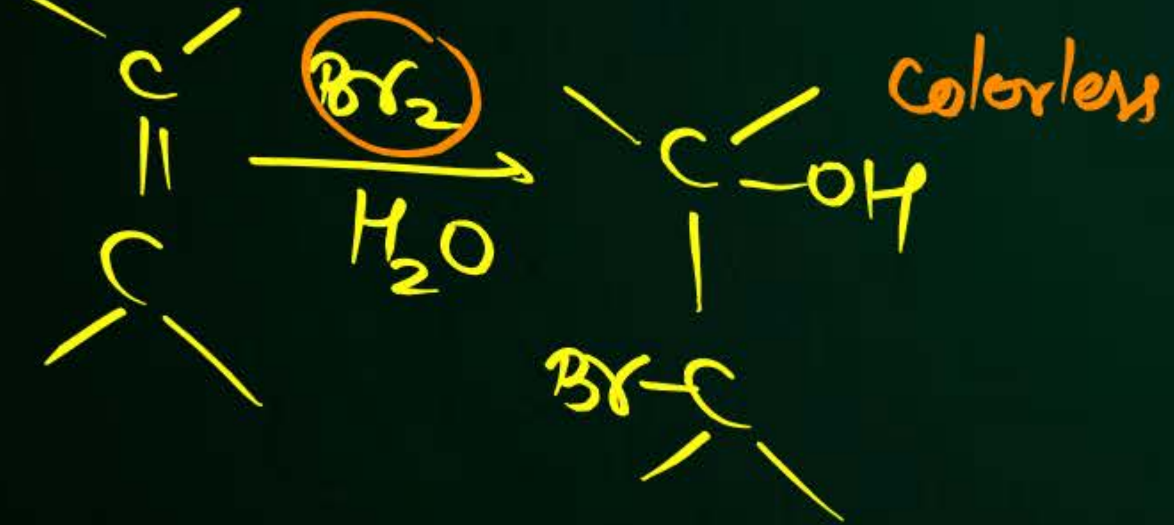
Q/


Me
O
O
Me
Me
H
Alk KMnO4/Δ
H+
Me
O
O
Me
Me
OH
Alk KMnO4
Me
Me
Me
OH
OH
H

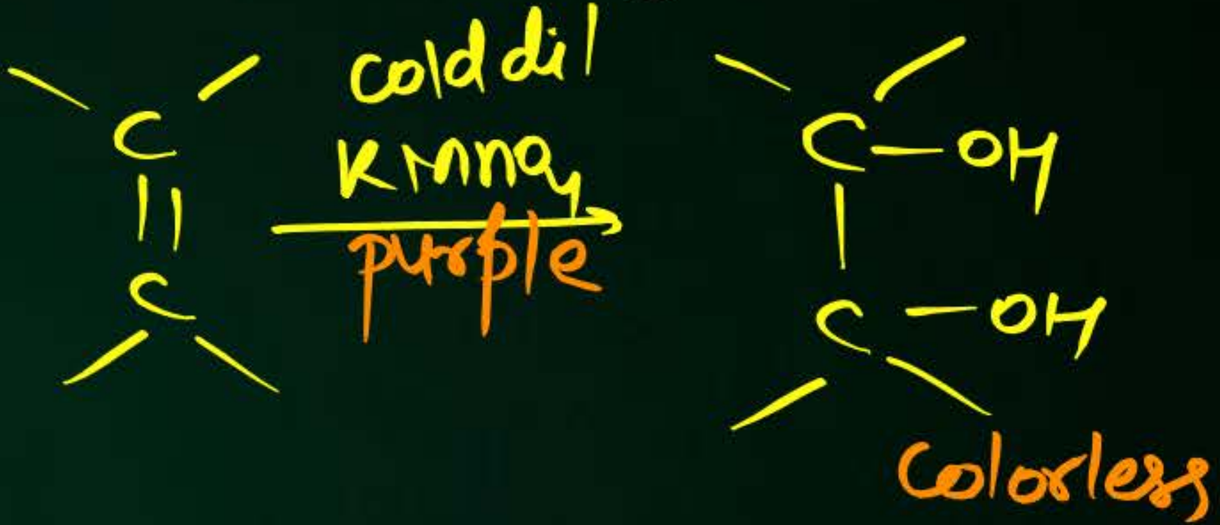
Test for unsaturation

① Br_2 Test


Br_2
CCl_4
Br
Br
colorless
Red
Brown


Br_2
H_2O
OH
Br
Colorless

2) Baeyer's Reagent

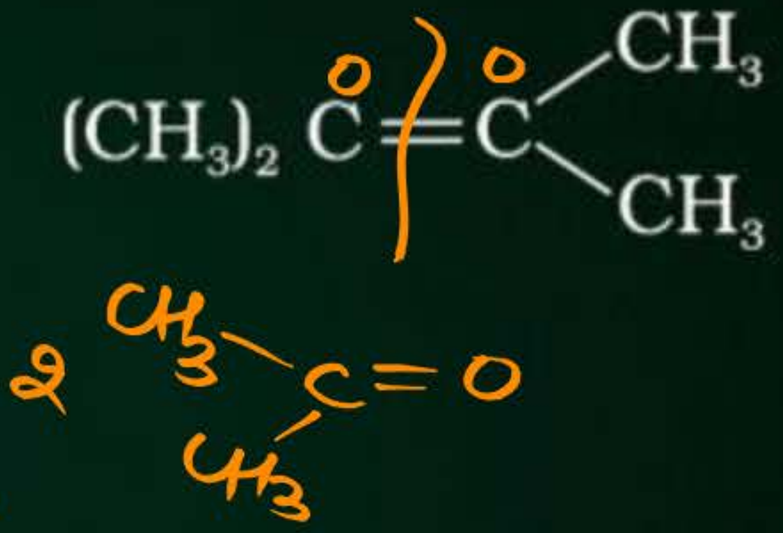

cold dil
$KMnO_4$
purple
OH
OH
Colorless

QUESTION (NCERT Exemplar)

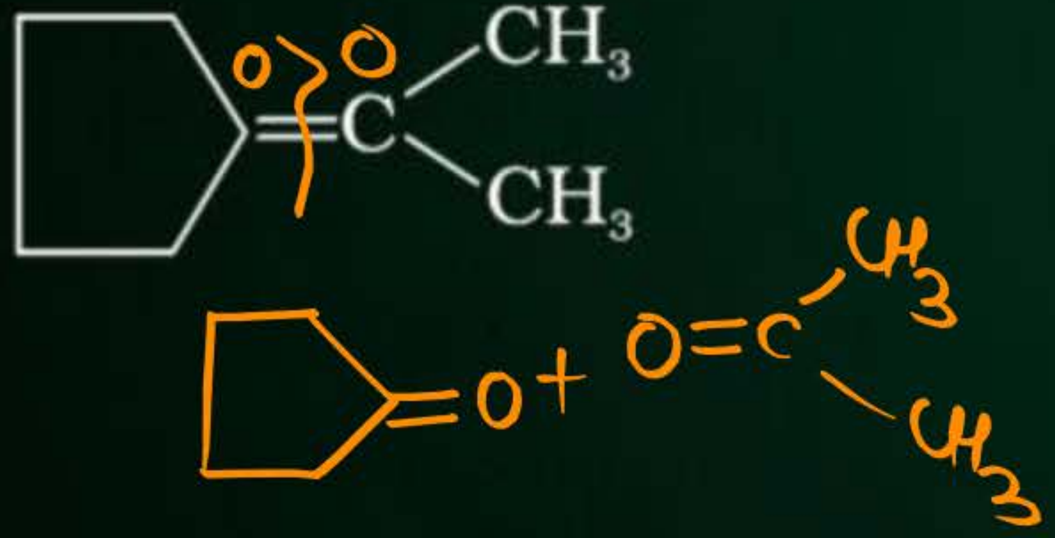
Which of the following alkenes on ozonolysis give a mixture of ketones only?

A $CH_3-CH=CH-CH_3$

2 CH_3CHO

B 

$(CH_3)_2C=C(CH_3)_2$

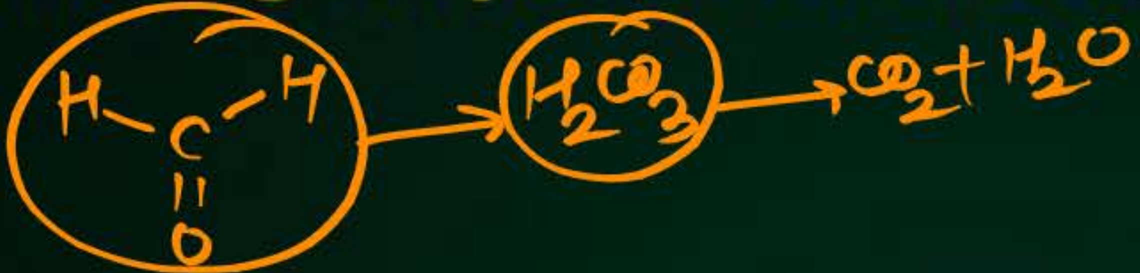
C 

CH_3
C
CH_3
=O+ O=C
CH_3
CH_3

D ✓ Both (B) & (C)

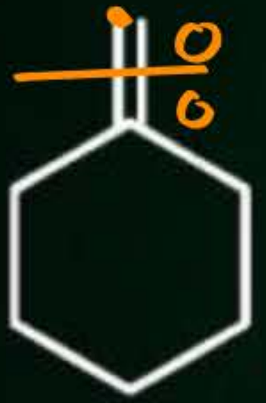
QUESTION

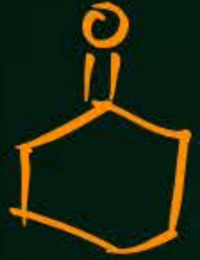
Which of the following compound does not evolve CO_2 gas when undergo oxidative ozonolysis?



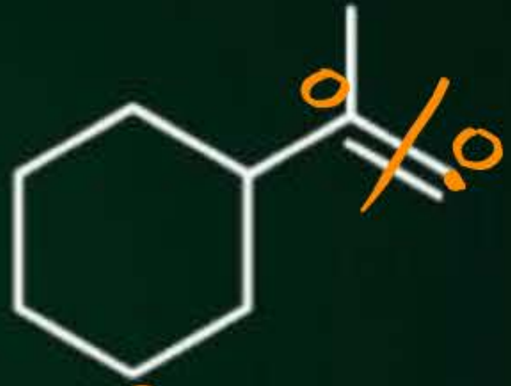
$\rightarrow H_2CO_3 \rightarrow CO_2 + H_2O$

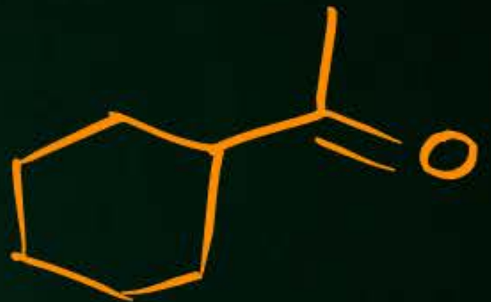
A





B





$\downarrow$
H_2CO_3
$\downarrow$
$CO_2 + H_2O$

C $H_2C=CH-CH=CH_2$

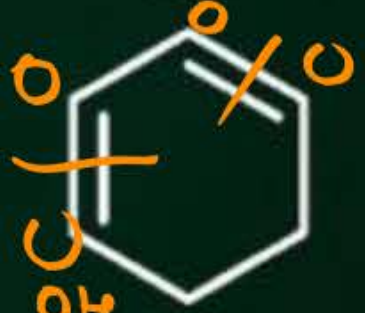
$CO_2 + H_2O$

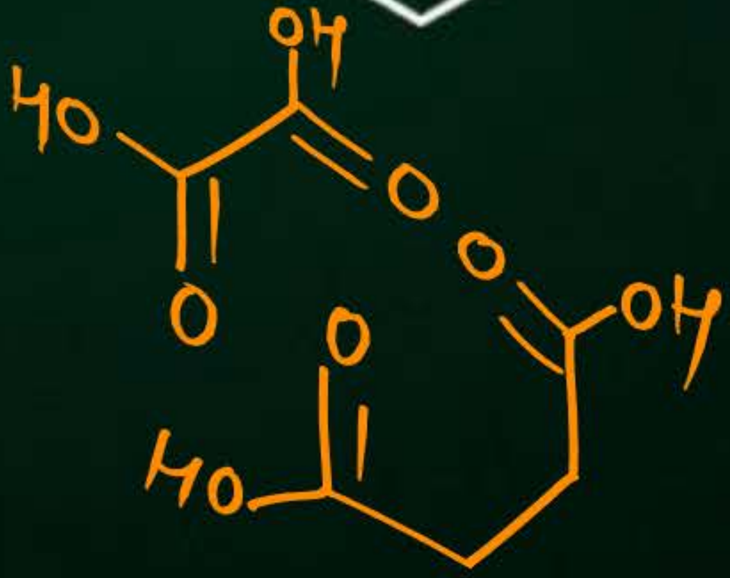
CHO
|
CHO

→

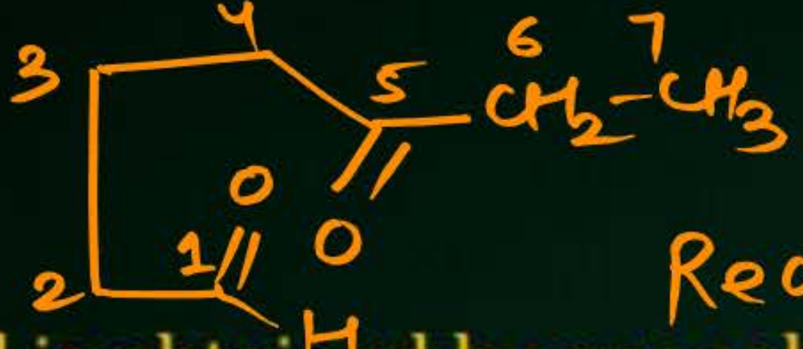
COOH
|
COOH

D ✓

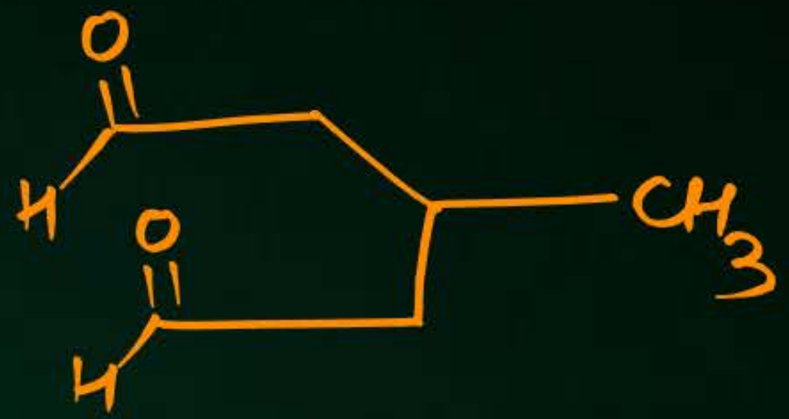




QUESTION

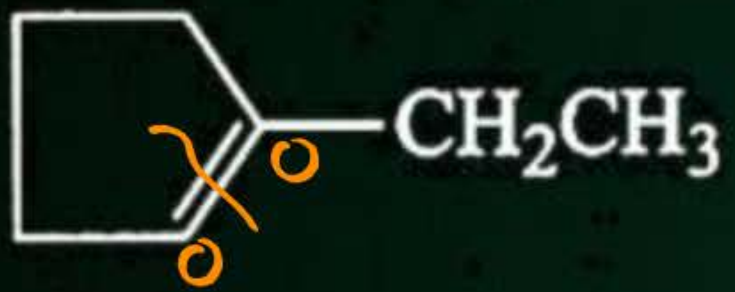

3
4
5
6
7
CH_2-CH_3
O
1
O
2
H

Red



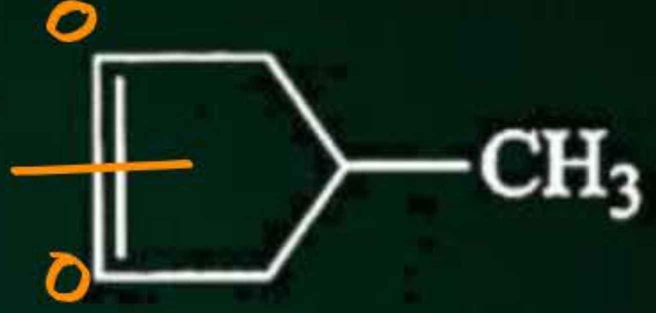
5-Oxohexanal is obtained by ozonolysis of:

A



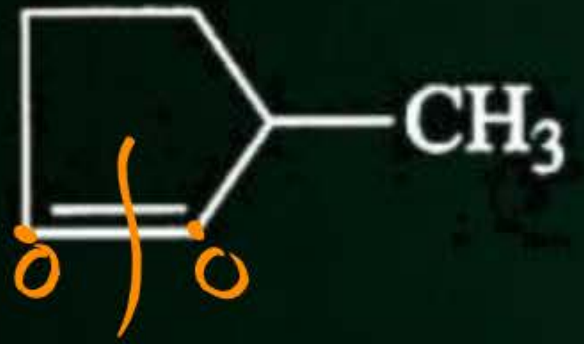
☐

B



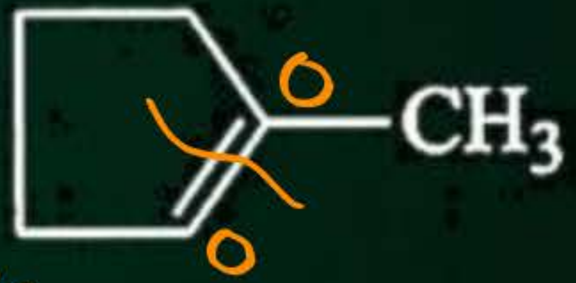
☐

C

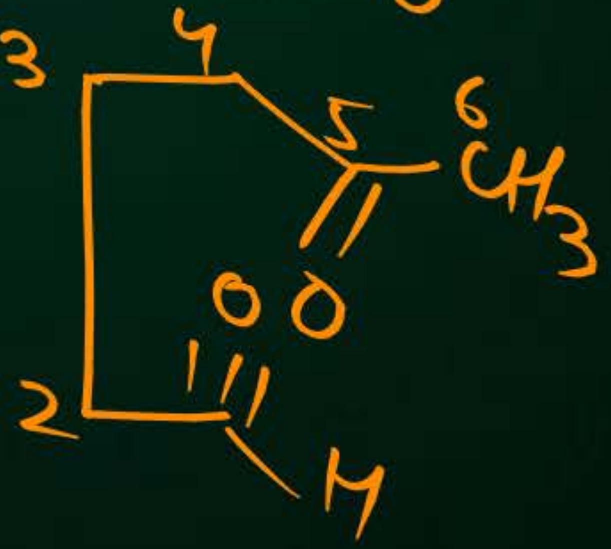


☐

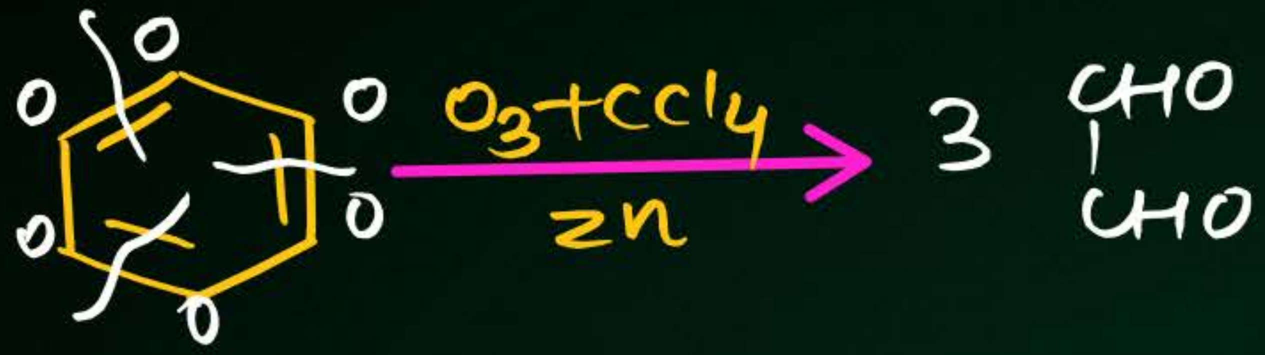
D



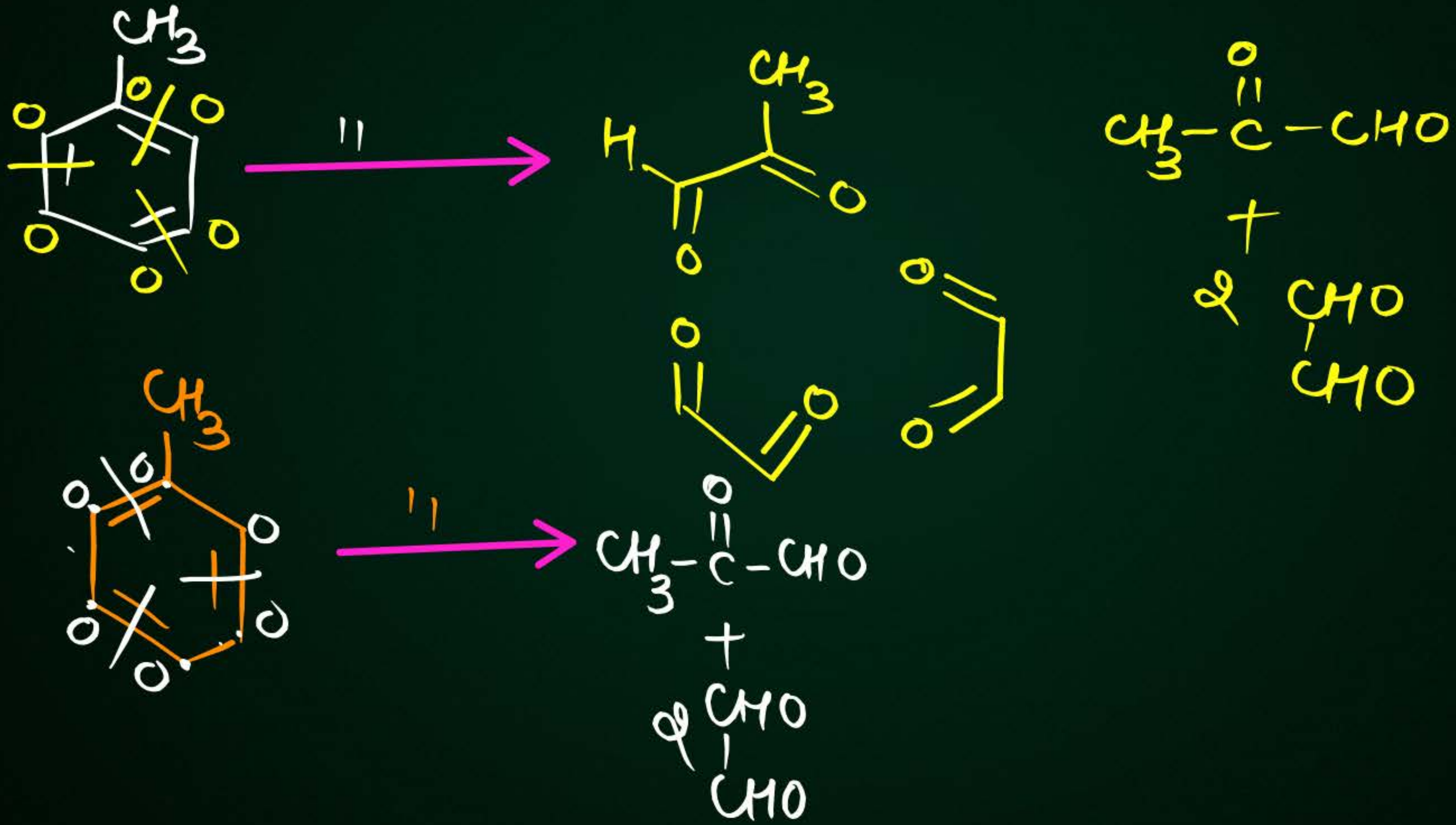
☐


3
4
5
6
CH_3
O
O
1
2
H

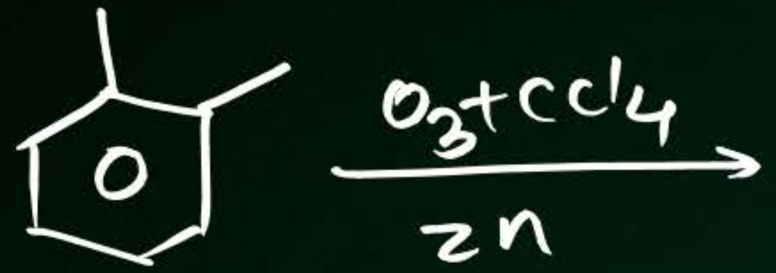
Q.


O
O
O
O
O
O
O_3+CCl_4
Zn
3 CHO
CHO

Q.

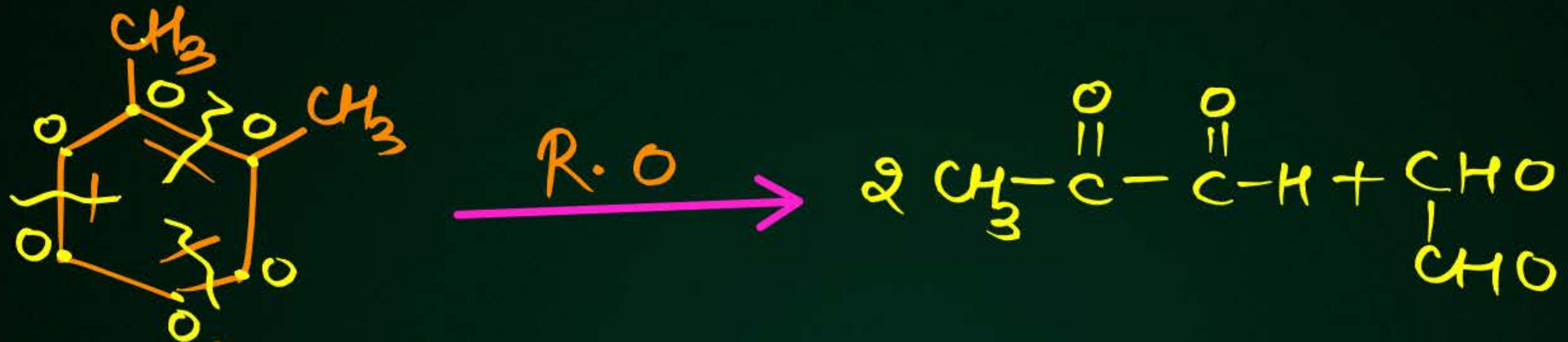

CH3
O
O
O
O
O
O
"
H
CH3
O
O
O
O
O
O
O
$CH_3-\overset{O}{\overset{\|}{C}}-CHO$
+
2 CHO
CHO
CH3
O
O
O
O
O
O
"
$CH_3-\overset{O}{\overset{\|}{C}}-CHO$
+
2 CHO
CHO

Q.

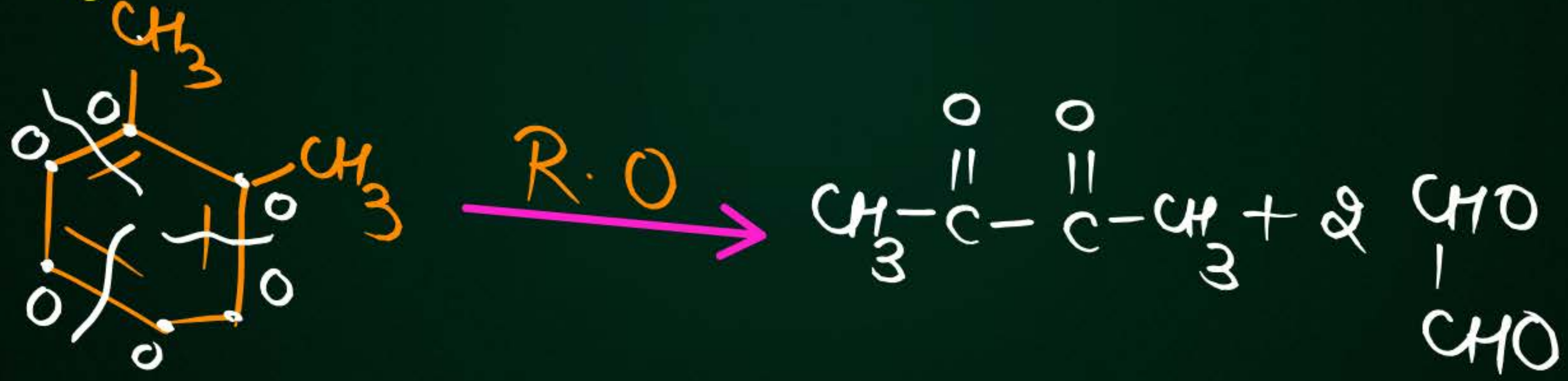


Total types of products ?

Ans ③

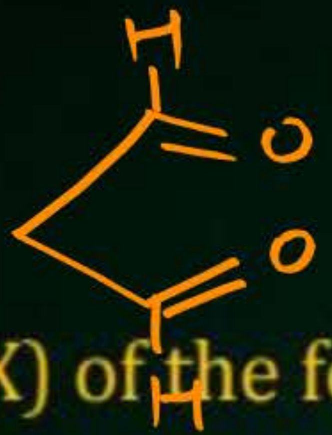

CH3
O
O
CH3
O
O
O
O
R.O

$$2\,CH_3-\overset{\overset{O}{\|}}{C}-\overset{\overset{O}{\|}}{C}-H+\begin{matrix}CHO\\|\\CHO\end{matrix}$$

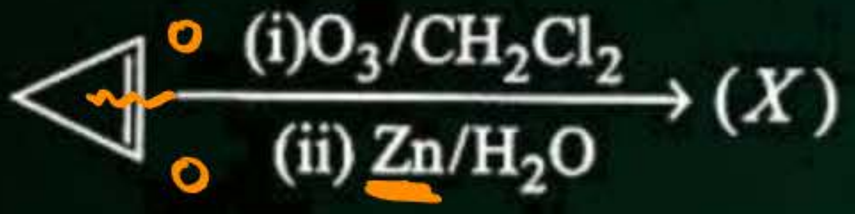

CH3
O
O
CH3
O
O
O
O
R.O

$$CH_3-\overset{\overset{O}{\|}}{C}-\overset{\overset{O}{\|}}{C}-CH_3+2\begin{matrix}CHO\\|\\CHO\end{matrix}$$

QUESTION



Final product (X) of the following reaction is:


O
O
(i)O_3/CH_2Cl_2
(ii) Zn/H_2O
(X)

- **A** methanal
- **B** propane-1, 3-dioic acid
- **C** ethanal
- [✓ **D**] propane-1, 3-dial

QUESTION

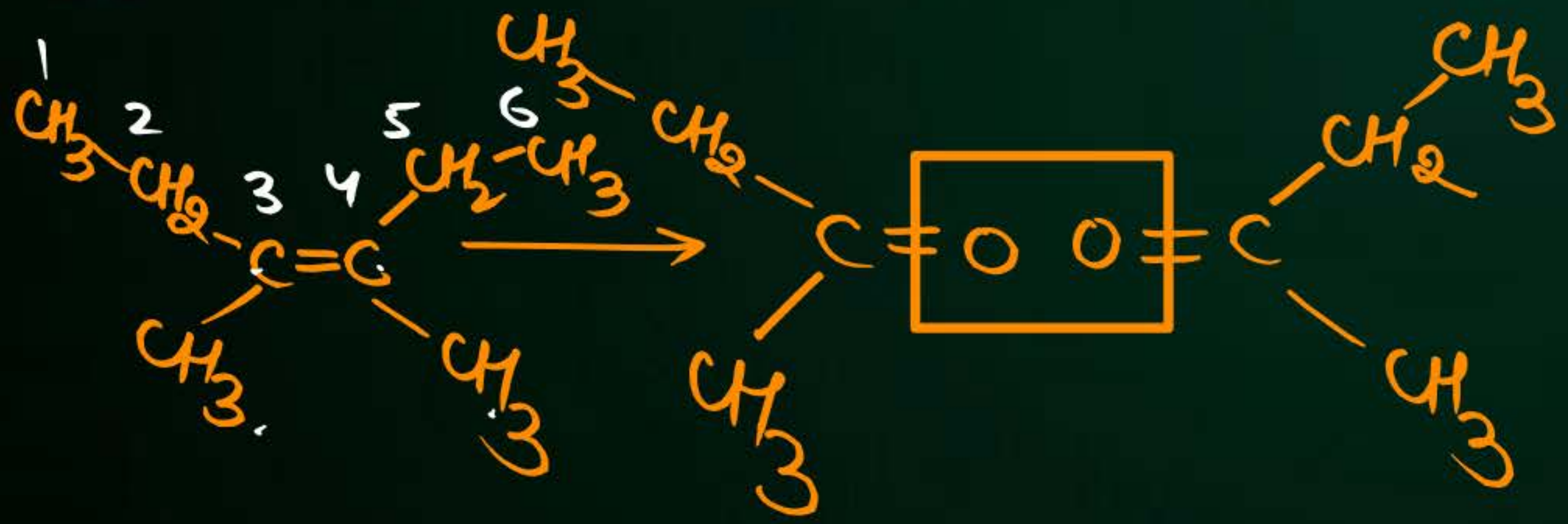
One mole of alkene on ozonolysis gives 2 moles of butanone. The alkene is:

A 3, 4-dimethylhex-2-ene

B 2, 3-dimethylhex-3-ene

C 2, 3-dimethylhex-2-ene

[✓ D] 3, 4-dimethylhex-3-ene


1
2
3
4
5
6
CH3
CH2
C=C
CH2-CH3
CH3
CH3
CH3
CH2
C=O
O=C
CH2
CH3
CH3
CH3

QUESTION

One mole of an unsaturated hydrocarbon on ozonolysis gives one mole each of CH_3CHO, $HCHO$ and $OHC-CHO$. The hydrocarbon is:

Ⓐ $CH_3CH_2-\overset{O}{C}\equiv\overset{O}{C}-CH_3$ $CH_3-CH_2-\overset{\overset{O}{\|}}{C}-\overset{\overset{O}{\|}}{C}-CH_3$

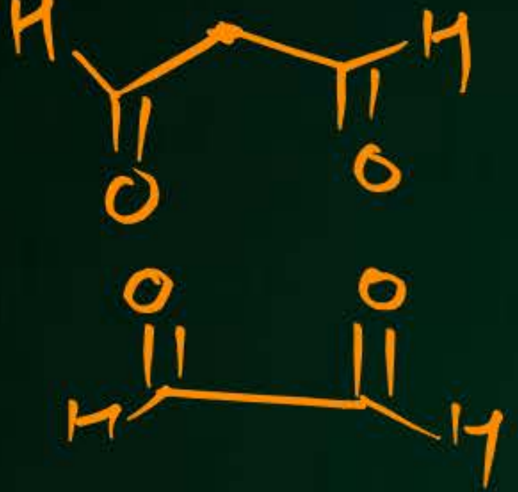
Ⓑ $H\overset{O}{C}\equiv\overset{O}{C}-CH_2CH_2CH_3$ $H-\overset{\overset{O}{\|}}{C}-\overset{\overset{O}{\|}}{C}-CH_2CH_2CH_3$

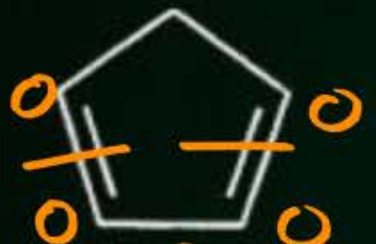
Ⓒ ✓ $CH_3\overset{O}{C}H = \overset{O}{C}H\overset{O}{C}H = \overset{O}{C}H_2$

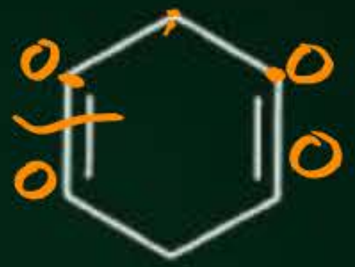
Ⓓ $H_2\underset{O}{C}=\underset{O}{C}H-CH_2-\underset{O}{C}H=\underset{O}{C}H_2$

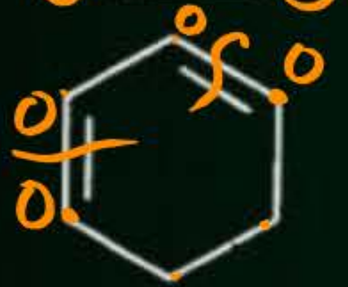
QUESTION

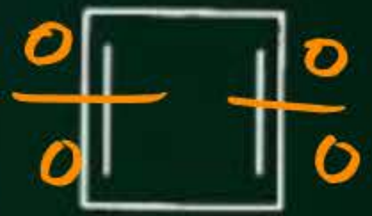
Ozonolysis products of an olefin are OHC–CHO and $\underline{OHC}-\underbrace{CH_2-CH_2}-\underline{CHO}$, the olefin is:



A 

B 

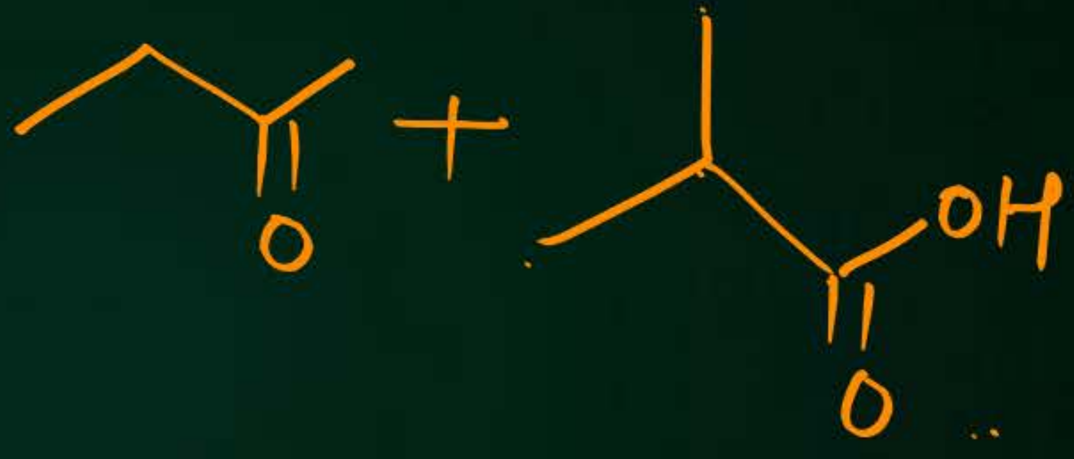
C 

D 

QUESTION

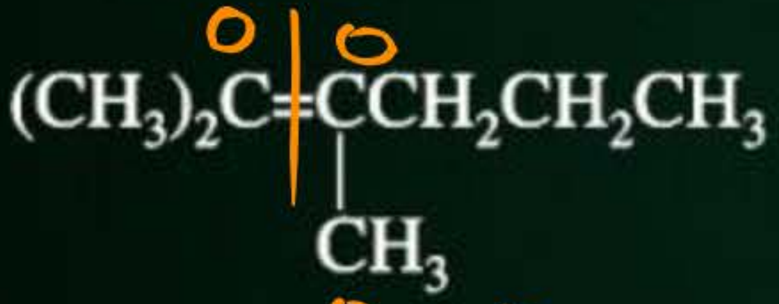
Same as oxidative ozono

A hydrocarbon C_8H_{16} on oxidation with a $\underbrace{\text{hot acidified solution of KMnO}}$$_4$ forms 2-butanone and isobutyric acid. The hydrocarbon is:



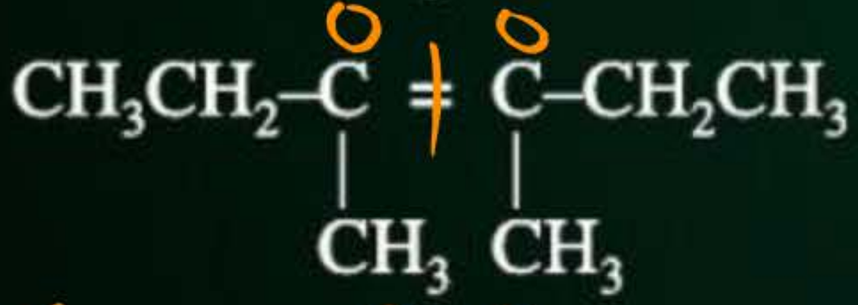
A $(CH_3)_2\overset{O}{C}=\overset{O}{C}(CH_2CH_3)_2$

B



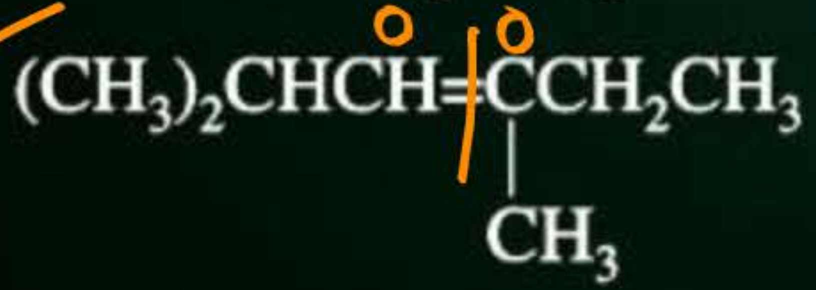
$(CH_3)_2\overset{O}{C}=\overset{O}{\underset{\displaystyle CH_3}{C}}CH_2CH_2CH_3$

C



$CH_3CH_2-\overset{O}{\underset{\displaystyle CH_3}{C}}=\overset{O}{\underset{\displaystyle CH_3}{C}}-CH_2CH_3$

D ✓



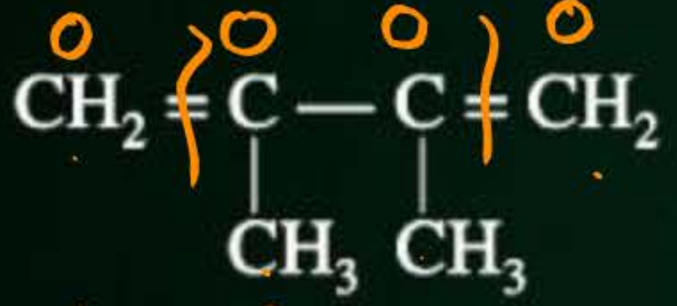
$(CH_3)_2CH\overset{O}{C}H=\overset{O}{\underset{\displaystyle CH_3}{C}}CH_2CH_3$

QUESTION

$1\ \begin{matrix} CHO \\ | \\ CHO \end{matrix} + 2\ HCHO$

One mole of a hydrocarbon on ozonolysis yields one mole of glyoxal and two moles of formaldehyde. The hydrocarbon is:

A ×



$\overset{O}{CH_2} \mid = \overset{O}{\underset{CH_3}{C}} - \overset{O}{\underset{CH_3}{C}} = \mid \overset{O}{CH_2}$

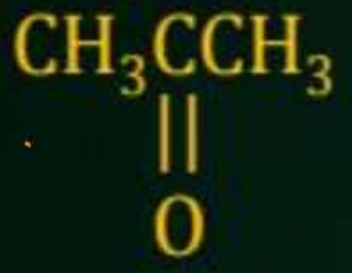
✓ **B** $\underline{\overset{O}{CH_2}} \mid = \underbrace{\overset{O}{CH} - \overset{O}{CH}} = \mid \underline{\underline{\overset{O}{CH_2}}}$

C $\underline{\underline{\overset{O}{CH_2}}} \mid = \underbrace{\overset{O}{CH} - CH_2 - \overset{O}{CH}} = \mid \underline{\overset{O}{CH_2}}$

D $CH_3\overset{O}{CH} = \mid \overset{OO}{C} = \mid \overset{O}{CH_2}$

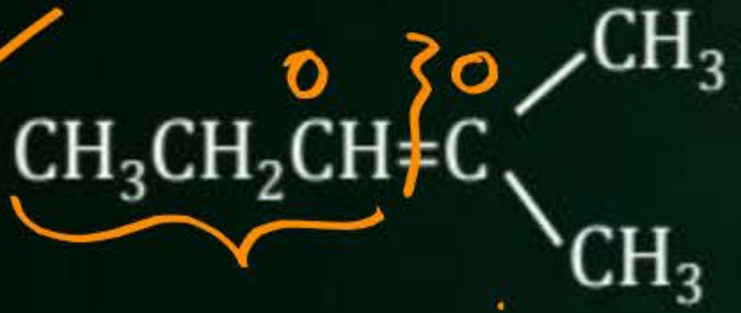
QUESTION

Which alkene on ozonolysis gives $\underline{CH_3CH_2CHO}$ and CH_3CCH_3



$CH_3\underset{\underset{O}{\|}}{C}CH_3$

[✓ A]

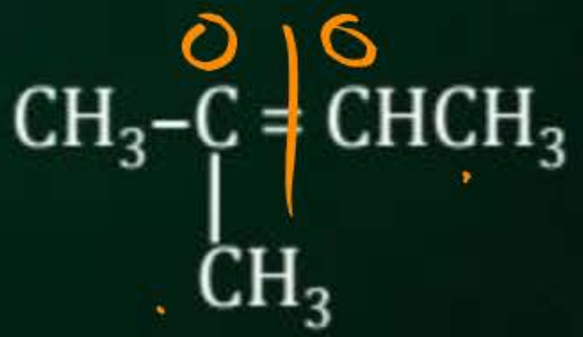


$\underbrace{CH_3CH_2\overset{O}{C}H}=\overset{O}{C}(CH_3)_2$

B $\underline{CH_3CH_2\overset{O}{C}H} = \underline{\overset{O}{C}HCH_2CH_3}$

C $\underline{CH_3CH_2\overset{O}{C}H} = \underline{\overset{O}{C}HCH_3}$

D



$CH_3-\underset{\underset{CH_3}{|}}{\overset{O}{C}}=\overset{O}{C}HCH_3$

QUESTION

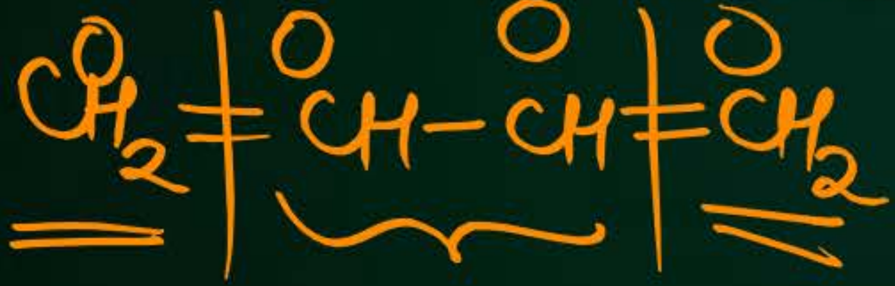
Ozonolysis of buta-1,3-diene gives:

[✓ A] HCHO and glyoxal

B $\underline{CH_3CHO}$ and $\underline{\text{glyoxal}}$

C CO_2 and glyoxal

D HCHO + glyoxal + CH_3CHO

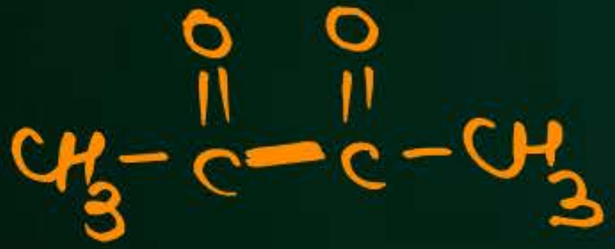


$$\underline{\underline{\overset{O}{CH_2}}} \,\Big|\!= \underbrace{\overset{O}{CH}-\overset{O}{CH}} =\!\Big|\, \underline{\underline{\overset{O}{CH_2}}}$$

QUESTION

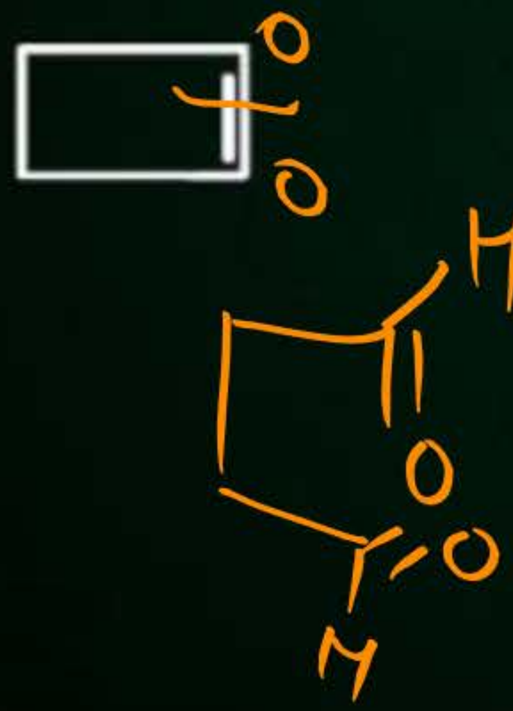
An organic compound C_4H_6 on ozonolysis give HCHO, CO_2, CH_3CHO. Compound will be:

- (A) ✗ $H_2\overset{O}{C}=\overset{O}{C}H-\overset{O}{C}H=\overset{O}{C}H_2$
- (B) ✓ $CH_3-\overset{O}{C}H=\overset{OO}{C}=\overset{O}{C}H_2$
- (C) $CH_3-\overset{O}{C}\equiv\overset{O}{C}-CH_3 \longrightarrow$



$CH_3-\overset{\overset{O}{\parallel}}{C}-\overset{\overset{O}{\parallel}}{C}-CH_3$

- (D)



Home Work

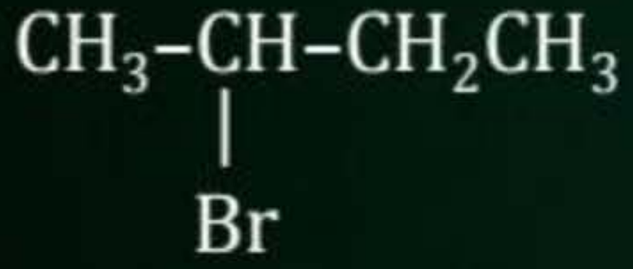
QUESTION 01

3-phenyl propene on reaction with HBr in presence of benzoyl peroxide gives (major product)

A $C_6H_5CH_2CH(Br)CH_3$

B $C_6H_5CH_2CH_2Br$

C



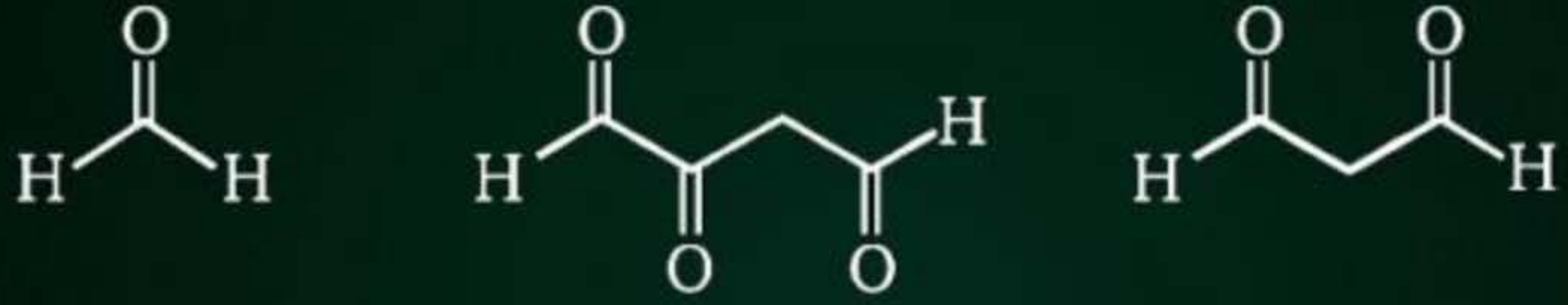
$CH_3-\underset{\underset{Br}{|}}{C}H-CH_2CH_3$

D $C_6H_5-CH_2CH_2CH_2Br$

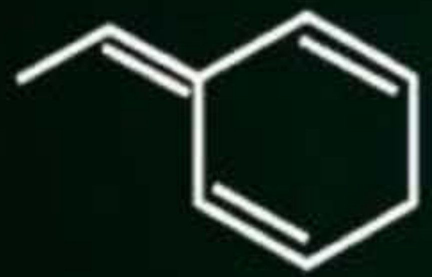
QUESTION 02

A triene is treated with ozone followed by zinc in acetic acid to give the following three products. What is the structure of the triene?

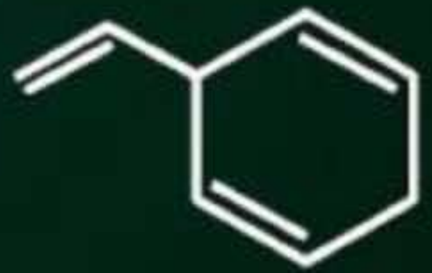
Products =



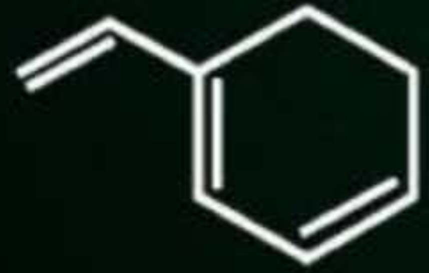
A



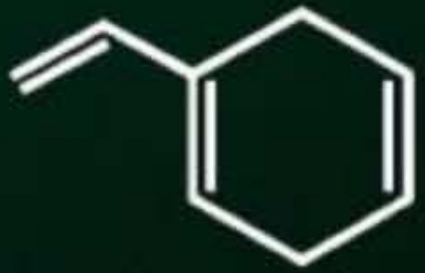
B



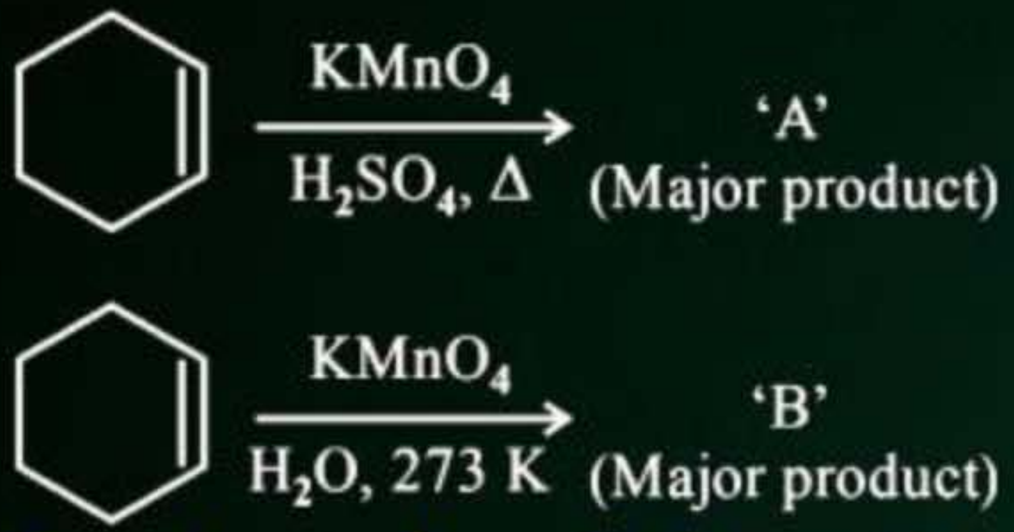
C



D



QUESTION 03


$\xrightarrow[H_2SO_4,\ \Delta]{KMnO_4}$
'A'
(Major product)
$\xrightarrow[H_2O,\ 273\ K]{KMnO_4}$
'B'
(Major product)

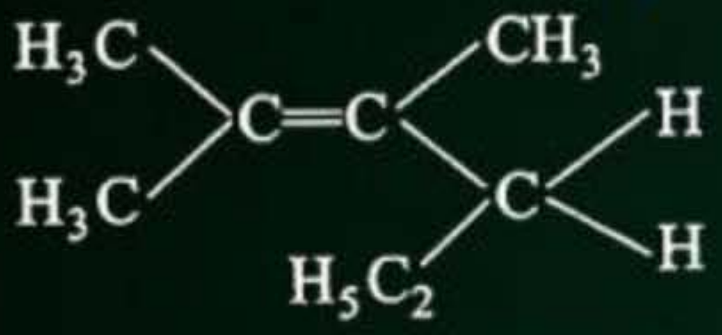
For above chemical reactions, identify the correct statement from the following.

- **A** Compound 'A' is diol and compound 'B' is dicarboxylic acid.
- **B** Both compound 'A' and compound 'B' as dicarboxylic acids.
- **C** Compound 'A' is dicarboxylic acid and compound 'B' is diol.
- **D** Both compound 'A' and compound 'B' are diol.

QUESTION 04

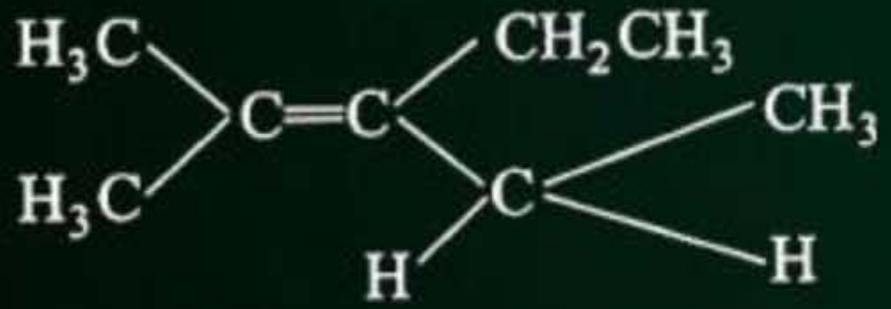
An optically active compound having molecular formula C_8H_{16} on ozonolysis gives acetone as one of the products. The structure of the compound is:

A



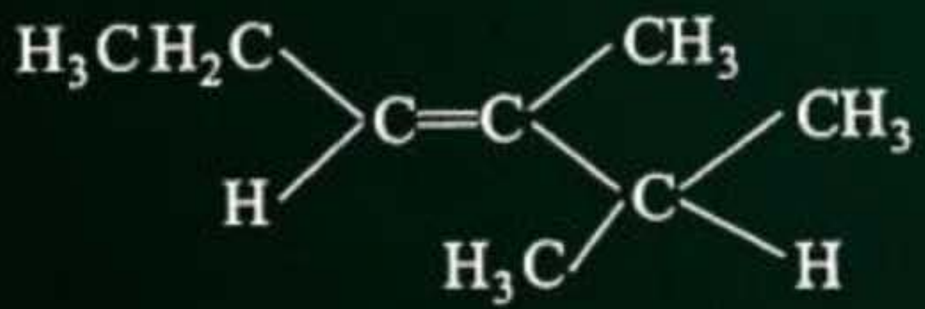
H₃C
H₃C
C=C
CH₃
H
C
H
H₅C₂

B



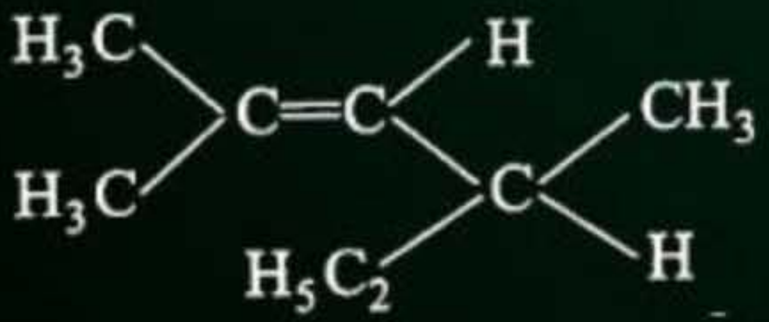
H₃C
H₃C
C=C
CH₂CH₃
CH₃
C
H
H

C



H₃CH₂C
H
C=C
CH₃
CH₃
C
H₃C
H

D



H₃C
H₃C
C=C
H
CH₃
C
H₅C₂
H

QUESTION 05

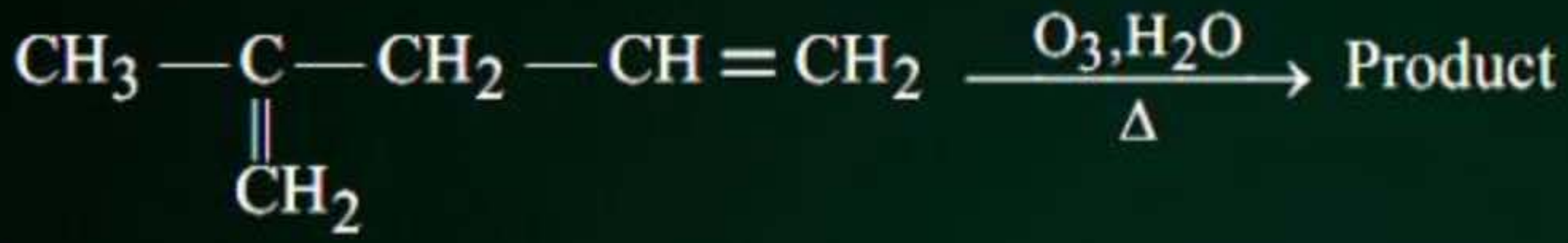
$$CH_3CH_2{-}CH{=}CH_2 + HBr \xrightarrow{ROOR} \underset{\text{Major}}{[X]} + \underset{\text{Minor}}{[Y]}$$

[X] and [Y] respectively are:

- A $BrCH_2CH_2CH = CH_2$ and $C_2H_5 - CHBr - CH_3$
- B $C_2H_5 - CH_2CH_2 - Br$ and $Br - CH_2CH_2 - CH = CH_2$
- C $C_2H_5 - CH_2 - CH_2Br$ and $C_2H_5 - CHBr - CH_3$
- D $C_2H_5CHBr - CH_3$ and $C_2H_5 - CH_2 - CH_2Br$

QUESTION 06

Which product will not form in the following reaction?



$$CH_3-\underset{\underset{CH_2}{\|}}{C}-CH_2-CH=CH_2 \xrightarrow[\Delta]{O_3,H_2O} \text{Product}$$

A HCOOH

B CH_3COCH_2COOH

C Me_2CO

D All are possible

QUESTION 07

Products of the following reaction

$Me_2C = CHCH_3 \xrightarrow[\text{(ii) } (CH_3)_2S]{(i) O_3}$? are

A $CH_3CHO + CH_3COOH$

B $Me_2CO + CH_3CHO$

C $Me_2CO + CH_3COOH$

D $2\ Me_2CO$

QUESTION 08

Unbranched alkenes on ozonolysis give

(A) Only ketone

(B) Only aldehydes

(C) Aldehydes & ketone

(D) All of the above

QUESTION 09

Ethylene reacts with Baeyer's reagent to give

A ethane

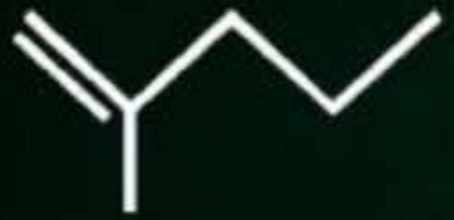
B ethyl alcohol

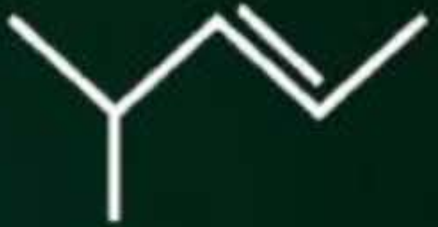
C ethylene glycol

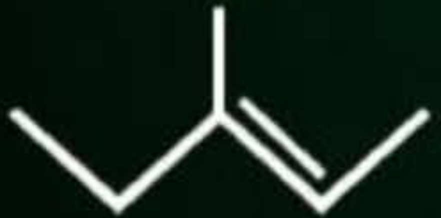
D None of these

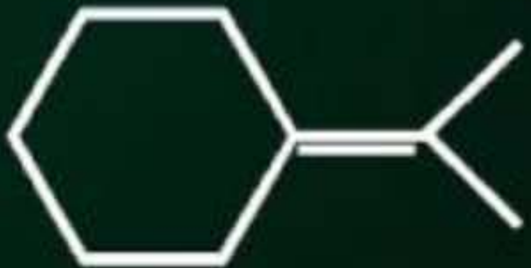
QUESTION 10

Which one of the following compound gives acetone $(CH_3)_2C=O$ as one of the product of its ozonolysis?

Ⓐ


Ⓑ


Ⓒ


Ⓓ


QUESTION 11

Addition of HCl to propene in presence of peroxides gives

Ⓐ 1-Chloropropane

Ⓑ 2-Chloropropane

Ⓒ 3-Chloropropane

Ⓓ Propene dichloride

ANSWER KEY

1. D
2. D
3. C
4. D
5. C
6. C
7. B
8. B
9. C
10. D
11. B

Home Work From PW Module (Yakeen NEET)

Prarambh: Q 50, 51, 52, 67, 68, 69, 74, 75, 81, 82, 88

Prabal: Q 14

MARK THE DATE 4th May, 2025

Only 04 Months left for the NEET

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Thank you "

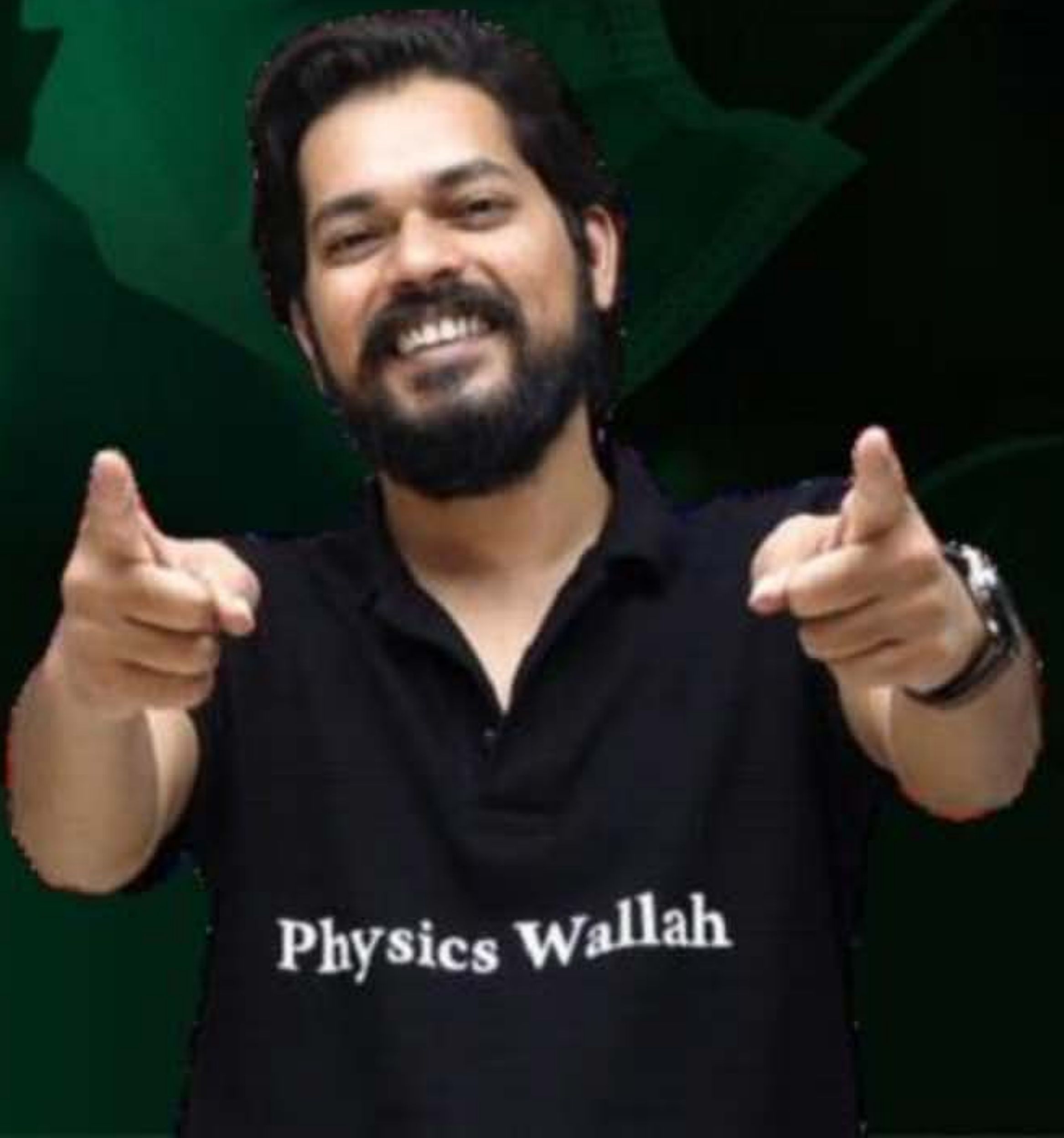
YAKEEN 2.0

FOR NEET 2025

Lecture- 09 Organic Chemistry

HYDROCARBONS

By- Pankaj Sir(POPU MAMA)


Physics Wallah

Topics *to be covered*

1. Methods of Preparation of Alkynes ✓
2. Chemical Properties of Alkynes ✓
3. Practice

Methods of Preparation of Alkynes

1. From calcium carbide:

quicklime

$$\underset{\text{lime stone}}{CaCO_3} \xrightarrow{\Delta} \underset{+\ CO_2}{CaO} \xrightarrow[-CO]{+coke}$$

✓ 1) $CaC_2 \xrightarrow[H^+ \bar{O}H]{H_2O} Ca(OH)_2 + \underset{\text{(Ethyne)}}{\overset{\text{(Acetylene)}}{CH \equiv CH}}$

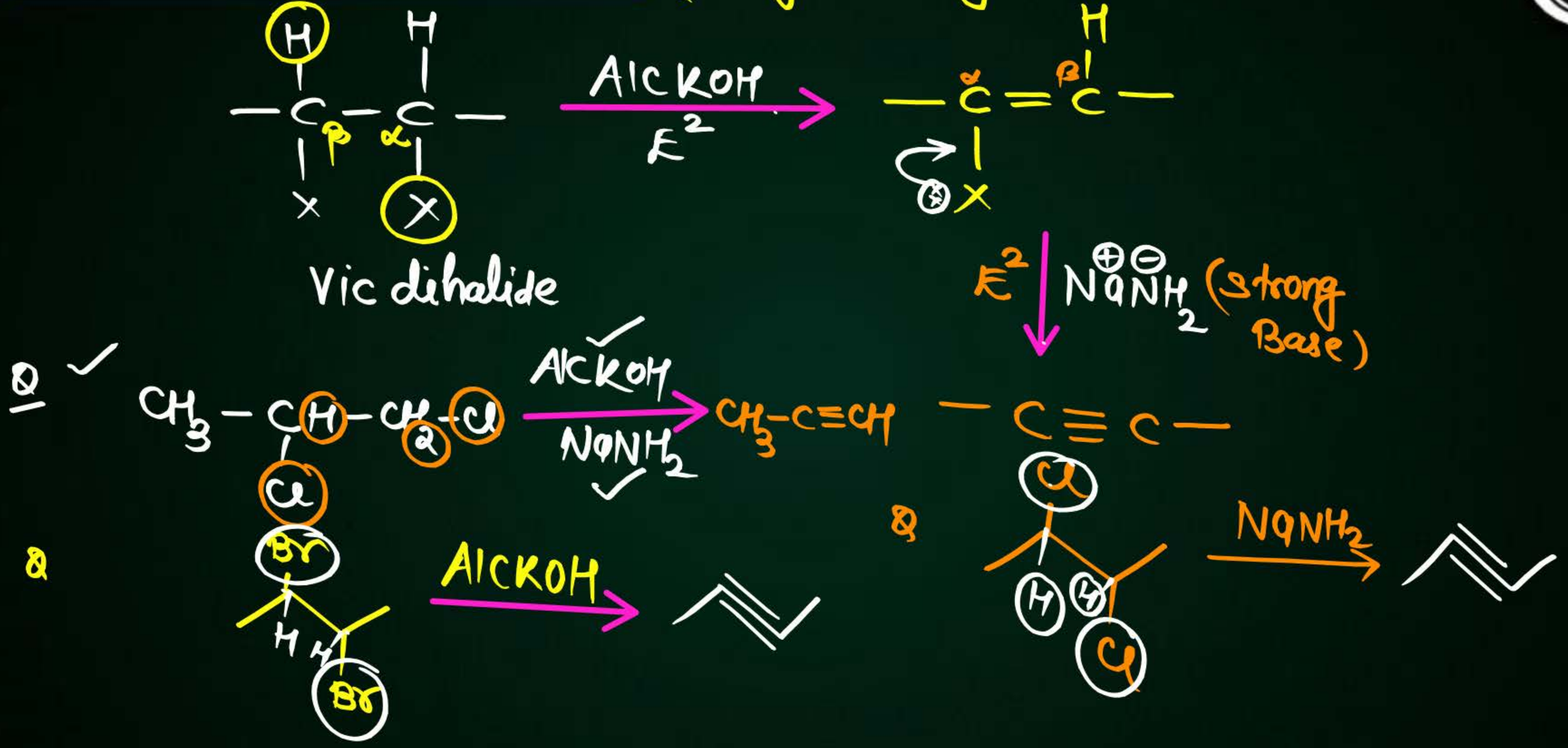
Ca^{2+}

$^{-}C \equiv C^{-}$

✓ 2) $Mg_2C_3 \xrightarrow{H_2O} \overset{\text{Propyne}}{CH_3-C \equiv CH} + 2Mg(OH)_2$

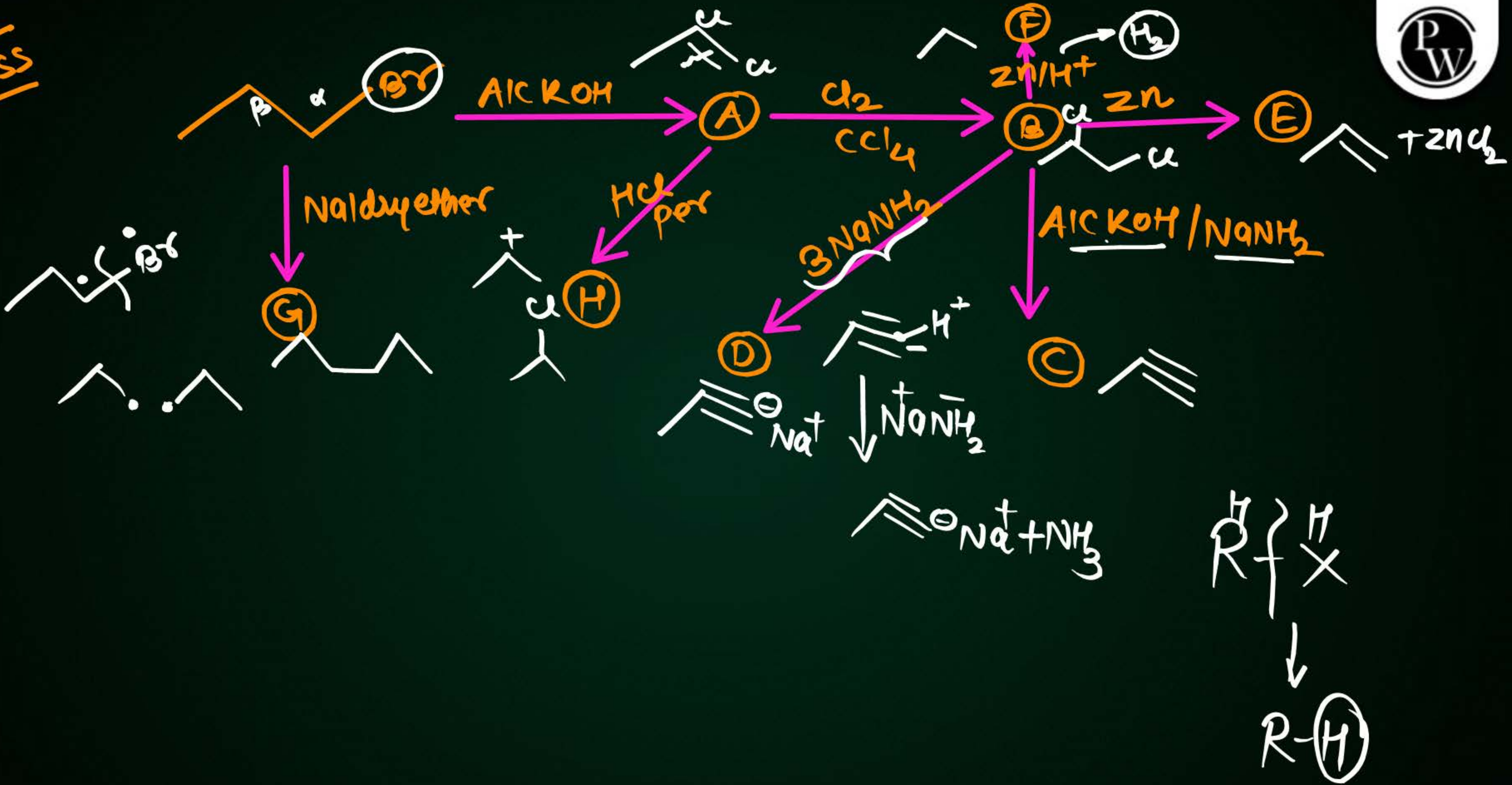
$2Mg^{2+} + \overset{3-}{C}-C \equiv \bar{C}$

2. From vicinal dihalides: (Dehydrohalogenation)



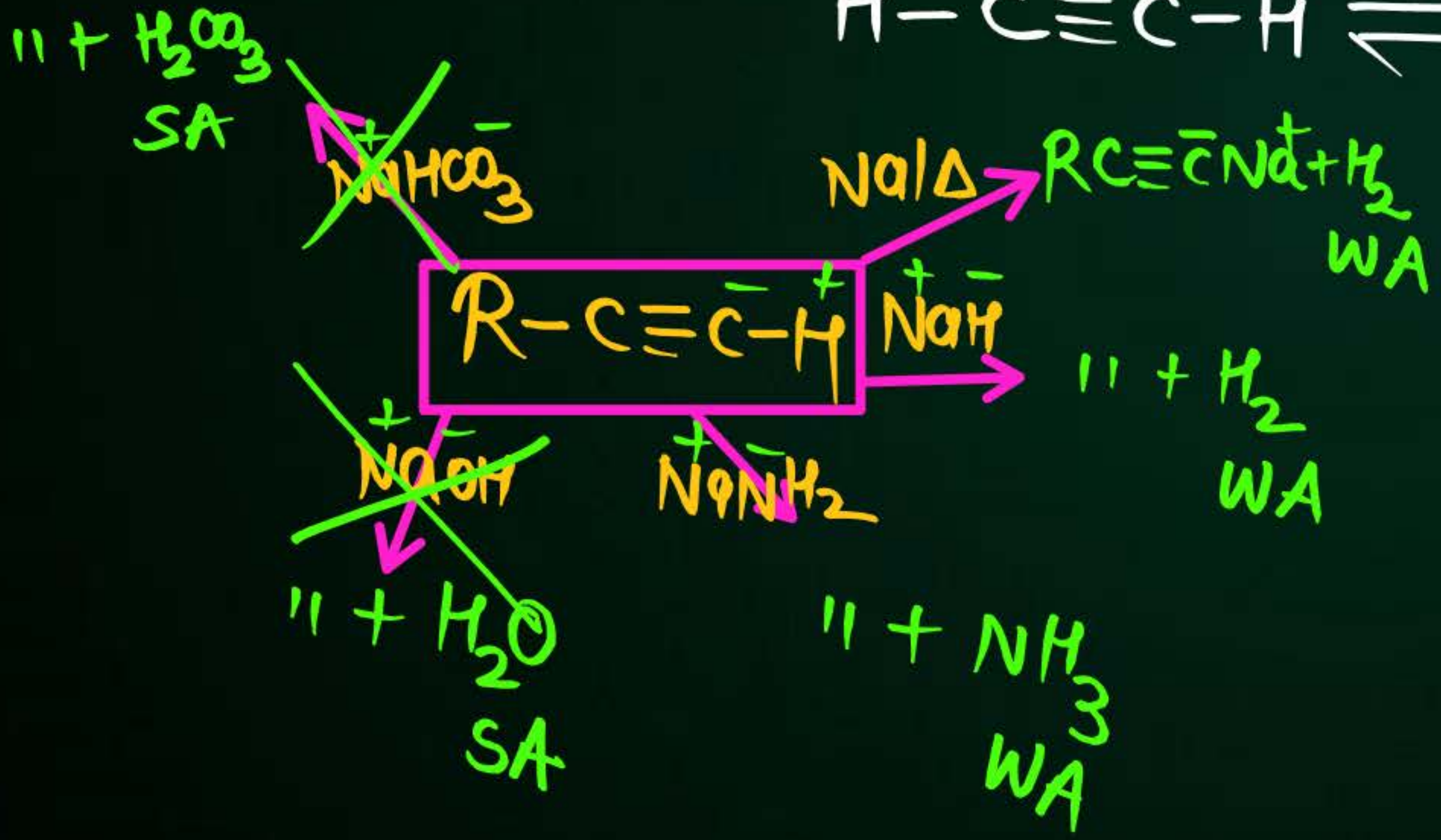
H
H
X
X
β
α
Alc KOH
E^2
Vic dihalide
α
β
H
X
E^2
$\overset{\oplus}{Na}\overset{\ominus}{N}H_2$ (strong Base)
$-C\equiv C-$
Q
$CH_3-\underset{Cl}{CH}-CH_2-Cl$
Alc KOH
$NaNH_2$
$CH_3-C\equiv CH$
Q
Br
H H
Br
Alc KOH
Q
Cl
H
H
Cl
$NaNH_2$

PSS


Br
β
α
Alc KOH
A
Cl2
CCl4
B
Cl
Cl
Zn/H+
F
H2
Zn
E
+ZnCl2
Cl
Cl
Nal/dry ether
G
Br
HCl
per
+
Cl
H
3NaNH2
D
⊖
Na+
H+
Alc KOH / NaNH2
C
N+aNH̄2
⊖Na+ + NH3
H
H
R
X
R-H

Chemical Properties of Alkynes

1. Acidic character of alkyne:



$R-C\equiv \bar{C}-\overset{+}{H}$
$\cancel{\overset{+}{Na}H\overset{-}{CO_3}}$
'' + H_2CO_3
SA
Na/Δ
$RC\equiv\bar{C}\overset{+}{Na} + H_2$
WA
$\overset{+}{Na}\overset{-}{H}$
'' + H_2
WA
$\cancel{\overset{+}{Na}\overset{-}{OH}}$
'' + H_2O
SA
$\overset{+}{Na}\overset{-}{NH_2}$
'' + NH_3
WA

% S = 50%

SP

$$H-C\equiv C-H \rightleftharpoons H-C\equiv\bar{C} + H^+$$

$$\upharpoonleft\downharpoonright$$

$$H^+ + \bar{C}\equiv\bar{C}$$

Extention of 'C'

$$R-C\equiv C-H \xrightarrow{Na/\Delta} R-C\equiv \bar{C}\,\boxed{Na^+ \;\; X}-R' \xrightarrow[SN^2]{} R-C\equiv C-R'$$

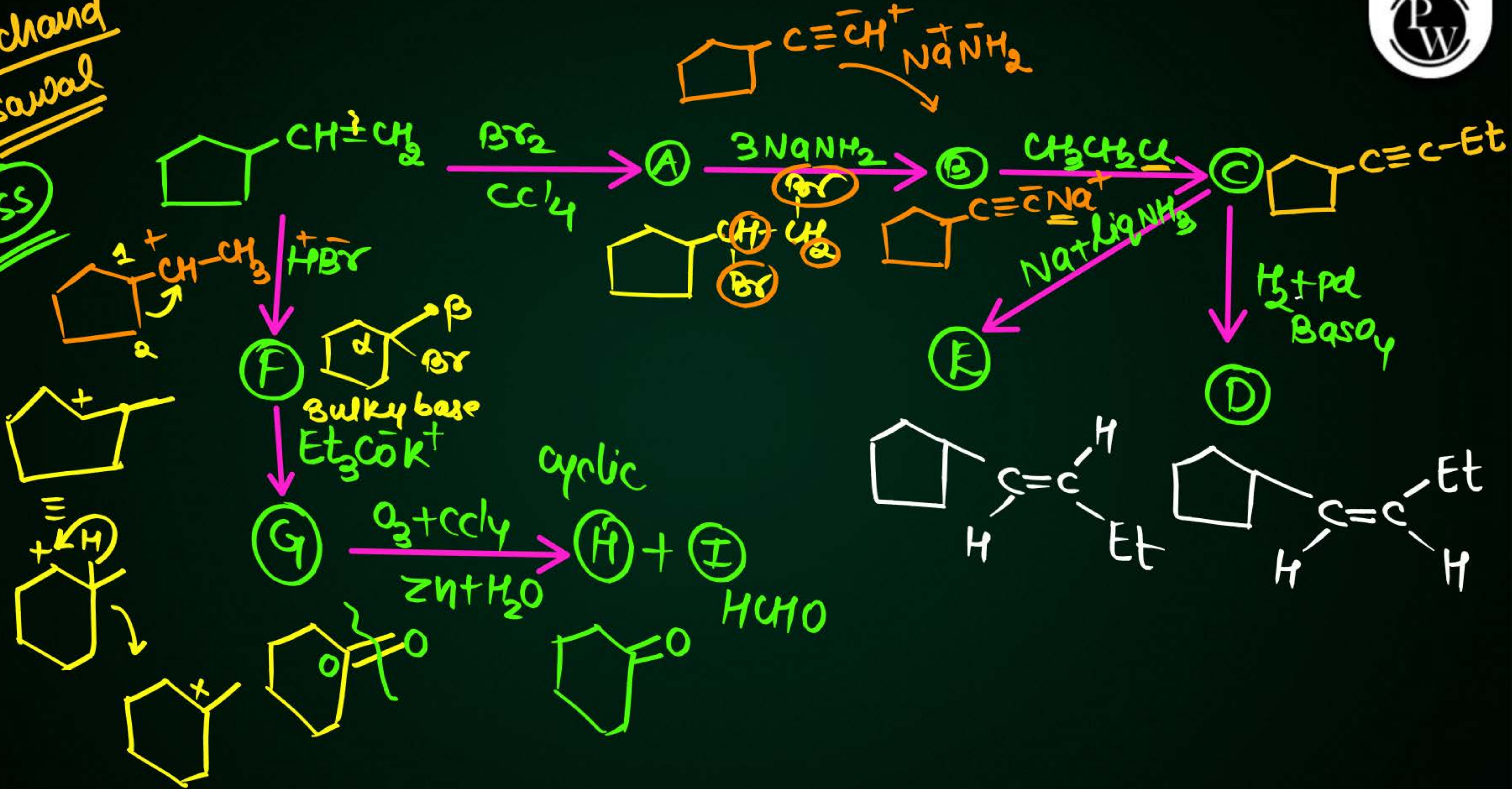
$$+\frac{1}{2}H_2$$

Q 1-butyne ⟶ 2-pentyne

$$\begin{tikzcd}
CH_3-CH_2-C\equiv C-H \arrow[r] \arrow[d, "Na/\Delta"] & CH_3-CH_2-C\equiv C-CH_3 \\
CH_3-CH_2-C\equiv \bar{C}\,\boxed{Na^+ \;\; X}-CH_3 \arrow[ur] &
\end{tikzcd}$$

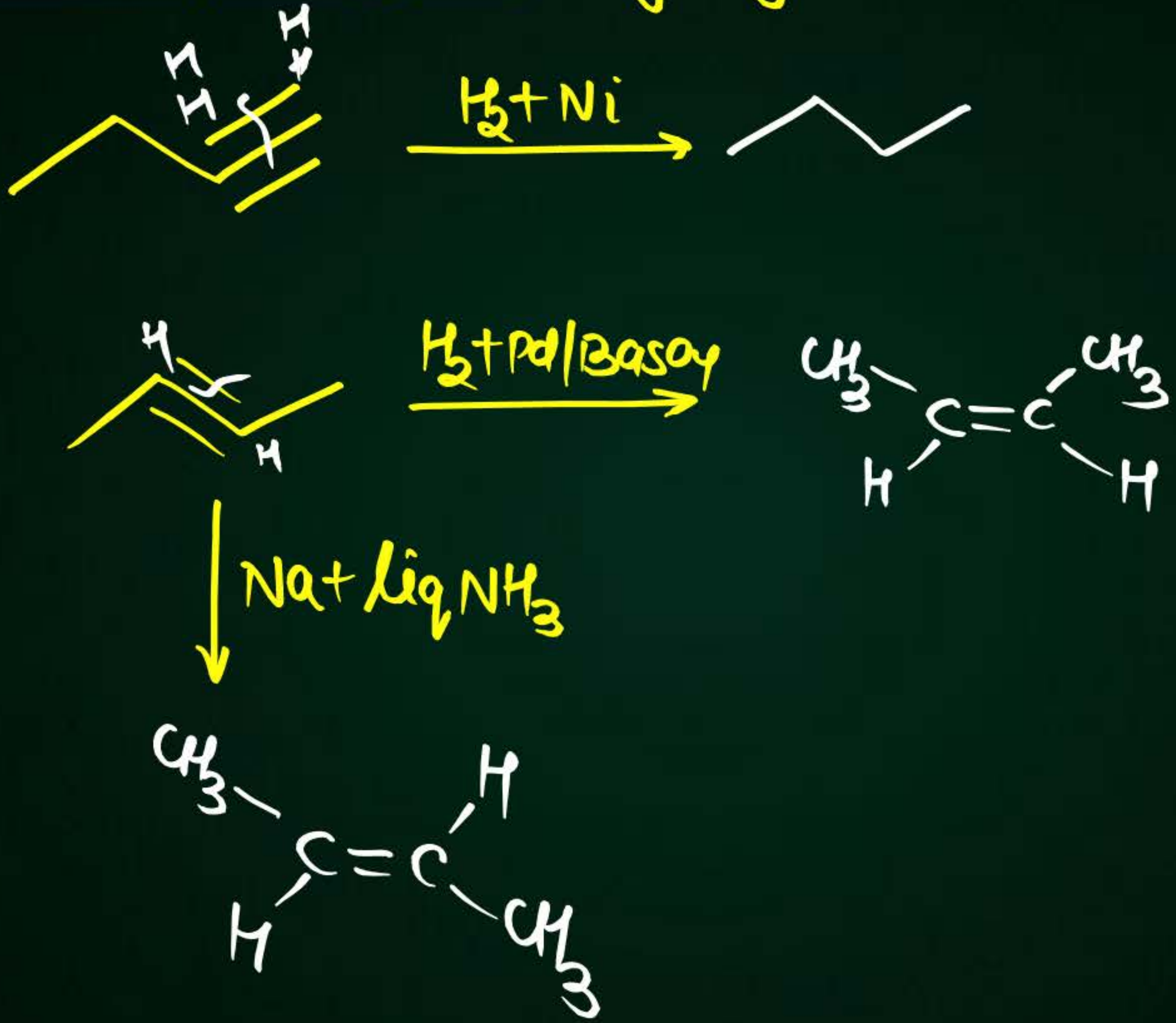
Prachand Sawal

PSS

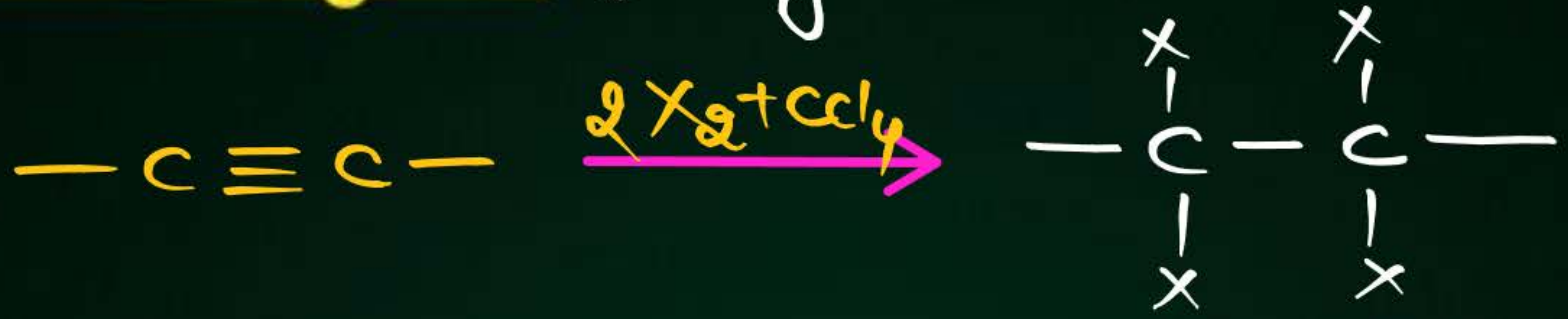


C≡C̄H⁺ Na⁺N̄H₂
CH=CH₂
Br₂
CCl₄
A
3NaNH₂
B
CH₃CH₂Cl
C
C≡C–Et
CH–CH₂
Br
Br
C≡C̄Na⁺
Na+liq NH₃
E
H₂+Pd
BaSO₄
D
1 + CH–CH₃
2
H⁺B̄r
F
α
β
Br
Bulky base
Et₃CŌK⁺
G
O₃+CCl₄
Zn+H₂O
H
I
cyclic
HCHO
O
O
+
≡
H
C=C
H
H
Et
Et

2. Addition of dihydrogen: (Hydrogenation)


H
H
H
H2+Ni
H
H
H2+Pd/BaSO4
CH3
CH3
C=C
H
H
Na+ liq NH3
CH3
H
C=C
H
CH3

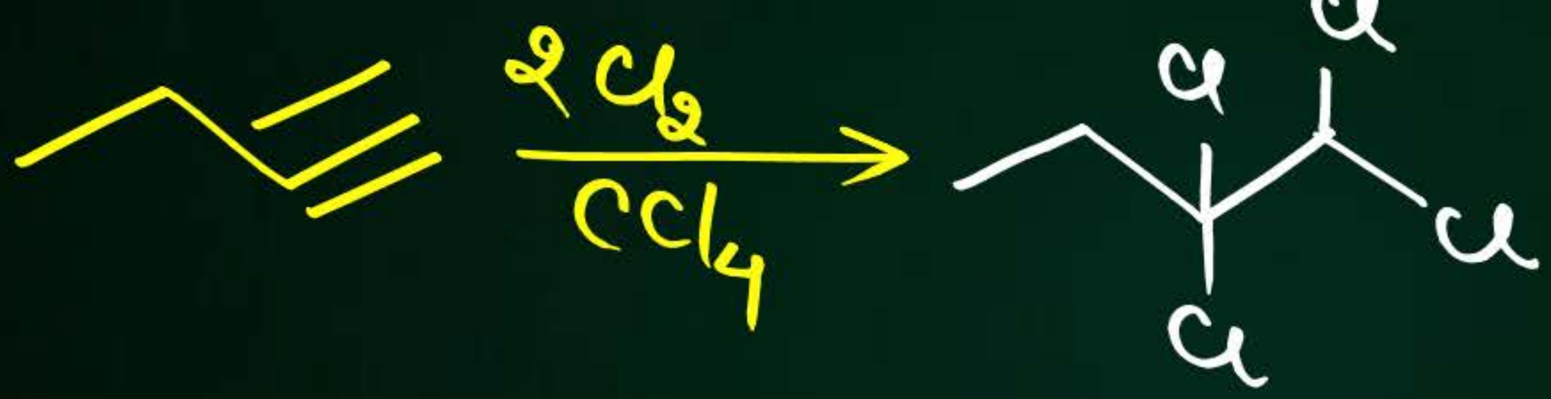
3. Addition of halogens: (Halogenation)


—C≡C—
2X2+CCl4
X
C
X

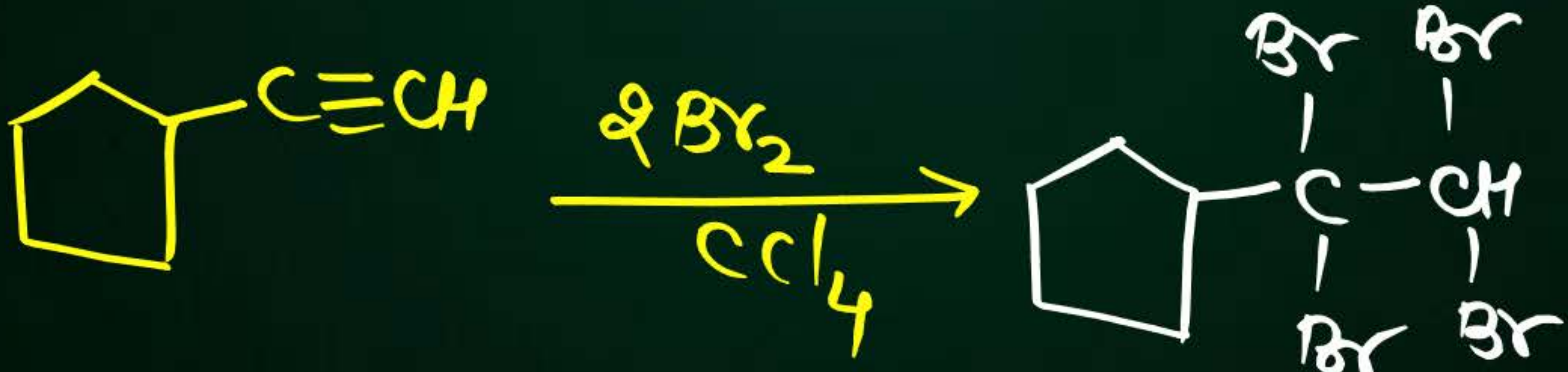
$$-C\equiv C- \xrightarrow{2X_2+CCl_4} -\overset{X}{\underset{X}{C}}-\overset{X}{\underset{X}{C}}-$$

Tetrahalide

Q 1)

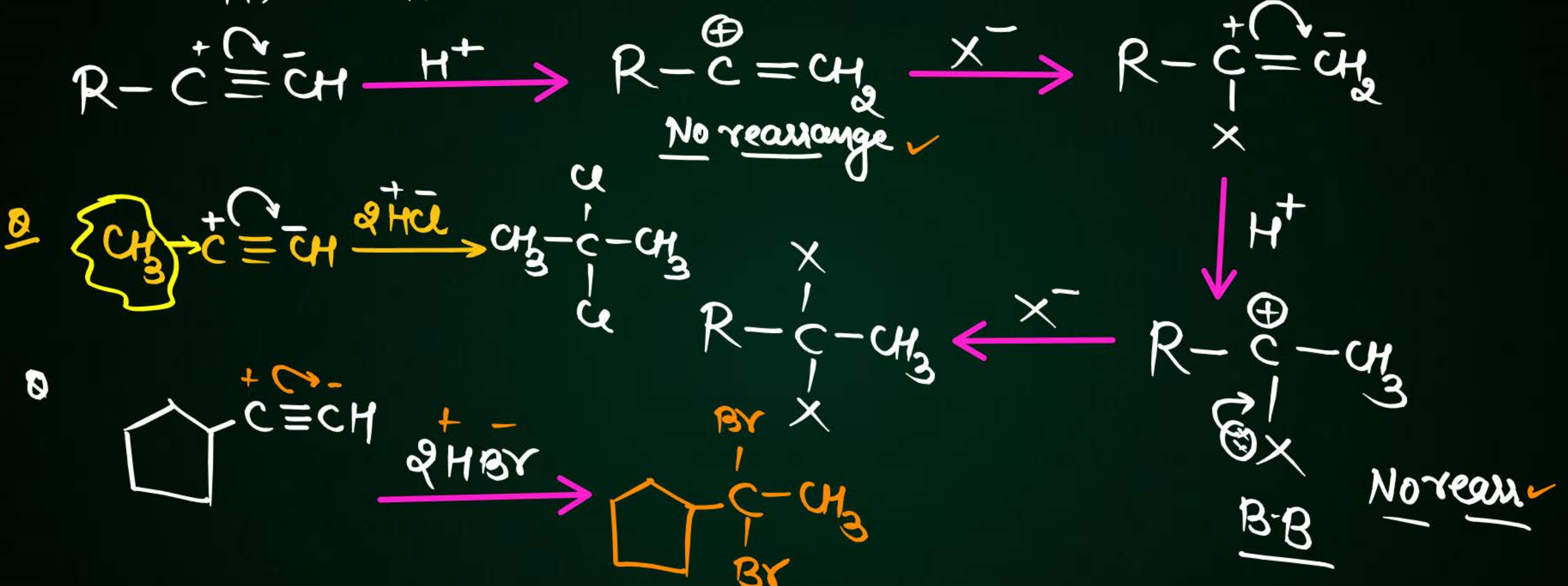

2Cl2
CCl4
Cl
Cl
Cl
Cl

2)


C≡CH
2Br2
CCl4
Br
Br
C
CH
Br
Br

4. Addition of hydrogen halides:

$HX \longrightarrow H^+ + X^-$



$R-\overset{+}{C}\equiv\overset{-}{C}H \xrightarrow{H^+} R-\overset{\oplus}{C}=CH_2 \xrightarrow{X^-} R-\underset{X}{\overset{+}{C}}=\overset{-}{C}H_2$

No rearrange ✓

$R-\underset{X}{\overset{+}{C}}=\overset{-}{C}H_2 \xrightarrow{H^+} R-\underset{\ominus X}{\overset{\oplus}{C}}-CH_3 \xrightarrow{X^-} R-\underset{X}{\overset{X}{C}}-CH_3$

B-B

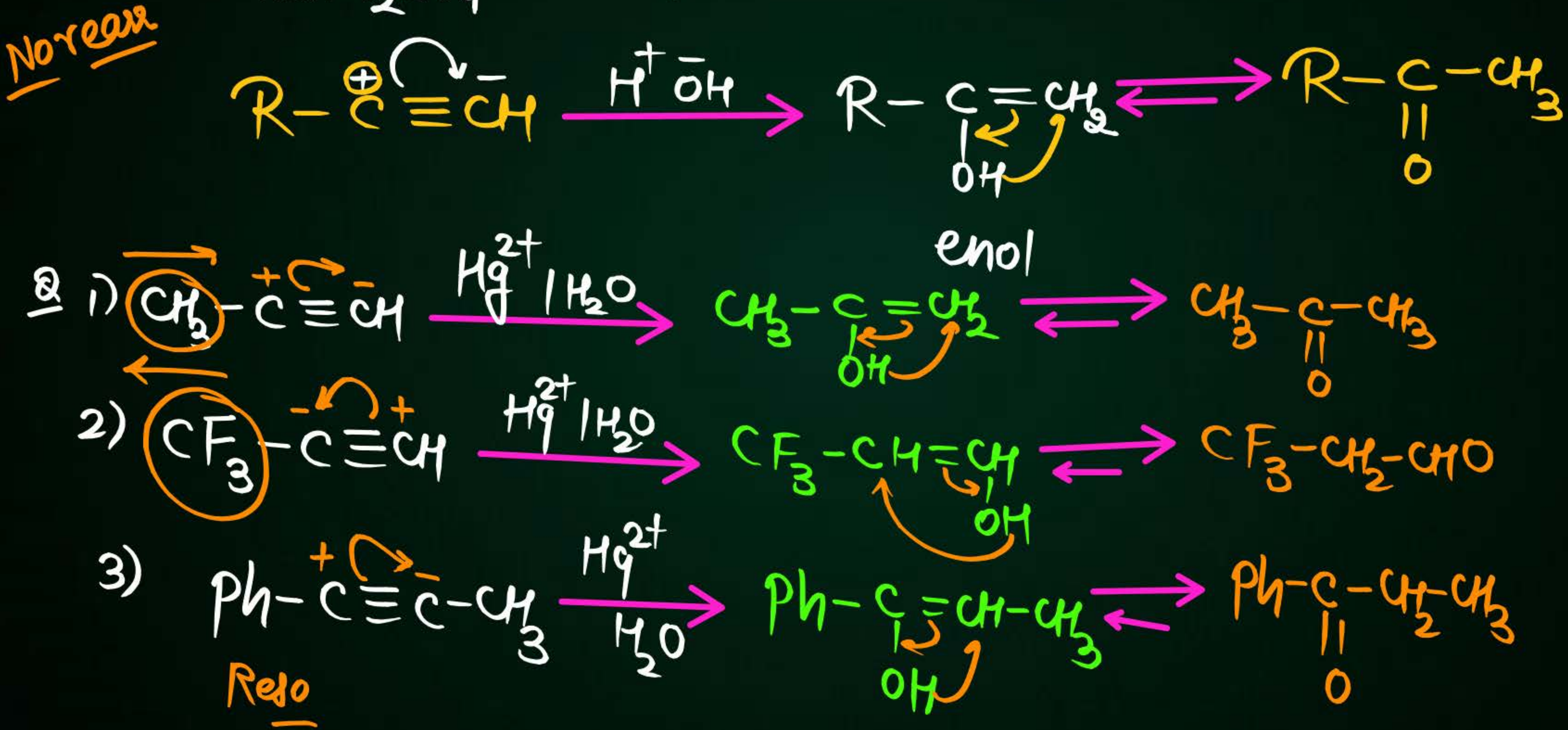
No rearr ✓

Q $CH_3-\overset{+}{C}\equiv\overset{-}{C}H \xrightarrow{2\overset{+}{H}\overset{-}{Cl}} CH_3-\underset{Cl}{\overset{Cl}{C}}-CH_3$

Q $C_5H_9-\overset{+}{C}\equiv\overset{-}{C}H \xrightarrow{2\overset{+}{H}\overset{-}{Br}} C_5H_9-\underset{Br}{\overset{Br}{C}}-CH_3$

5. Addition of water: Kucherov rxn

Reagent $\begin{pmatrix} \text{dil } HgSO_4 \\ \text{dil } H_2SO_4 \end{pmatrix}$ or Hg^{2+}/H_2O



No rearr

$$R-\overset{+}{C}\equiv\overset{-}{C}H \xrightarrow{H^+\ \overset{-}{O}H} R-\underset{OH}{\underset{|}{C}}=CH_2 \rightleftharpoons R-\underset{O}{\underset{\|}{C}}-CH_3$$

enol

Q 1) $CH_3-\overset{+}{C}\equiv\overset{-}{C}H \xrightarrow{Hg^{2+}/H_2O} CH_3-\underset{OH}{\underset{|}{C}}=CH_2 \rightleftharpoons CH_3-\underset{O}{\underset{\|}{C}}-CH_3$

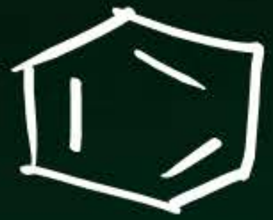
2) $CF_3-\overset{-}{C}\equiv\overset{+}{C}H \xrightarrow{Hg^{2+}/H_2O} CF_3-CH=\underset{OH}{\underset{|}{C}H} \rightleftharpoons CF_3-CH_2-CHO$

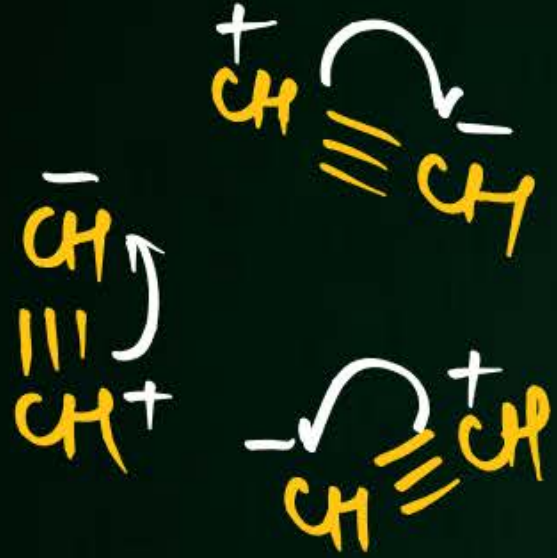
3) $Ph-\overset{+}{C}\equiv\overset{-}{C}-CH_3 \xrightarrow[H_2O]{Hg^{2+}} Ph-\underset{OH}{\underset{|}{C}}=CH-CH_3 \rightleftharpoons Ph-\underset{O}{\underset{\|}{C}}-CH_2-CH_3$

Reso

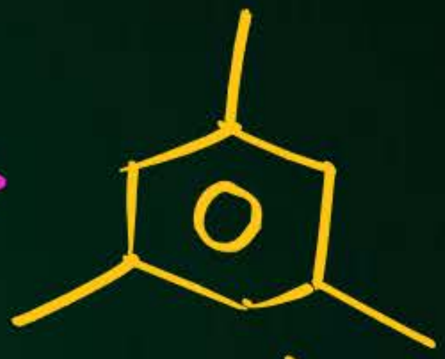
6. Cyclic Polymerizations:

1) $3\ CH \equiv CH \xrightarrow[\text{(Red Hot tube)}]{R.H.T}$




$\overset{+}{CH}$
$\overset{-}{CH}$
$\overset{-}{CH}$
CH^+
$\overset{+}{CH}$
CH

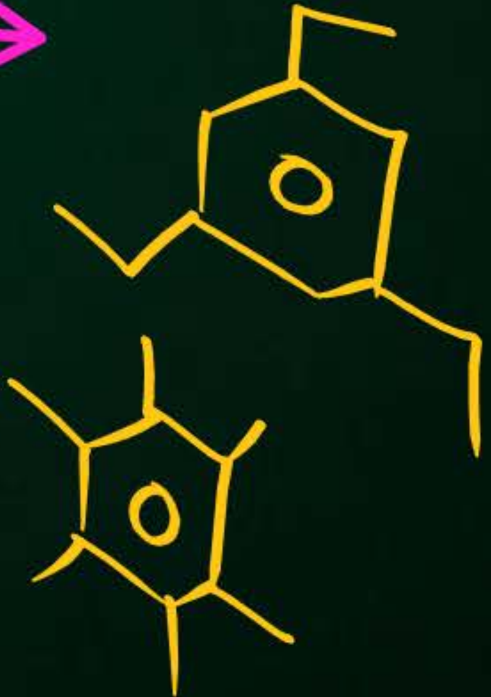
2) $\overset{3}{CH_3}-\boxed{C \equiv C}H \xrightarrow{RHT}$



Mesitylene

3) $\overset{3}{Et}-\boxed{C \equiv C}H \xrightarrow{RHT}$

4) $\overset{3}{Me}-\boxed{C \equiv C}-Me \xrightarrow{RHT}$



7. Test of Terminal alkynes:

1. Tollen's Test

$$R-C\equiv \overset{-}{C}-H^{+} \xrightarrow{Ag^{+}} R-C\equiv C-Ag$$

white ppt

Tollen's reagent

$\overset{+1}{Ag}NO_3 + NH_4OH$

or

$[\overset{+1}{Ag}(NH_3)_2]^{+}$

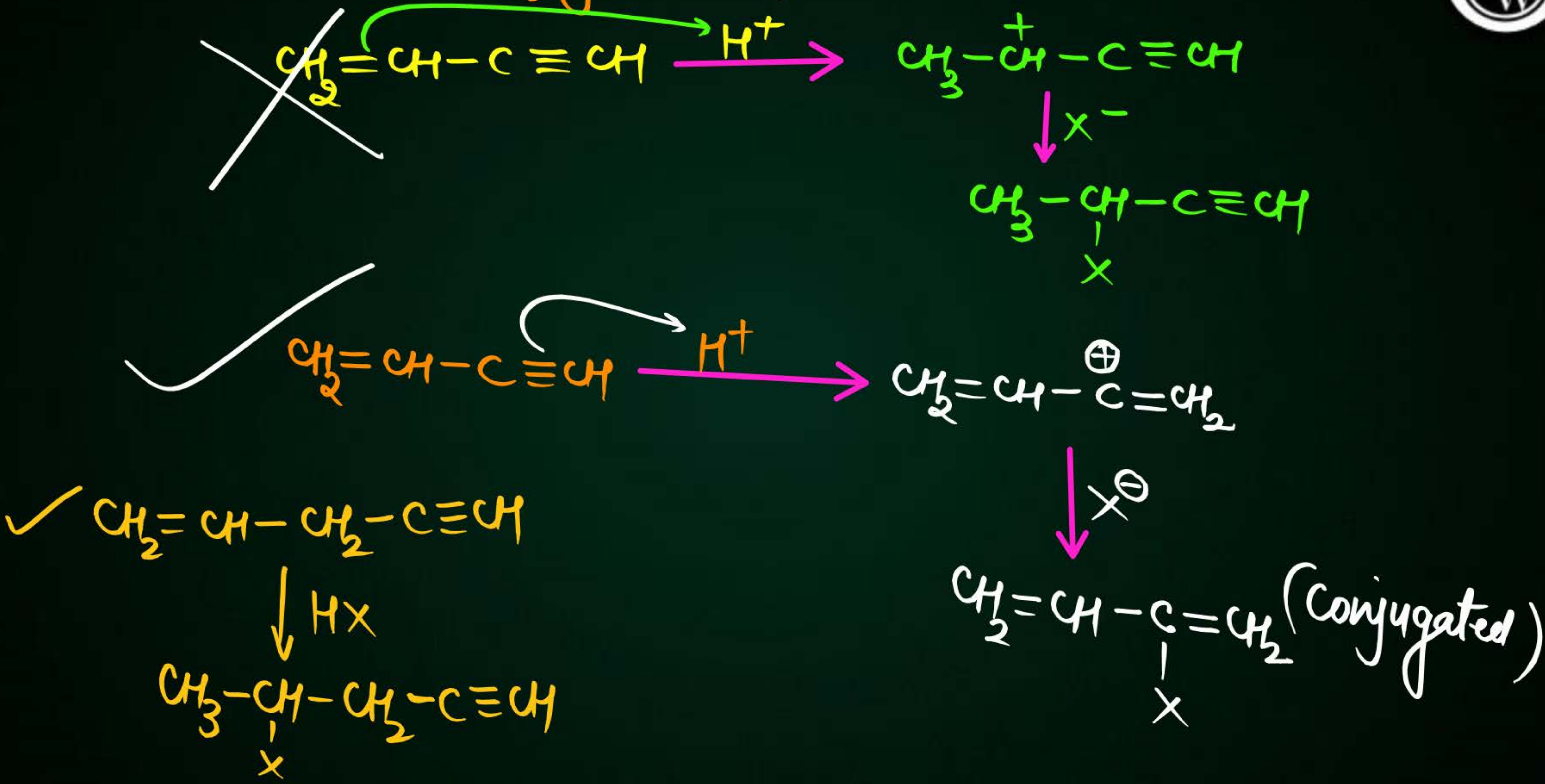
2. Cuprous chloride Test

Reagent :- $\overset{+1}{Cu_2}Cl_2 \mid NH_4OH$

$$R-C\equiv C-H \xrightarrow{Cu^{+}} R-C\equiv C-Cu$$

Red-brown ppt

Addition of HX on conjugated enyne ÷ Alkyne par attack hoga.



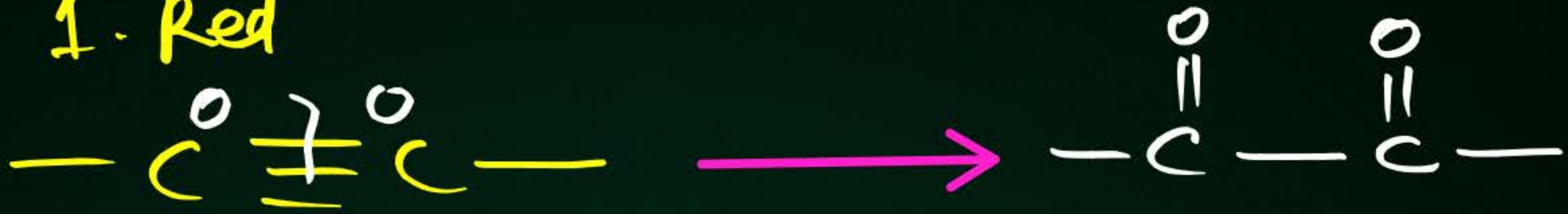
$\cancel{CH_2=CH-C\equiv CH} \xrightarrow{H^+} CH_3-\overset{+}{C}H-C\equiv CH \xrightarrow{X^-} CH_3-\underset{X}{\underset{|}{C}H}-C\equiv CH$

✓ $CH_2=CH-C\equiv CH \xrightarrow{H^+} CH_2=CH-\overset{\oplus}{C}=CH_2 \xrightarrow{X^\ominus} CH_2=CH-\underset{X}{\underset{|}{C}}=CH_2$ (Conjugated)

✓ $CH_2=CH-CH_2-C\equiv CH \xrightarrow{HX} CH_3-\underset{X}{\underset{|}{C}H}-CH_2-C\equiv CH$

Ozonolysis of Alkyne

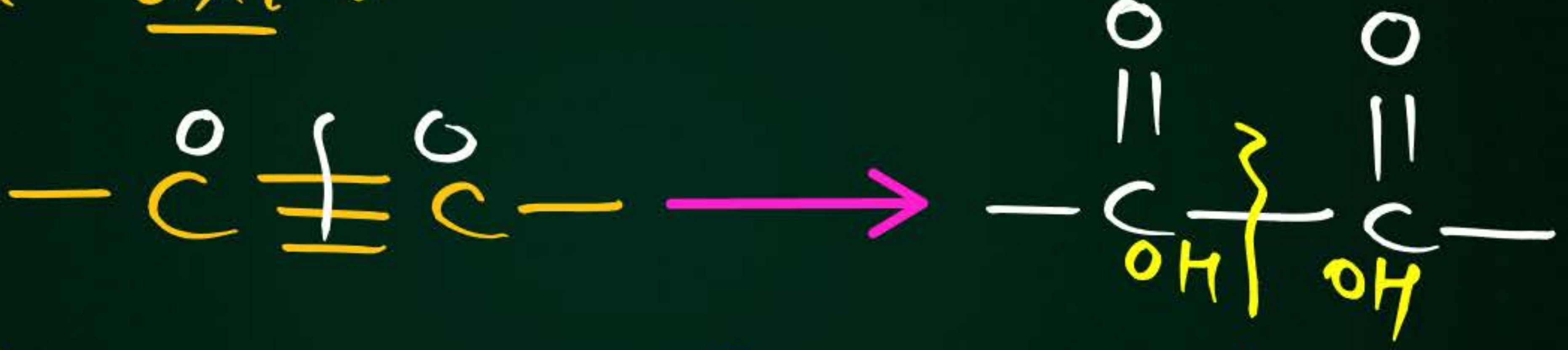
1. Red



$$-\overset{O}{C}\equiv\overset{O}{C}- \longrightarrow -\overset{\overset{O}{\|}}{C}-\overset{\overset{O}{\|}}{C}-$$

(O, O don't go)

2. OXI ✓

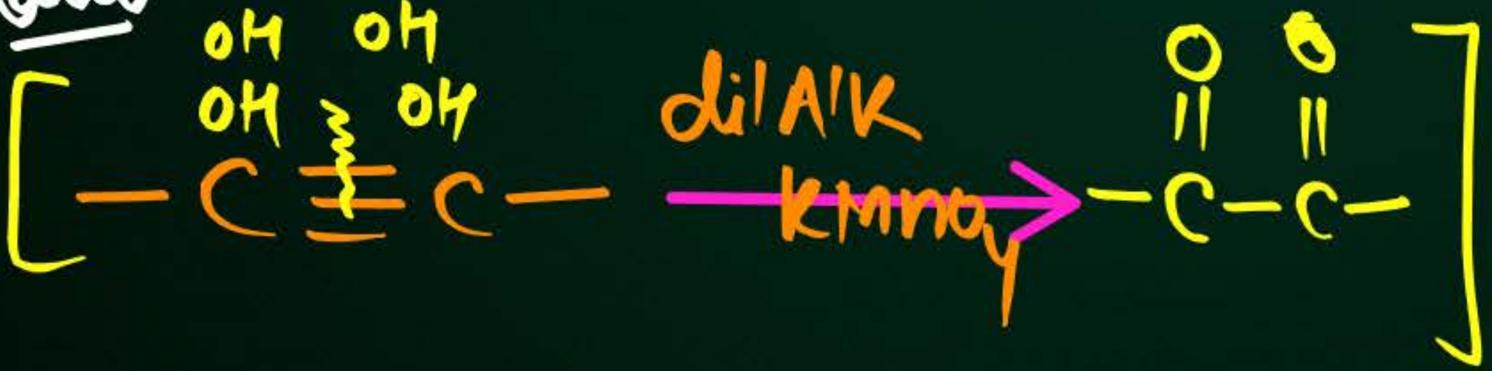


$$-\overset{O}{C}\equiv\overset{O}{C}- \longrightarrow -\underset{OH}{\overset{\overset{O}{\|}}{C}}-\underset{OH}{\overset{\overset{O}{\|}}{C}}-$$

$$\downarrow$$

$$-COOH + HOOC-$$

Hydroxylation



$$\left[-\overset{OH\;OH}{\overset{OH}{C}}\equiv\overset{OH}{C}- \xrightarrow[KMnO_4]{dil\,Alk} -\overset{\overset{O}{\|}}{C}-\overset{\overset{O}{\|}}{C}-\right]$$

QUESTION (NCERT Exemplar)

Arrange the following carbanions in order of their decreasing stability.

(A) $\overset{\rightarrow}{\boxed{H_3C}} - C \equiv C^-$ sp

(B) $H - C \equiv C^-$ sp

(C) $H_3C - CH_2^-$ sp3

A $A > B > \underline{C}$

[✓ B] $B > A > \underline{C}$

C $C > B > \cancel{A}$

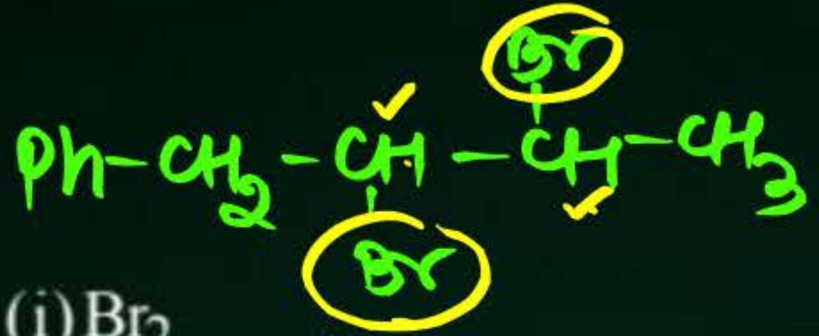
D $C > A > \cancel{B}$

QUESTION (NCERT Exemplar)

Match the reactions given in Column I with the reaction types in Column II.

Column I	Column II
(i) $CH_2{=}CH_2 + H_2O \xrightarrow{H^+} CH_3CH_2OH$ ⓓ	(a) Hydrogenation
(ii) $CH_2{=}CH_2 + H_2 \xrightarrow{Pd} CH_3{-}CH_3$ ⓐ	(b) Halogenation
(iii) $CH_2{=}CH_2 + Cl_2 \longrightarrow Cl{-}CH_2{-}CH_2{-}Cl$ ⓑ	(c) Polymerization
(iv) $3\ CH{\equiv}CH \xrightarrow[Heat]{Cu\ tube} C_6H_6$ ⓒ	(d) Hydration
	(e) Condensation

QUESTION (AIIMS 2019)

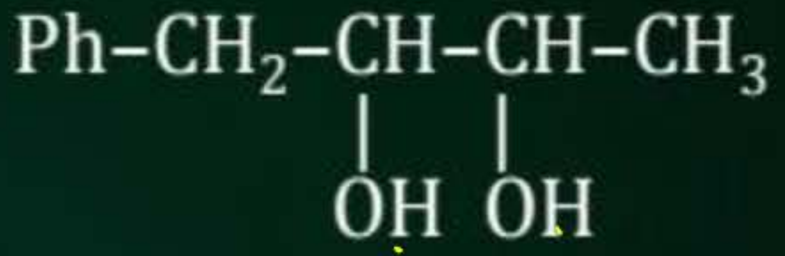


$$Ph-CH_2-\underset{Br}{\overset{\checkmark}{CH}}-\overset{Br}{CH}-CH_3$$

$$Ph-CH_2-\underset{Br}{CH}=\overset{Br}{CH}-CH_3 \xrightarrow[\text{(ii) } \underline{\text{Alc. KOH}}]{\text{(i) } Br_2}$$

(A) $Ph-CH=CH-CH=CH_2$

(B)



$$Ph-CH_2-\underset{OH}{CH}-\underset{OH}{CH}-CH_3$$

[✓ (C)] $Ph-CH_2-C\equiv C-CH_3$

(D) $Ph-C\equiv C-CH_2-CH_3$

QUESTION (AIIMS 2015)

Which is the most suitable reagent among the following to distinguish compound (3) from rest of the compound?

1. $CH_3-C\equiv C-CH_3$ ✗
2. $CH_3-CH_2-CH_2-CH_3$ ✗
3. $CH_3-CH_2C\equiv CH$ ✓
4. $CH_3-CH=CH_2$ ✗

A Bromine in carbon tetrachloride

B Bromine in acetic acid

C Alkaline $KMnO_4$

[✓ D Ammoniacal silver nitrate]

QUESTION (AIIMS 1997)

In the following reaction, Z is identified as

$$CH \equiv CH \xrightarrow{Z} CH_3CHO$$

$$\xrightarrow{H^+\bar{O}H} CH_2=\underset{OH}{CH}$$

A concentrated H_2SO_4

B CH_3COCl

[✓ C] $20\%\ H_2SO_4 + HgSO_4$

D CH_3OH

QUESTION

Assertion (A): Acidity of C–H bond lies in following sequence:

$$\overset{+}{H}\overset{-}{C} \equiv CH > \overset{+}{H_2}\overset{-}{C} = CH_2 > \overset{-}{C}\overset{+}{H_3} - CH_3$$

Reason (R): Percentage character of 's' orbital in these compound lie in following sequence :

$$\underset{sp}{\overset{50\%}{H-C\equiv CH}} > \underset{sp^2}{\overset{33.33\%}{H_2C=CH_2}} > \underset{sp3}{\overset{25\%}{CH_3-CH_3}}$$

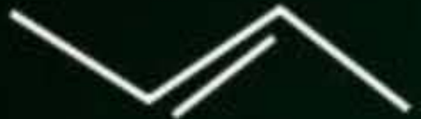
(A) ✓ If both (A) and (R) are correct and (R) is the correct explanation for (A)

(B) If both (A) and (R) are correct but (R) is not the correct explanation for (A)

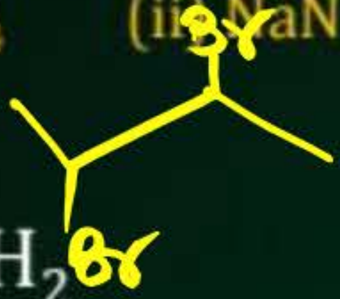
(C) If (A) is correct but (R) is incorrect.

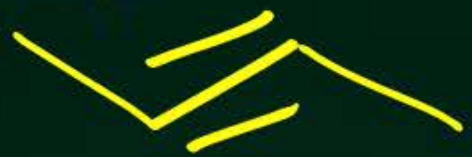
(D) If (A) is incorrect but (R) is correct.

QUESTION



$\xrightarrow[CCl_4]{Br_2}\ \xrightarrow[(ii)\,NaNH_2]{(i)\,alc.\,KOH}$ (A); Product (A) is:
major





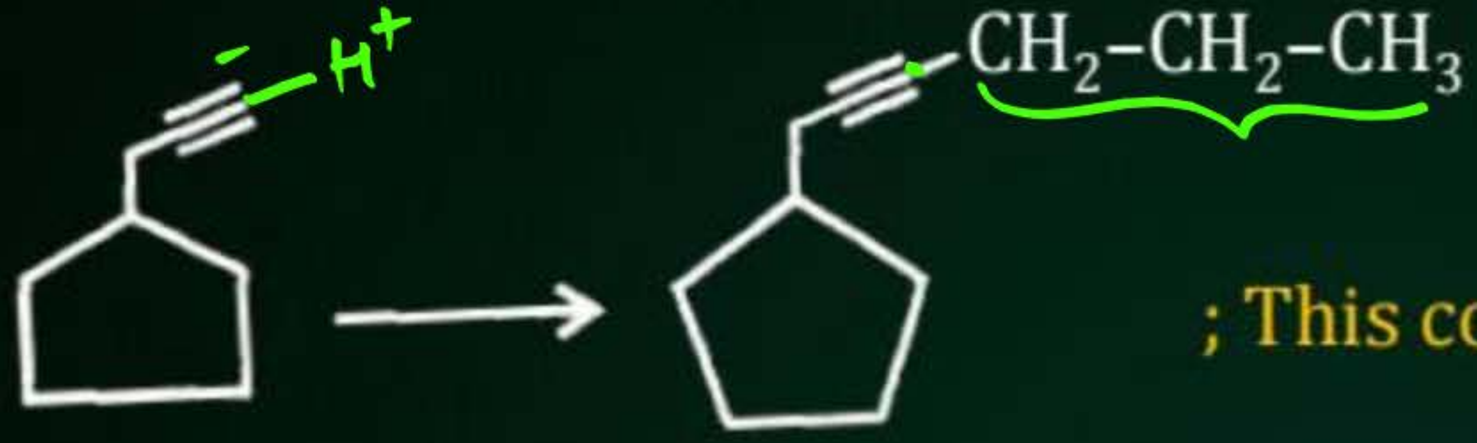
(A) $H_2C=CH-CH=CH_2$

[✓ (B)] $CH_3-C\equiv C-CH_3$

(C) $CH_3-CH_2-C\equiv CH$

(D) $CH_3-CH=C=CH_2$

QUESTION



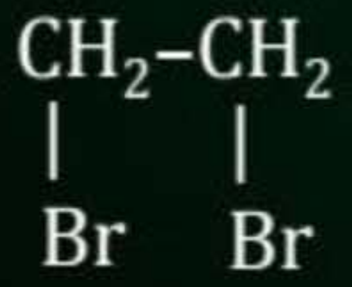
; This conversion can be achieved by:

(A) $NaNH_2, CH_3CHO$

[✓ (B)] $\underline{NaNH_2}, \underbrace{CH_3-CH_2-CH_2}-Br$

(C) KOH, CH_3-CH_2-Br

(D) KOH,



$$\begin{array}{cc} CH_2- & CH_2 \\ | & | \\ Br & Br \end{array}$$

QUESTION

$$CH\equiv CH \xrightarrow[NaNH_2]{Excess} \overset{+}{Na}\,\overset{-}{C}\equiv\overset{-}{C}\,Na^{+} \xrightarrow{\overset{Excess}{I-CH_2-CH_2-CH_2-CH_3}}$$

Predict the product of the following reaction sequence.

$$\text{ethyne} \xrightarrow[\substack{(2)\ \text{excess } I-CH_2-(CH_2)_2-CH_3 \\ (3)\ H^{\oplus}}]{(1)\ \text{excess } NaNH_2}$$

$$\overset{+}{Na}\,\overset{-}{C}\equiv C-C-C-C-C$$

$$\Big\downarrow\ I-CH_2-CH_2-CH_2-CH_3$$

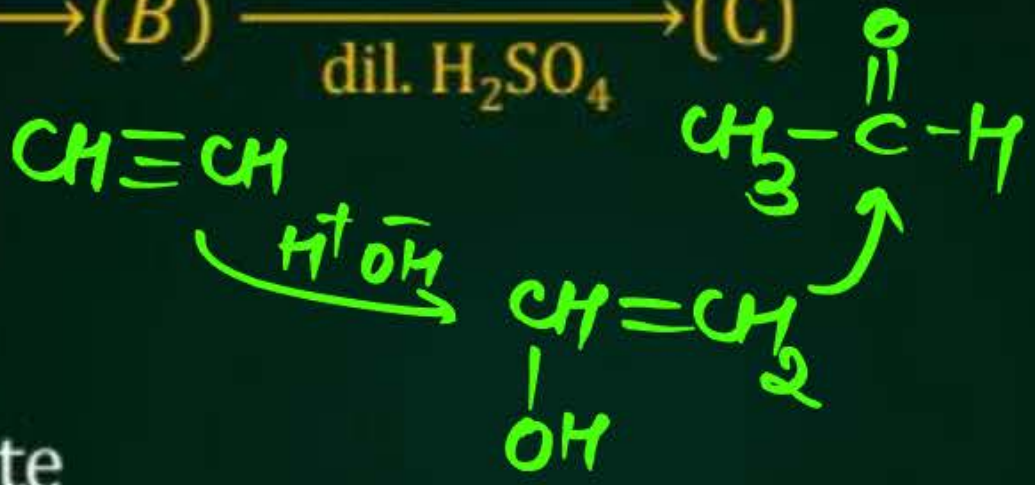
$$\overset{1}{C}-\overset{2}{C}-\overset{3}{C}-\overset{4}{C}-\overset{5}{C}\equiv\overset{6}{C}-\overset{7}{C}-\overset{8}{C}-\overset{9}{C}-\overset{10}{C}$$

- **A** 6-iodo-1-hexyne
- **B** 1-hexyne
- **C** [✓ 5-decyne]
- **D** 1-iodo-1-hexene

QUESTION

Major product (C) in the following sequence is:

$$\underbrace{CaO + \overset{coke}{C}} \xrightarrow{Heat} \underset{CaC_2}{(A)} \xrightarrow{H_2O} \underset{CH \equiv CH}{(B)} \xrightarrow[\text{dil. } H_2SO_4]{Hg^{2+}} (C)$$



$$CH \equiv CH \xrightarrow{H^+\bar{O}H} \underset{OH}{CH} = CH_2 \rightarrow CH_3-\overset{O}{\overset{\|}{C}}-H$$

A Ethanol

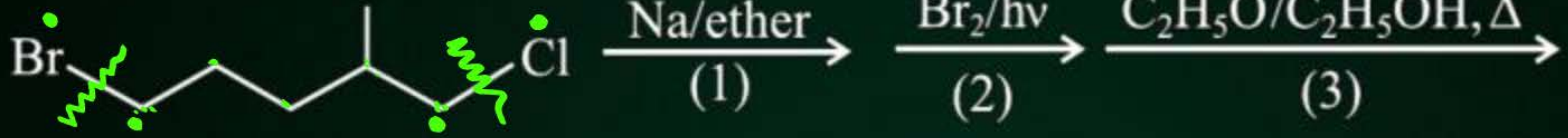
B Ethyl hydrogen sulphate

[✓ **C** Ethanal]

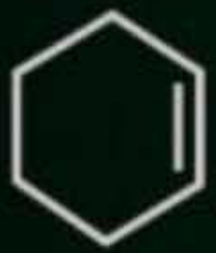
D Ethylene glycol

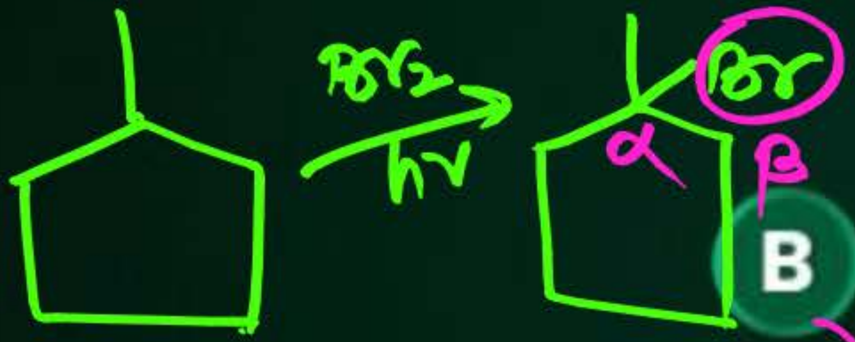
QUESTION

The final major product of the following reaction is: A'CKOH

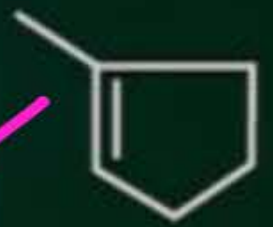

Br
Cl
Na/ether
(1)
Br_2/hν
(2)
$C_2H_5\overset{\ominus}{O}/C_2H_5OH, \Delta$
(3)

A

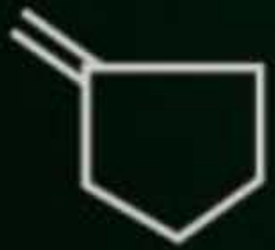




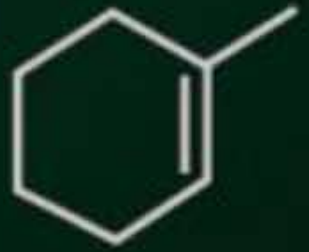
B



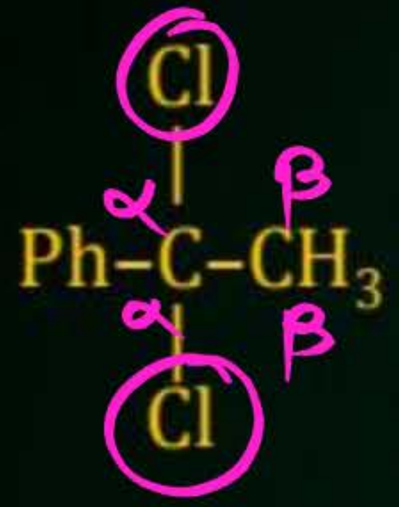
C



D



QUESTION



$Ph-\overset{Cl}{\underset{Cl}{C}}-CH_3 \xrightarrow[\text{Product}]{3NaNH_2}$ (A); Product (A) is:

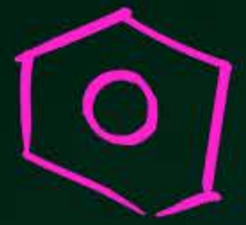
$Ph-C\equiv \overset{-}{C}H^{+} \xrightarrow{\overset{+}{Na}\overset{-}{N}H_2} Ph-C\equiv \overset{-}{C}Na^{+}$

(a) $Ph—CH=CH_2$ (b) $Ph—C\equiv CH$ (c) $Ph—CH_2—CH_3$ [✓ (d)] $Ph—C\equiv \overset{\ominus}{C}\overset{\oplus}{Na}$

QUESTION

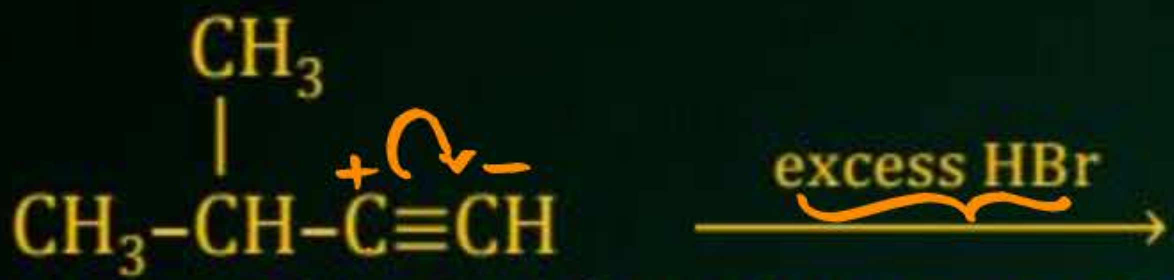
$CaC_2 \xrightarrow{H_2O} (A) \xrightarrow{\text{Red hot Cu tube}} (B)$, Product (B) of the reaction is:

(Calcium carbide) $CH \equiv CH$



- **A** Toluene
- **B** Ethyl-benzene
- [✓ **C** Benzene]
- **D** Butyne

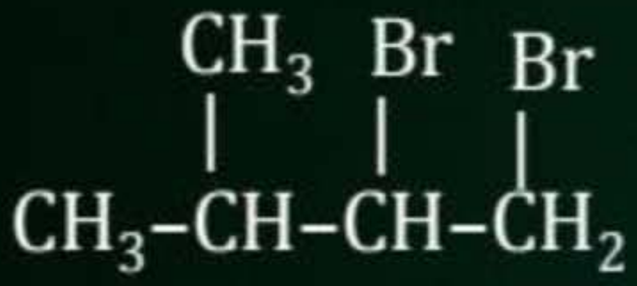
QUESTION



$$\mathrm{CH_3-\overset{\overset{\large CH_3}{|}}{C}H-\overset{+}{C}\equiv \overset{-}{C}H} \xrightarrow{\underbrace{\text{excess HBr}}}$$

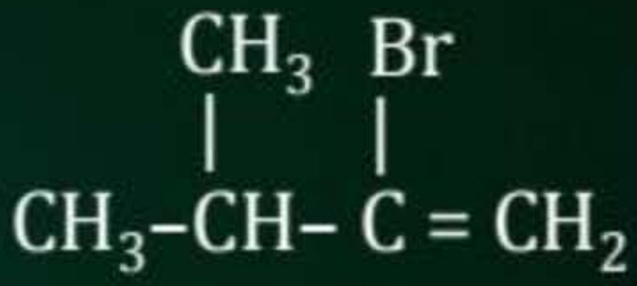
The product of the above reaction is:

(A)



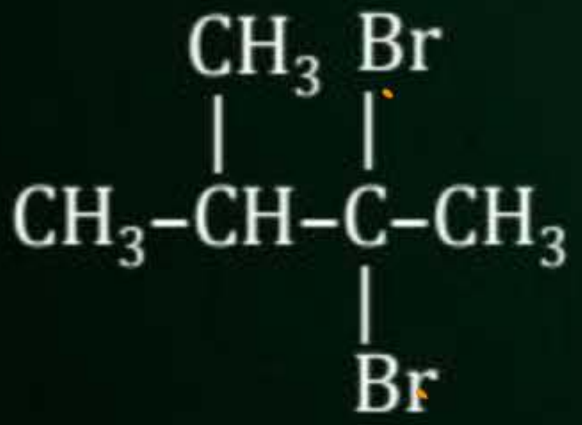
$$\mathrm{CH_3-\overset{\overset{\large CH_3}{|}}{C}H-\overset{\overset{\large Br}{|}}{C}H-\overset{\overset{\large Br}{|}}{C}H_2}$$

(B)



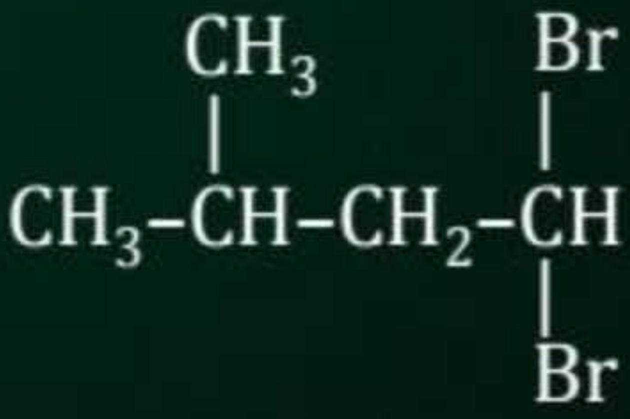
$$\mathrm{CH_3-\overset{\overset{\large CH_3}{|}}{C}H-\overset{\overset{\large Br}{|}}{C}=CH_2}$$

[✓ (C)]



$$\mathrm{CH_3-\overset{\overset{\large CH_3}{|}}{C}H-\underset{\underset{\large Br}{|}}{\overset{\overset{\large Br}{|}}{C}}-CH_3}$$

(D)



$$\mathrm{CH_3-\overset{\overset{\large CH_3}{|}}{C}H-CH_2-\underset{\underset{\large Br}{|}}{\overset{\overset{\large Br}{|}}{C}}H}$$

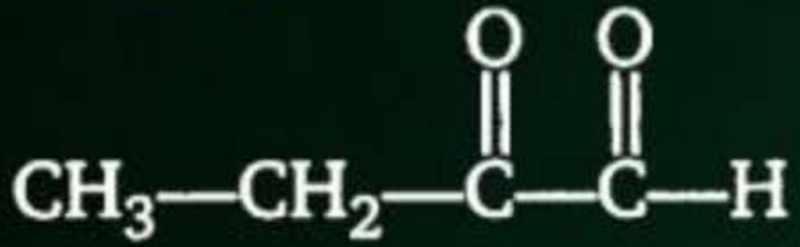
QUESTION

Baeyer's Reagent

$CH_3-\overset{\substack{OH\\OH}}{C}\equiv\overset{\substack{OH\\OH}}{C}-CH_3 \xrightarrow{Cold\ KMnO_4} (A)$

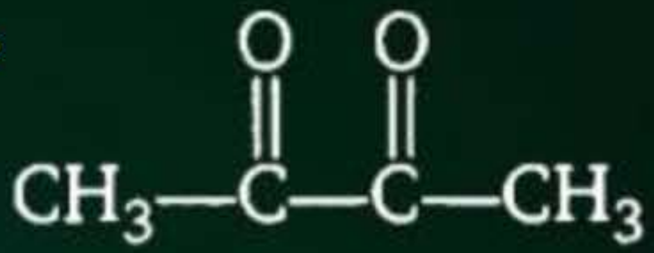
Product (A) is:

A



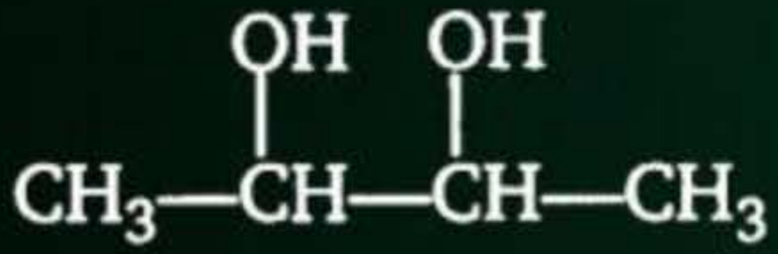
$CH_3-CH_2-\overset{O}{\overset{\|}{C}}-\overset{O}{\overset{\|}{C}}-H$

[✓ **B**]



$CH_3-\overset{O}{\overset{\|}{C}}-\overset{O}{\overset{\|}{C}}-CH_3$

C



$CH_3-\overset{OH}{\overset{|}{CH}}-\overset{OH}{\overset{|}{CH}}-CH_3$

D $O=CH-CH_2-CH_2CH=O$

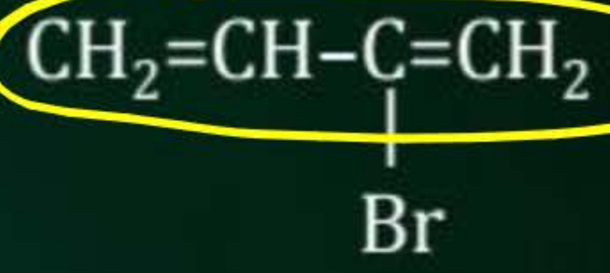
QUESTION

Conjugated

The reaction of one equivalent of HBr with $\underbrace{\overset{\text{ene}}{CH_2=CH}-\overset{\text{yne}}{C\equiv CH}}$ gives:

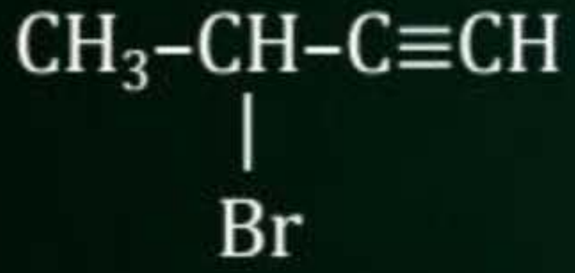
(A) $CH_2=CH-C\equiv CBr$

[✓ (B)]



$CH_2=CH-\underset{|}{\underset{Br}{C}}=CH_2$

(C)



$CH_3-\underset{|}{\underset{Br}{CH}}-C\equiv CH$

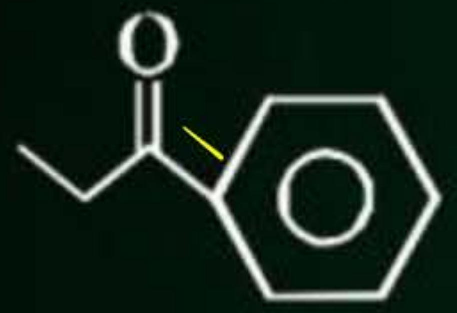
(D) $CH_2=CH-CH=CHBr$

QUESTION

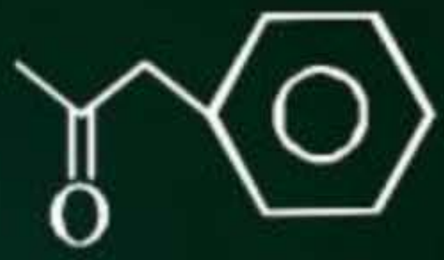
$C_6H_5-C\equiv C-CH_3 \xrightarrow[H_2SO_4]{HgSO_4}$ Product is:

Ph

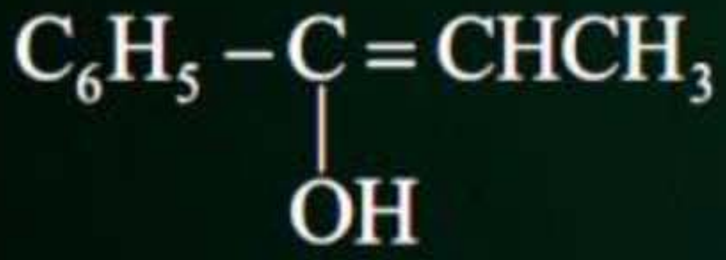
[✓ A]



(B)

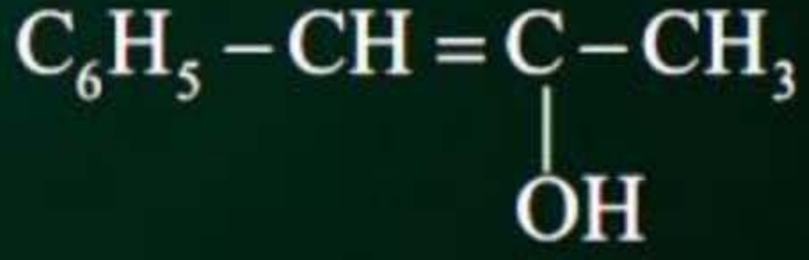


(C)



$C_6H_5-\underset{\displaystyle OH}{\underset{|}{C}}=CHCH_3$

(D)

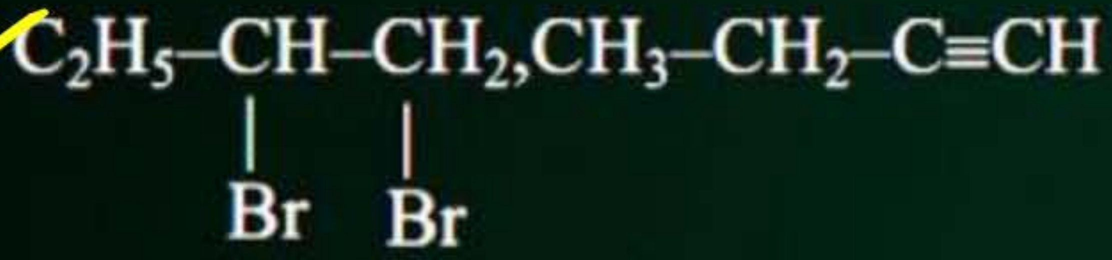


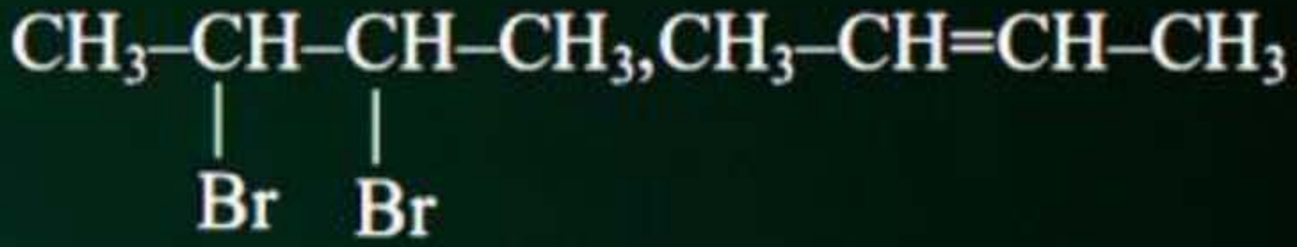
$C_6H_5-CH=\underset{\displaystyle OH}{\underset{|}{C}}-CH_3$

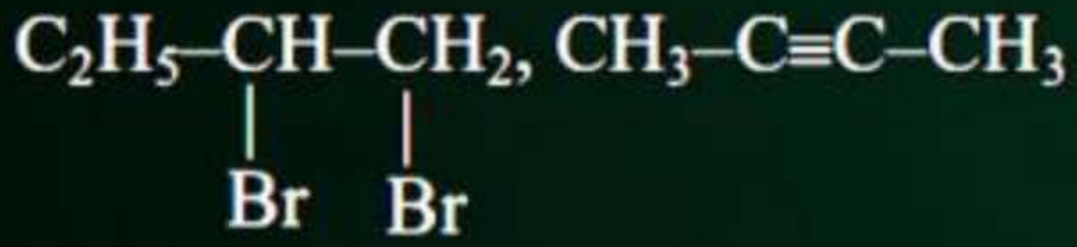
QUESTION

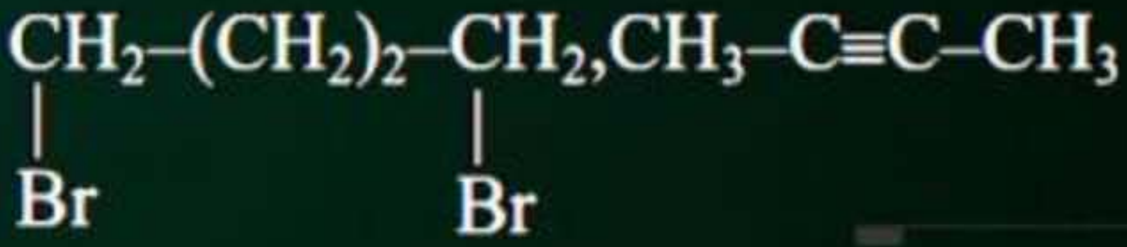
$C_2H_5-\underset{Br}{CH}-CH_2Br$

A and B in the reaction sequence are $C_2H_5-\underbrace{CH=CH_2} \xrightarrow[CCl_4]{Br_2\,in} A \xrightarrow[KOH]{alc.} B$ $C_2H_5-C\equiv CH$

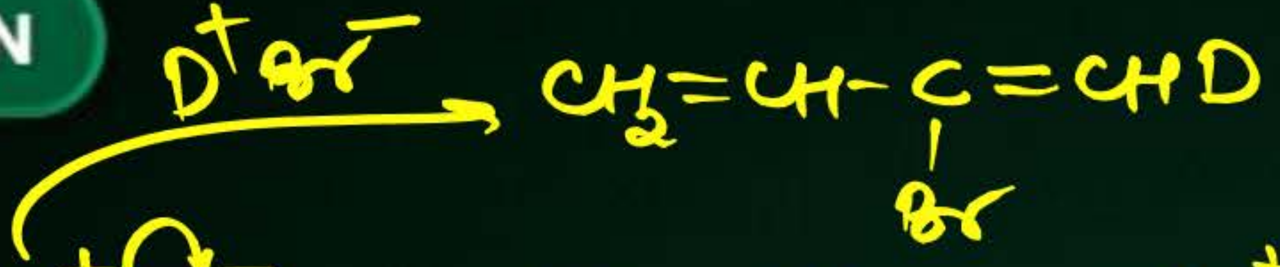
(A) ✓

$C_2H_5-\underset{Br}{CH}-\underset{Br}{CH_2}, CH_3-CH_2-C\equiv CH$

(B)

$CH_3-\underset{Br}{CH}-\underset{Br}{CH}-CH_3, CH_3-CH=CH-CH_3$

(C)

$C_2H_5-\underset{Br}{CH}-\underset{Br}{CH_2}, CH_3-C\equiv C-CH_3$

(D)

$\underset{Br}{CH_2}-(CH_2)_2-\underset{Br}{CH_2}, CH_3-C\equiv C-CH_3$

QUESTION



$\xrightarrow{D^+Br^-} CH_2=CH-\underset{Br}{\underset{|}{C}}=CHD$

$CH_2=CH-\overset{+}{C}\equiv\overset{-}{C}H$ on reaction with one mole $\underline{\underline{\overset{+}{D}\overset{-}{Br}}}$ gives:

Conjugated enyne

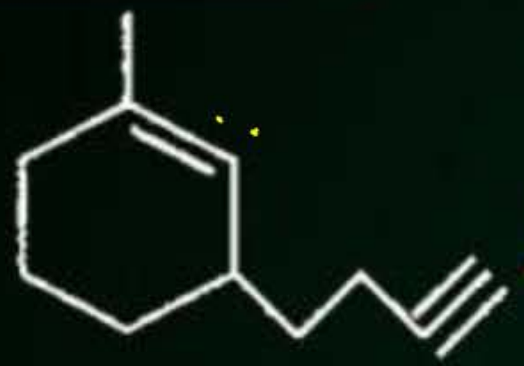
[✓ A] $CH_2=CH-C\underline{Br}=CH\underline{D}$

B $CH_2Br-CHDC\equiv CH$

C $DCH_2-CHBrC\equiv CH$

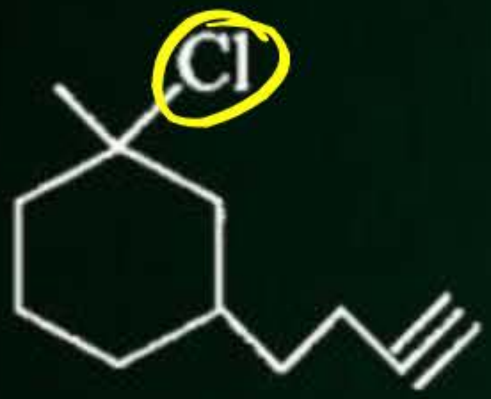
D $CH_2=CH-CD=CHBr$

QUESTION

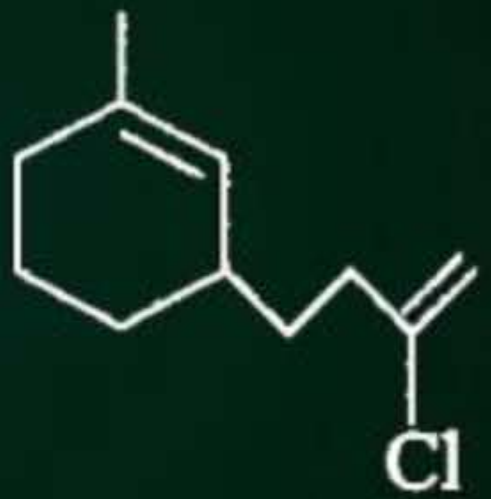


$\xrightarrow{\text{HCl (1 Mole)}}$

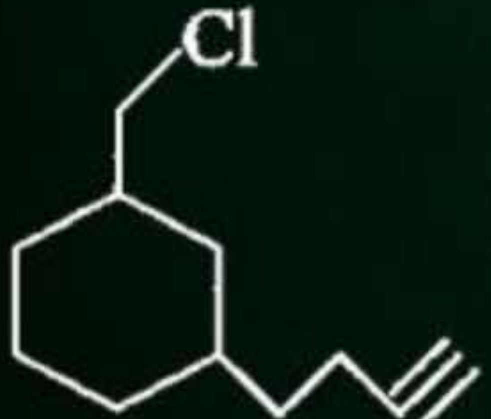
(A) ✓



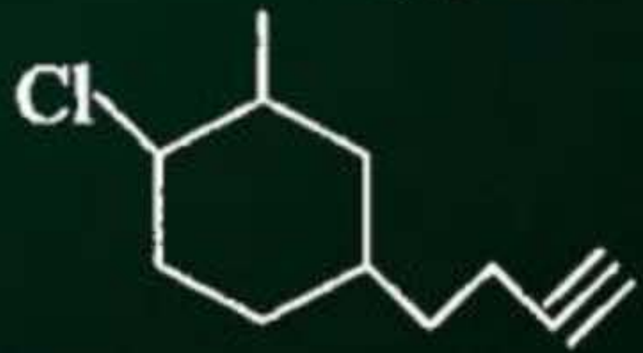
(B)



(C)



(D)



QUESTION

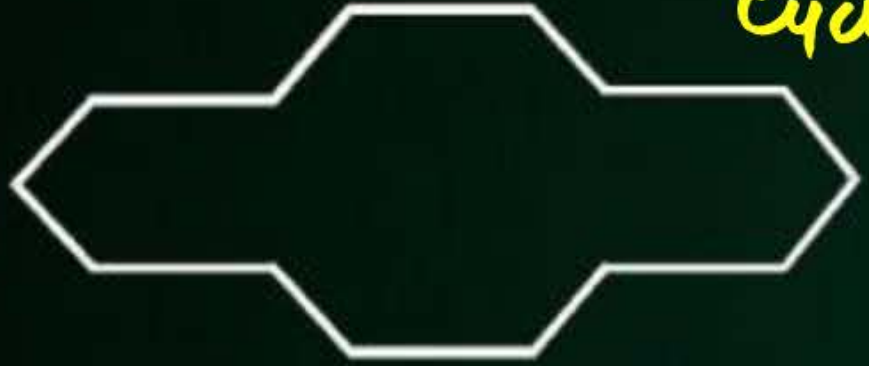
$Br-(CH_2)_{12}-C\equiv\bar{C}\,Na^{+}$

$Br-(CH_2)_{12}-C\equiv\overset{-}{C}H^{+}\xrightarrow{\overset{+\ \ -}{NaNH_2}}(A)\xrightarrow[\text{Catalyst}]{\text{Lindlar}}(B)$; Product (B) is:

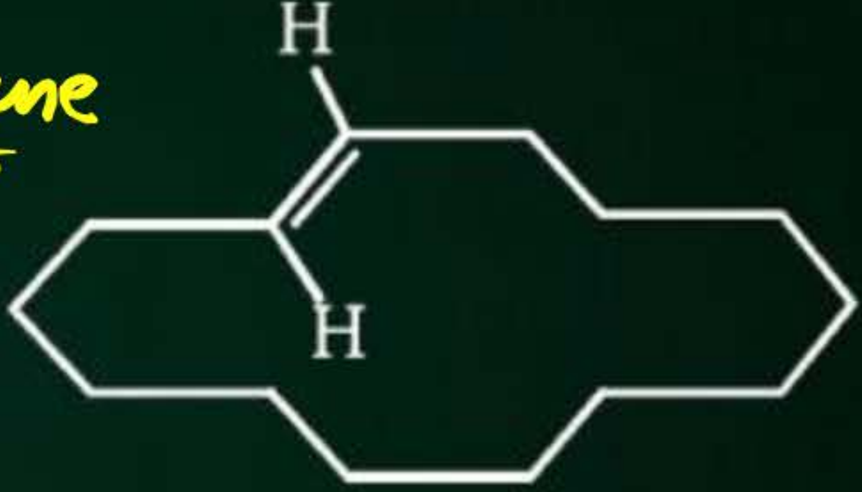
14 'C'
cyclic Alkyne

cis
Alkene

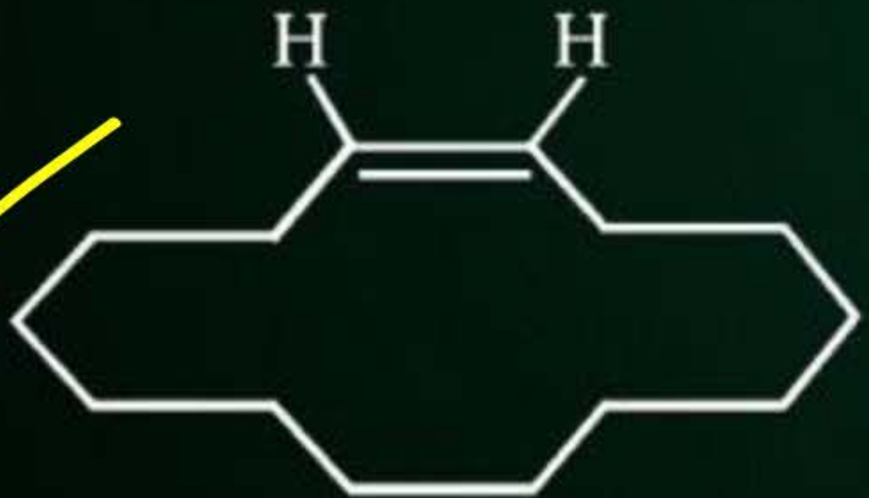
(A)



(B)



[✓ (C)]



(D) $Br-(CH_2)_{12}-CH=CH_2$

Home Work

QUESTION 01

In the following reaction:

$$C_2H_2 \xrightarrow[HgSO_4/H_2SO_4]{H_2O} X \rightleftharpoons CH_3CHO$$

What is X?

- **A** CH_3CH_2OH
- **B** CH_3CH_2CHO
- **C** $CH_3{-}O{-}CH_3$
- **D** $CH_2{=}CHOH$

QUESTION 02

$C_nH_{2n-2} + H_2 \xrightarrow{Pt/Pd/Ni} P \xrightarrow[Pt/Pd/Ni]{H_2} Q$. P is:

- A $C_nH_{2n}+2$
- B C_nH_{2n}
- C Both (A) and (B)
- D None of these

QUESTION 03

$$CH_3-CH_2-COONa \xrightarrow[CaO,\Delta]{NaOH} (A)$$

$$\xrightarrow[(ii)\,Alc.KOH]{(i)\,Cl_2/UV} (B) \xrightarrow[CCl_4]{Br_2} (C) \xrightarrow[(ii)\,NaNH_2]{(i)\,Alc.KOH} (D)$$

Compound (D) is:

- **A** C_2H_4
- **B** C_2H_6
- **C** C_2H_2
- **D** C_4H_8

QUESTION 04

The major product of the following reaction is:

$$CH_3C = CH \xrightarrow[\text{(ii) DI}]{\text{(i)DCl (equiv.)}}$$

A $CH_3C(I)(Cl)CHD_2$

B $CH_3CD_2(Cl)(I)$

C $CH_3CD(I)CHD(Cl)$

D $CH_3CD(Cl)CHD(I)$

QUESTION 05

The hydrocarbon which can react with sodium in liquid ammonia is:

(A) $CH_3CH_2C{\equiv}CCH_2CH_3$

(B) $CH_3CH_2CH_2C \equiv CCH_2CH_2CH_3$

(C) $CH_3CH_2C \equiv CH$

(D) $CH_3CH{=}CHCH_3$

QUESTION 06

Hydration of propyne gives:

(A) 1-Propanol

(B) 2-Propanol

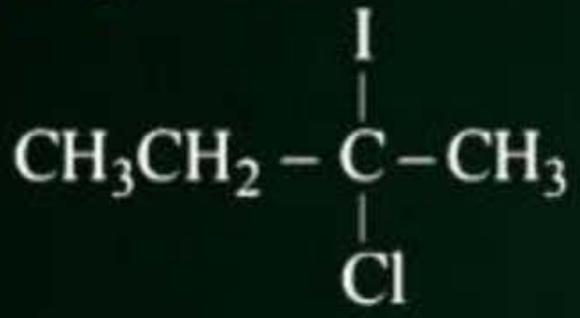
(C) Propanal

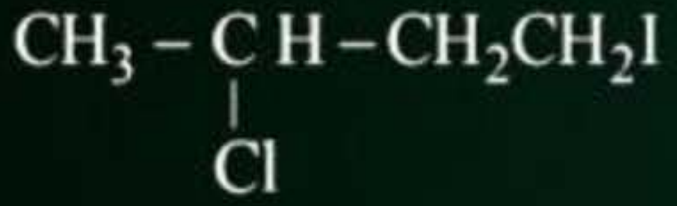
(D) Propanone

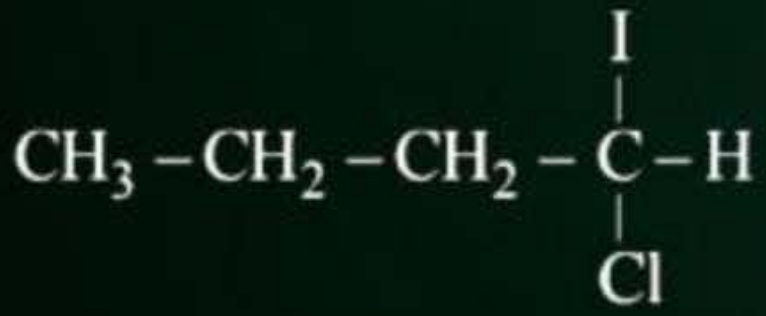
QUESTION 07

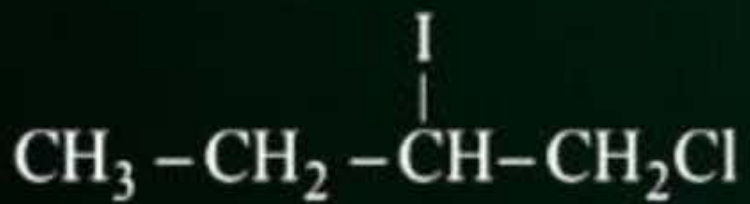
Predict the product C obtained in the following reaction of butyne-1

$CH_3CH_2-C\equiv CH + HCl \longrightarrow B \xrightarrow{HI} C$

A

$CH_3CH_2-\underset{Cl}{\overset{I}{C}}-CH_3$

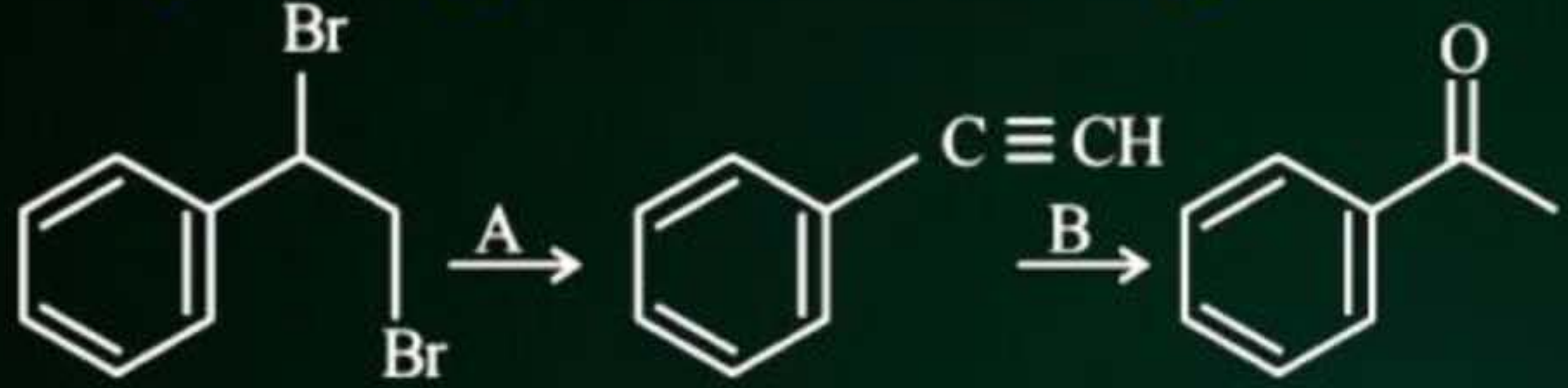
B

$CH_3-\underset{Cl}{C}H-CH_2CH_2I$

C

$CH_3-CH_2-CH_2-\underset{Cl}{\overset{I}{C}}-H$

D

$CH_3-CH_2-\overset{I}{C}H-CH_2Cl$

QUESTION 08

Identify the reagents in the following transformations:



A Aq. KOH and H_2O, $HgSO_4$, H_2SO_4

B Alc. KOH and $KMnO_4/H^+$

C $NaNH_2$ and H_2O, $HgSO_4$, H_2SO_4

D $NaNH_2$ and $KMnO_4/H^+$

QUESTION 09

$3CH \equiv CH \xrightarrow[\text{red hot iron tube}]{873\ K}$ Product. The Product is:

Ⓐ Hexyne

Ⓑ Hexene

Ⓒ Benzene

Ⓓ Hexane

QUESTION 10

In the reaction:

$CH_3CH_2CCl_2CH_3 \xrightarrow{x} CH_3C\equiv CCH_3$ the reagent x is:

Ⓐ KOH/C_2H_5OH

Ⓑ Zn

Ⓒ HCl/H_2O

Ⓓ Na

ANSWER KEY

1. D
2. B
3. C
4. A
5. C
6. D
7. A
8. C
9. C
10. A

Home Work From PW Module (Yakeen NEET)

Prarambh: Q 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97

Prabal: Q 25

Parikshit: Q 05, 08, 16, 19

MARK THE DATE 4th May, 2025

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YAKEEN 2.0

FOR NEET 2025

Lecture- 10 **Organic Chemistry**

HYDROCARBONS

By- Pankaj Sir(POPU MAMA)

Physics Wallah

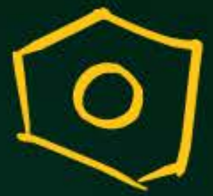
Topics *to be covered*

1. Methods of Preparation of Benzene ✓
2. Chemical Properties of Benzene ✓
3. Electrophilic Aromatic Substitution Reaction (ESR) ✓
4. Practice

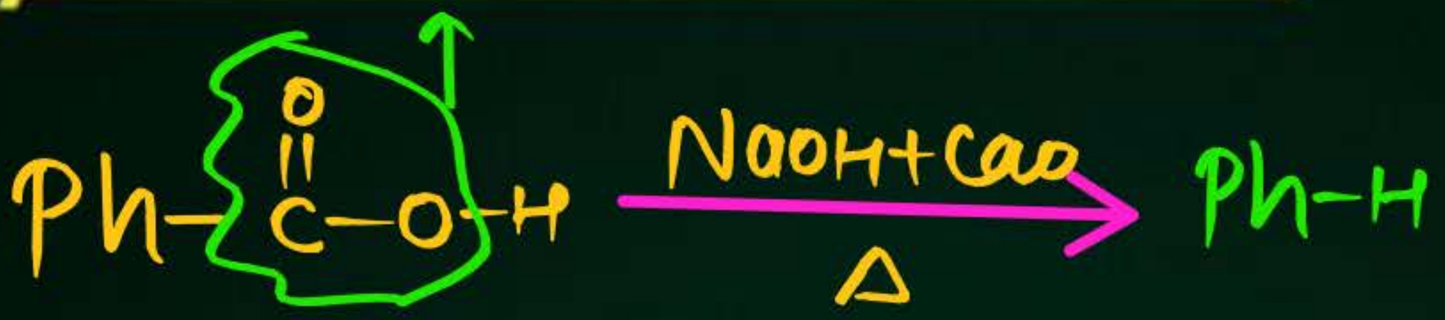
Methods of Preparation of Benzene

1. From ethyne:

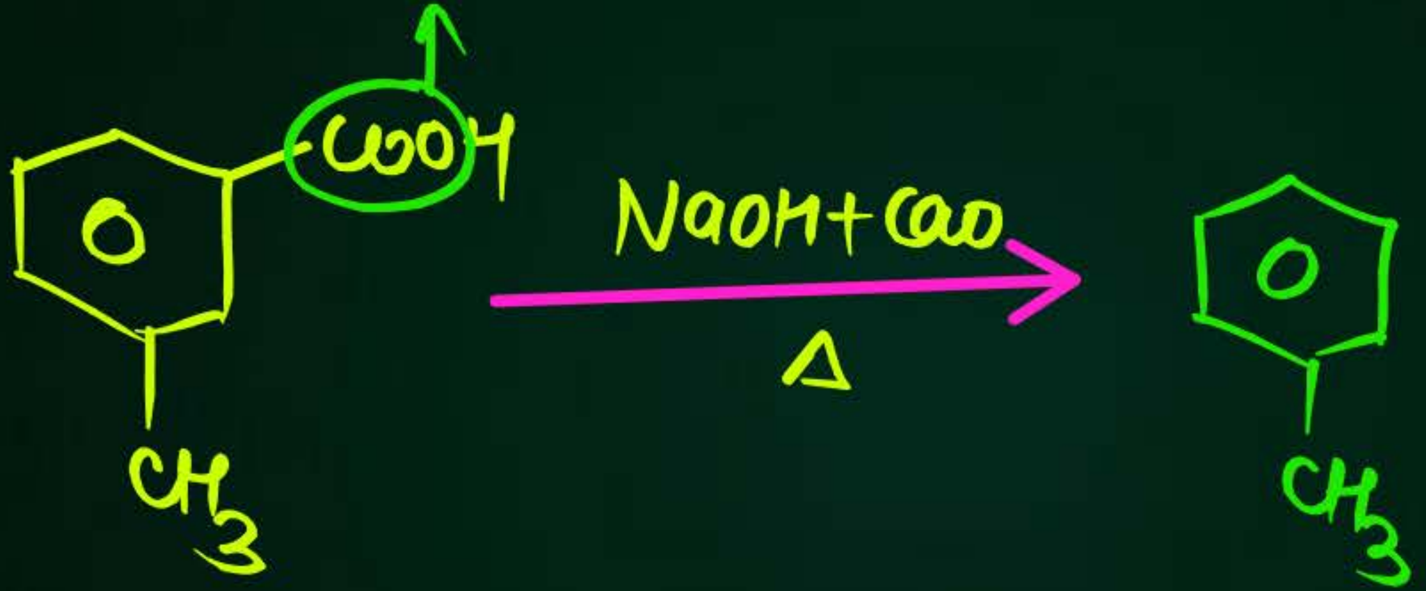
$3CH\equiv CH \xrightarrow{R.H.T}$



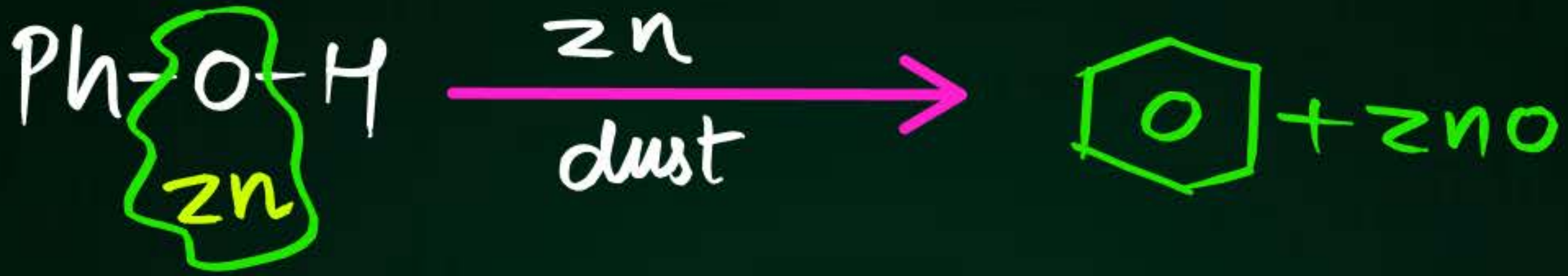
2. Decarboxylation of aromatic acids:


Ph
O
C—O—H
NaOH+CaO
Δ
Ph–H

a


COOH
CH3
NaOH+CaO
Δ
CH3

3. Reduction of Phenol:


Ph-O-H
Zn
Zn
dust
+ ZnO

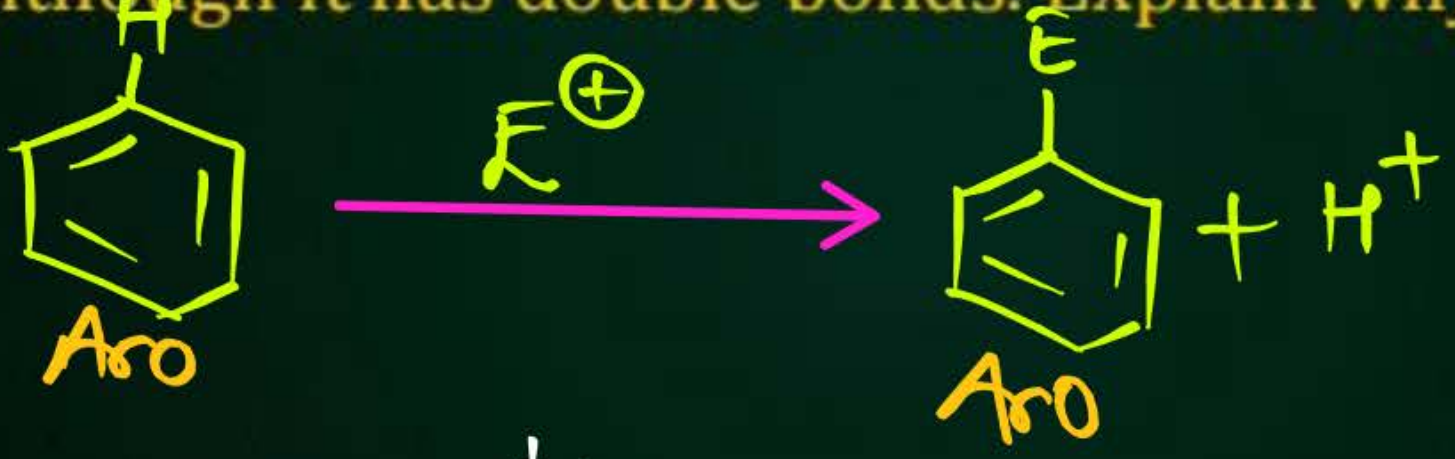
Chemical Properties of Benzene

[Maha imp]

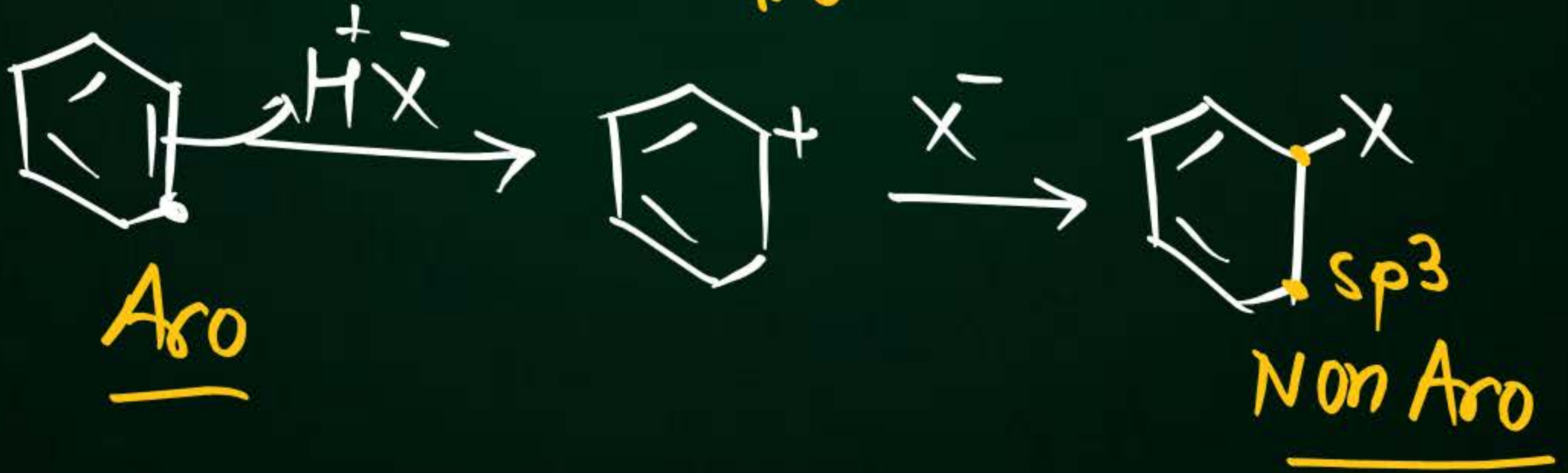
1. Electrophilic Substitution Reactions:

Normally, benzene gives electrophilic substitution reaction rather than electrophilic addition reaction although it has double bonds. Explain why?

✓ E.S.R


H
Aro
$E^{\oplus}$
E
$+ H^+$
Aro

✗ Addition

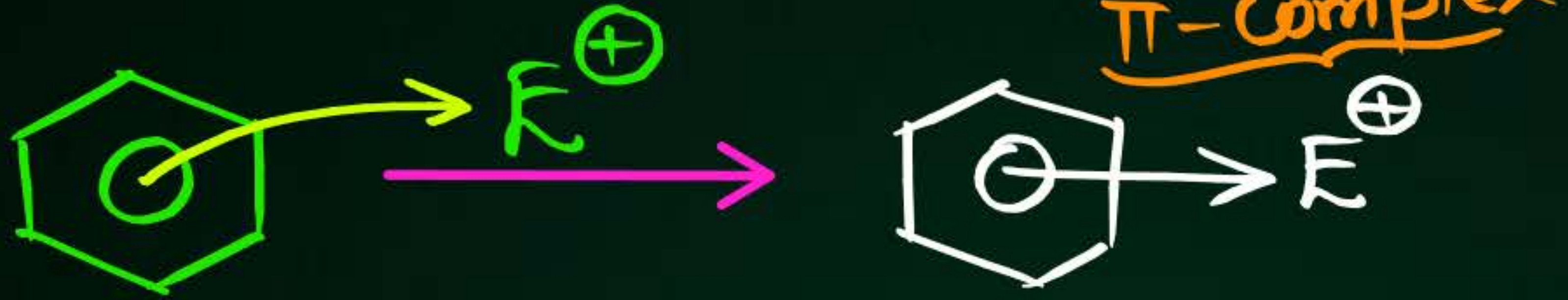

$\overset{+}{H}\overset{-}{X}$
+
X^-
X
sp3
Aro
Non Aro

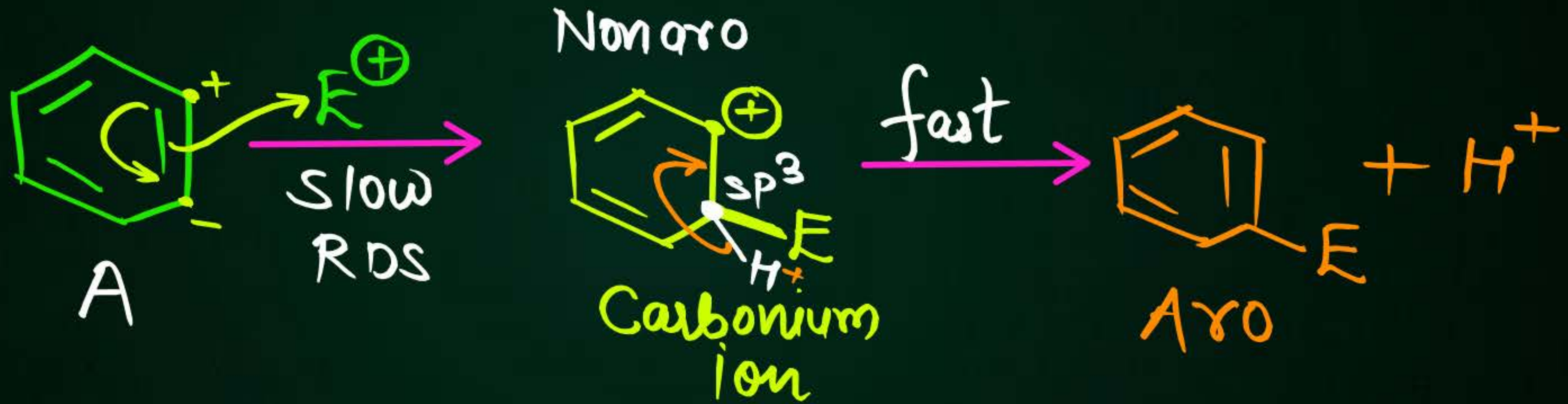
Mechanism of E.S.R:

$\pi e^{\ominus}$

Nu

Mech


E⊕
π-complex
E⊕


Nonaro
E⊕
+
−
Slow
RDS
A
⊕
sp3
E
H+
Carbonium ion
fast
E
+ H+
Aro

op point ÷ ① 2 step Rxn

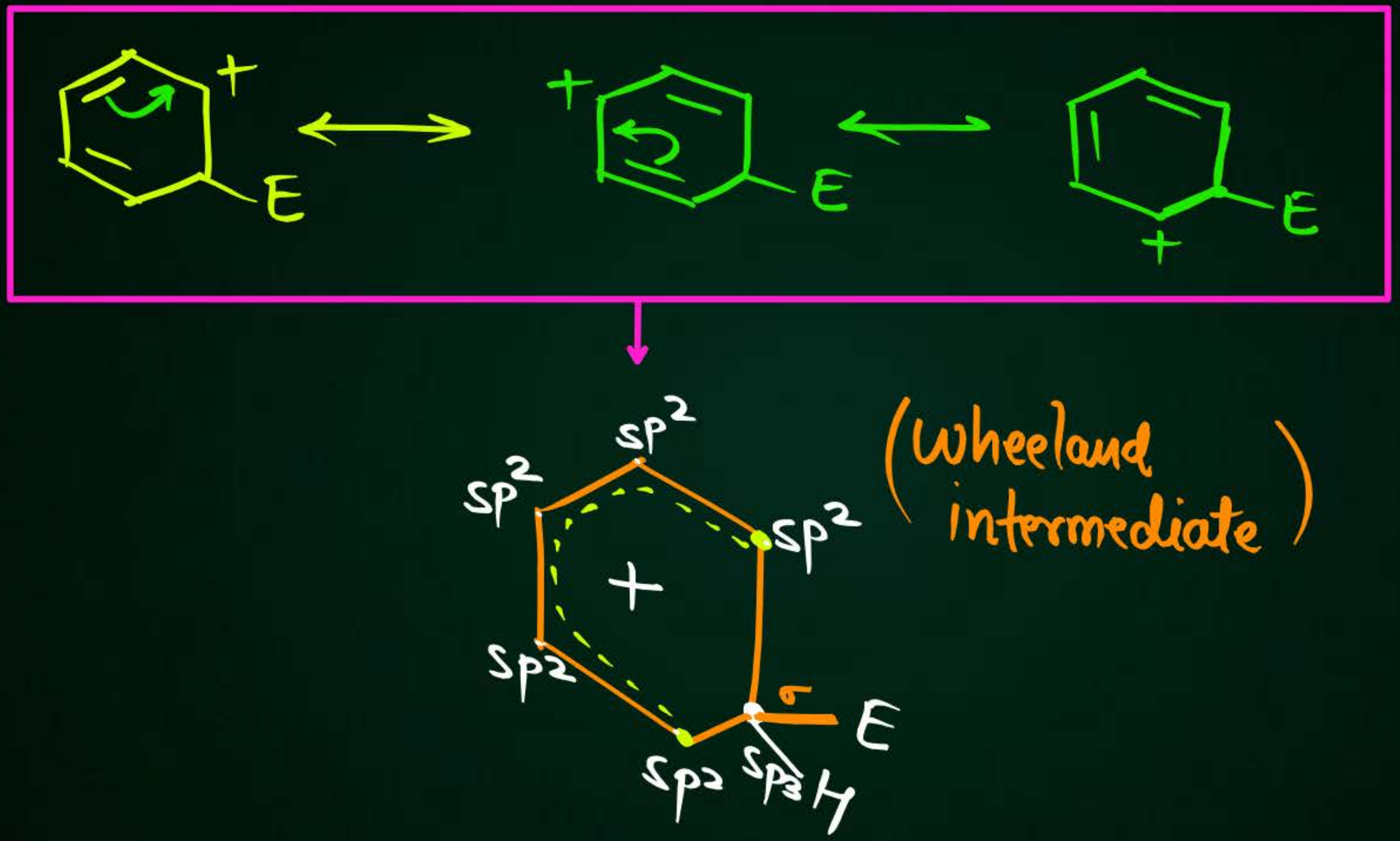
② 1st step (Carbocation formation) is the RDS

③ Carbocation intermediate is a non aro comp

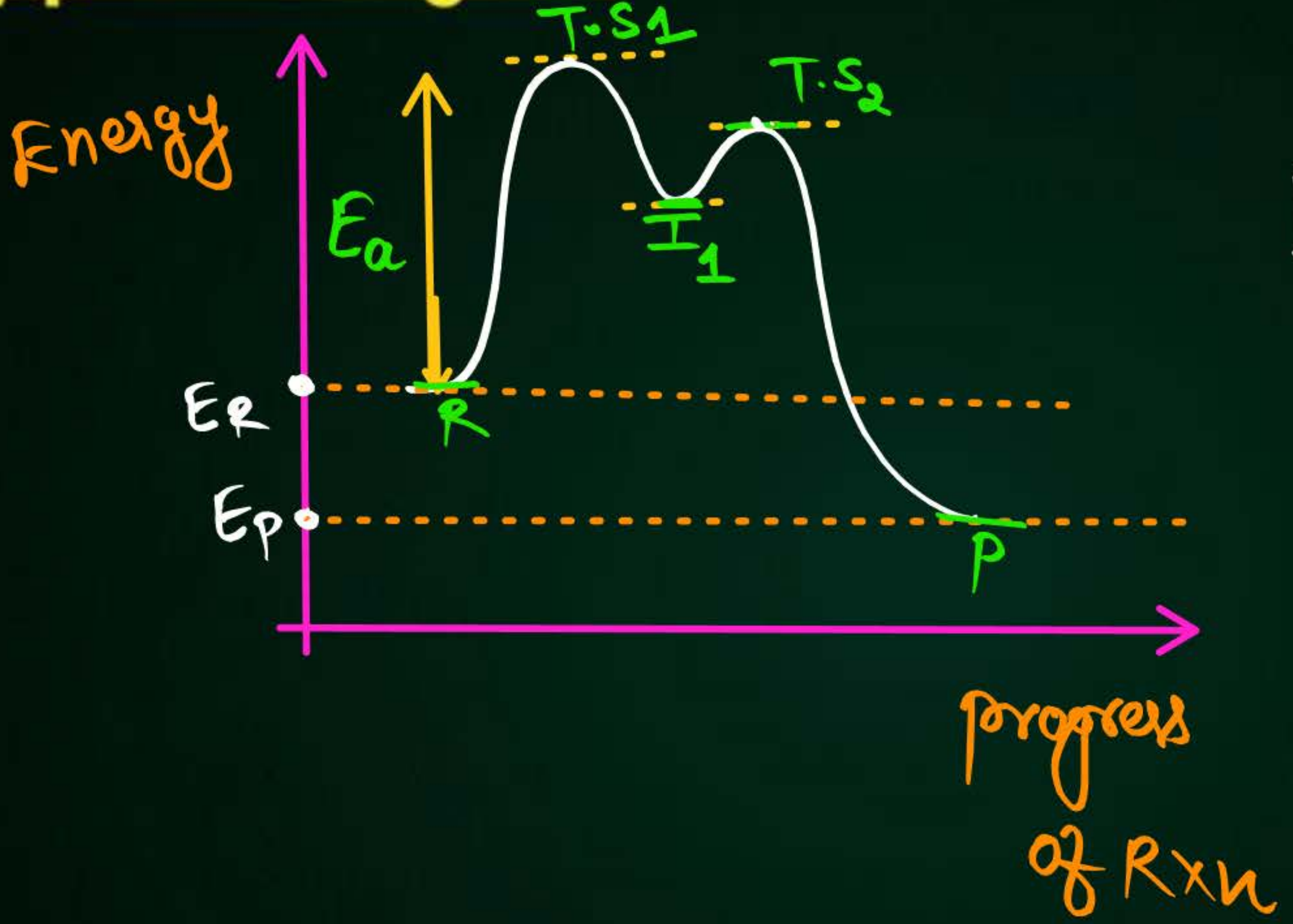
④ Carbocation is stabilized by resonance

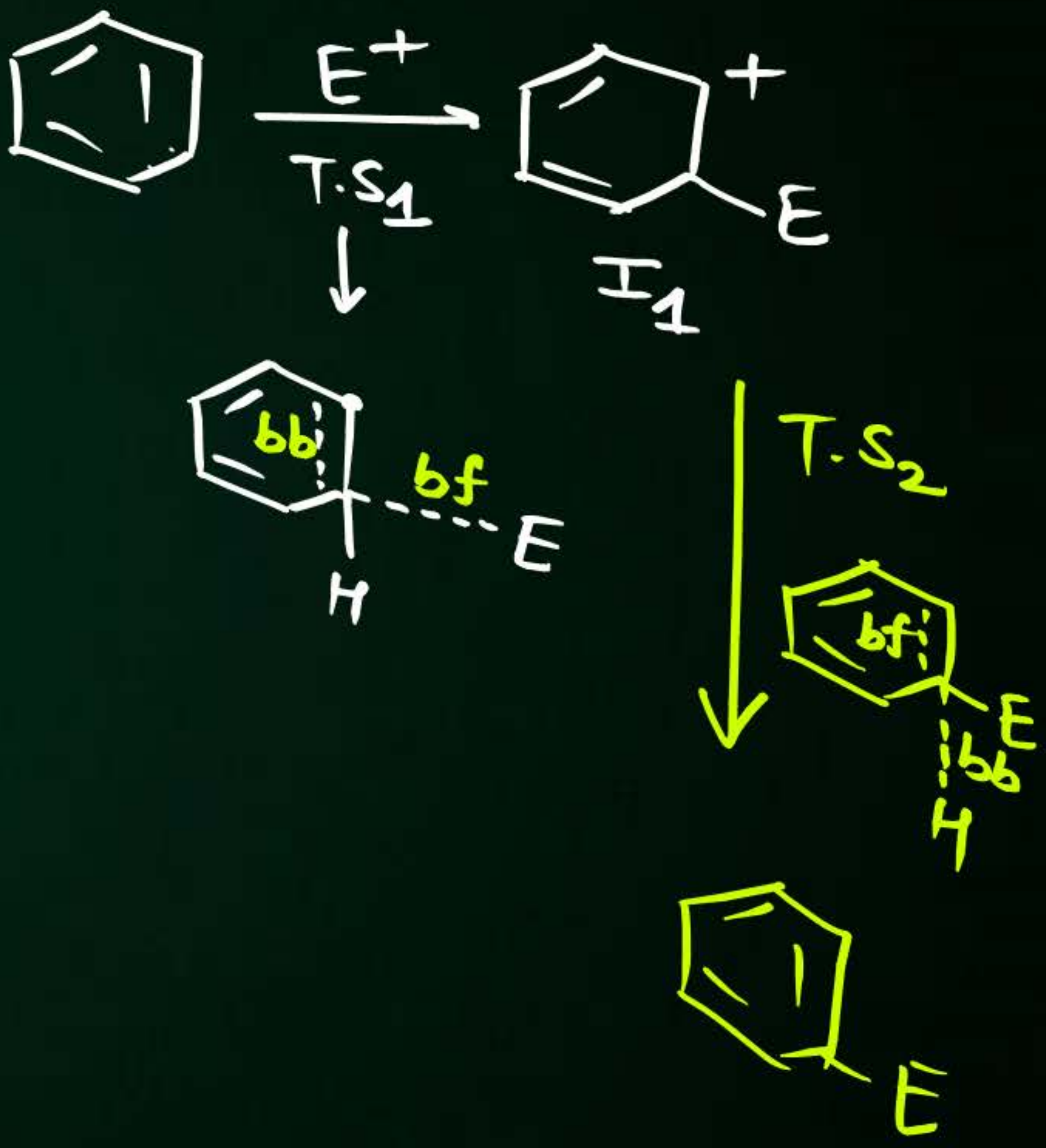
⑤ R.O.R $\propto$ Nucleophilicity of benzene $\propto$ edg $\propto \frac{1}{ewg}$

⑥ Wheeland intermediate (Arenium complex, σ complex)


+
E
+
E
E
+
sp²
sp²
sp²
sp²
sp2
sp3
+
σ
E
H
(Wheeland intermediate)

Energy profile diagram


T.S1
T.S2
Energy
Ea
I1
ER
EP
R
P
progress of Rxn


E+
T.S1
+
E
I1
bb
bf
E
H
T.S2
bf
E
bb
H
E

1. Nitration:

Reagent $\left.\begin{matrix}\text{conc } HNO_3 \\ + \\ \text{conc } H_2SO_4\end{matrix}\right\}$

H^+

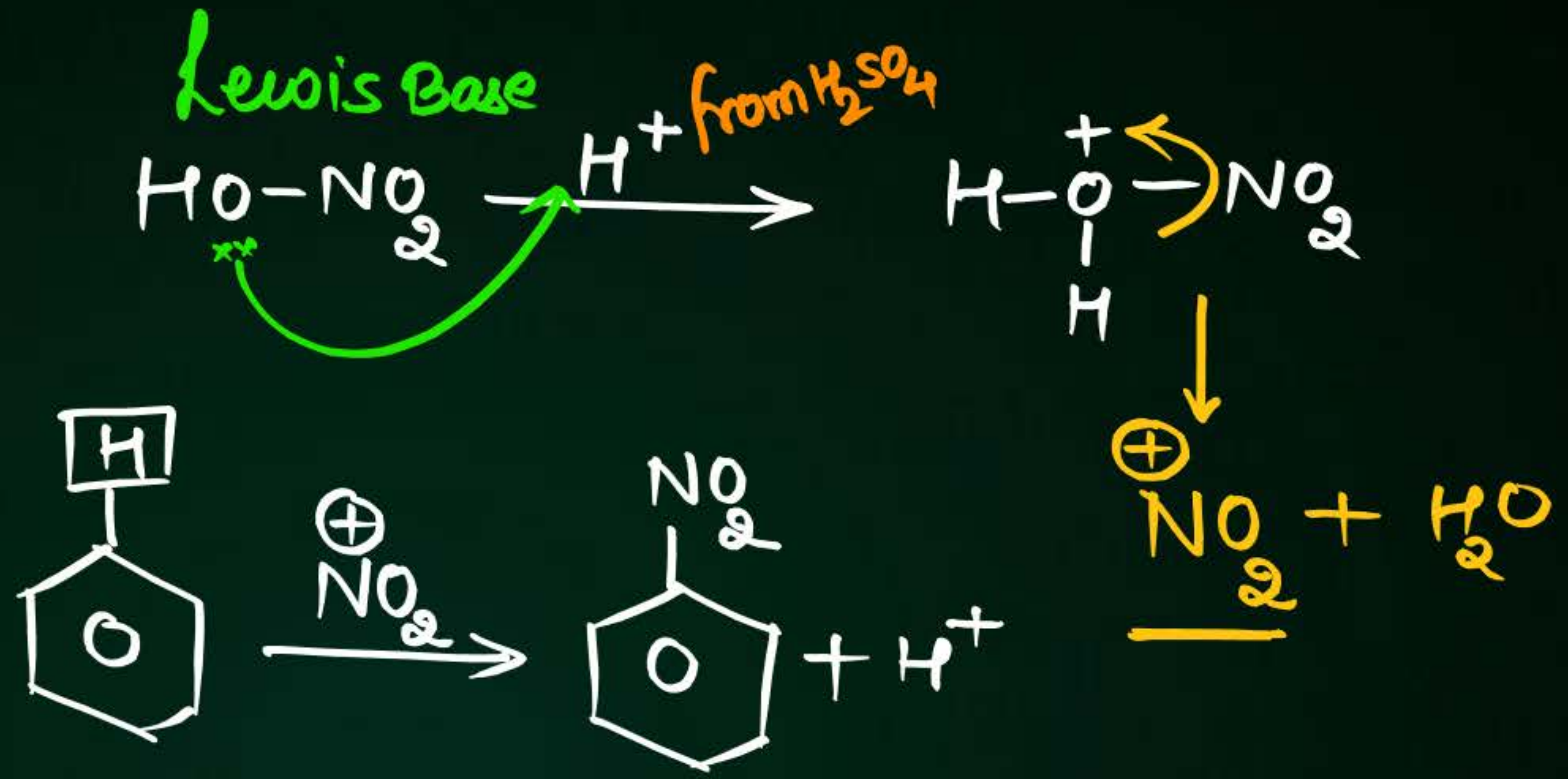
AS $\underbrace{H_2SO_4 > HNO_3}$

other reagent

1) $\overset{+}{N}O_2\overset{-}{B}F_4$

2) $\overset{+}{N}O_2\overset{-}{ClO_4}$

3) $N_2O_{5(s)}$ $\overset{+}{N}O_2\overset{-}{NO_3}$

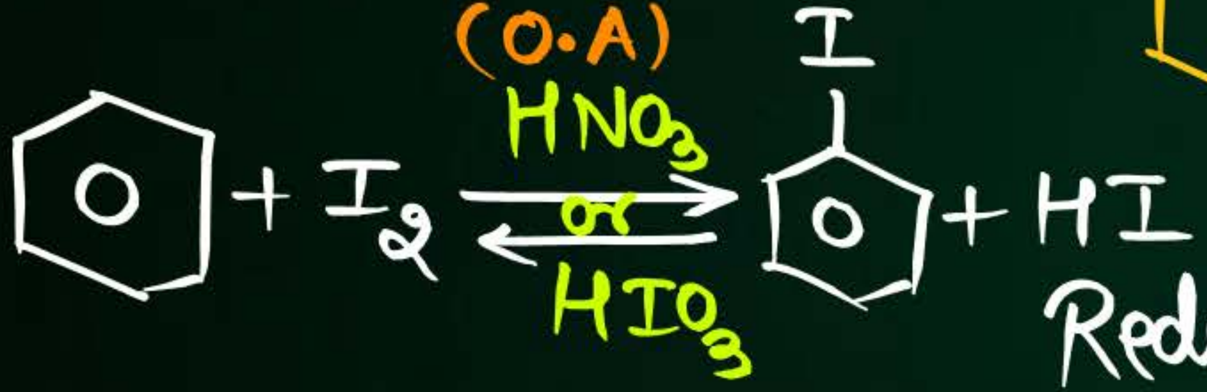

Lewis Base
H^+ from H_2SO_4
$HO-NO_2$
$H-\overset{+}{O}-NO_2$
H
$\overset{\oplus}{N}O_2 + H_2O$
H
$\overset{\oplus}{N}O_2$
NO_2
$+ H^+$

2. Halogenation:

Reagent $X_2 + \overset{\text{Anhy}}{FeX_3}$

# fav for phcl & phBr

# for Iodination



(O.A)
HNO_3
or
HIO_3
I
+ I_2
+ HI
Reducing agent

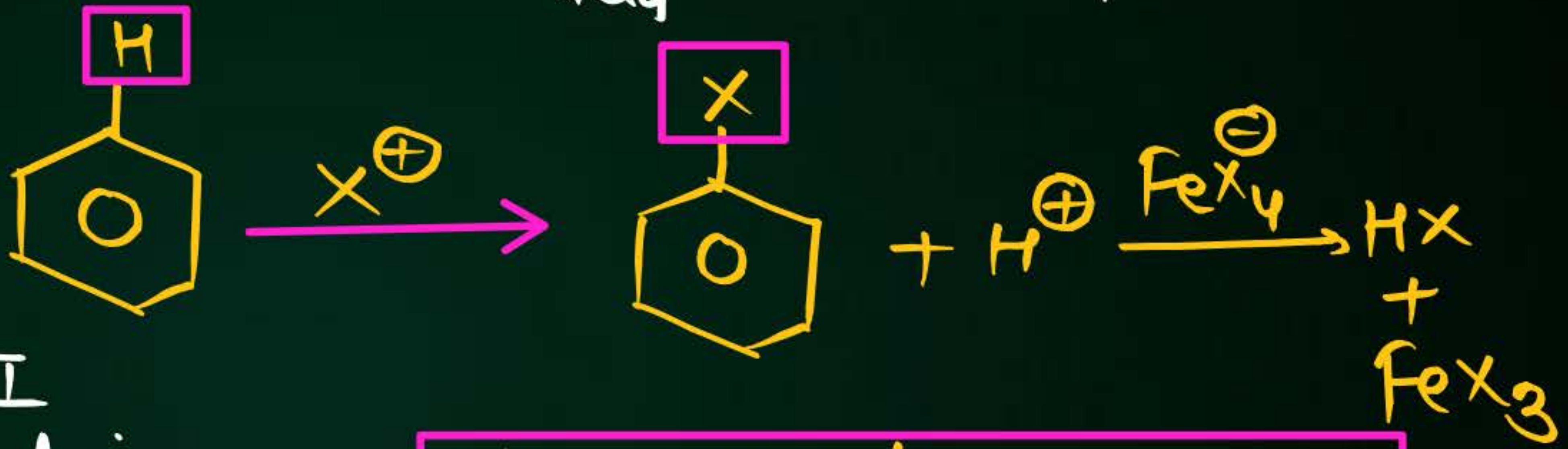
$HI + HIO_3 \longrightarrow I_2 + H_2O$

$HI + HNO_3 \longrightarrow I_2 + NO_2 + H_2O$

# fluorination is highly exo & uncontrolled

$$\overset{\delta+}{X}-\overset{\delta-}{X} + FeX_3 \longrightarrow X^{\oplus} + FeX_4^{\ominus}$$

non polar — Lewis acid — Electrophile



H
$X^{\oplus}$
X
+ $H^{\oplus}$
$FeX_4^{\ominus}$
HX
+
FeX_3

other reagents

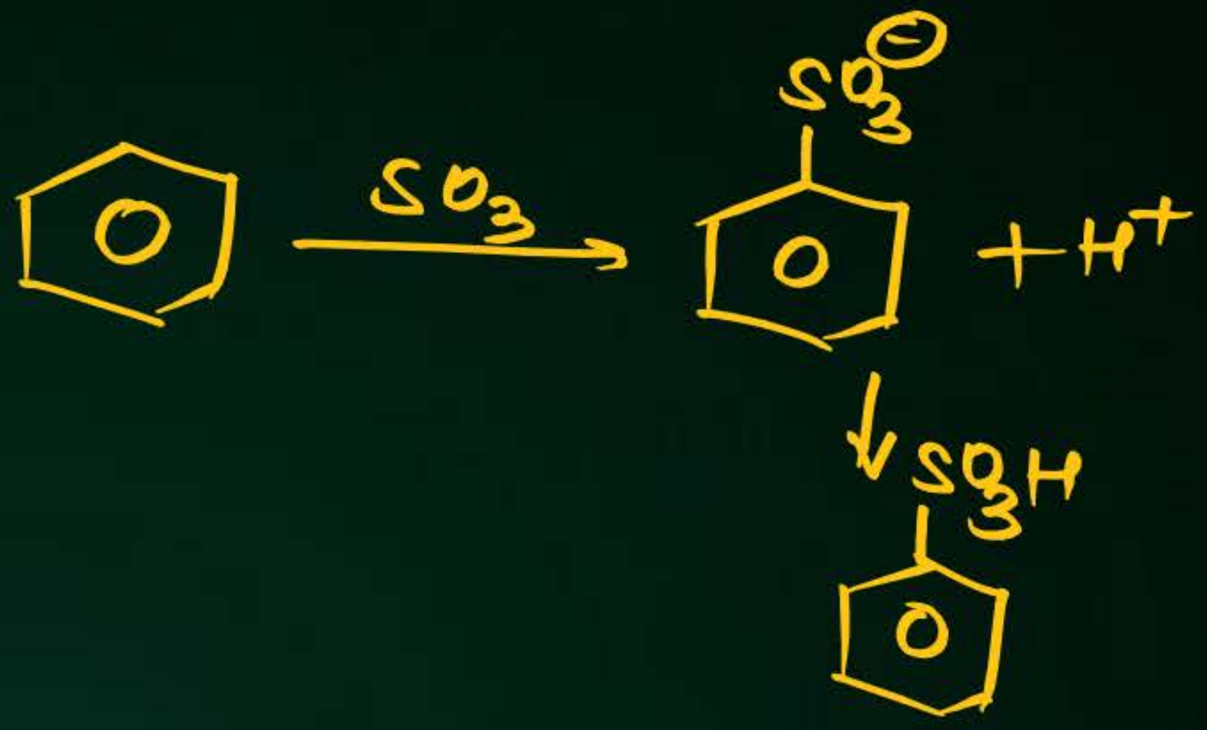
1) $X_2 + Fe$ ($X^{\oplus}$)

2) $\overset{\delta+}{X}-\overset{\delta-}{X'}$ ($\overset{\oplus}{I}-\overset{\ominus}{Br}$, $\overset{\oplus}{Br}-\overset{-}{Cl}$)

E.N $X < X'$ ($\overset{\oplus}{I}-\overset{\ominus}{Cl}$)

3. Sulphonation:

Reagent ÷
1) conc H_2SO_4 ($\boxed{SO_3}$ + H_2O)
2) $\boxed{SO_3}$ + H_2O
3) oleum (H_2SO_4 + $\boxed{SO_3}$)
4) fuming H_2SO_4 (SO_3 + H_2SO_4)

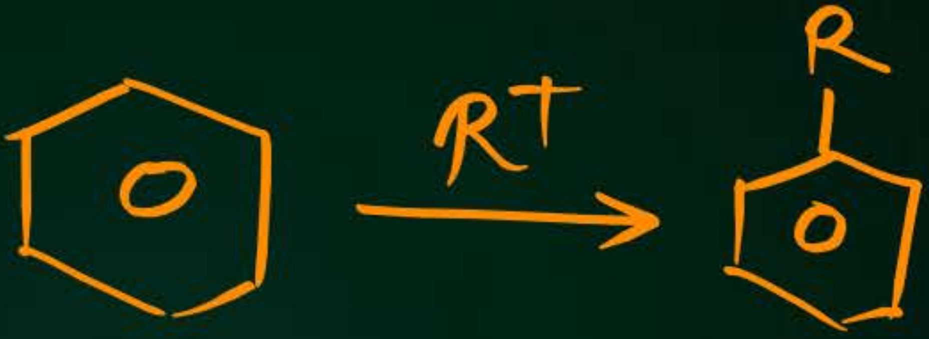

SO_3
$SO_3^{\ominus}$
$+H^+$
SO_3H

4. Friedel-Crafts alkylation reaction:

Reagent ✓ $R-X + \text{Anhy } AlX_3$

$$\overset{\delta+}{R}-\overset{\delta-}{X} + AlX_3 \longrightarrow R^+ + AlX_4^{\ominus}$$

(Rearrange if pos)



other reagent

✓1) $R-OH + H^+ \longrightarrow R-\overset{+}{O}H_2$

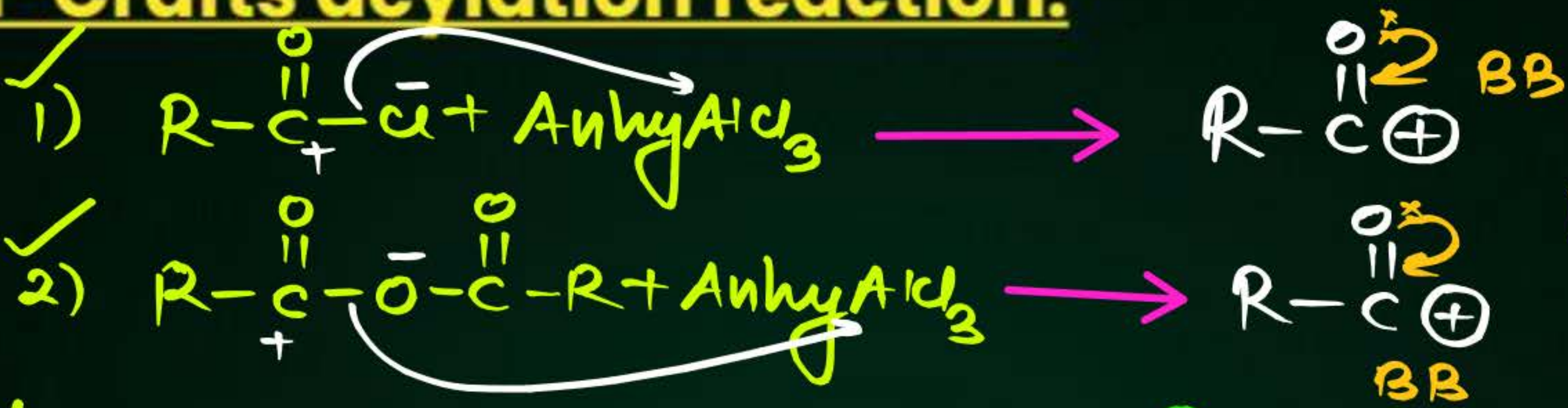
$\downarrow$

$R^{\oplus}$

✓2) $R-CH=CH_2 + H^+ \longrightarrow R-\overset{\oplus}{C}H-CH_3$

5. Friedel-Crafts acylation reaction:

Reagent

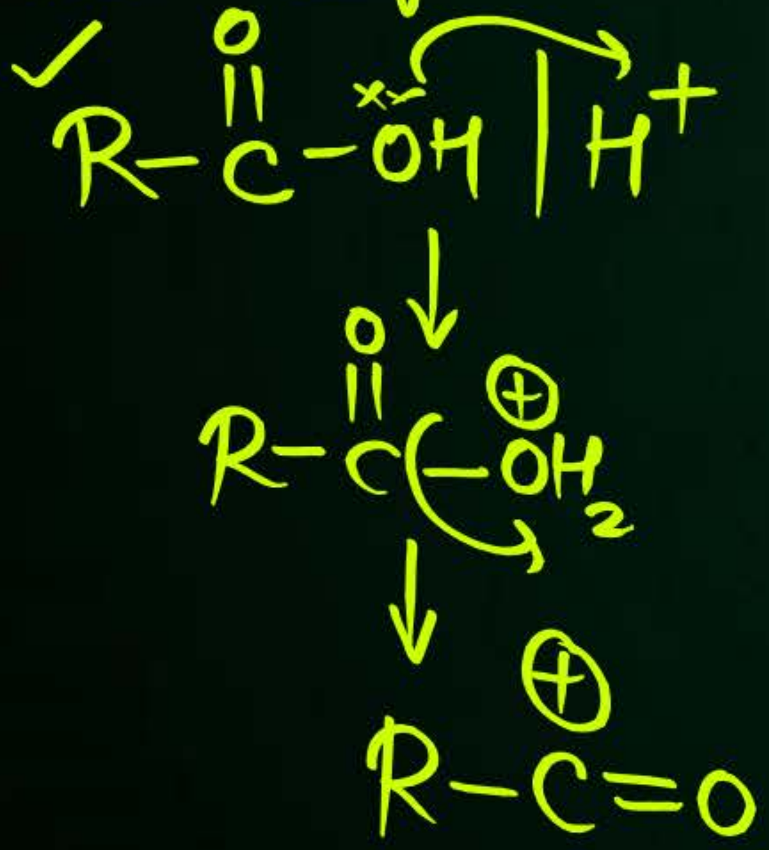


✓ 1) $R-\overset{O}{\overset{\|}{\underset{+}{C}}}-\bar{Cl} + \text{Anhy}\,AlCl_3 \longrightarrow R-\overset{O}{\overset{\|}{C}}\oplus$

✓ 2) $R-\overset{O}{\overset{\|}{\underset{+}{C}}}-\bar{O}-\overset{O}{\overset{\|}{C}}-R + \text{Anhy}\,AlCl_3 \longrightarrow R-\overset{O}{\overset{\|}{C}}\oplus$

No rearrangement

other reagent



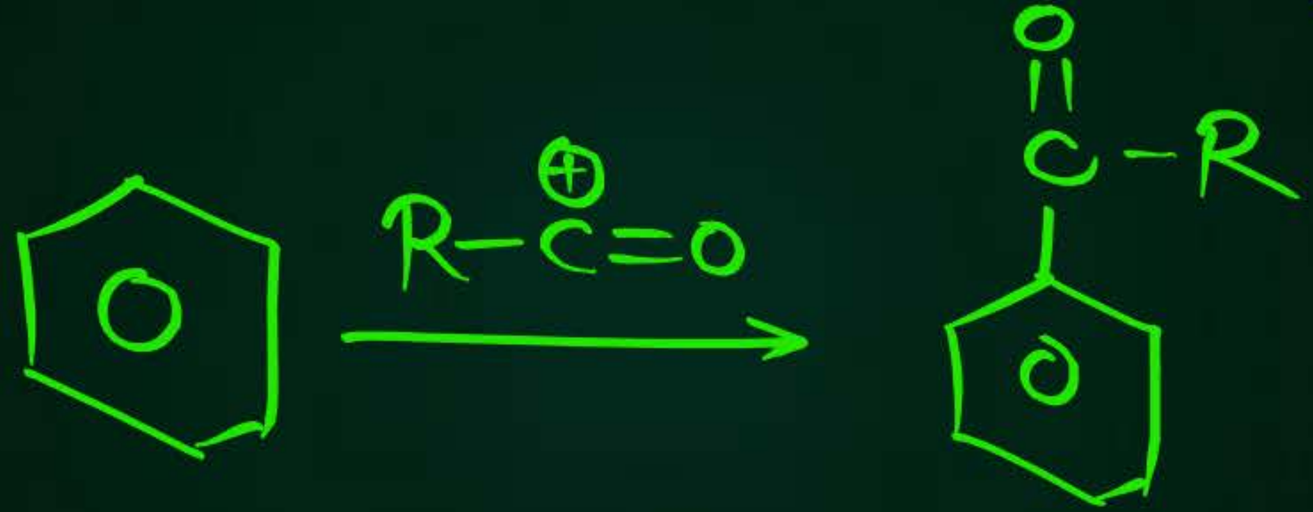
✓ $R-\overset{O}{\overset{\|}{C}}-\ddot{O}H \;|\; H^+$

$\downarrow$

$R-\overset{O}{\overset{\|}{C}}-\overset{\oplus}{O}H_2$

$\downarrow$

$R-\overset{\oplus}{C}=O$

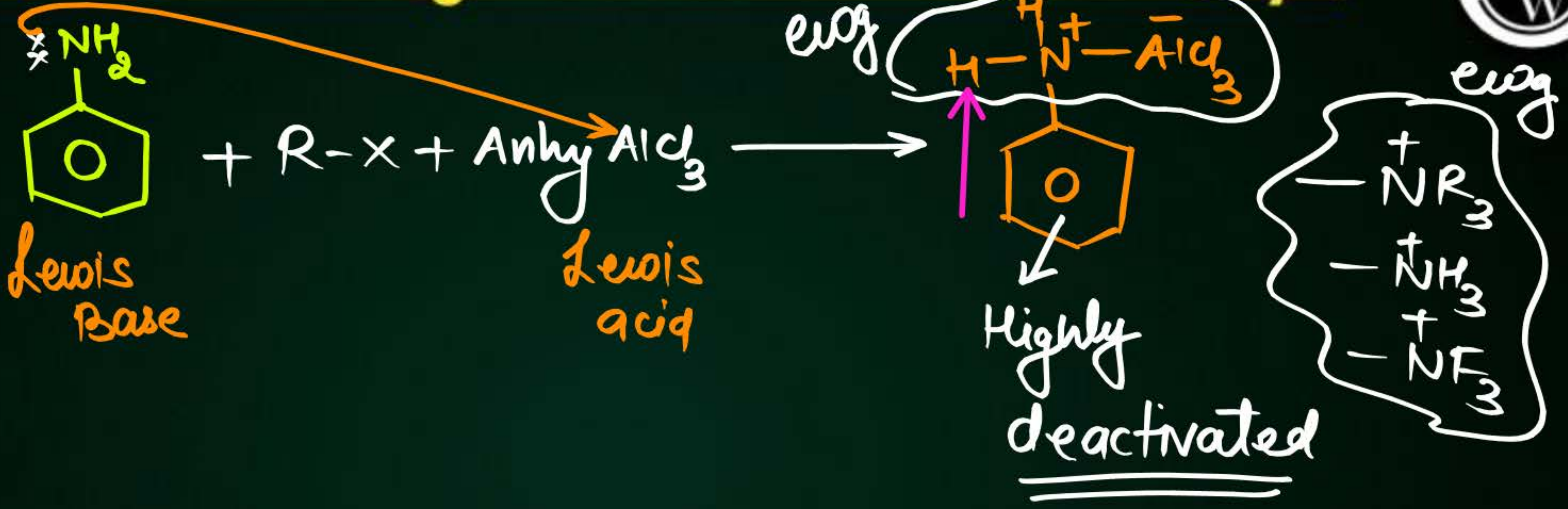


$\xrightarrow{R-\overset{\oplus}{C}=O}$

Q. Aniline does not undergo Friedel craft reaction why ?

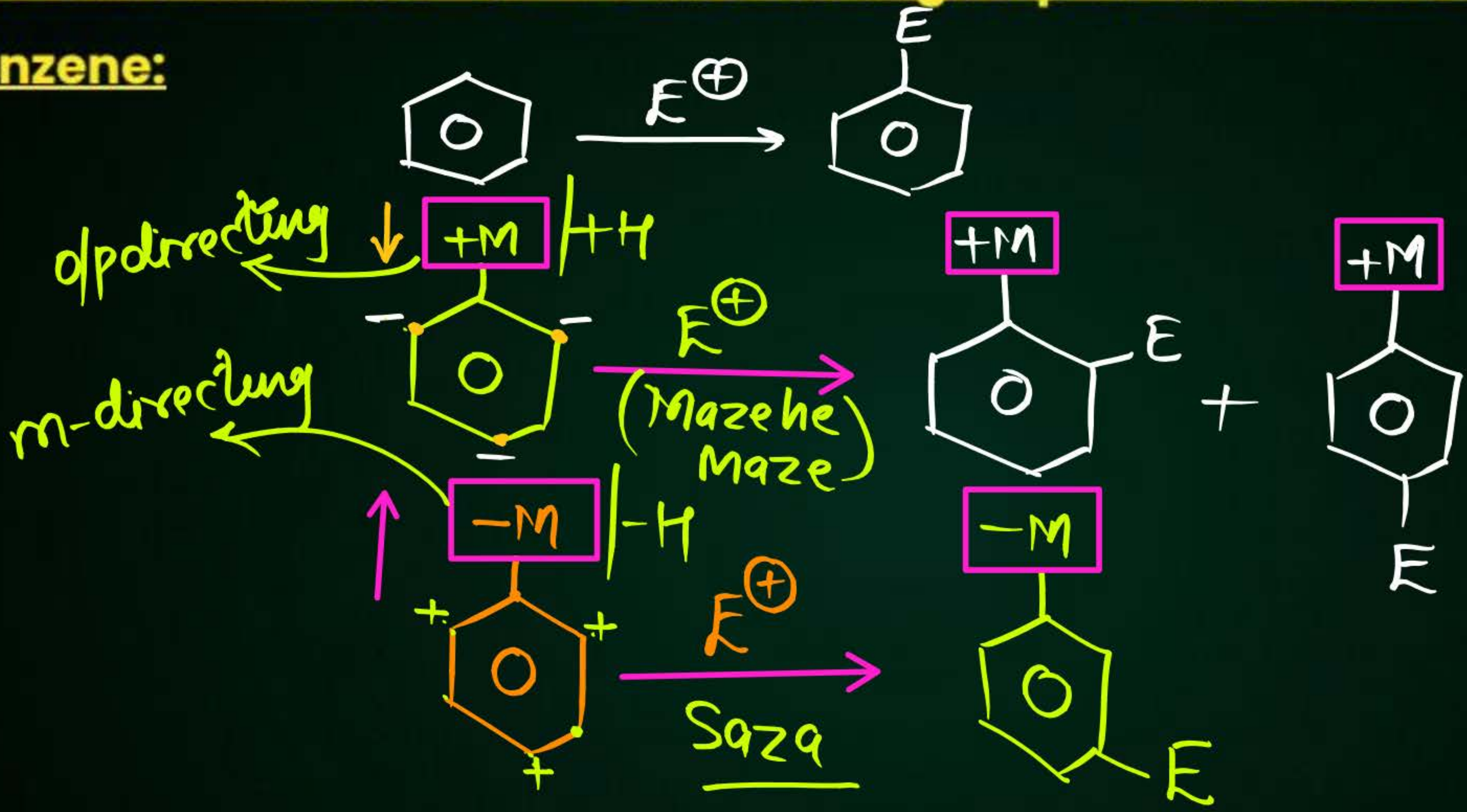
Neet 2025

A·R



NH$_2$
+ R–X + Anhy AlCl$_3$
Lewis Base
Lewis acid
ewg
H–N$^+$(H)–$\bar{A}$lCl$_3$
Highly deactivated
ewg
–$\overset{+}{N}$R$_3$
–$\overset{+}{N}$H$_3$
–$\overset{+}{N}$F$_3$

Directive influence of a functional group in monosubstituted benzene:

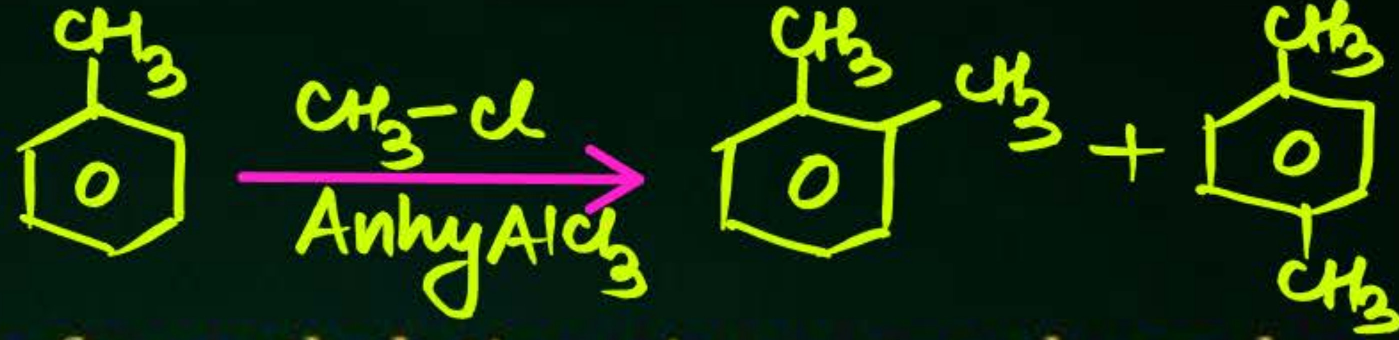

E
E⊕
o/p directing
+M
+H
−
−
−
E⊕
(Mazehe Maze)
m-directing
−M
−H
+
+
+
E⊕
Saza
+M
E
+
+M
E
−M
E

due to
Steric hind
factor
P-Major

O-major
tab hoga
Jab H-Bond
horahiho

QUESTION (NCERT Exemplar)

+M|+H −M|−H



Assertion (A): Toluene on Friedal Crafts methylation gives o– and p–xylene.

Reason (R): CH_3- group bonded to benzene ring increases electron density at o– and p– position. due to +H

[✓ A] Both A and R are correct and R is the correct explanation of A.

B Both A and R are correct but R is not the correct explanation of A.

C Both A and R are not correct.

D A is not correct but R is correct.

QUESTION (NCERT Exemplar)

Assertion (A): Nitration of benzene with nitric acid requires the use of concentrated sulphuric acid.

Reason (R): The mixture of concentrated sulphuric acid and concentrated nitric acid produces the electrophile, NO_2^+.

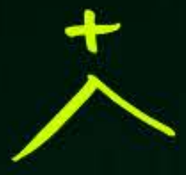
[✓ A] Both A and R are correct and R is the correct explanation of A.

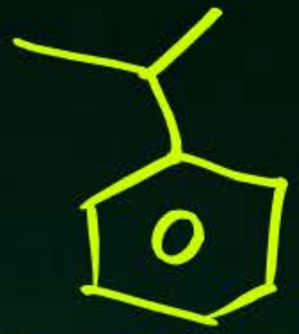
B Both A and R are correct but R is not the correct explanation of A.

C Both A and R are not correct.

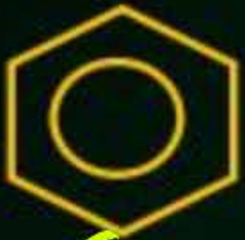
D A is not correct but R is correct.

QUESTION (AIIMS 2018)





(cumene)

Assertion:  + $CH_3-CH_2-CH_2-Cl \xrightarrow{AlCl_3}$ Product is isopropyl benzene.

Reason: Due to rearrangement of primary carbocation into secondary carbocation.

A If both Assertion and Reason are correct and the Reason is a correct explanation of the Assertion.

B If both Assertion and Reason are correct but Reason is not the correct explanation of the Assertion.

C If Assertion is correct but Reason is incorrect.

D If both the Assertion and Reason are incorrect.

QUESTION (AIIMS 2015)

Assertion: Nitrating mixture used for carrying out nitration of benzene consists of conc. HNO_3 + conc. H_2SO_4. ✓

Reason: In presence of H_2SO_4, HNO_3 acts as a base and produces NO_2^+ ions. ✓

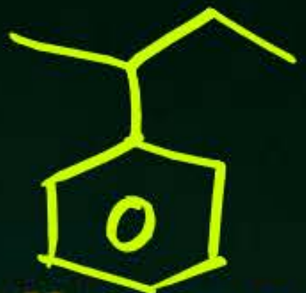
[✓ A] If both Assertion and Reason are correct and the Reason is a correct explanation of the Assertion.

B If both Assertion and Reason are correct but Reason is not the correct explanation of the Assertion.

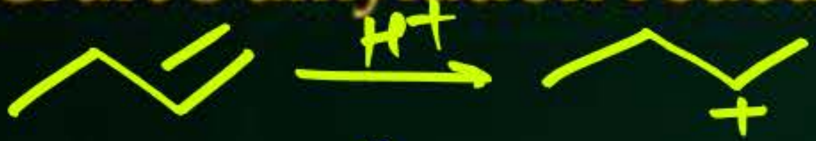
C If Assertion is correct but Reason is incorrect.

D If both the Assertion and Reason are incorrect.

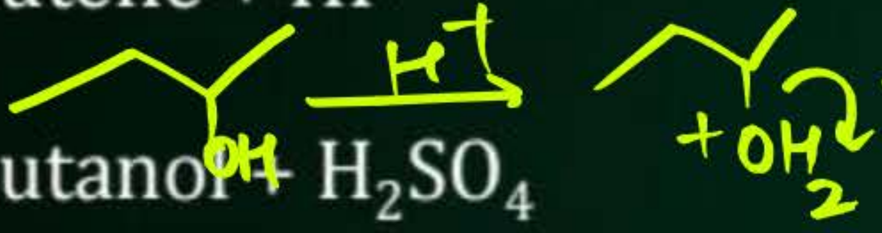
QUESTION (AIIMS 2014)



Which of the following would not give 2-phenylbutane as the major product in the Friedel-Craft's alkylation reaction?

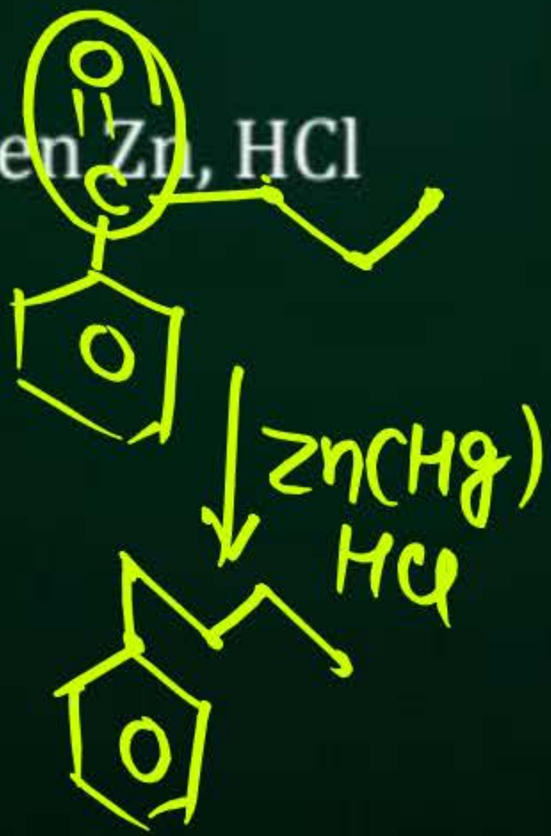


✓ (A) 1-butene + HF

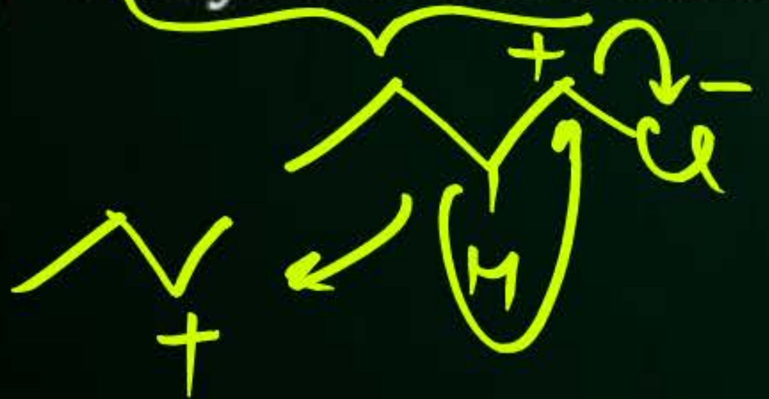


(B) 2-butanol + H_2SO_4

✓ (C) Butanoyl chloride + $AlCl_3$ then Zn, HCl



(D) Butyl chloride + $AlCl_3$



QUESTION (AIIMS 2007)

Which of the following species participate in sulphonation of benzene ring?

A H_2SO_4

[✓ B] SO_3

C HSO_3^-

D SO_2^-

QUESTION (AIIMS 1999)

$$\underset{\text{Benzene}}{C_6H_6} + \underset{\text{Methyl chloride}}{CH_3Cl} \xrightarrow{AlCl_3} \underset{\text{Toluene}}{C_6H_5CH_3} + HCl$$

The above reaction is:

Ⓐ Wurtz Fitting reaction

Ⓑ Grignard reaction

[✓ Ⓒ Friedel-Craft's reaction]

Ⓓ Ullmann reaction

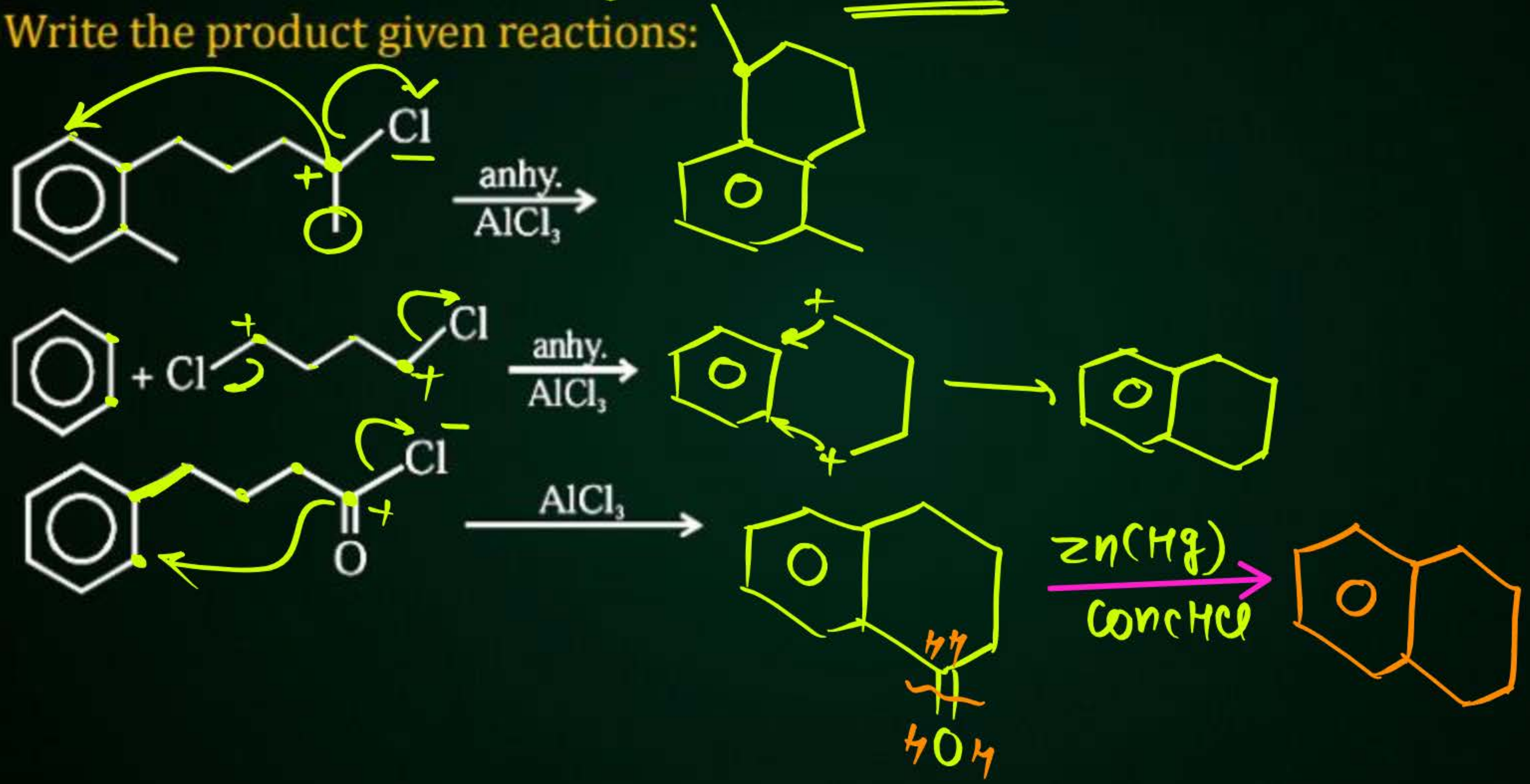
QUESTION

Intramolecular rxn

Ring formation → at ortho position only

6>5>4>3

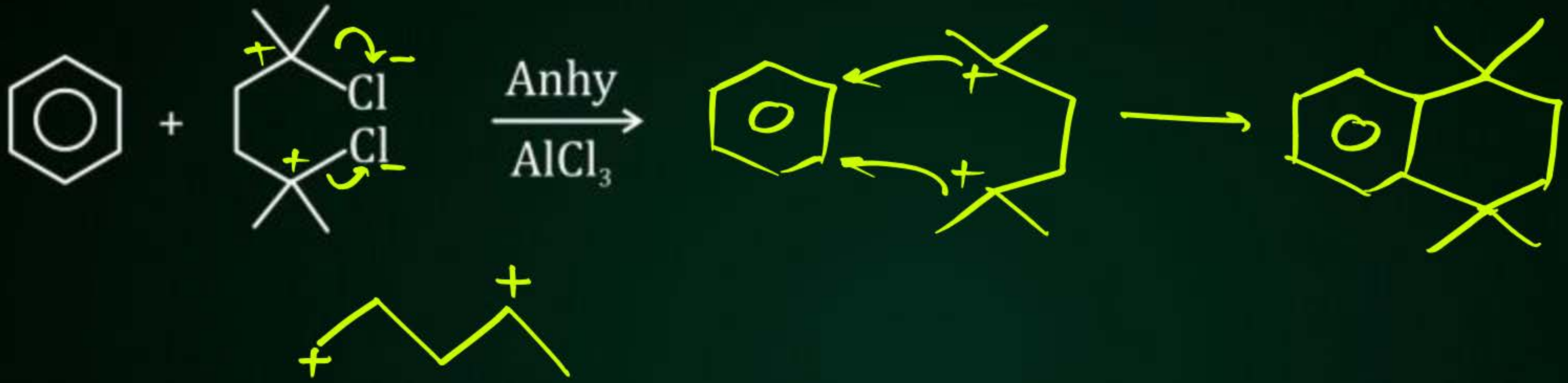
Write the product given reactions:


Cl
anhy.
AlCl3
+
Cl
+ Cl
anhy.
AlCl3
Cl⁻
O
AlCl3
Zn(Hg)
conc HCl
H H
HOH

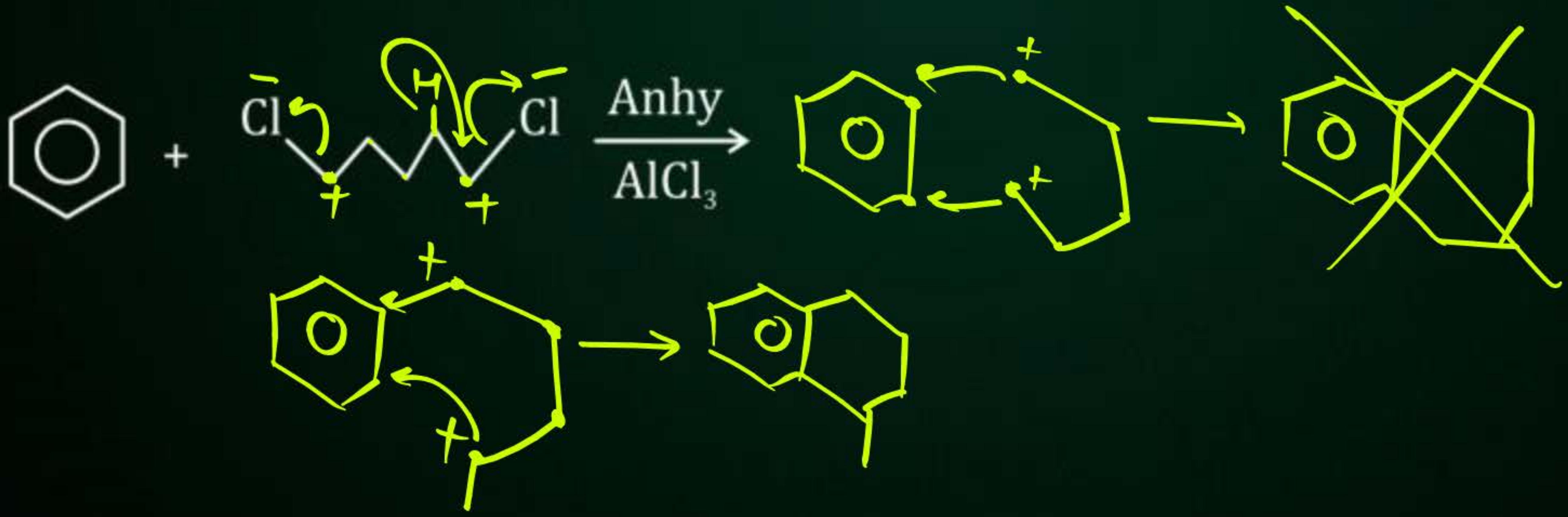
QUESTION

6>5>4>3

Intramolecular F.C.R main Ring ko priority dena hai (Rearrangement se ooper)

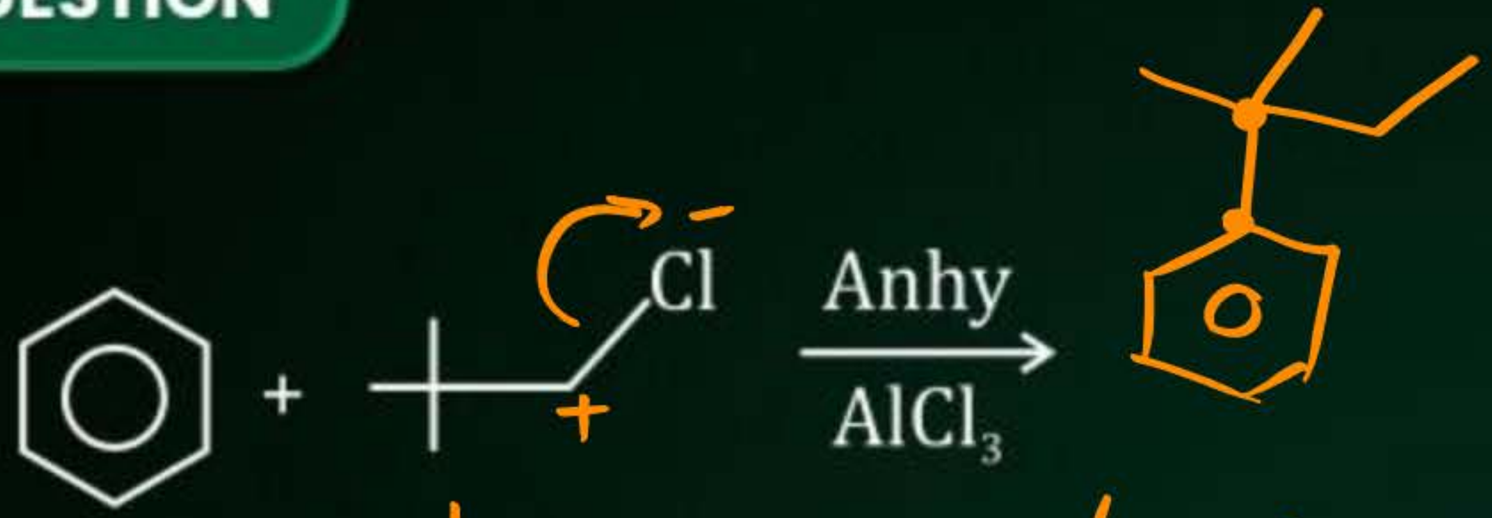


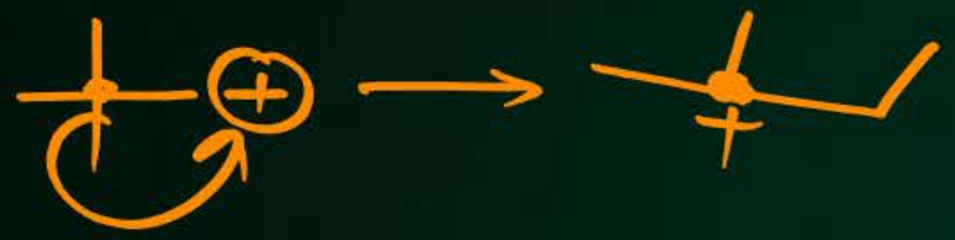
Cl
Cl
Anhy
AlCl$_3$

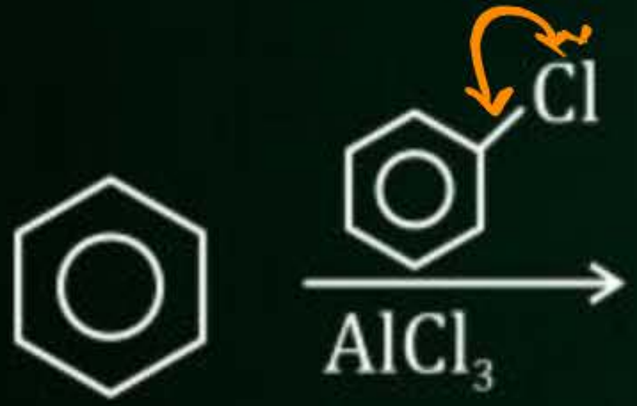


Cl
H
Cl
Anhy
AlCl$_3$

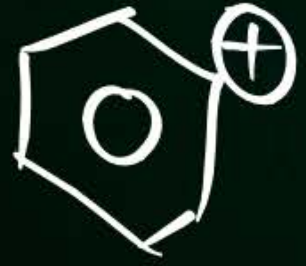
QUESTION


Cl
Anhy
AlCl3



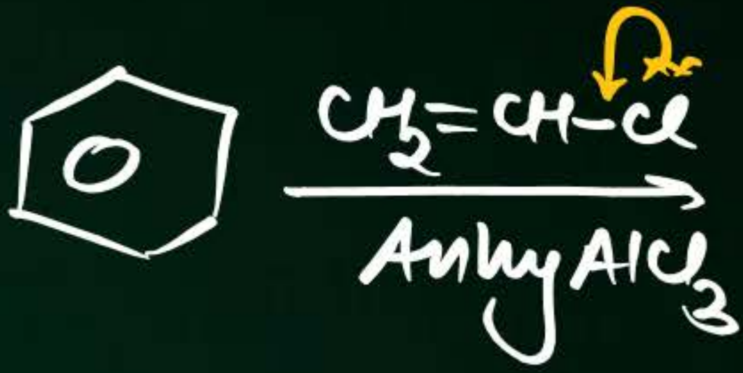


No Rxn

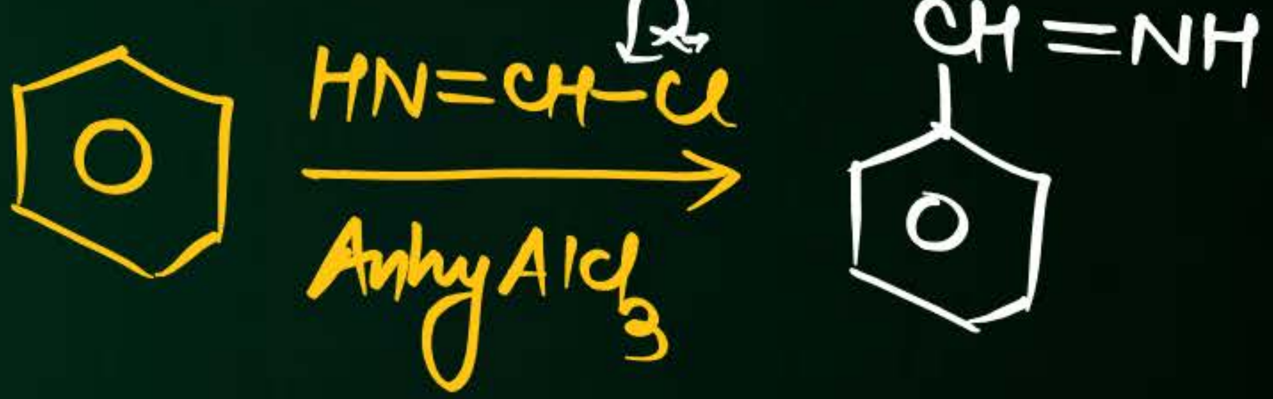


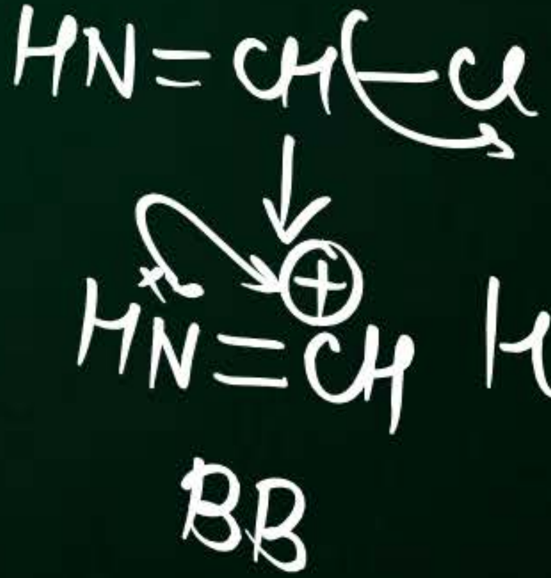
Highly unstable

$CH_2=\overset{\oplus}{C}H$ Highly unstable


CH2=CH–Cl
Anhy AlCl3

NO Rxn


HN=CH–Cl
Anhy AlCl3
CH=NH


HN=CH–Cl
HN=CH
BB

Highly stable

Home Work

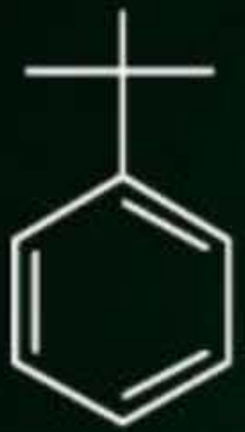
QUESTION 01

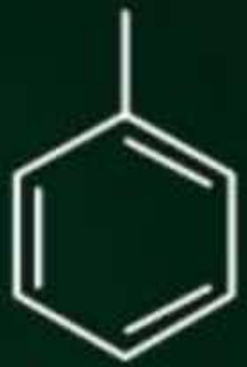
Attacking of reactive or electrophilic species in nitration of benzene is or In the nitration of benzene with concentrated $H_2SO_4 + HNO_3$, the attack on ring is made by

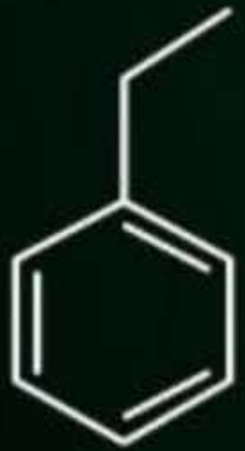
- **A** NO_2^-
- **B** NO_2^+
- **C** NO_3^-
- **D** NO_2

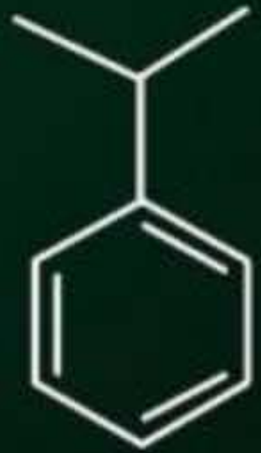
QUESTION 02

Which of the following will undergo sulphonation at the fastest rate?

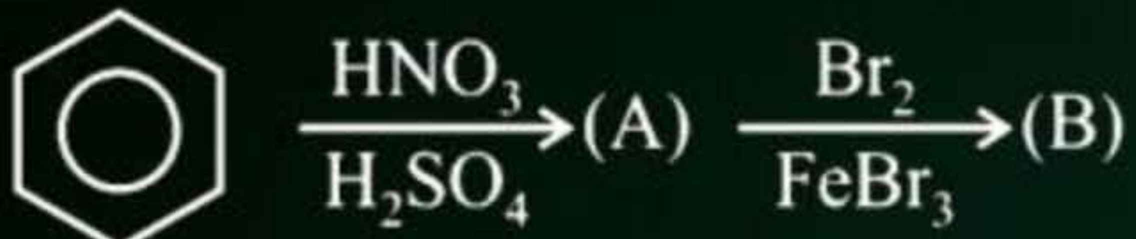
A 

B 

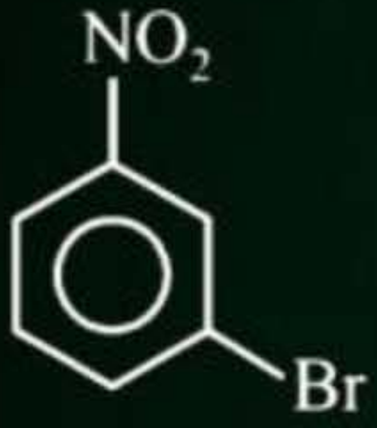
C 

D 

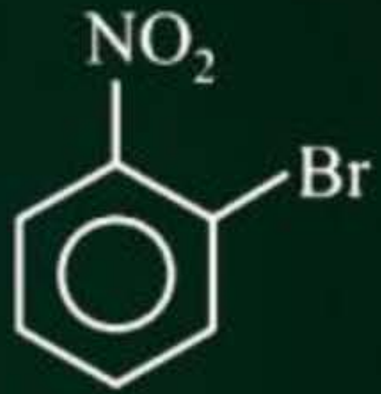
QUESTION 03


$\xrightarrow[H_2SO_4]{HNO_3}$ (A) $\xrightarrow[FeBr_3]{Br_2}$ (B)

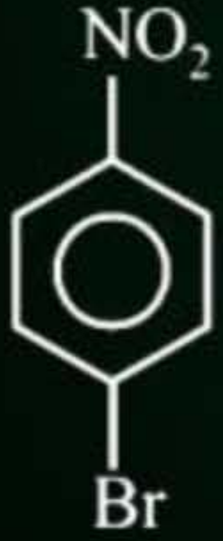
A



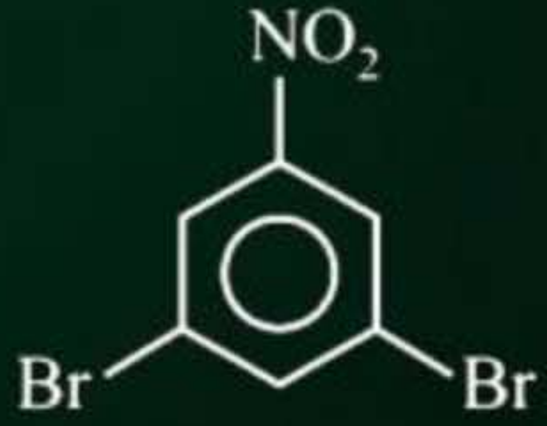
B



C



D



QUESTION 04

When Friedel-Craft alkylation of benzene is carried out with *n*-propyl bromide, the major product is:

A *n*-propyl benzene

B isopropyl benzene

C 2-ethyl benzene

D none of the above

QUESTION 05

The reaction of toluene with Cl_2 in presence of $FeCl_3$ gives predominantly.

Ⓐ benzyl chloride

Ⓑ o- and p-chlorotoluene

Ⓒ m-chlorotoluene

Ⓓ benzoyl chloride

QUESTION 06

Which of the following organic chlorides will not give a Friedel-Craft alkylation product when heated with benzene and $AlCl_3$?

A $(CH_3)_3CCl$

B $CH_2=CHCH_2Cl$

C CH_3CH_2Cl

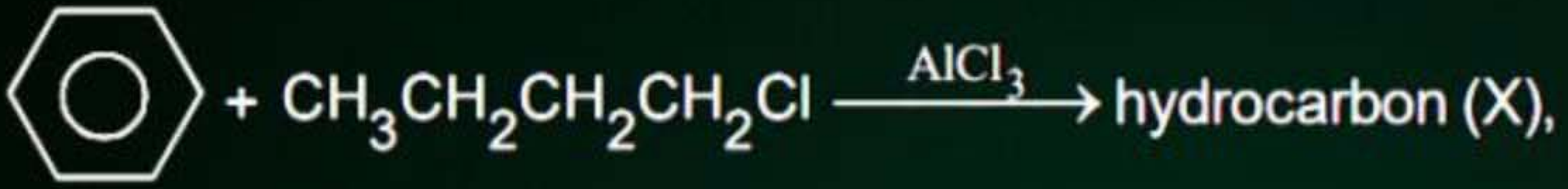
D $CH_2=CHCl$

QUESTION 07

Among the following groups, the group that deactivates the benzene ring for further electrophilic substitution is:

- **A** Hydroxyl
- **B** Methyl
- **C** Nitro
- **D** Amino

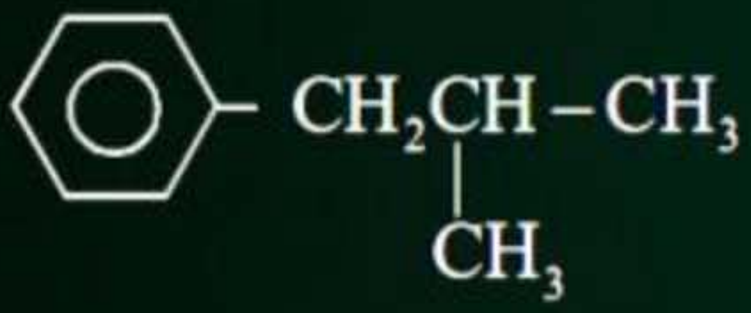
QUESTION 08



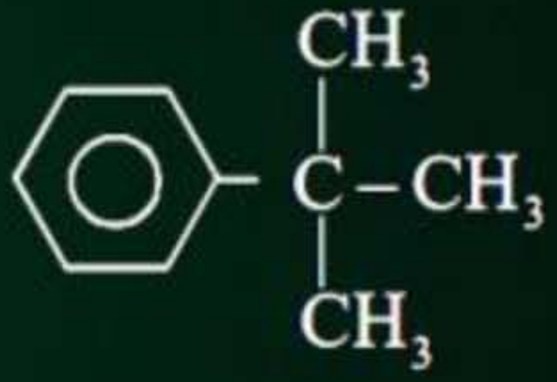
$+ CH_3CH_2CH_2CH_2Cl \xrightarrow{AlCl_3}$ hydrocarbon (X),

Major Product X is:

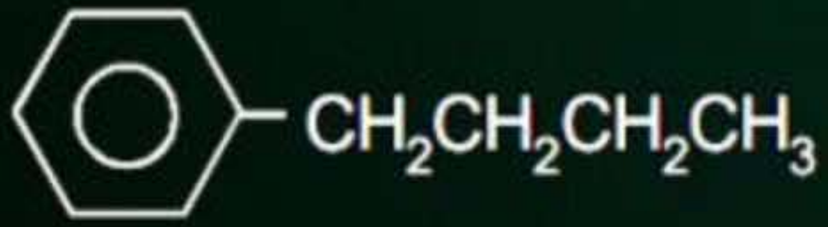
A


CH_2CH-CH_3
CH_3

B

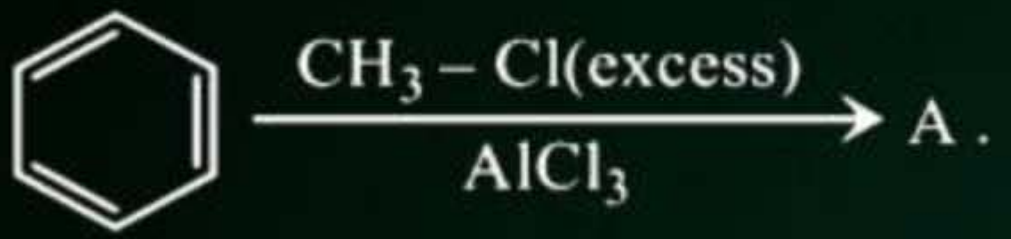

CH_3
$C-CH_3$
CH_3

C

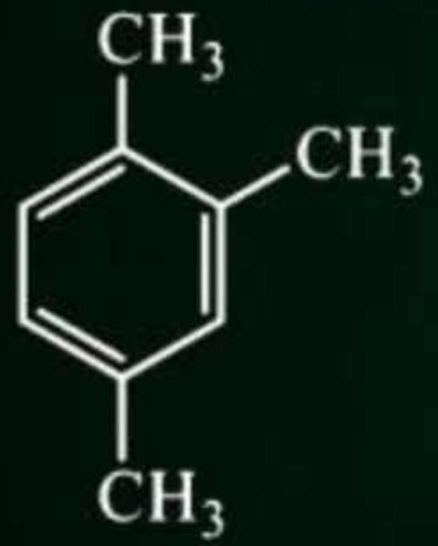

$CH_2CH_2CH_2CH_3$

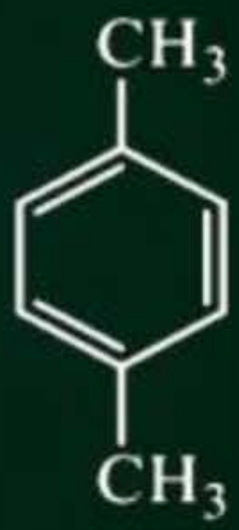
D None is correct

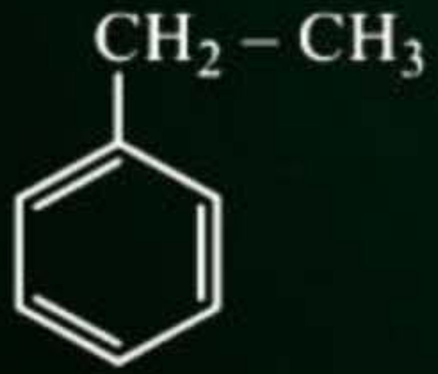
QUESTION 09

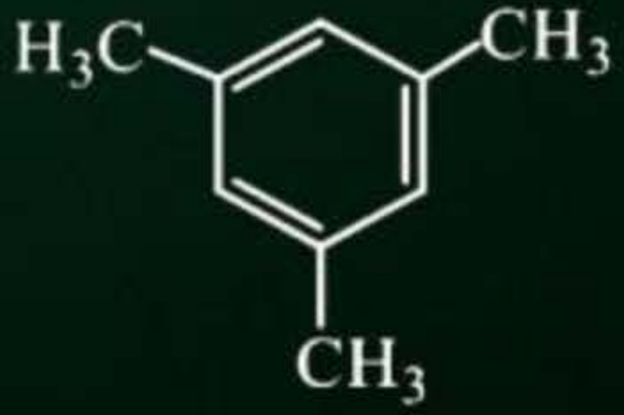

$CH_3 - Cl$(excess)
$AlCl_3$
A .

A is a trisubstituted benzene. The structure of 'A' is:

A


B


C


D


QUESTION 10

Which of equations does not represent an example of Friedal-crafts reaction?

(A) $C_6H_6 + C_2H_5Cl \xrightarrow[\text{(Anhy)}]{AlCl_3} C_6H_5C_2H_5 + HCl$

(B) $C_2H_5OH + HCl \xrightarrow{ZnCl_2} C_2H_5Cl + H_2O$

(C) $C_6H_6 + CHCl_3 \xrightarrow[\text{(Anhy)}]{AlCl_3} (C_6H_5)_3CH$

(D) $C_6H_6 + CH_3CH_2COCl \xrightarrow[AlCl_3]{\text{Anhy}} C_6H_5COCH_2CH_3 + HCl$

ANSWER KEY

1. B
2. B
3. A
4. B
5. B
6. D
7. C
8. D
9. A
10. B

Home Work From PW Module (Yakeen NEET)

Prarambh: Q 156, 157, 158, 159, 160, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 178

Parikshit: Q 03, 07, 22, 38, 39

MARK THE DATE 4th May, 2025

Only 04 Months left for the NEET

Ab sirf practice aur practice,
Nahi toh Medical Dream miss!

10
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14
NEET RANKERS TEST SERIES-2025
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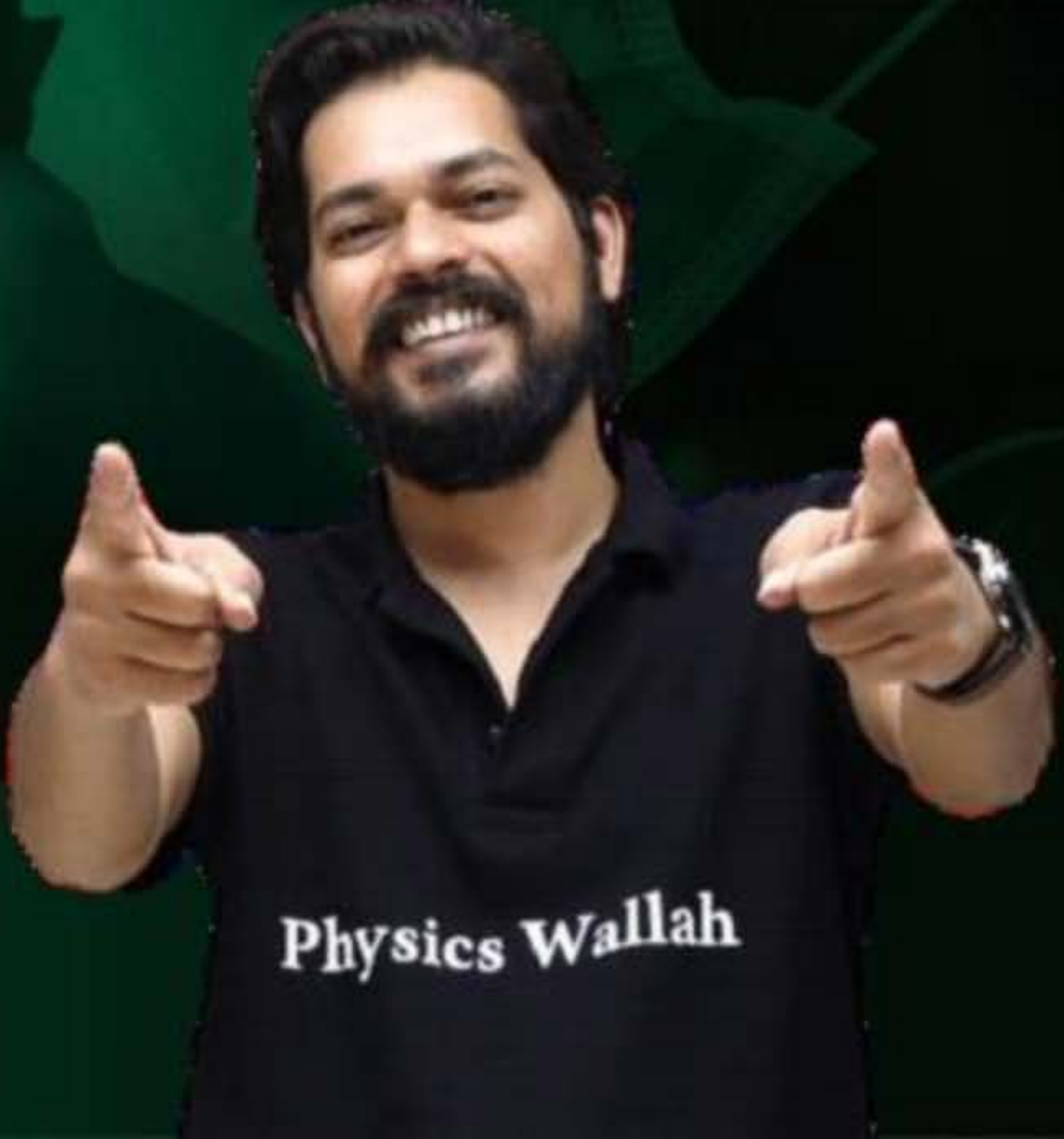
Thank you!!

YAKEEN 2.0

FOR NEET 2025

Lecture- 11 | **Organic Chemistry**

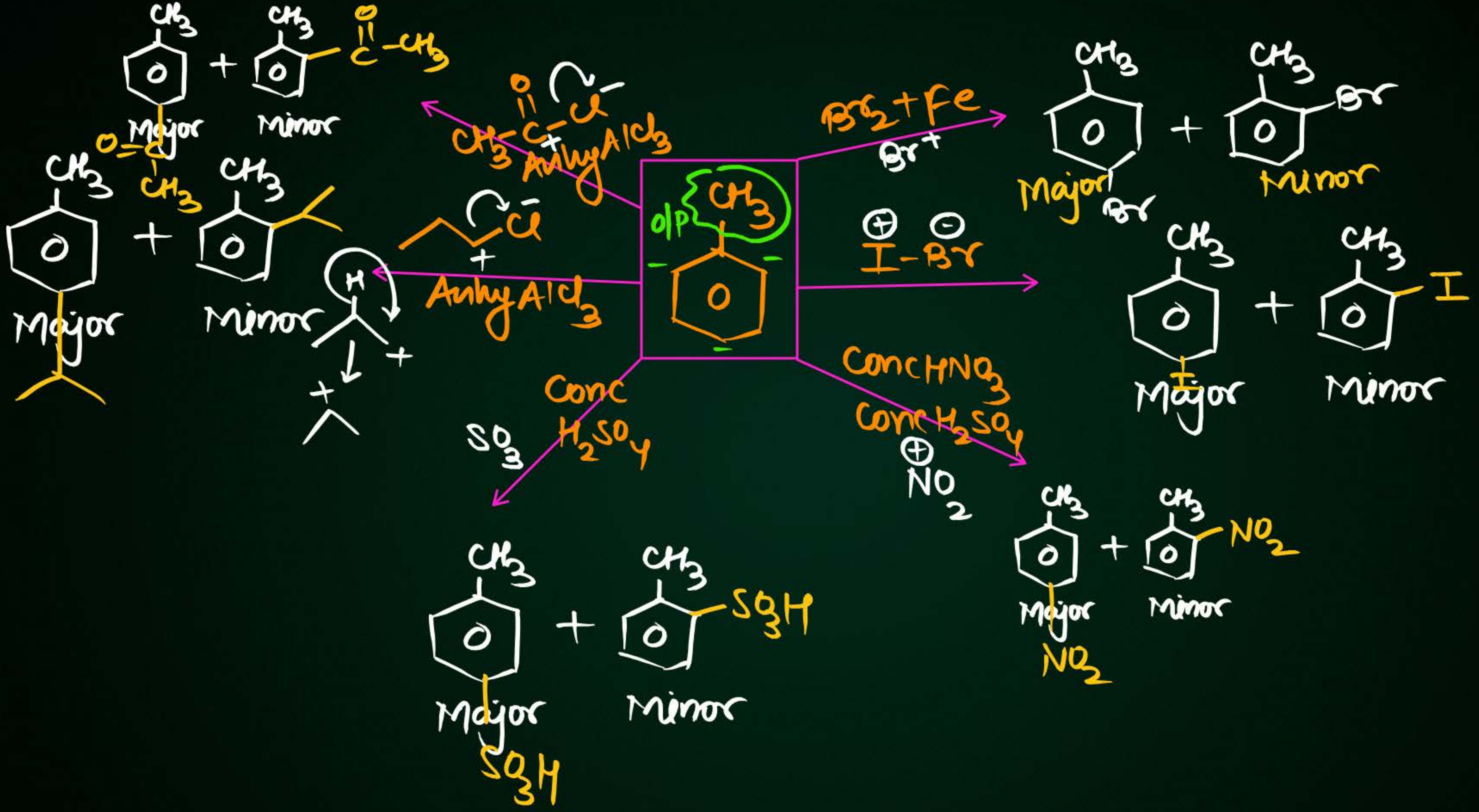
HYDROCARBONS

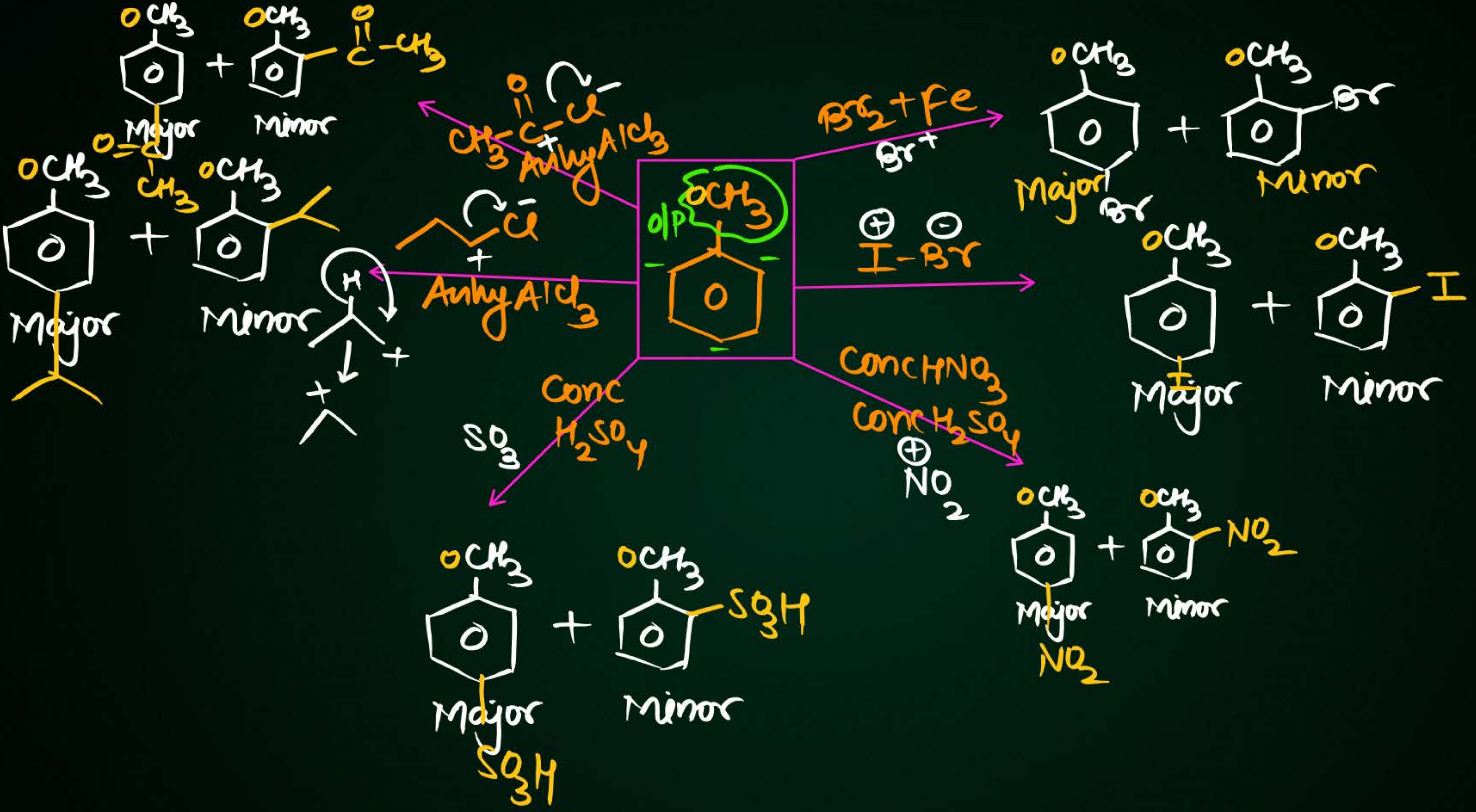

Physics Wallah

By- Pankaj Sir(POPU MAMA)

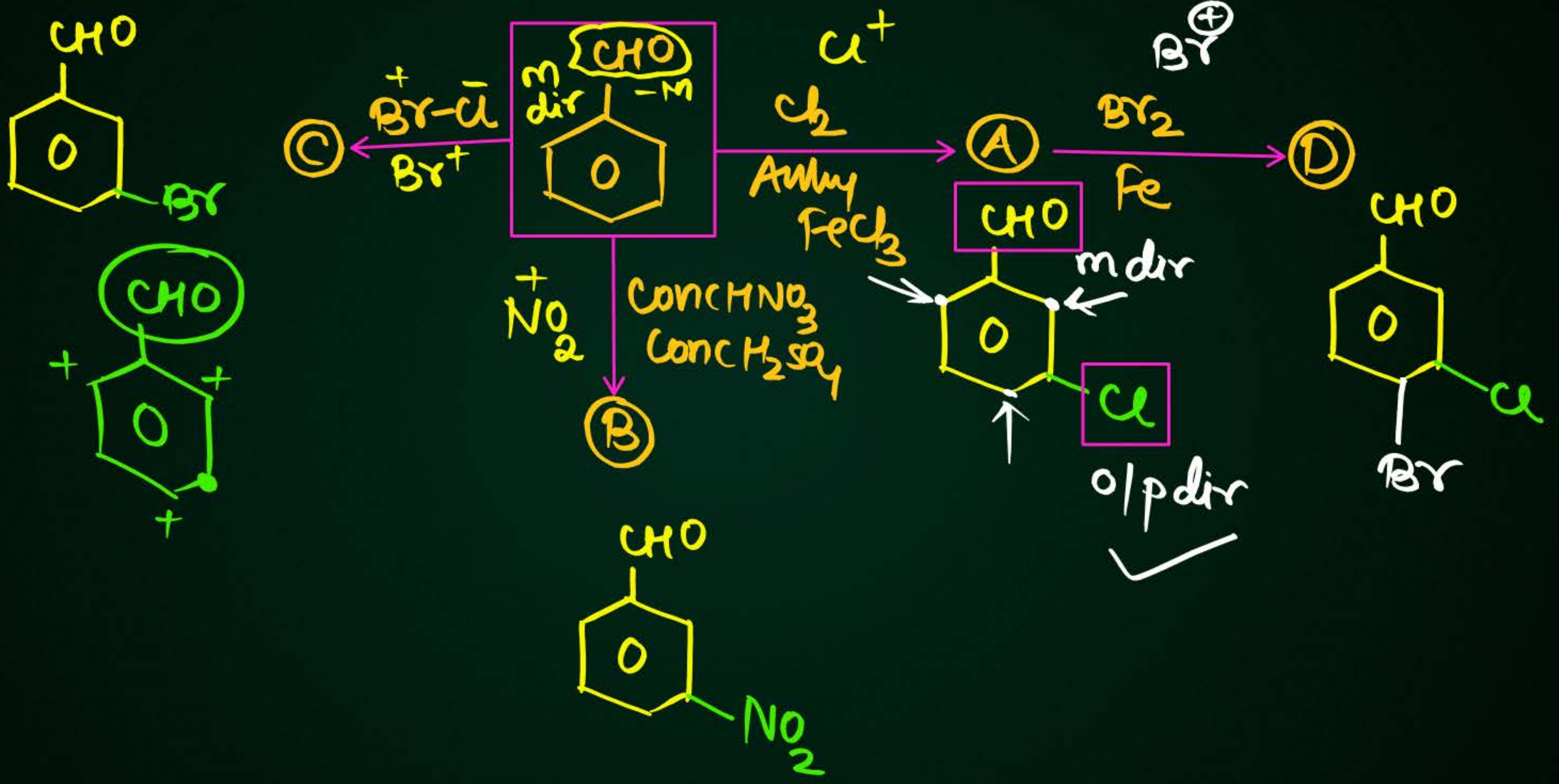
Topics *to be covered*

1. ESR Practice ✓
2. Addition reaction ✓


o/p
CH3
Br2 + Fe
Br+
Major
Minor
Br
I–Br
I
Conc HNO3
Conc H2SO4
NO2+
NO2
Conc H2SO4
SO3
SO3H
Anhy AlCl3
CH3–C(=O)–Cl
Cl
H
+
Anhy AlCl3
O=C–CH3
C(=O)–CH3



OCH3
o/p
Br2+Fe
Br+
Major
Br
Minor
Br
I-Br
I
Major
Minor
Conc HNO3
Conc H2SO4
NO2
Major
Minor
NO2
Conc
H2SO4
SO3
SO3H
Major
Minor
SO3H
Anhy AlCl3
Cl
+
H
Major
Minor
CH3-C-Cl
O
Anhy AlCl3
O=C
CH3
C-CH3
Major
Minor


CHO
Br
$\overset{+}{Br}-\overset{-}{Cl}$
Br^+
C
m dir
CHO
−M
Cl^+
Cl_2
Anhy
$FeCl_3$
A
$Br^{\oplus}$
Br_2
Fe
D
CHO
+
+
+
$\overset{+}{NO_2}$
Conc HNO_3
Conc H_2SO_4
B
CHO
m dir
Cl
o/p dir
✓
CHO
Cl
Br
CHO
NO_2

How to compare R.O.R in E.S.R

Rxn ka E$^+$ kaha jayega

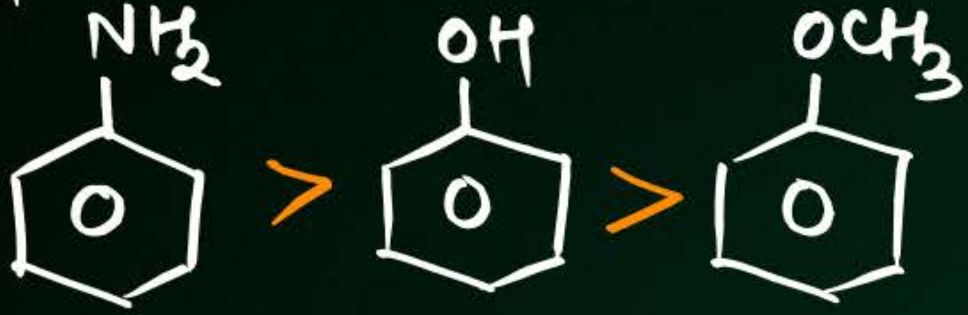
Answer nikalne ke liye M ya H

Dominating effect se Dekhenge

R.O.R $\propto$ $e^\ominus$ density of benzene ring $\propto$ edg $\propto \frac{1}{\text{ewg}}$

Q Compare R.O.R towards E.S.R

①

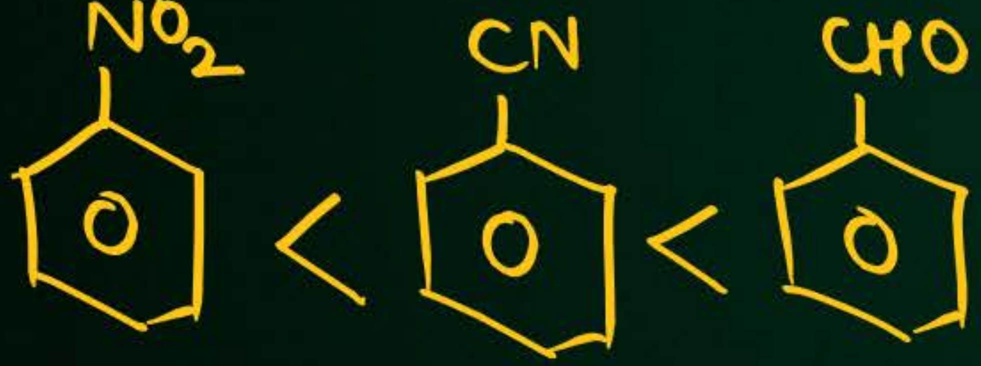


Ⓐ Ⓑ Ⓒ

$+M > -I$ $+M > -I$ $+M > -I$

+M power $NH_2 > OH > OCH_3$

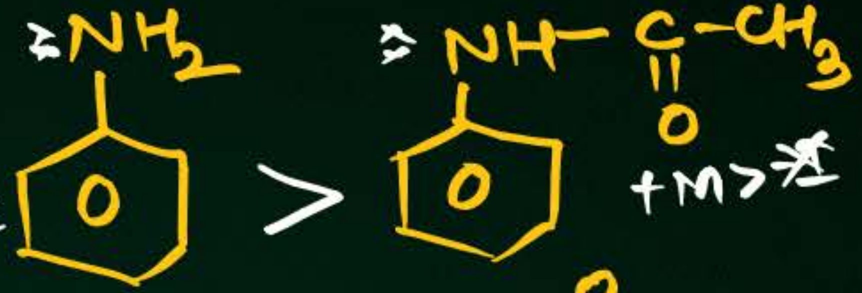
②



$-M > -I$ $-M > -I$ $-M > -I$

-M power $NO_2 > CN > CHO$

③

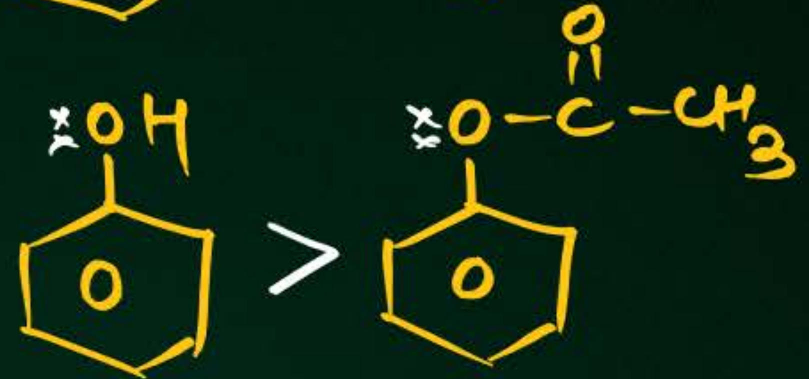


NH2
NH-C-CH3
O

$+M > -I$ $+M > -I$

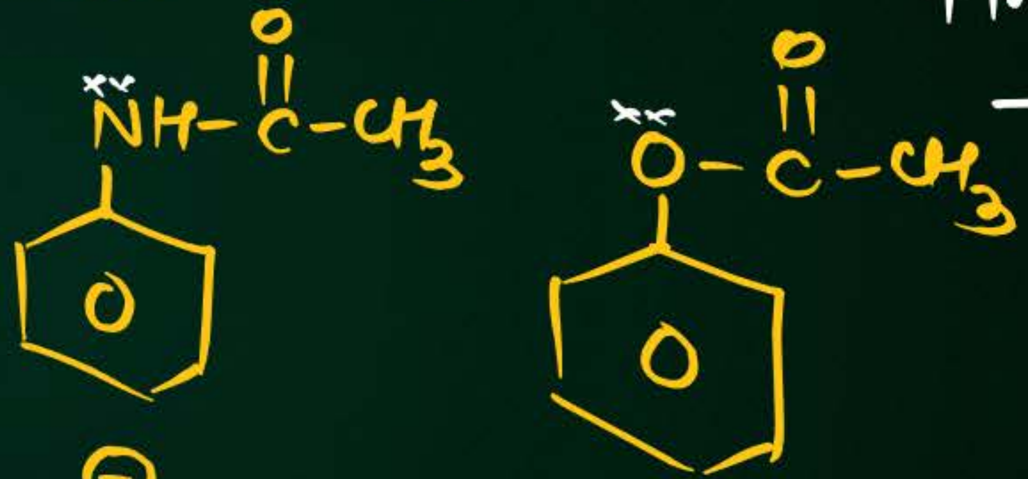
+M power $-NH_2 > -NH\underset{\underset{O}{\|}}{C}CH_3$

④



+M power $-\ddot{O}H > -\ddot{O}-\overset{\overset{O}{\|}}{C}-CH_3$

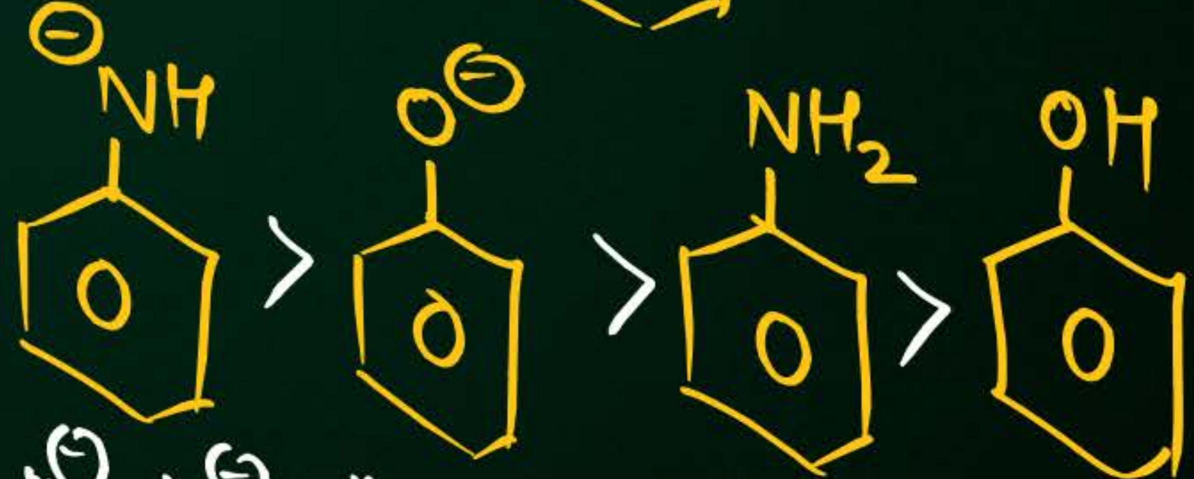
⑤



NH-C-CH3
O
O-C-CH3
O

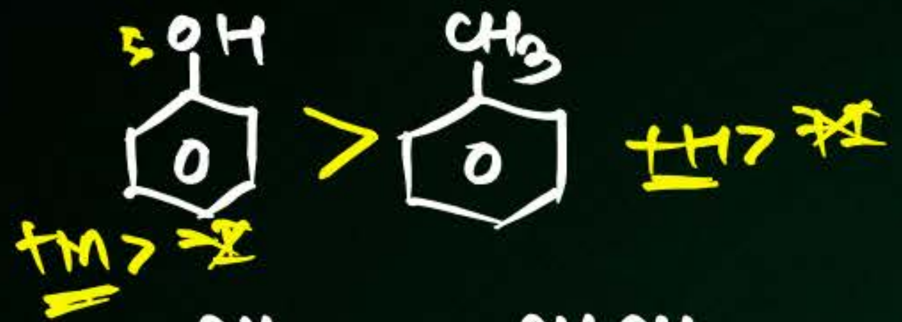
+M power $-NHCOCH_3 > OCOCH_3$

⑥

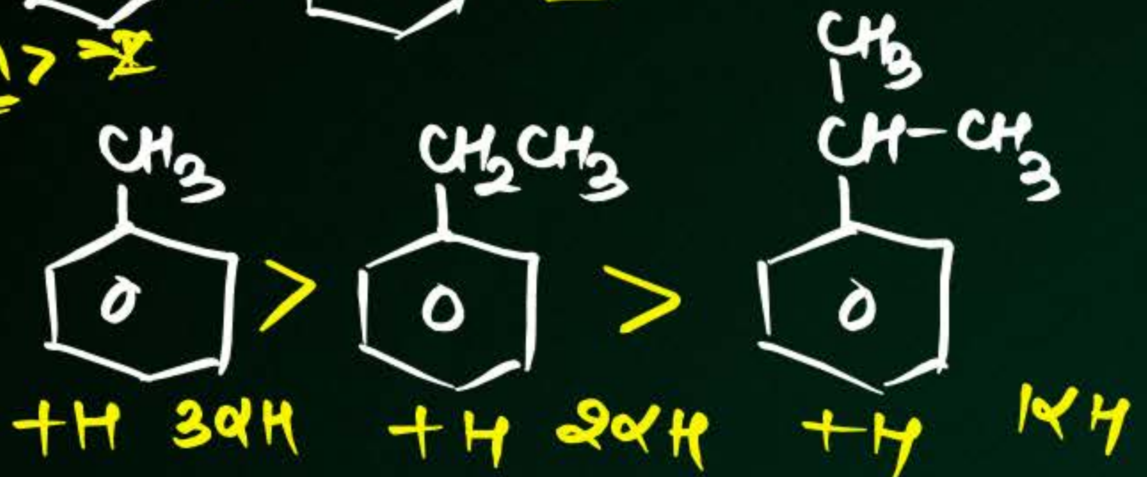


+M power $\ddot{N}^{\ominus} > \ddot{O}^{\ominus} > \ddot{N} > \ddot{O}$

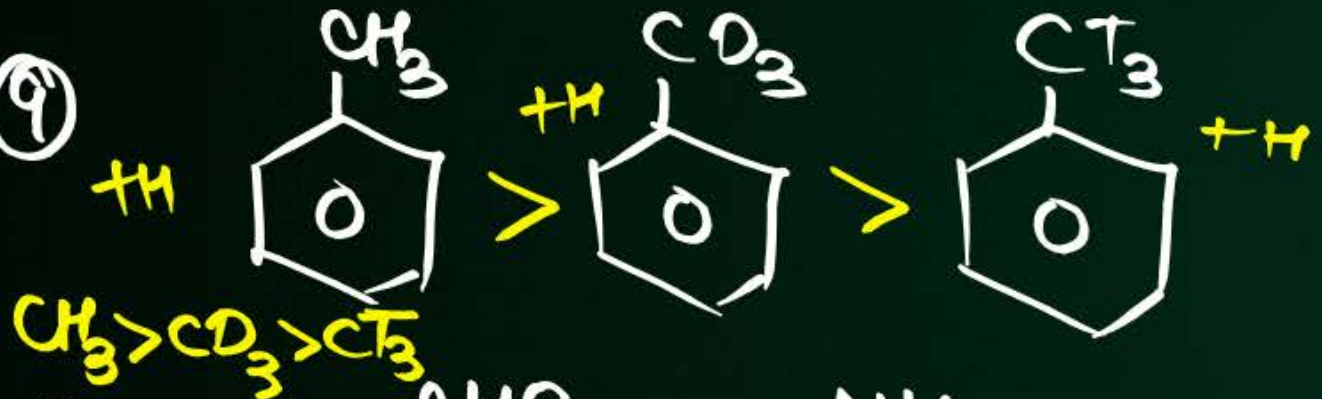
⑦


OH
CH3
>
+M > -I
+H > +I

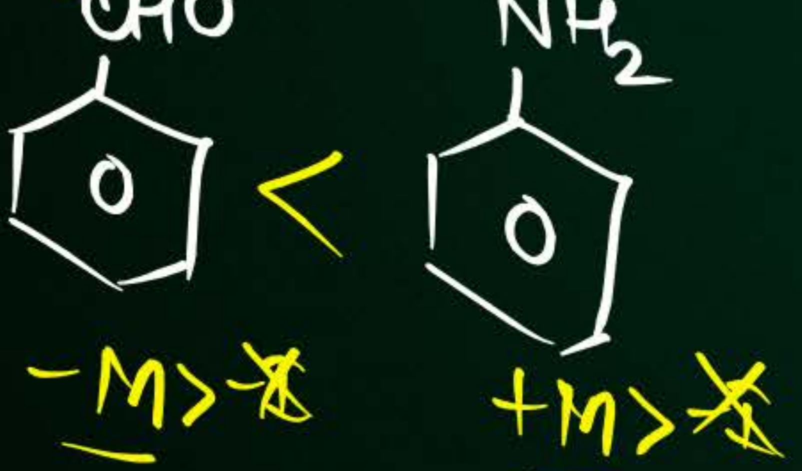
⑧


CH3
CH2CH3
CH3
CH-CH3
>
>
+H 3αH
+H 2αH
+H 1αH

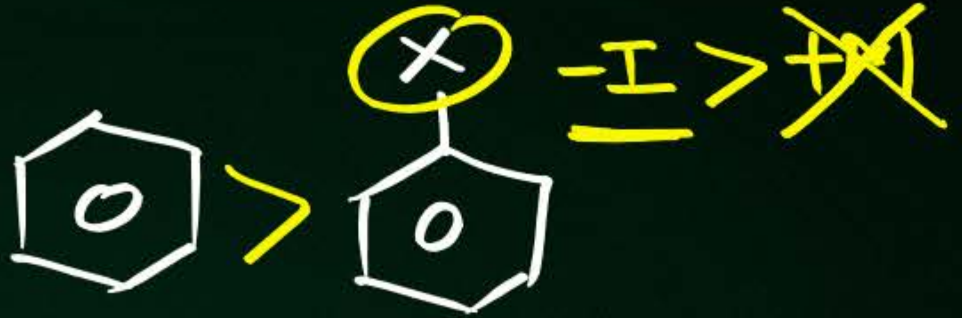
⑨


+H
CH3
+H
CD3
CT3
+H
>
>
CH3>CD3>CT3

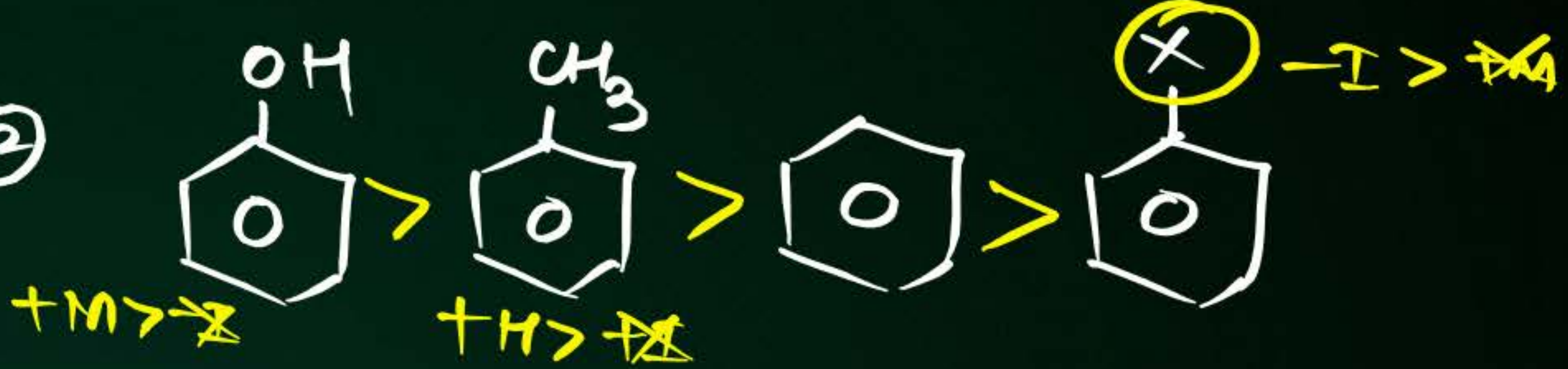
⑩


CHO
NH2
<
-M > -I
+M > -I

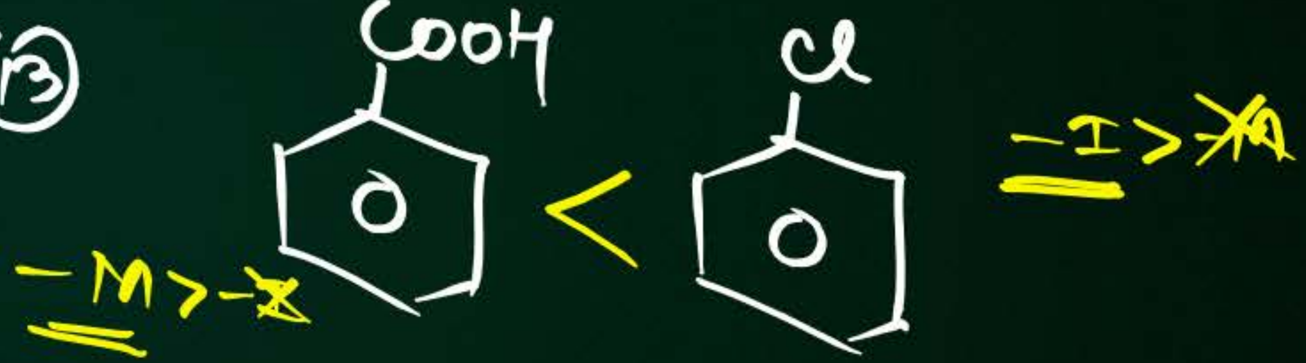
⑪


X
>
-I > +M

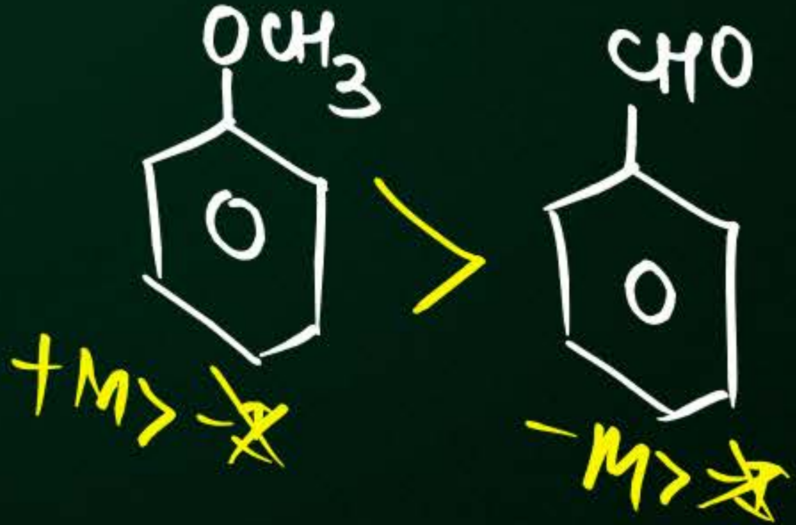
⑫


OH
CH3
X
>
>
>
-I > +M
+M > -I
+H > +I

⑬

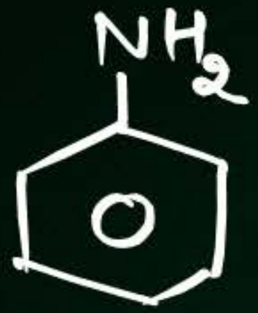

COOH
Cl
<
-I > +M
-M > -I

⑭


OCH3
CHO
>
+M > -I
-M > -I

op point

①

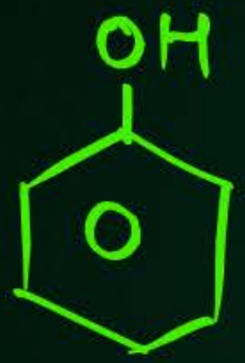


$+M \longrightarrow NH_2$ increases $\overset{\ominus}{e}$ density due to $+M$

$-I \longrightarrow NH_2$ decreases $\overset{\ominus}{e}$ density due to $-I$

$\underbrace{+M > -I}$ overall $\longrightarrow NH_2$ increases $\overset{\ominus}{e}$ density

②

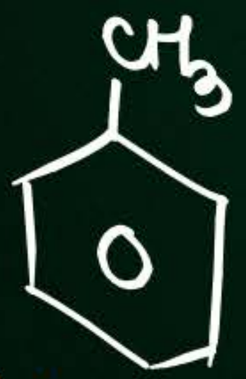


$+M \longrightarrow OH$ increases $\overset{\ominus}{e}$ density due to $+M$

$-I \longrightarrow OH$ decreases $\overset{\ominus}{e}$ density due to $-I$

$\underbrace{+M > -I}$ overall $\longrightarrow OH$ increases $\overset{\ominus}{e}$ density

③



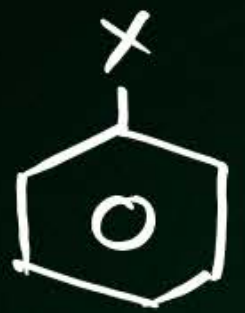
$+H \longrightarrow CH_3$ increases $\overset{\ominus}{e}$ density due to $+H$

$+I \longrightarrow CH_3$ increases $\overset{\ominus}{e}$ density due to $+I$

$\underbrace{+H > +I}$ Overall $\longrightarrow CH_3$ increases $\overset{\ominus}{e}$ density

op point

④

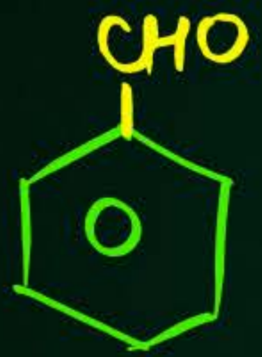


+M → X increases $e^{\ominus}$ density due to +M

−I → X decreases $e^{\ominus}$ density due to −I

$\underbrace{-I > +M}$ overall → X decreases $e^{\ominus}$ density

⑤



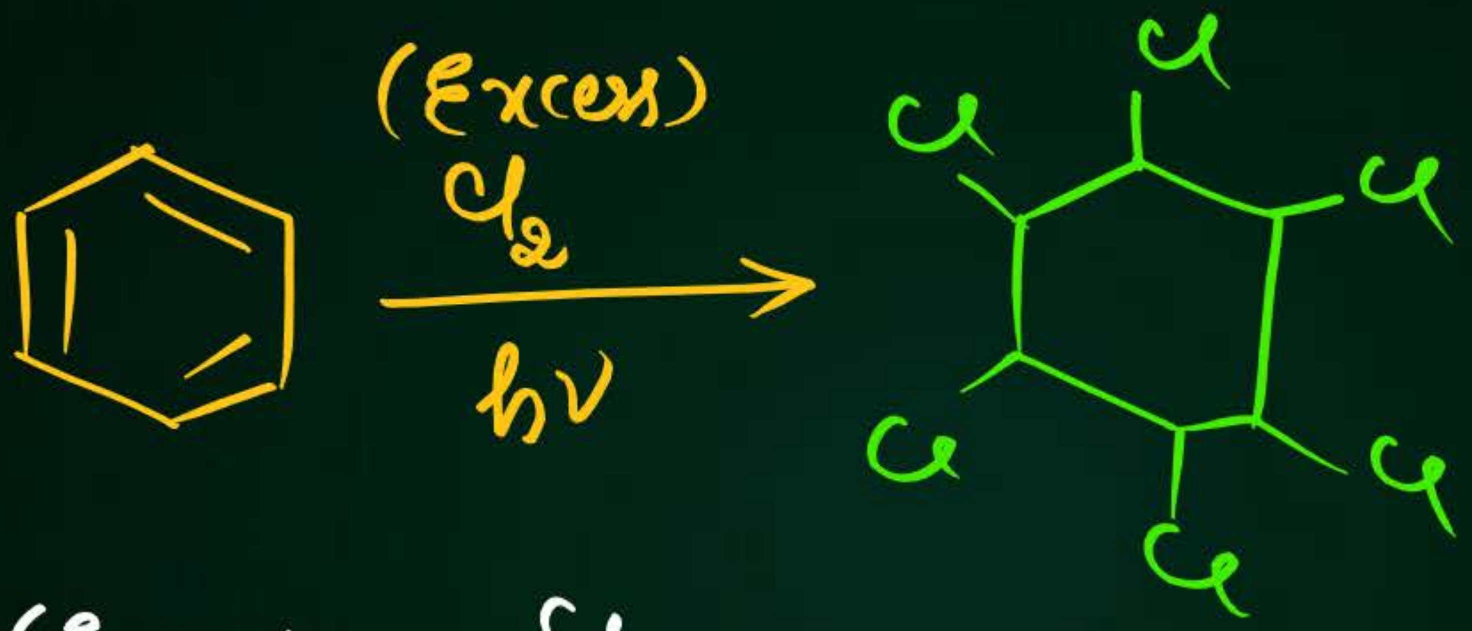
−M → CHO decreases $e^{\ominus}$ density due to −M

−I → CHO decreases $e^{\ominus}$ density due to −I

$\underbrace{-M > -I}$ overall → CHO decreases $e^{\ominus}$ density

2. Addition reactions

a. Addition of chlorine:



(Excess)
Cl_2
hν
Cl
Cl
Cl
Cl
Cl
Cl

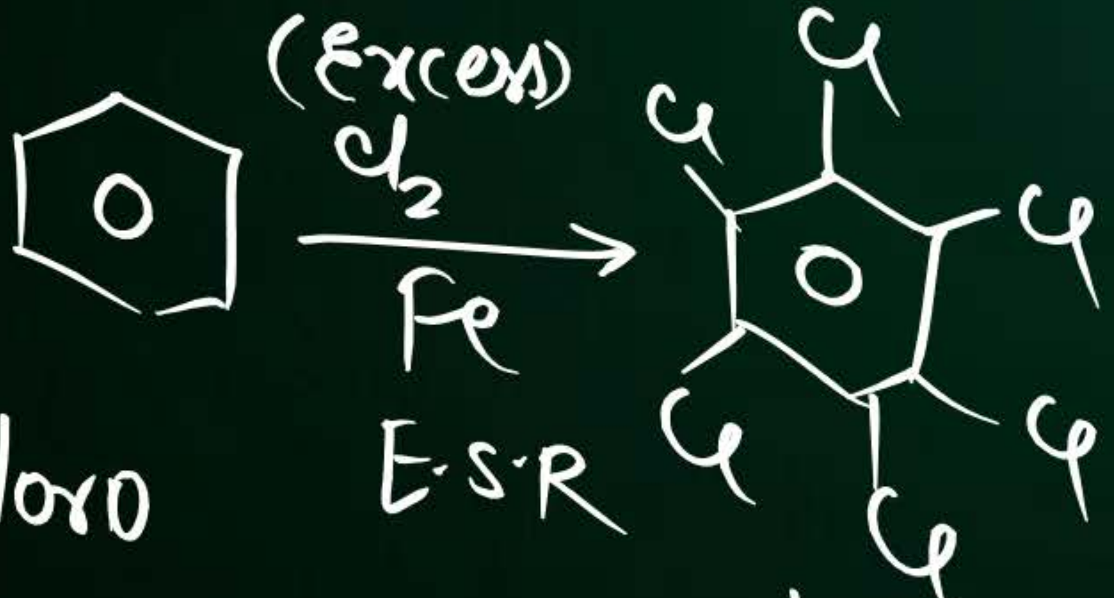
γ-6,6,6

$C_6H_6Cl_6$

γ-BHC
(Benzene hexa chloride)

Lindane

Gammaxane

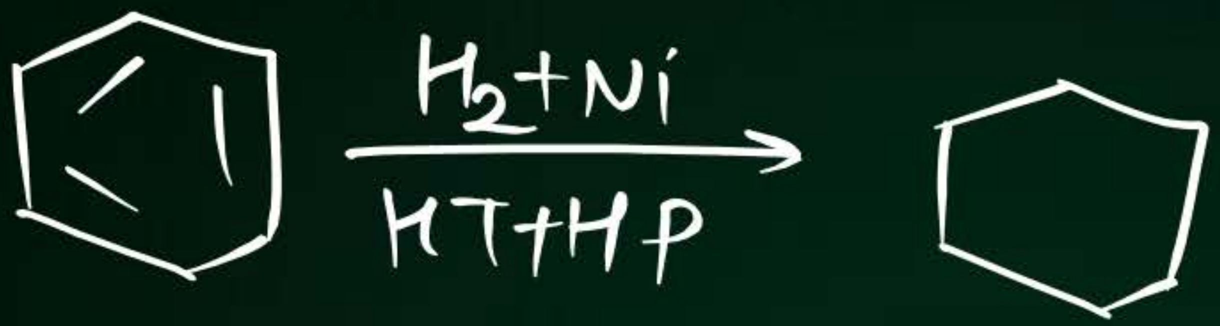


(Excess)
Cl_2
Fe
E.S.R
Cl
Cl
Cl
Cl
Cl
Cl

HCB

Hexa chloro benzene

b. Hydrogenation



QUESTION

R.O.R Br$^+$ ESR

Which order is correct for the decreasing reactivity to ring monobromination of the following compound?

(i) $C_6H_5CH_3$ $+H > \cancel{+I}$ (ii) C_6H_5COOH $-M > \cancel{-I}$ (iii) C_6H_6 (iv) $C_6H_5NO_2$ $-M > \cancel{-I}$

A i > ii > iii > iv

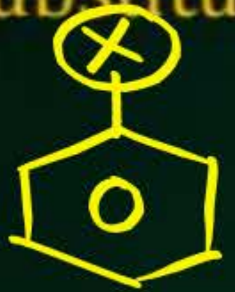
B ✓ i > iii > ii > Iv

C ~~ii~~ > iii > iv > i

D ~~iii~~ > i > ii > iv

QUESTION (NCERT Exemplar)

For an electrophilic substitution reaction, the presence of a halogen atom in the benzene ring _____.



$+M \rightarrow e^{\ominus}$ density ↑

$-I \rightarrow e^{\ominus}$ density ↓

$\underbrace{-I > +M}$

[✓ A] deactivates the ring by inductive effect.

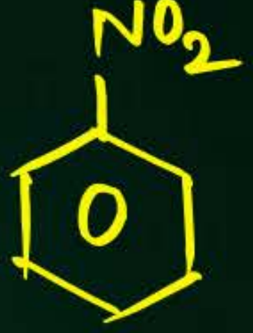
B deactivates the ring by resonance.

C increases the charge density at ortho and para position relative to meta position by resonance.

[✓ D] Both (A) & (C)

QUESTION (NCERT Exemplar)

In an electrophilic substitution reaction of nitrobenzene, the presence of nitro group ______.



−Rn $e^{\ominus}$ density ↓

−I $e^{\ominus}$ density ↓

(A) deactivates the ring by inductive effect.

(B) activates the ring by inductive effect.

(C) decreases the charge density at ortho and para position of the ring relative to meta position by resonance.

(D) Both (A) & (C)

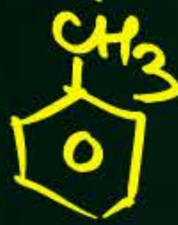
QUESTION (AIIMS 1999)

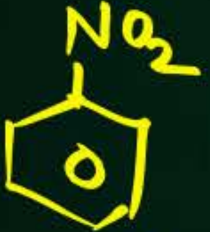
ESR

Which compound can be Sulphonated easily?

ROR

(A) benzene

✓ (B) toluene

+H > ~~+I~~

(C) nitrobenzene

−M > ~~−I~~

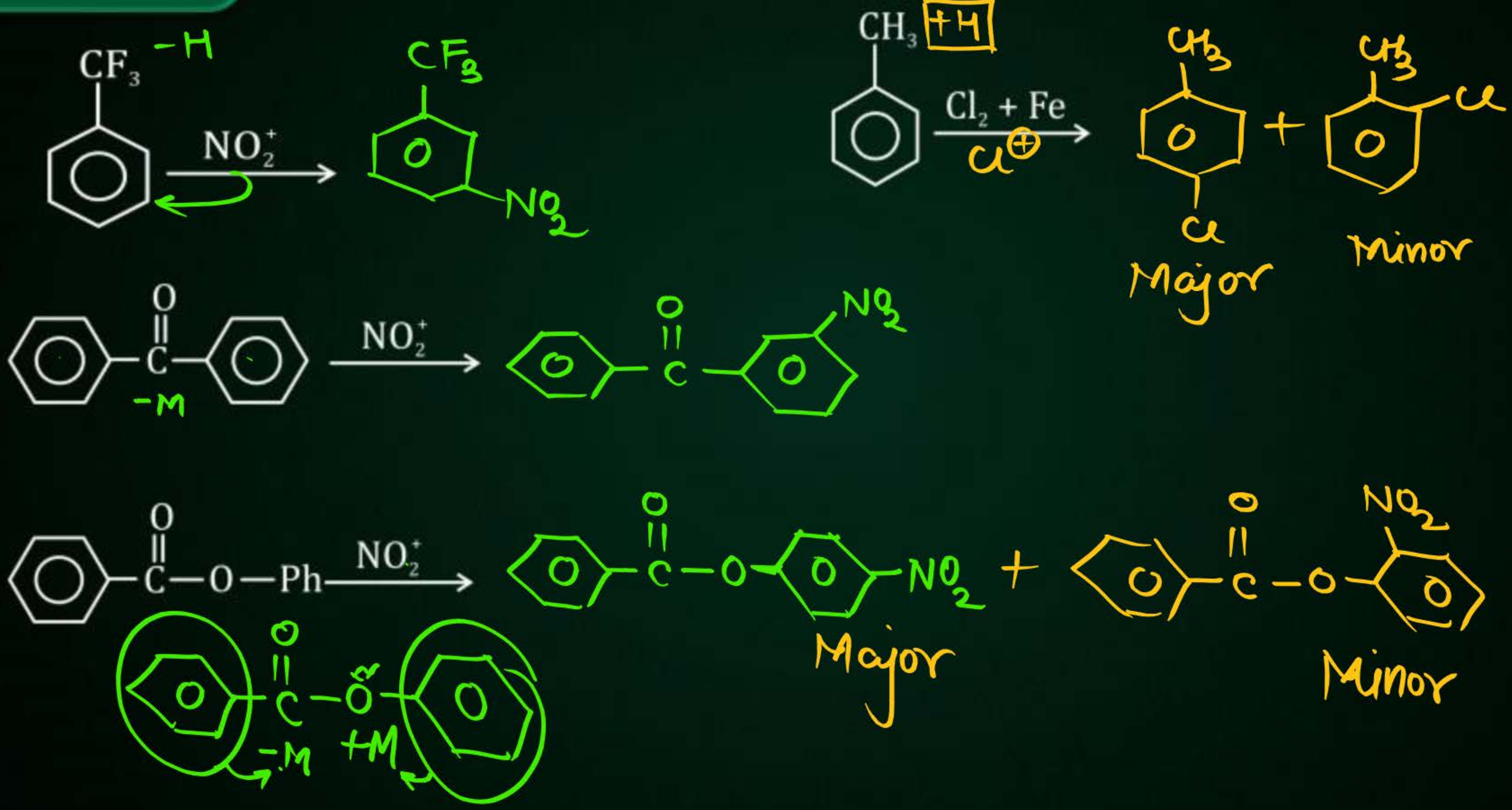
(D) chlorobenzene

−I > ~~+M~~

B > A > D > C

QUESTION

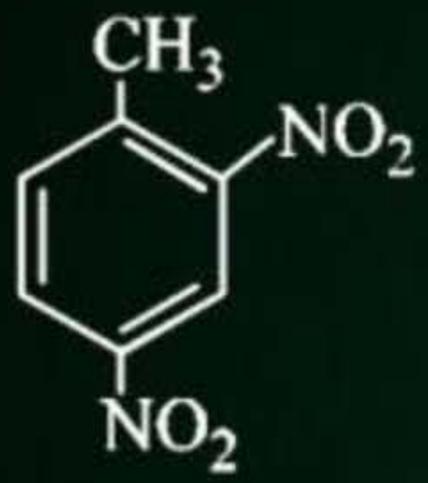
[E$^+$ kaha Jayega M ya H effect]

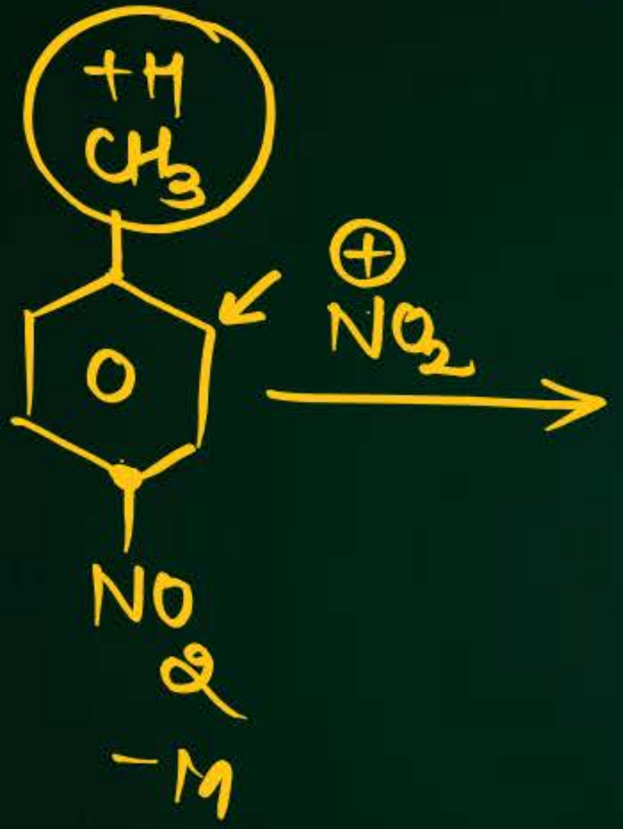

CF3
-H
NO2+
CF3
NO2
CH3
+H
Cl2 + Fe
Cl⊕
CH3
Cl
Major
CH3
Cl
Minor
O
C
-M
NO2+
O
C
NO2
O
C—O—Ph
NO2+
O
C
O
NO2
Major
O
C
O
NO2
Minor
O
C
O
-M
+M

QUESTION

p-Nitrotoluene on further nitration gives:

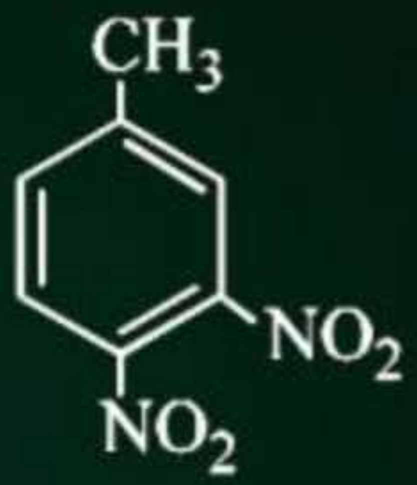
[✓ A]



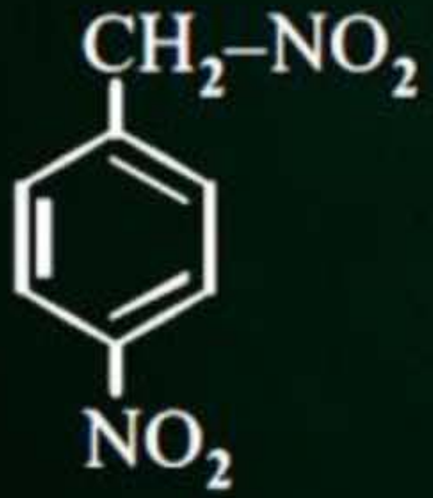


+H
CH$_3$
$\oplus$
NO$_2$
NO$_2$
-M

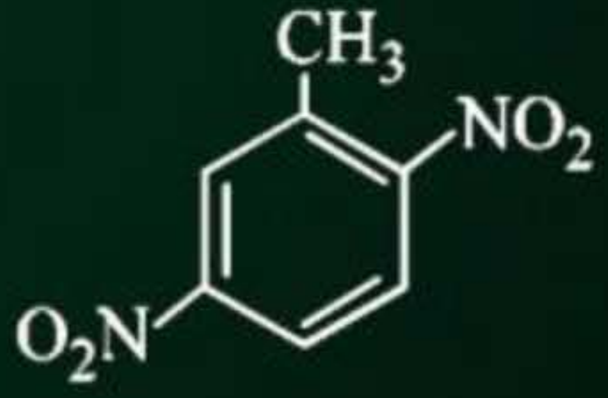
B



C



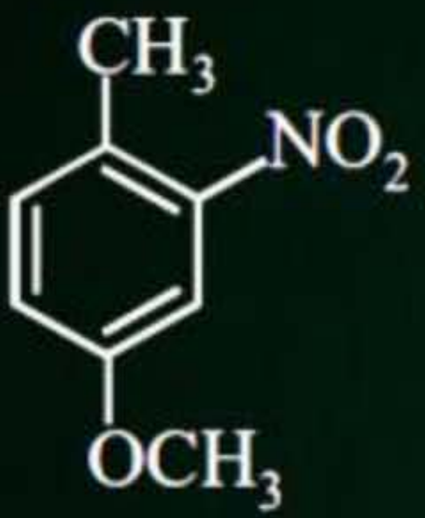
D

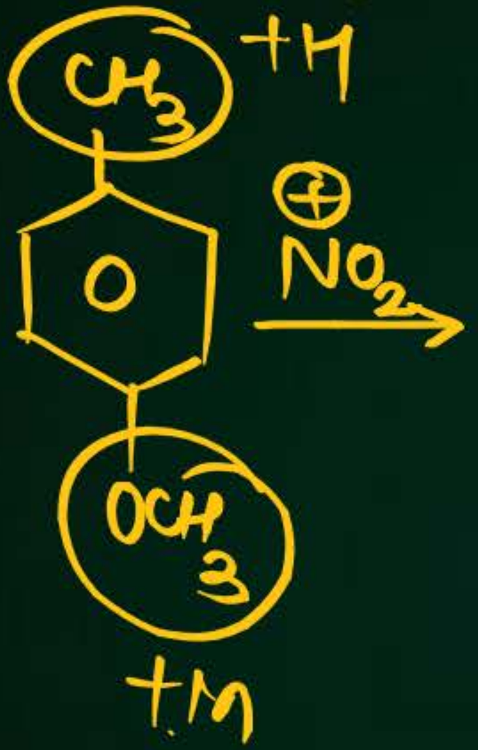


QUESTION

If p-methoxy toluene is nitrated, the major product is:

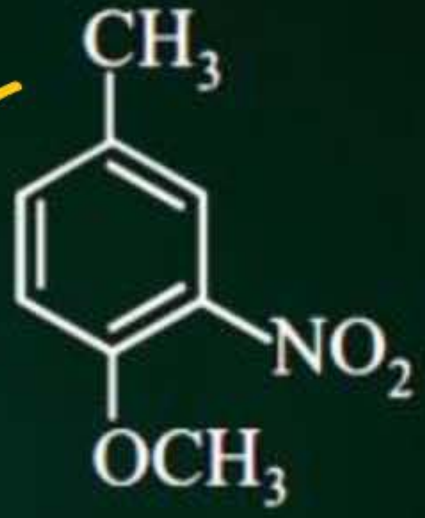
(A)



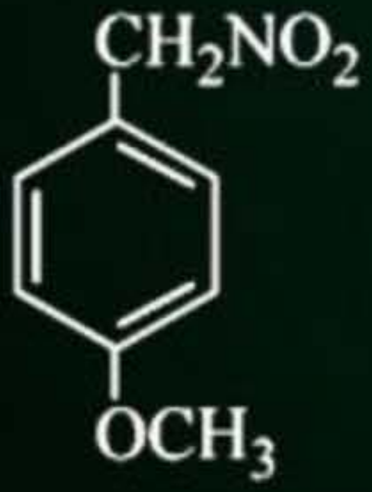


CH_3
+H
$\overset{\oplus}{NO_2}$
O
OCH_3
+M

[✓ (B)]



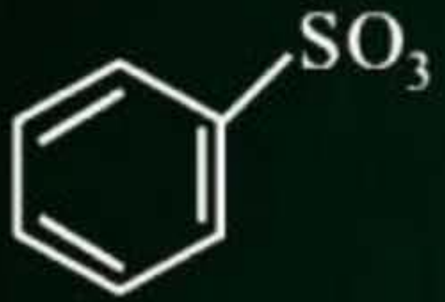
(C)

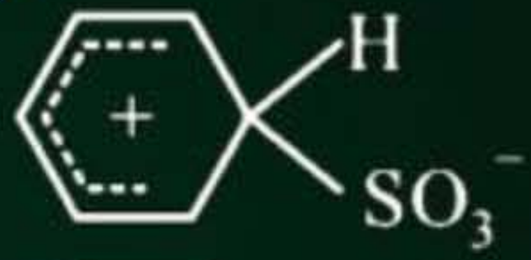


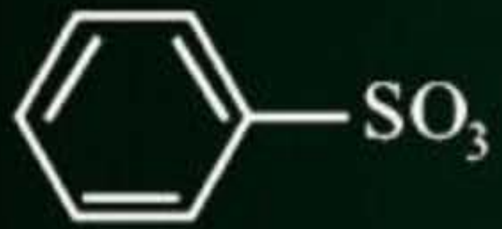
(D) No reaction

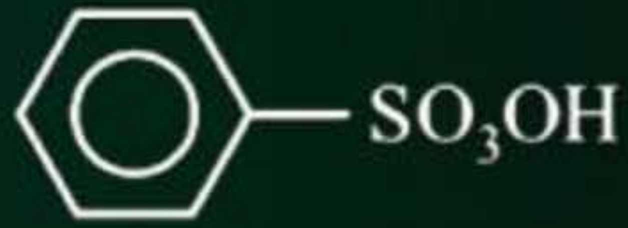
QUESTION

The wheeland intermediate in reaction of benzene with SO_3 dissolved in H_2SO_4

A


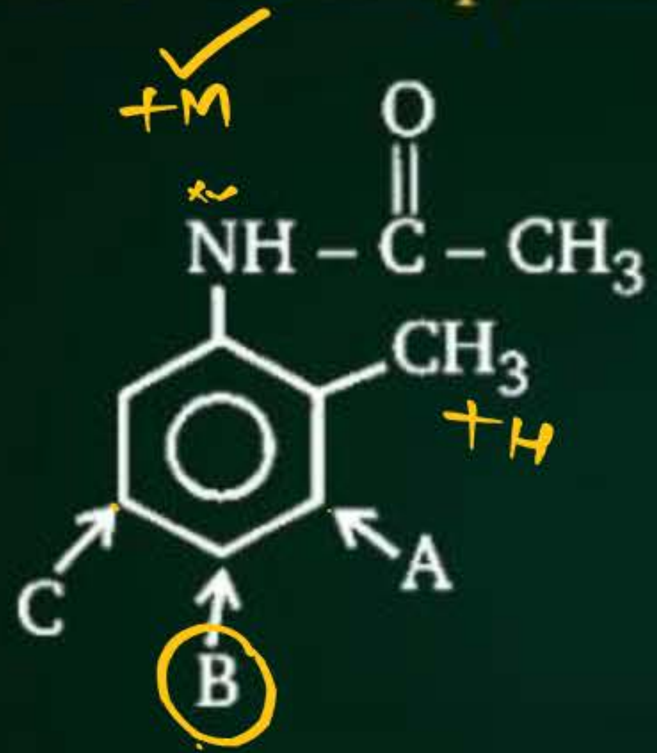
[✓ B]


C


D


QUESTION

Identify the position where electrophilic aromatic substitution (EAS) is more favorable.


+M
O
NH – C – CH3
CH3
+H
A
B
C

A A

[✓ **B** B]

C C

D A and C

QUESTION

ROR

Among the following compounds, the one that is most reactive towards electrophilic nitration is:

A Benzoic acid $Ph-COOH$

$-M > \cancel{-I}$

B Nitrobenzene $Ph-NO_2$

$-M > \cancel{-I}$

C Toluene

$Ph-CH_3 \quad +H > \cancel{+I}$

D Benzene $Ph-H$

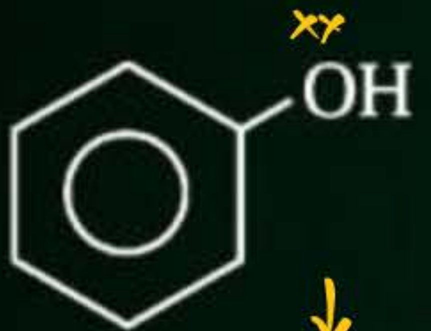
$C > D > A > B$

QUESTION

R.O.R

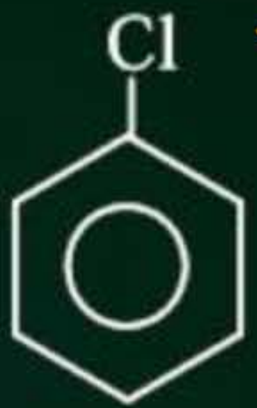
Which one of the following is most reactive towards electrophilic attack?

(A)



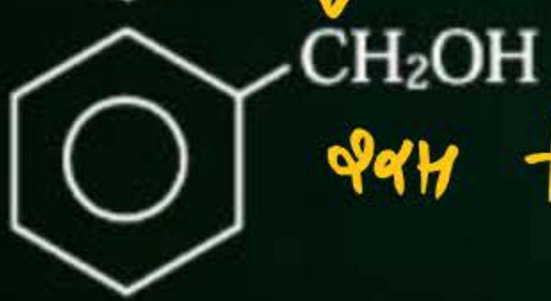
$+M > \cancel{-I}$

(B)



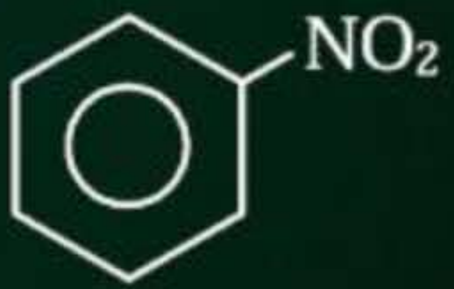
$-I > \cancel{+M}$

(C)



[illegible] $+M > \cancel{+I}$

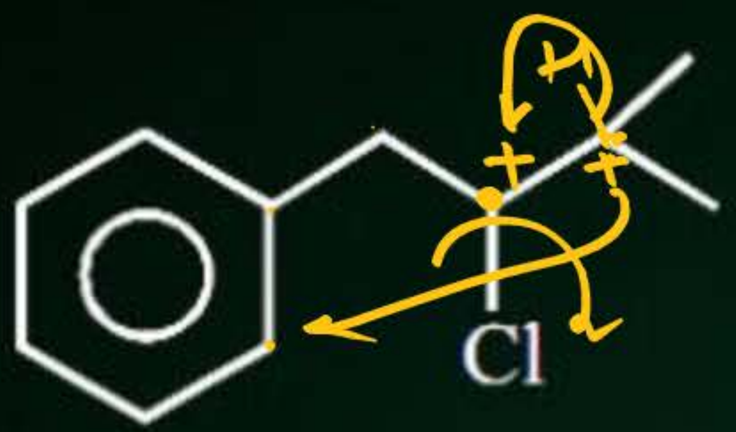
(D)



$-M > \cancel{-I}$

A > C > B > D

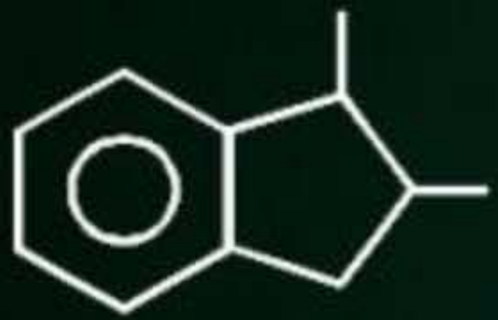
QUESTION

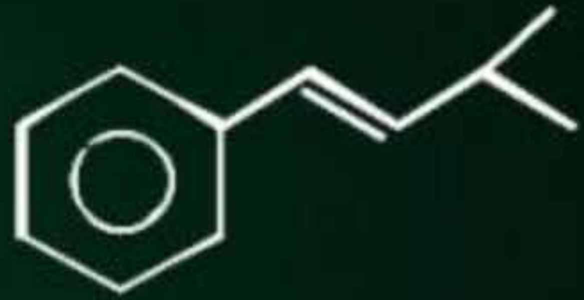


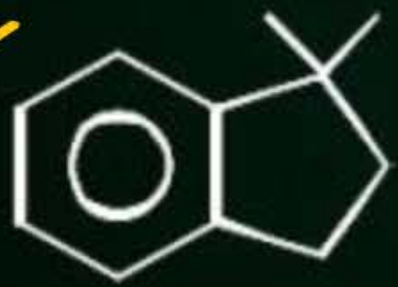
$\xrightarrow{AlCl_3}$ Major product

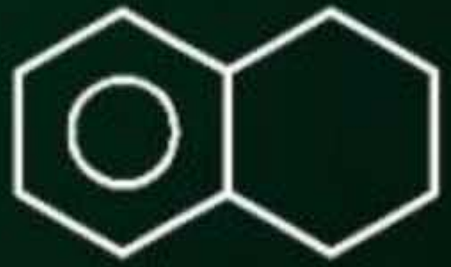
Intramolecular
F.C Alkylation

Major Product is:

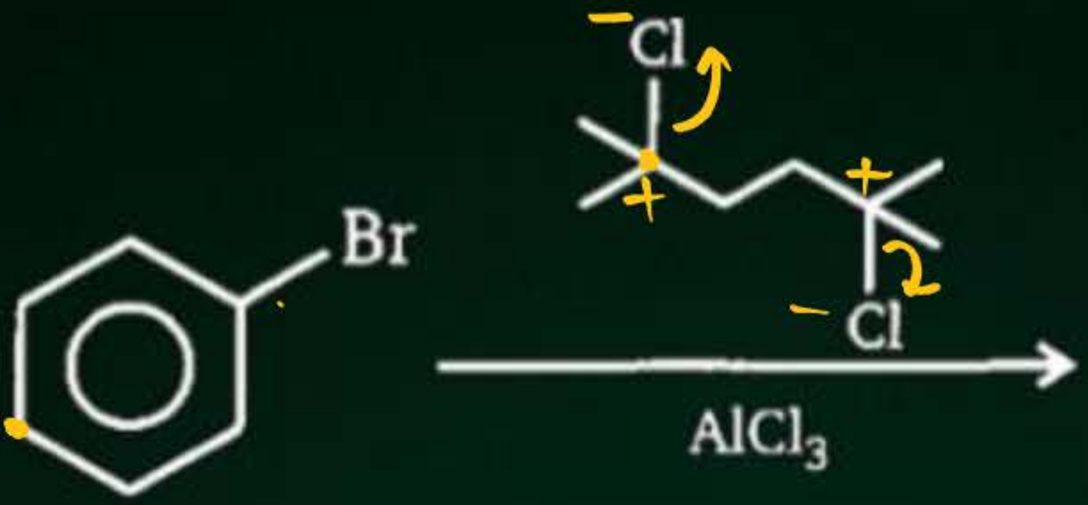
(A)


(B)


[✓ (C)]


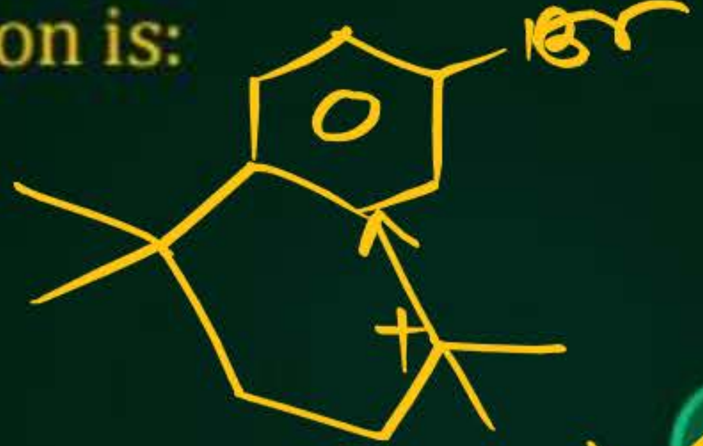
(D)


QUESTION

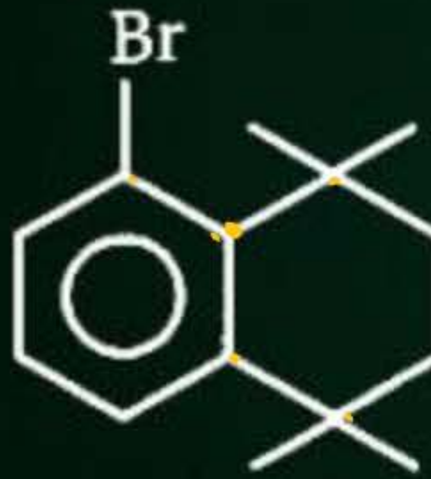

Br
Cl
Cl
2
AlCl$_3$

(A);

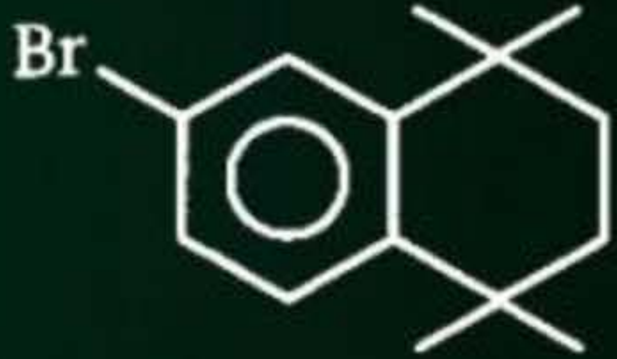
Product (A) of the reaction is:



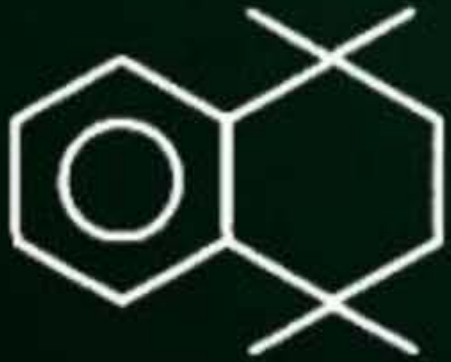
A



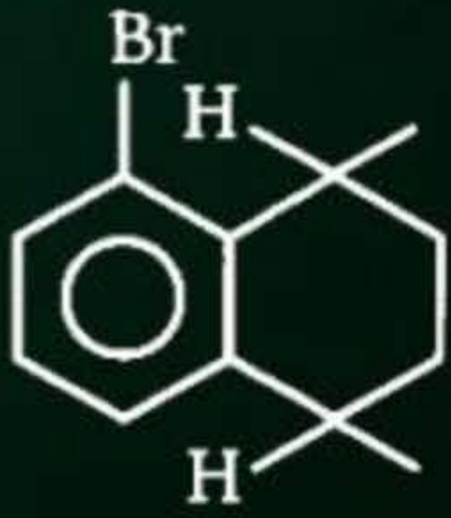
B



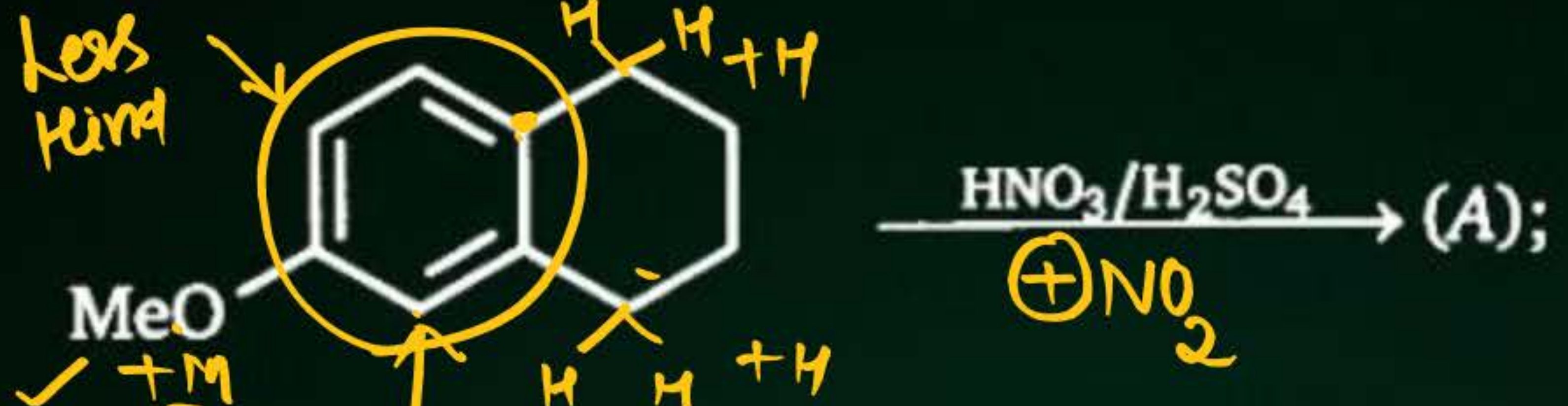
C



D

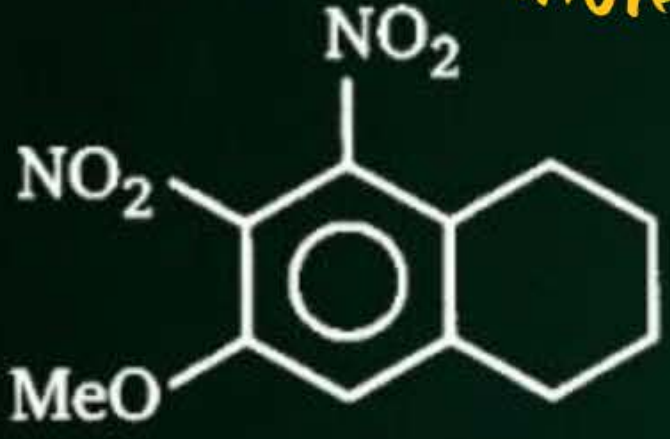


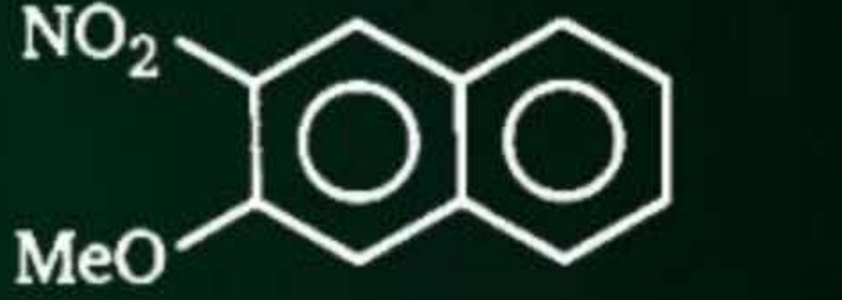
QUESTION

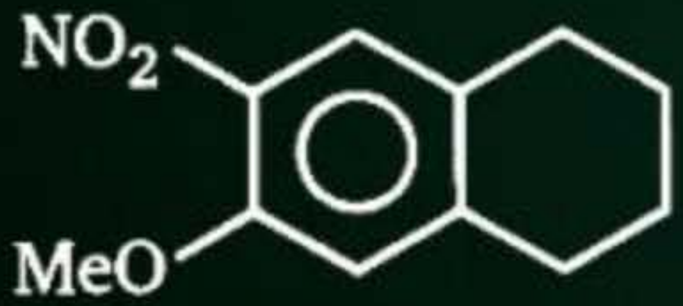

Less
Hind
H
H
+H
MeO
✓ +M
H
H
+H
HNO3/H2SO4
⊕NO2
(A);

Product (A) of the above reaction is:

more hind

Ⓐ


Ⓑ


Ⓒ ✓


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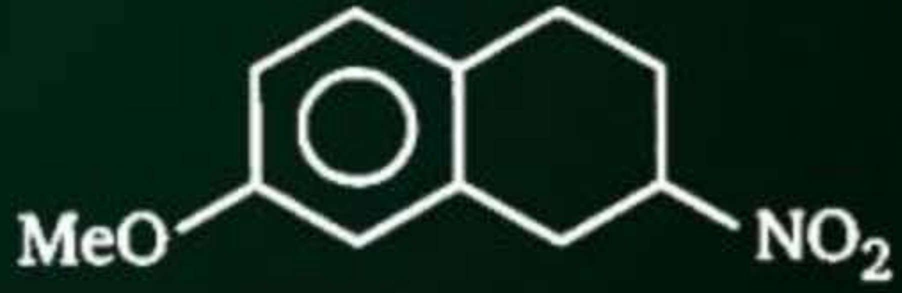
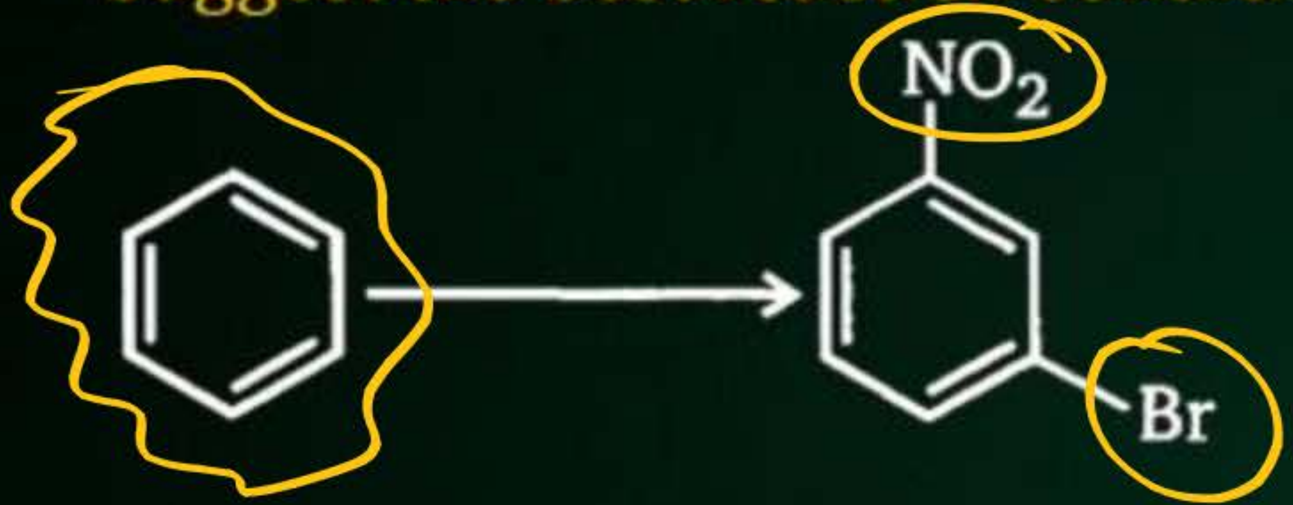


QUESTION

Suggest the best reaction conditions for the synthesis shown below.



A (1) HNO_3, H_2SO_4; then (2) Br_2

B (1) Br_2; then (2) HNO_3, H_2SO_4

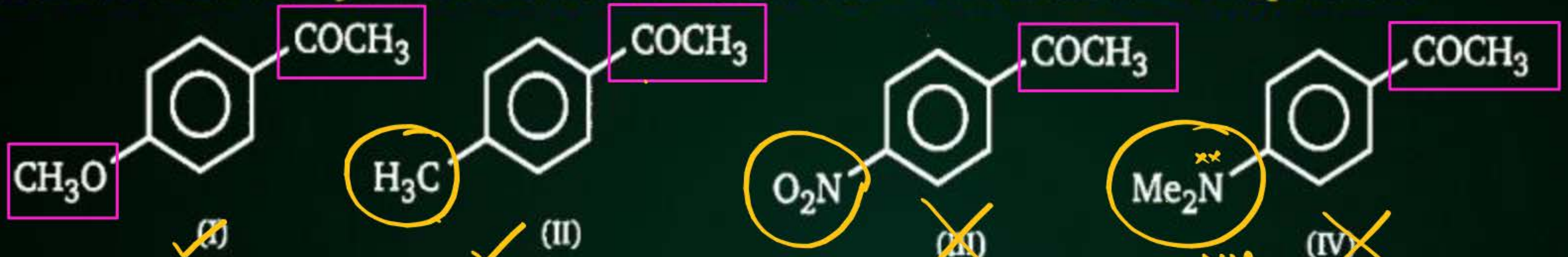
C (1) CH_3Br, $AlBr_3$; then (2) HNO_3, H_2SO_4

$^{+}NO_2$ $Br^{\oplus}$

[✓ D] (1) HNO_3, H_2SO_4, then (2) Br_2, $FeBr_3$

QUESTION

Friedel-Crafts acylation reaction can be used to obtain the compounds


COCH$_3$
CH$_3$O
COCH$_3$
H$_3$C
COCH$_3$
O$_2$N
COCH$_3$
Me$_2$N

✓ (I) ✓ (II) ~~(III)~~ (IV) ✗

NH$_2$

Aniline does not F-C R

A II, III and IV

B I, III and IV

C I and II ✓

D II and III

QUESTION

✓ >

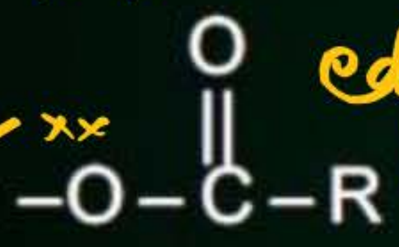
How many of the following substituents can cause aromatic electrophilic substitution faster than benzene?

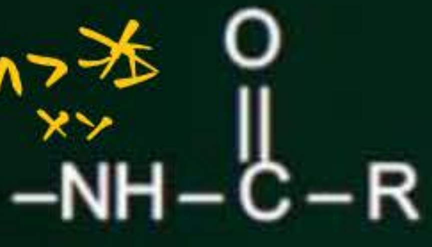
✓ (a) $-\ddot{N}H_2$ edg
+M > -I

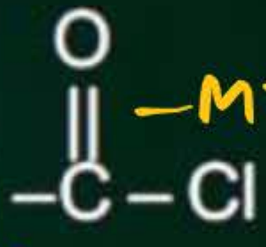
✓ (b) $-\ddot{N}R_2$ edg
+M > -I

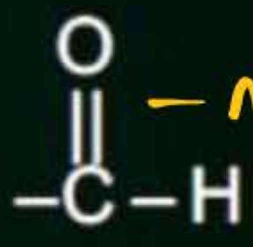
✗ (c) $-NO_2$ ewg
-M > -I

✗ (d) $-\overset{+}{N}H_3$ ewg
-I

✓ (e) 
$-\ddot{O}-\overset{O}{\overset{\|}{C}}-R$ edg

✓ (f) 
$-\ddot{N}H-\overset{O}{\overset{\|}{C}}-R$
+M > -I

✗ (g) 
$-\overset{O}{\overset{\|}{C}}-Cl$
-M > -I

✗ (h) 
$-\overset{O}{\overset{\|}{C}}-H$
-M > -I

✗ (i) $-SO_3H$
-M > -I

✓ (j) $-CH_3$
+H > +I

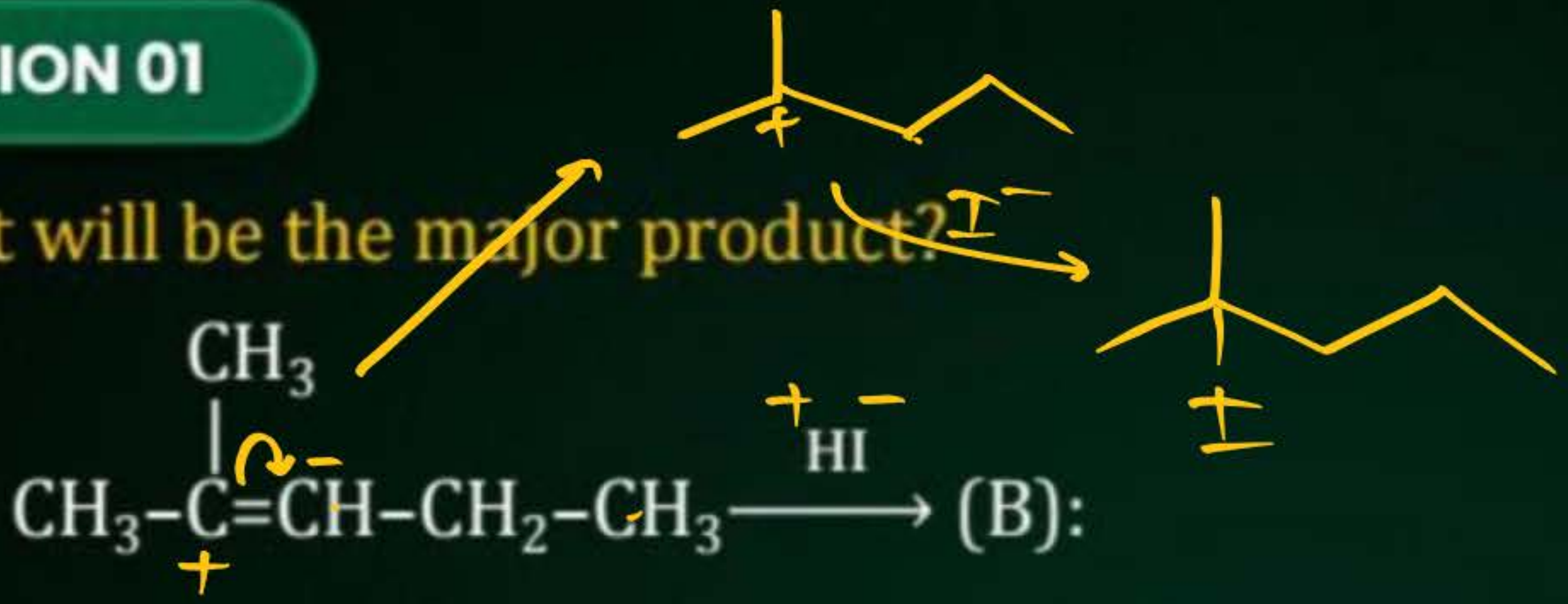
✓ * (k) $-CH=CR_2$
+M & -M
ESR NSR

Home Work

Discussion of L-06

QUESTION 01

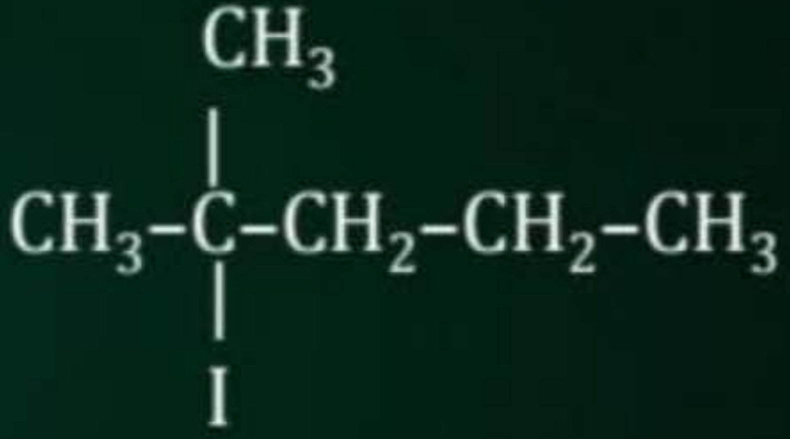
What will be the major product?



$$CH_3-\underset{+}{\overset{\overset{CH_3}{|}}{C}}=CH-CH_2-CH_3 \xrightarrow{\overset{+\ -}{HI}} (B):$$

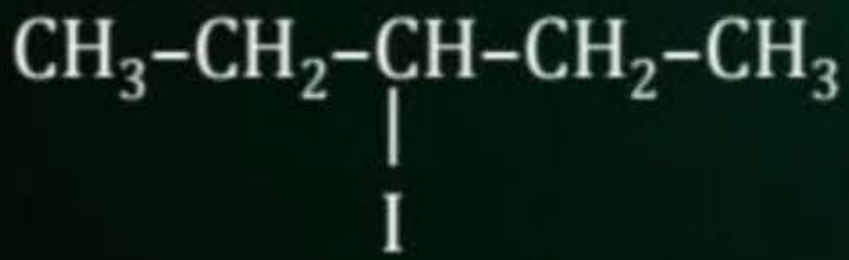
(A) $CH_3-CH_2-CH_2-CH_2-CH_2I$

(B) ✓



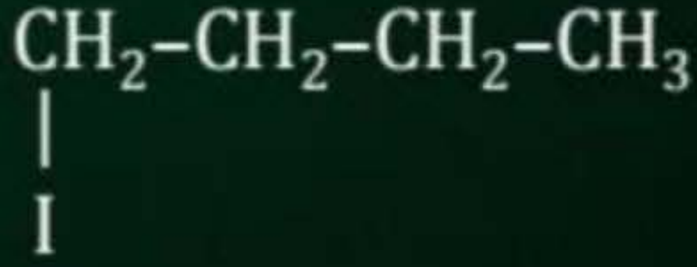
$$CH_3-\underset{\underset{I}{|}}{\overset{\overset{CH_3}{|}}{C}}-CH_2-CH_2-CH_3$$

(C)



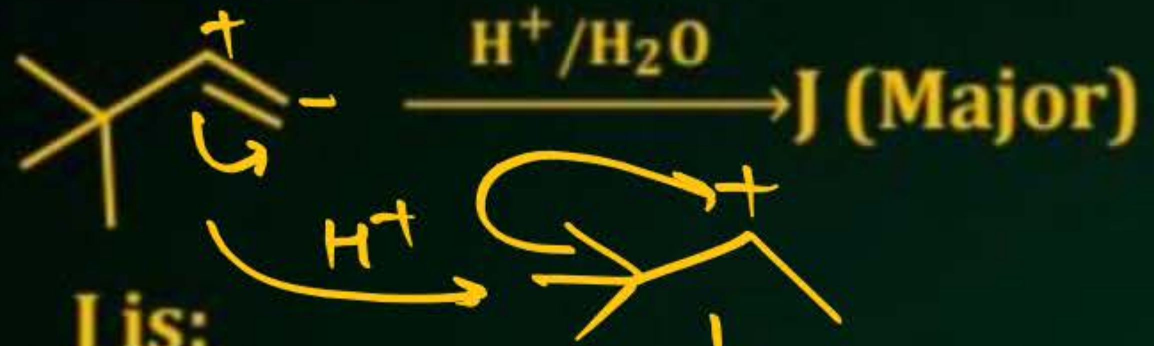
$$CH_3-CH_2-\underset{\underset{I}{|}}{CH}-CH_2-CH_3$$

(D)

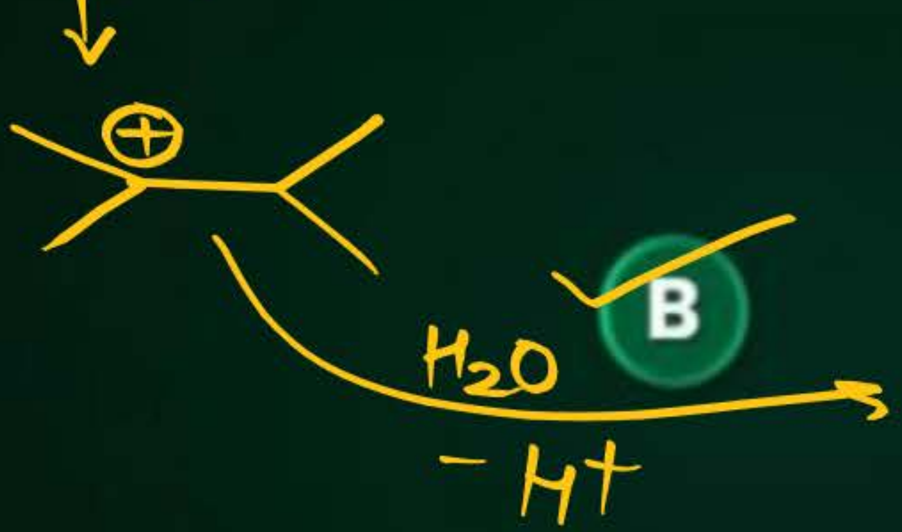


$$\underset{\underset{I}{|}}{CH_2}-CH_2-CH_2-CH_3$$

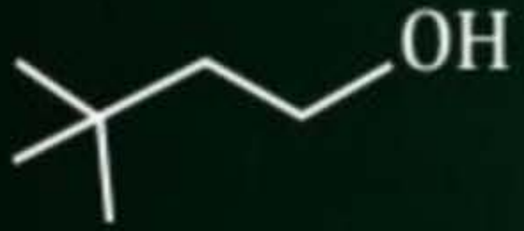
QUESTION 02


$\xrightarrow{H^+/H_2O}$ J (Major)

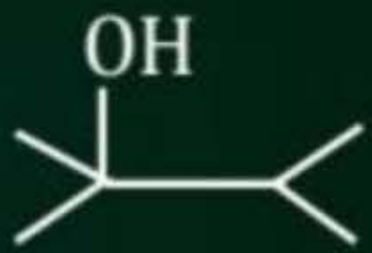
J is:



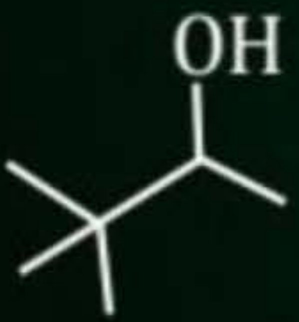
A



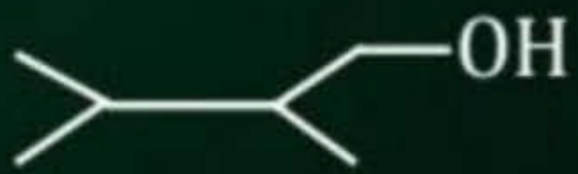
B ✓



C

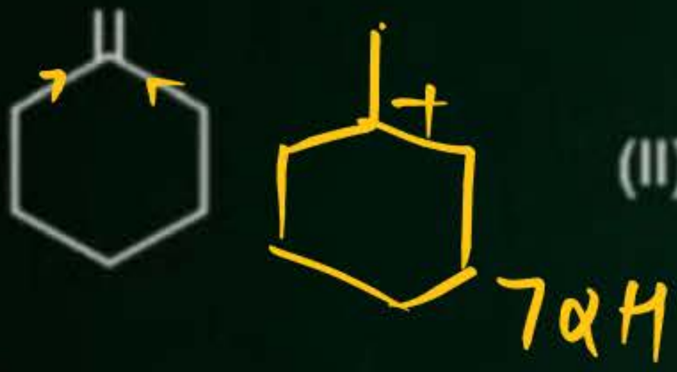


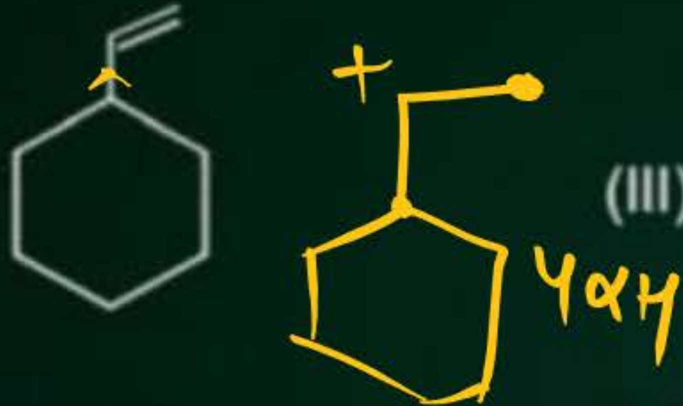
D

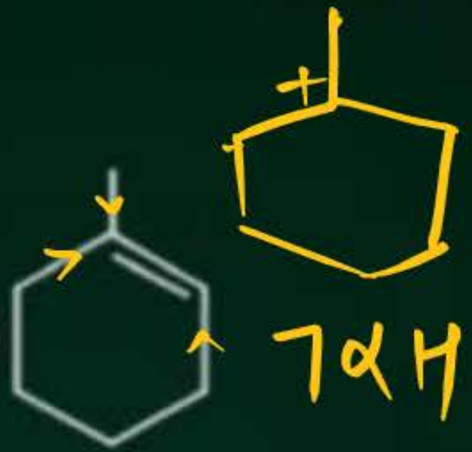


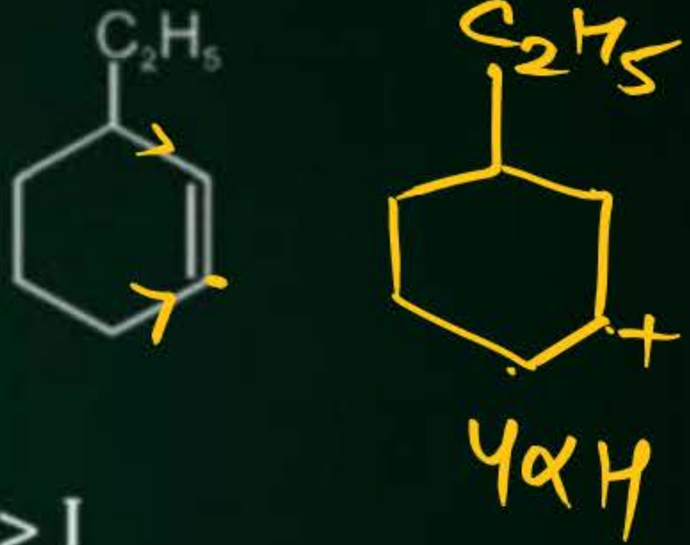
QUESTION 03

What is the correct reactivity order of electrophilic addition reactions in the following compounds?

(I)


(II)


(III)


(IV)

C₂H₅
C₂H₅
+
4αH

[✓ A] II > IV > I > III

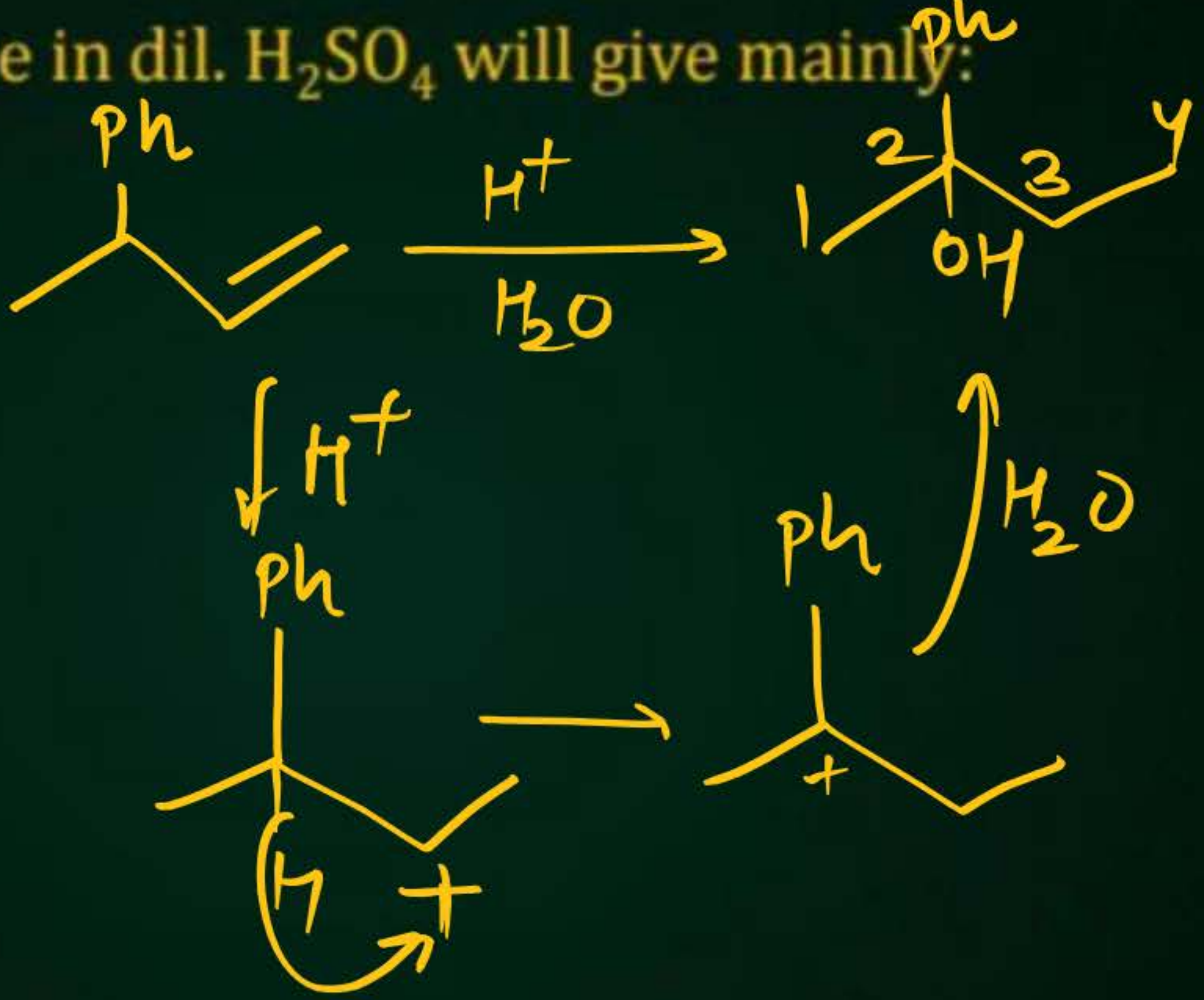
B IV > III > II > I

[✓ C] III > I > IV > II

D I > II > III > IV

QUESTION 04

Hydration of 3-phenyl but-1-ene in dil. H_2SO_4 will give mainly:


Ph
H+
H2O
Ph
1
2
3
4
OH
H+
Ph
H
+
Ph
+
H2O

A 3-Phenyl butan-1-ol

B 3-Phenyl butan-2-ol

[✓ C 2-Phenyl butan-2-ol]

D 2-Phenyl butan-1-ol

QUESTION 05

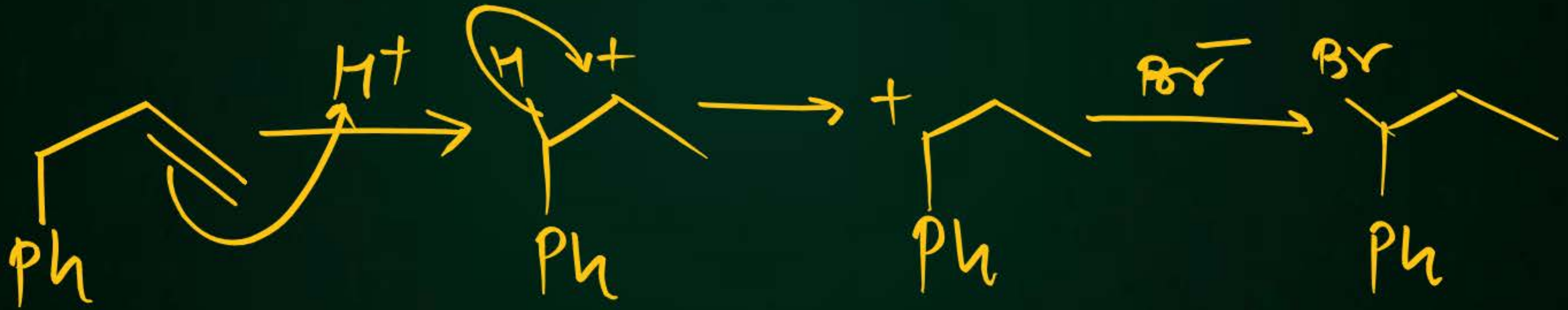
3-Phenyl Propene on reaction with HBr gives (as a major product):

A $C_6H_5CH_2CH(Br)CH_3$

[✓ B] $C_6H_5CH(Br)CH_2CH_3$

C $C_6H_5CH_2CH_2CH_2Br$

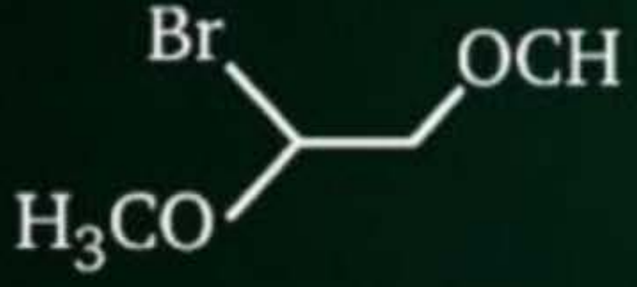
D $C_6H_5CH(Br)CH{=}CH_2$

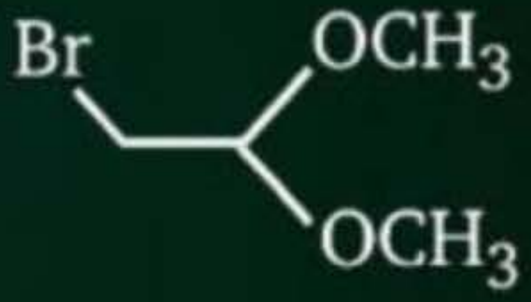

Ph
H+
H
+
Ph
+
Ph
Br⁻
Br
Ph

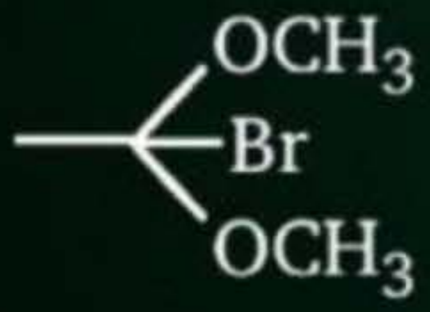
QUESTION 06

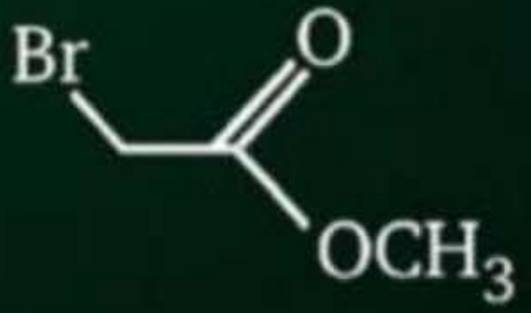
$CH_3\bar{O}\ Br^+$

Methyl vinyl ether $H_2\overset{-}{C} = \overset{+}{C}H - OCH_3$ reacts with $\underbrace{Br_2/CH_3OH}$. If methanol is reacting as water would, and if this reaction follows a typical mechanism of electrophilic addition. What would be expected product?

(A)


(B)


(C)


(D)


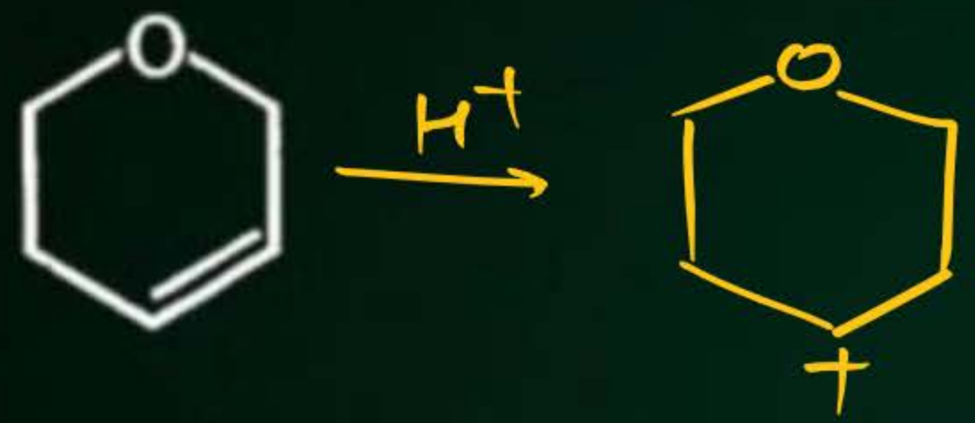
QUESTION 07

Which of the following is most reactive toward Markovnikov addition?

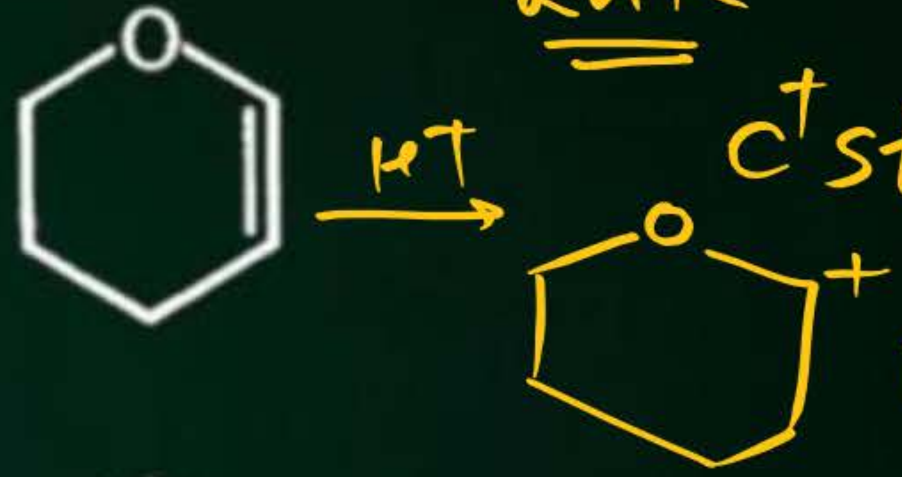
EAR

C$^+$ stability

(A)

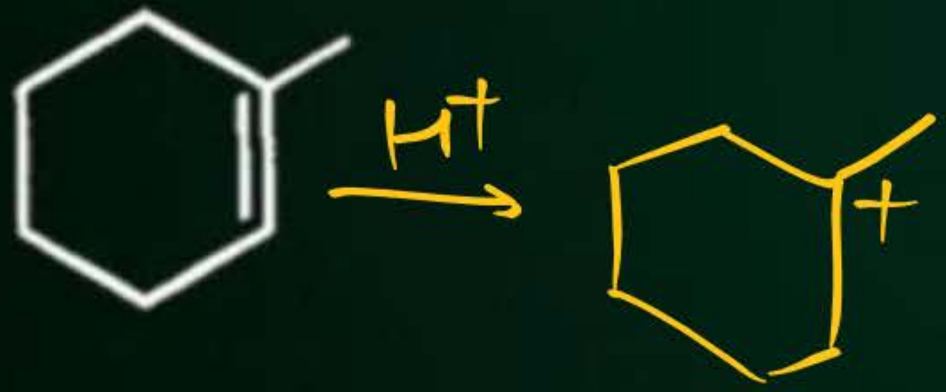


(B)

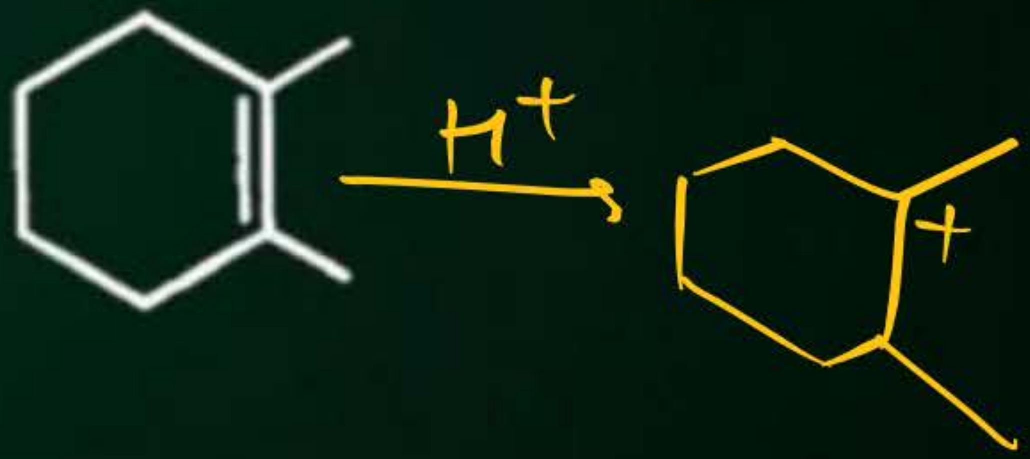


BB

(C)



(D)



QUESTION 08

Consider the following compounds.

$Ph_2C=CH_2$
1

$Ph_2\overset{+}{C}-CH_3$

$(CH_3)_2C=CH_2$
2

$CH_3-\underset{CH_3}{\overset{+}{\underset{|}{C}}}-CH_3$

$Ph_2C=CHCF_3$
3

Correct order of rate of electrophilic addition reaction is:

2 Ring + 3αH

9αH

$Ph-\underset{Ph}{\overset{+}{\underset{|}{C}}}-CH_2CF_3$

(A) 1 > 2 > 3

(B) 3 > 2 > 1

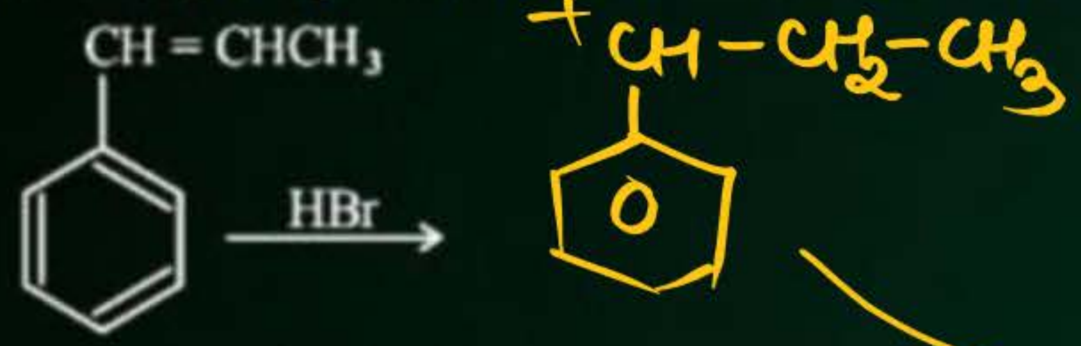
[✓ (C) 1 > 3 > 2]

(D) 3 > 1 > 2

2 Ring reso + 2αH

QUESTION 09

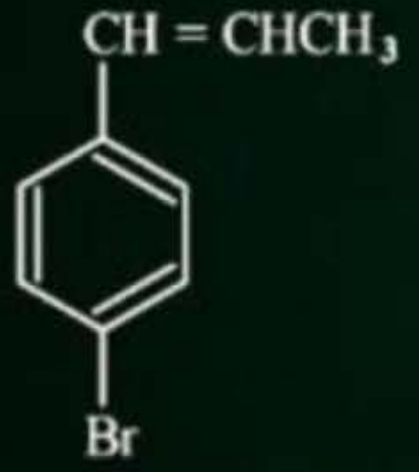
The major product of the following reaction is:



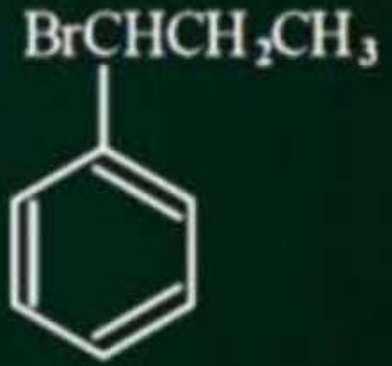
CH = CHCH$_3$
HBr
$^+$CH – CH$_2$ – CH$_3$

Br^-

A

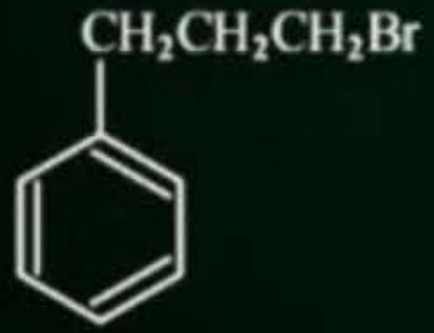


B



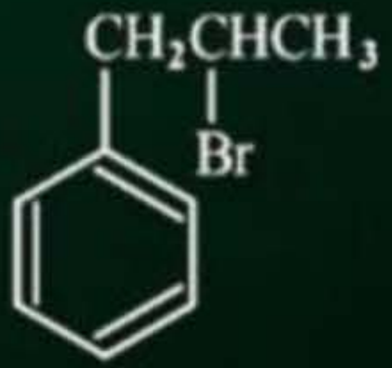
BrCHCH$_2$CH$_3$

C



CH$_2$CH$_2$CH$_2$Br

D



CH$_2$CHCH$_3$
Br

QUESTION 10

Markovnikov's rule provides guidance of addition of HBr on

A × $\underline{CH_2} = \underline{CH_2}$

× B $CH_3\text{-}CH_2\text{-}CH_3$

C × $CH_3\underbrace{CH{=}CH}CH_3$

✓ D $\underbrace{CH_2 = CHBr}$

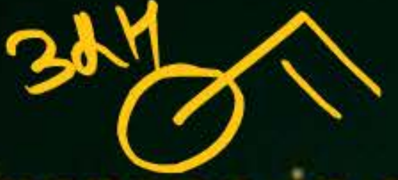
ANSWER KEY

1. B
2. B
3. C
4. C
5. B
6. B
7. B
8. C
9. B
10. D

Home Work

Discussion of L-07

QUESTION 01



$> CH_2=CH_2$

Assertion(A) ✓: Propene is more reactive than ethene towards electrophilic addition reactions.

Reason(R) ✓: Electron density of double bond increases due to hyperconjugation of methyl group.

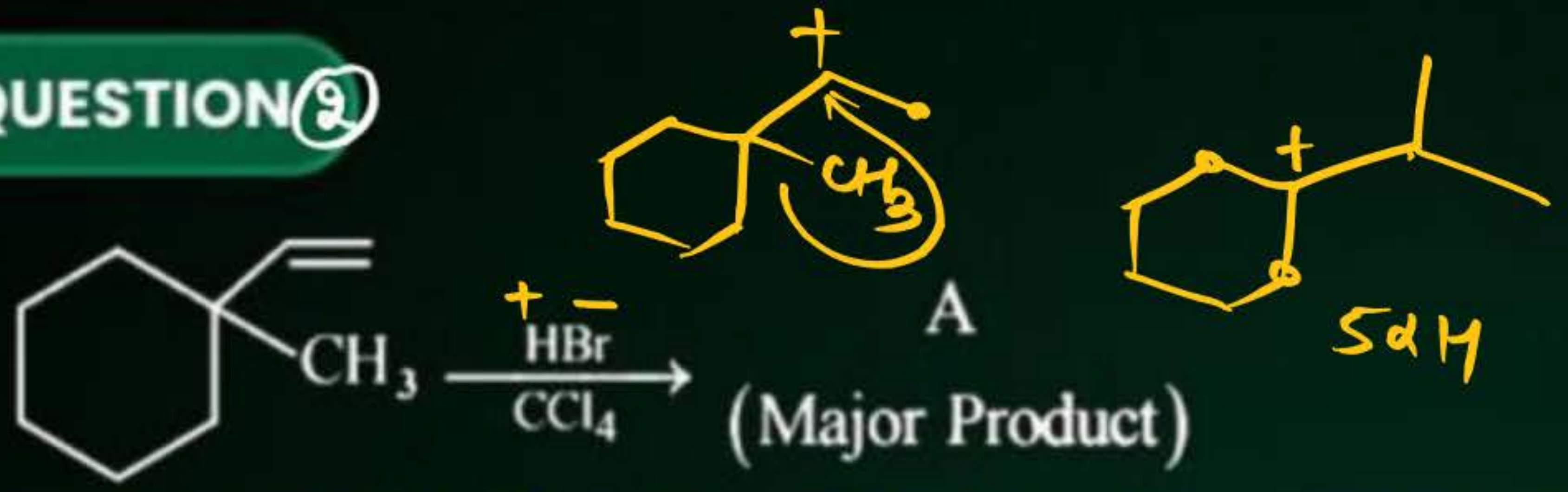
[✓ A] If both (A) and (R) are correct and (R) is the correct explanation for (A).

B If both (A) and (R) are correct but (R) is not the correct explanation for (A).

C If (A) is correct but (R) is incorrect.

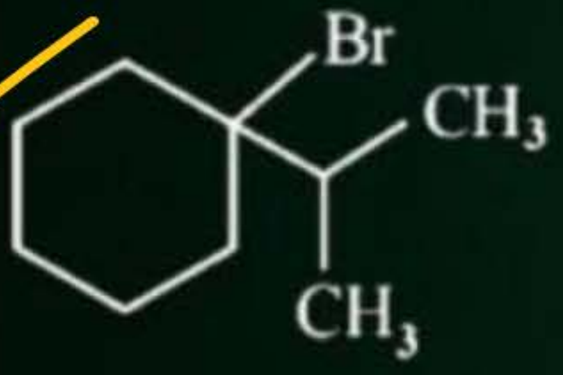
D If (A) is incorrect but (R) is correct.

QUESTION ②

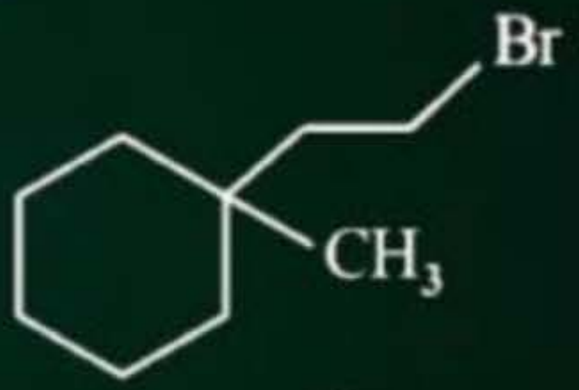

+
CH3
+
5αH
CH3
+ −
HBr
CCl4
A
(Major Product)

Product 'A' in the above chemical reaction is:

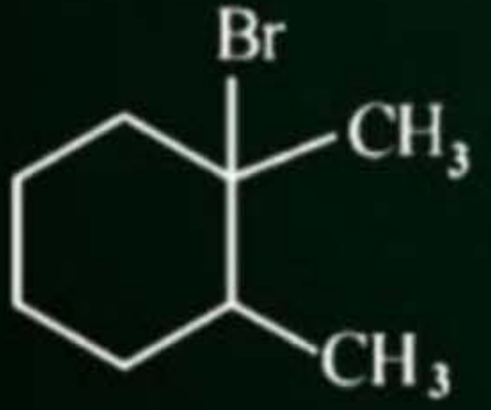
A



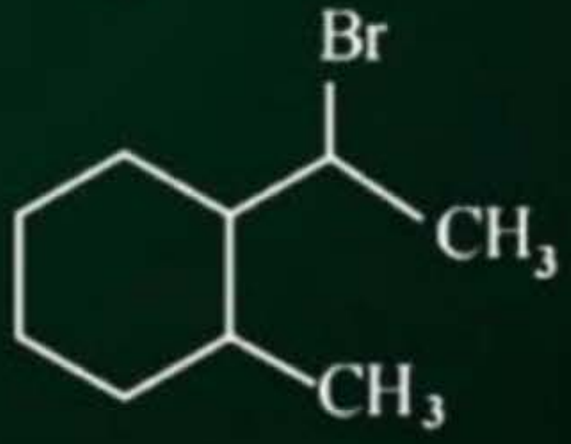
B



C



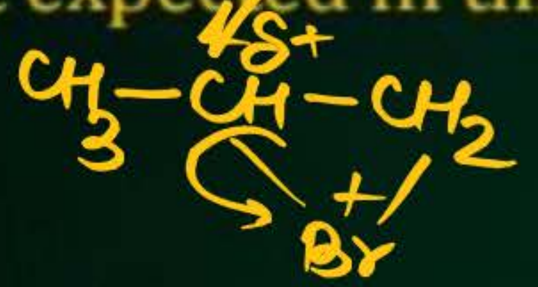
D



QUESTION 03

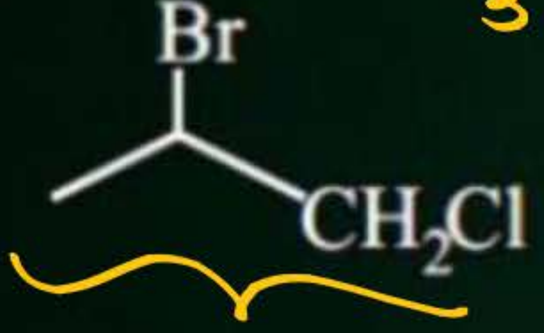
$CH_3-CH=CH_2+Br_2 \xrightarrow{\text{in } \overset{+}{Na}\overset{-}{Cl}} \text{Products}$

The product, not expected in this reaction is:

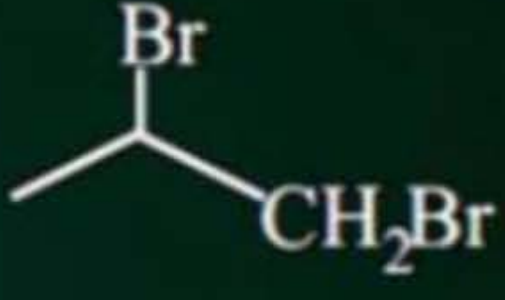


$\xrightarrow{Cl^{\ominus}} CH_3-\overset{Cl}{\overset{|}{CH}}-CH_2-Br$

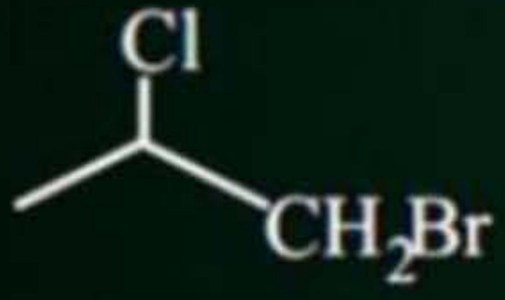
(A) ✓



(B)



(C)



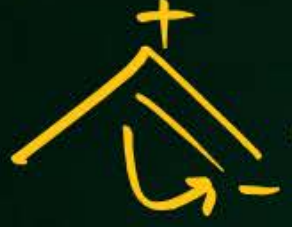
$\downarrow Br^{\ominus}$

$CH_3-\overset{Br}{\overset{|}{CH}}-\underset{\underset{Br}{|}}{CH_2}$

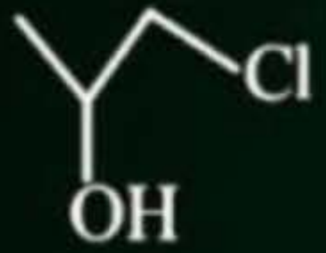
(D) All of these

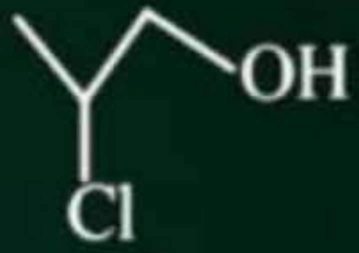
QUESTION 04

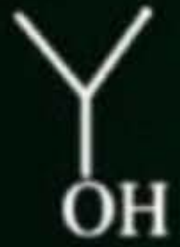
Propene on reaction with chlorine water gives

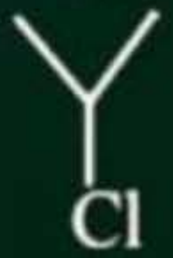


$\xrightarrow[H\bar{O}Cl^{+}]{Cl_2+H_2O}$

✓ A


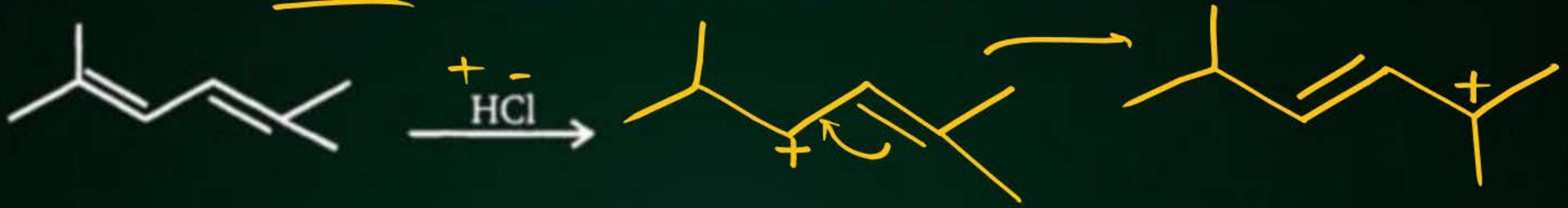
B


C


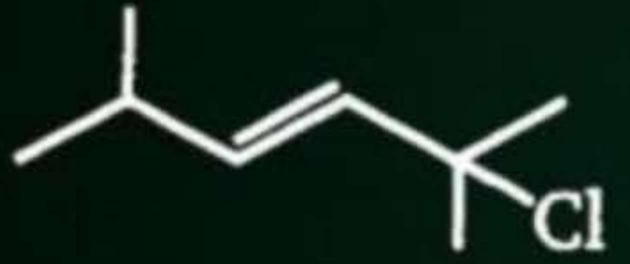
D


QUESTION⑤

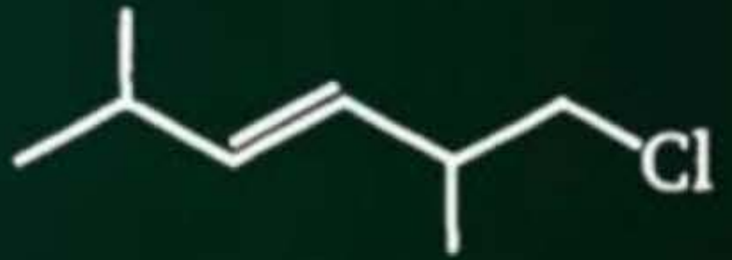
What is the product of 1, 4-addition in the reaction shown below?



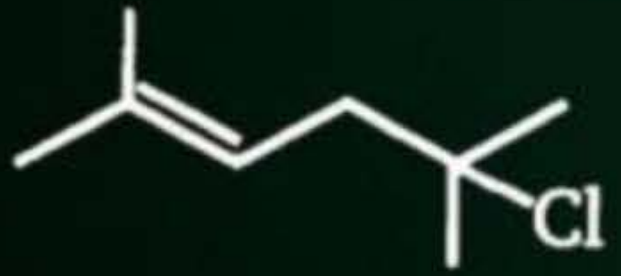
[✓ A]



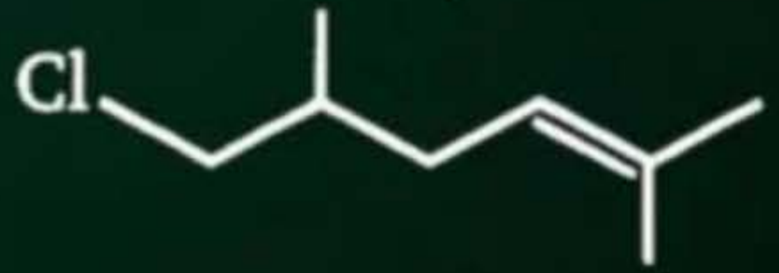
B



C



D



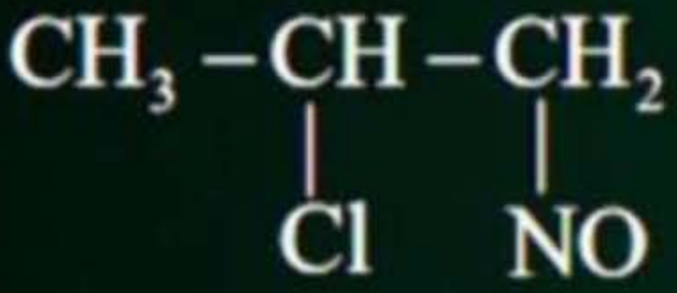
QUESTION 06

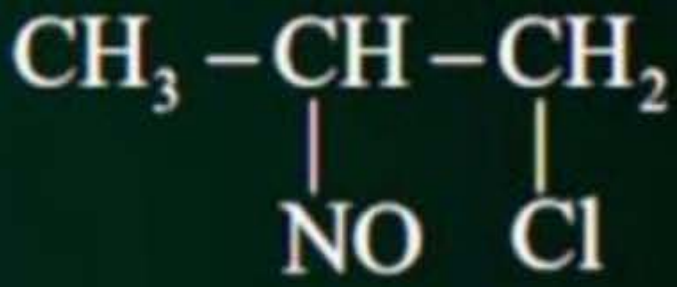
$\overset{-}{Cl}\rightarrow\overset{+}{N}=O$

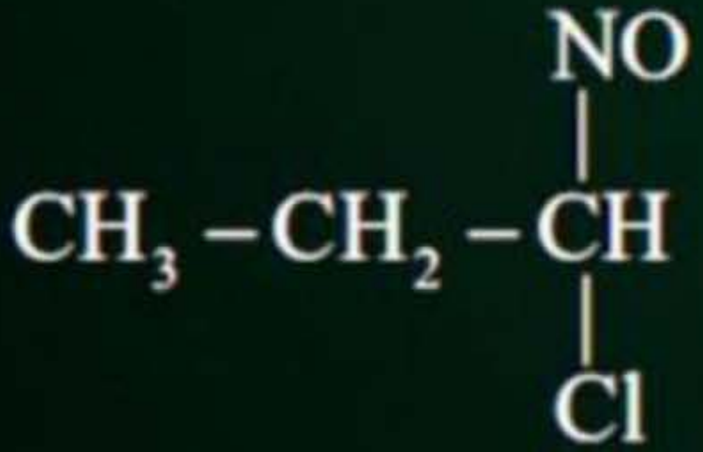
$CH_3-\overset{+}{C}H=\overset{-}{C}H_2+\overset{+}{N}O\overset{-}{Cl}\longrightarrow$ **Major product:**

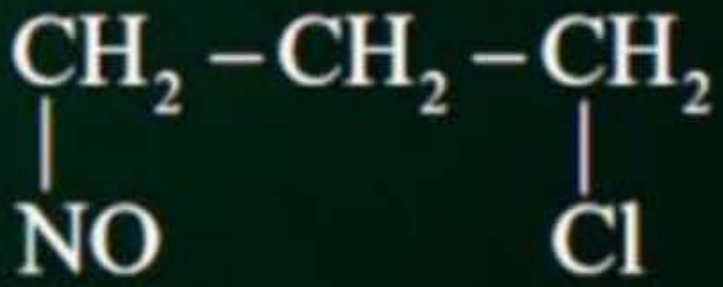
Tilden reagent

Identify the product.

[✓ (A)] 
$CH_3-\underset{Cl}{\underset{|}{CH}}-\underset{NO}{\underset{|}{CH_2}}$

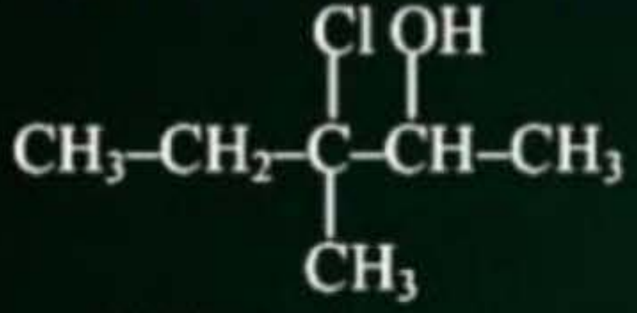
(B) 
$CH_3-\underset{NO}{\underset{|}{CH}}-\underset{Cl}{\underset{|}{CH_2}}$

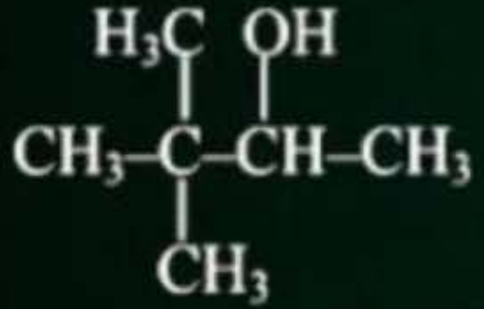
(C) 
$CH_3-CH_2-\underset{Cl}{\underset{|}{\overset{NO}{\overset{|}{CH}}}}$

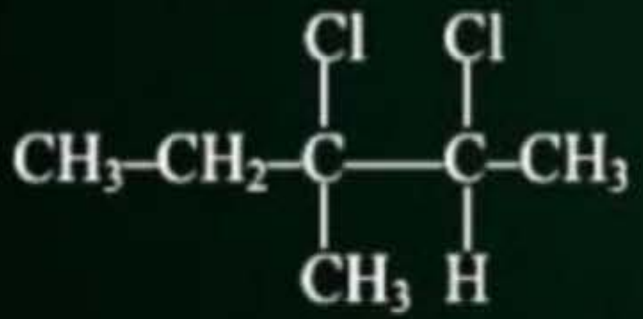
(D) 
$\underset{NO}{\underset{|}{CH_2}}-CH_2-\underset{Cl}{\underset{|}{CH_2}}$

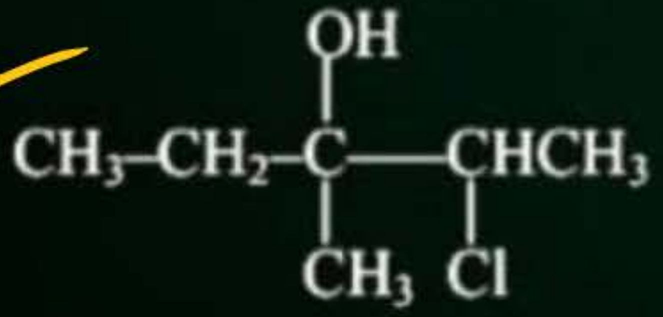
QUESTION 07

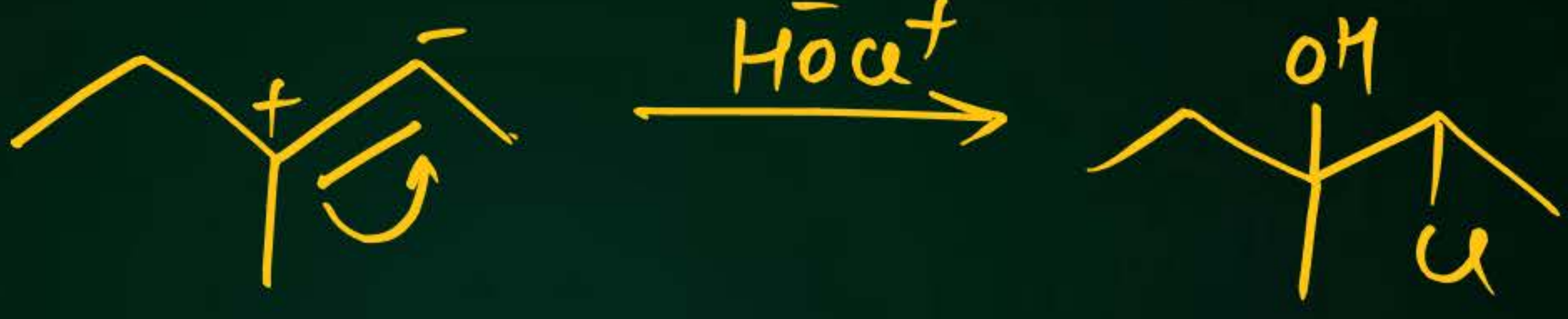
3-Methyl-2-pentene on reaction with HOCl gives:

A

$CH_3-CH_2-\underset{CH_3}{\overset{Cl}{C}}-\overset{OH}{CH}-CH_3$

B

$CH_3-\underset{CH_3}{\overset{H_3C}{C}}-\overset{OH}{CH}-CH_3$

C

$CH_3-CH_2-\underset{CH_3}{\overset{Cl}{C}}-\underset{H}{\overset{Cl}{C}}-CH_3$

[✓ D]

$CH_3-CH_2-\underset{CH_3}{\overset{OH}{C}}-\underset{Cl}{CHCH_3}$



QUESTION ⑧

Assertion: Alkenes undergo electrophilic addition reaction ✓ at carbon-carbon double bond.

Reason: Electrophilic addition at double bond produces carbocation ✓ intermediate.

[✓ A] Both assertion and reason are correct and the reason is the correct explanation for assertion.

(B) Both assertion and reason are correct but reason is not the correct explanation for assertion.

(C) Assertion is correct but reason is incorrect.

(D) Both assertion and reason are incorrect.

QUESTION 09

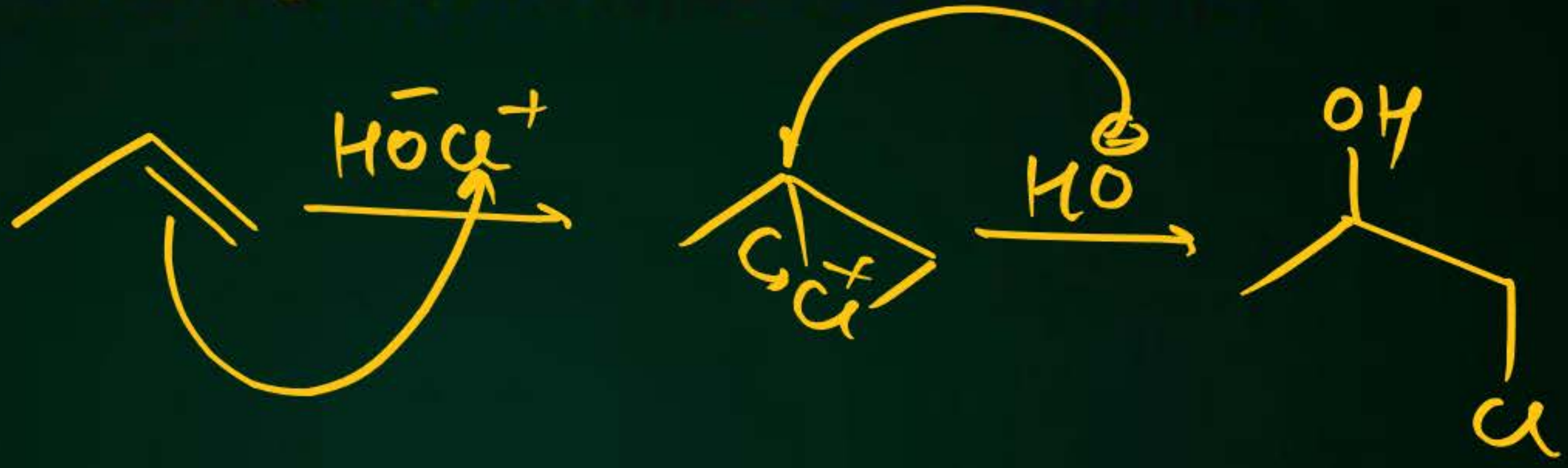
The reaction of propene with HOCl proceeds via the addition of:

(A) H^+ in first step

[✓ (B)] Cl^+ in first step

(C) OH^- in first step

(D) Cl^+ and OH^- in single step



QUESTION 10

$Br_2 + MeOH \longrightarrow Me\bar{O}Br^+$

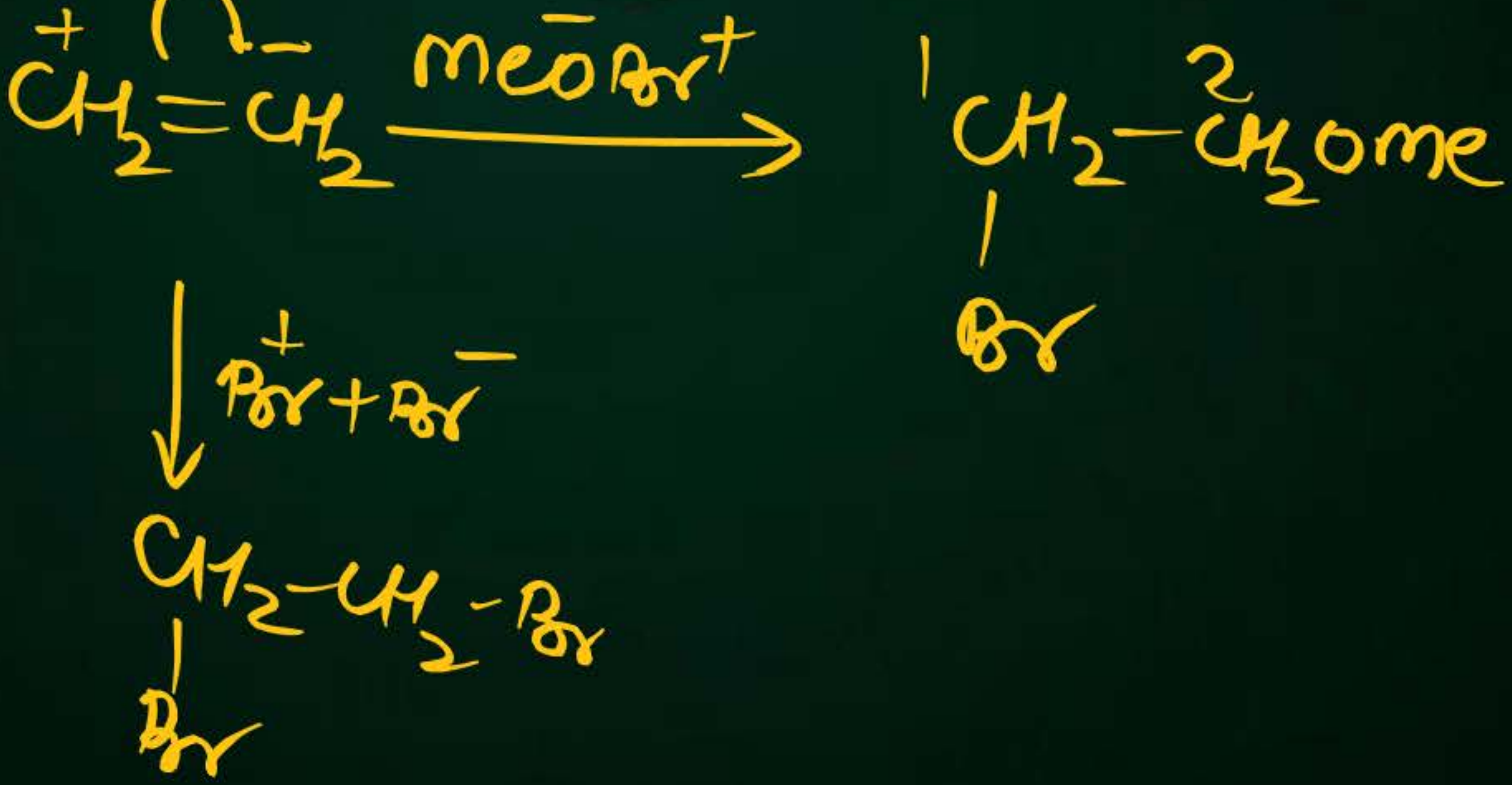
Ethylene on reaction with $\underbrace{Br_2 \text{ in methanol}}$ forms

(A) 1,2-dimethoxyethane

(B) 1-bromo-2-methoxyethane

(C) $\underbrace{\text{1, 2-dibromoethane}}$

(D) ✓ a mixture of (B) and (C)



$\overset{+}{C}H_2=\overset{-}{C}H_2 \xrightarrow{Me\bar{O}Br^+} \underset{\displaystyle Br}{\overset{1}{C}H_2}-\overset{2}{C}H_2OMe$

$\downarrow Br^+ + Br^-$

$\underset{\displaystyle Br}{CH_2}-CH_2-Br$

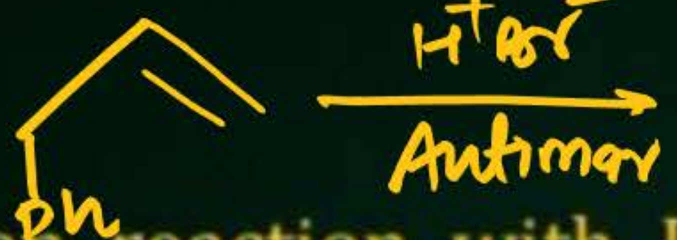
ANSWER KEY

1. A
2. A
3. A
4. A
5. A
6. A
7. D
8. A
9. B
10. D

Home Work

Discussion of L-08

QUESTION 01



3-phenyl propene on reaction with HBr in presence of benzoyl peroxide gives (major product)

(A) $C_6H_5CH_2CH(Br)CH_3$

(B) $C_6H_5CH_2CH_2Br$

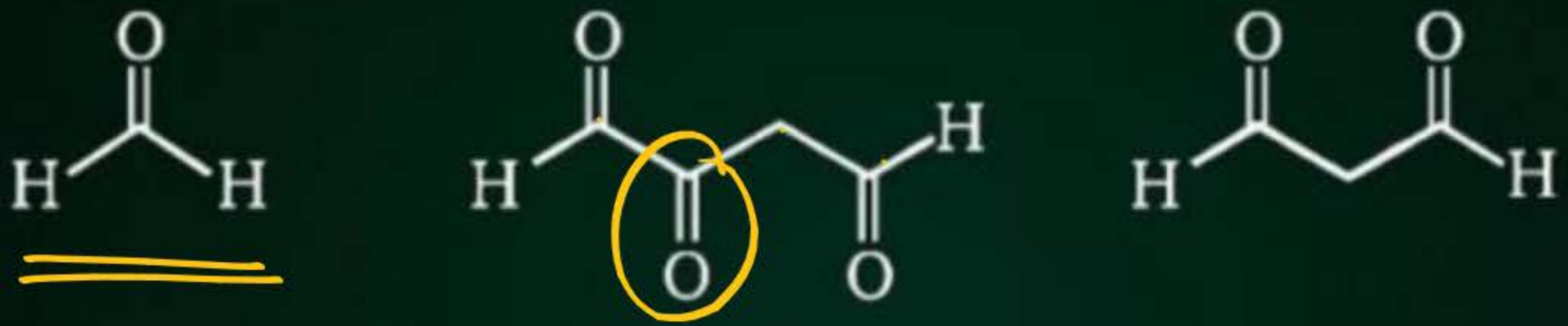
(C) $CH_3-\underset{\displaystyle Br}{\underset{|}{C}H}-CH_2CH_3$

[✓ (D)] $C_6H_5-CH_2CH_2CH_2Br$

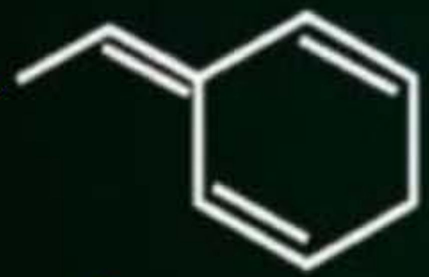
QUESTION 02

A triene is treated with ozone followed by zinc in acetic acid to give the following three products. What is the structure of the triene?

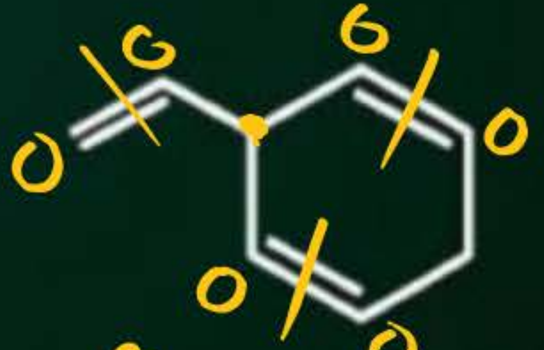
Products =



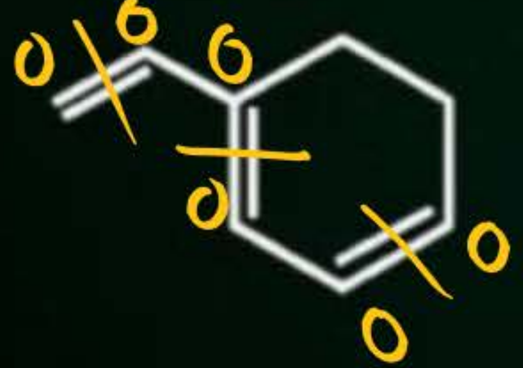
A



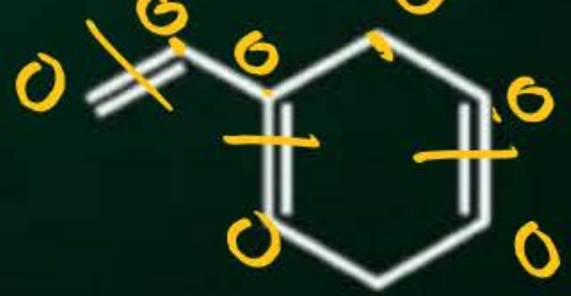
B



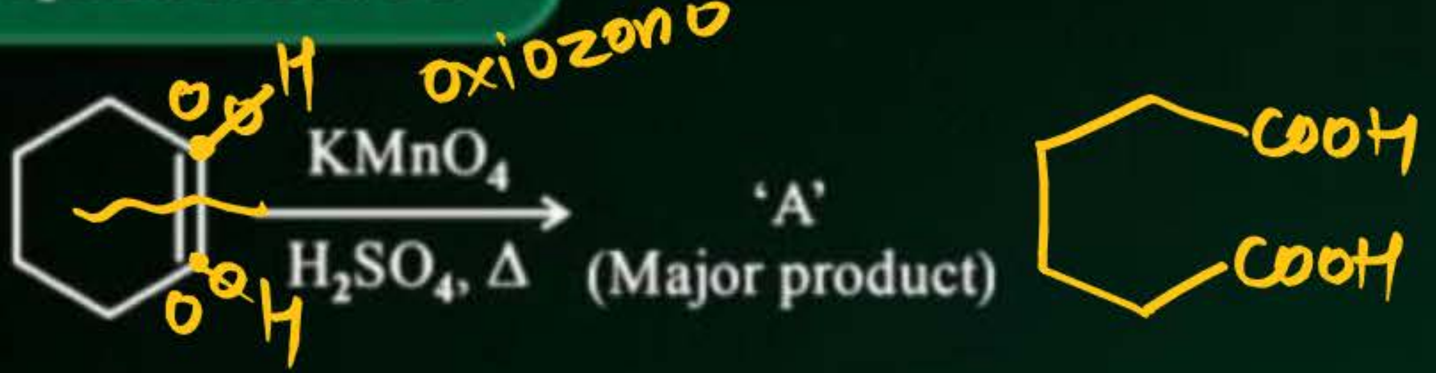
C

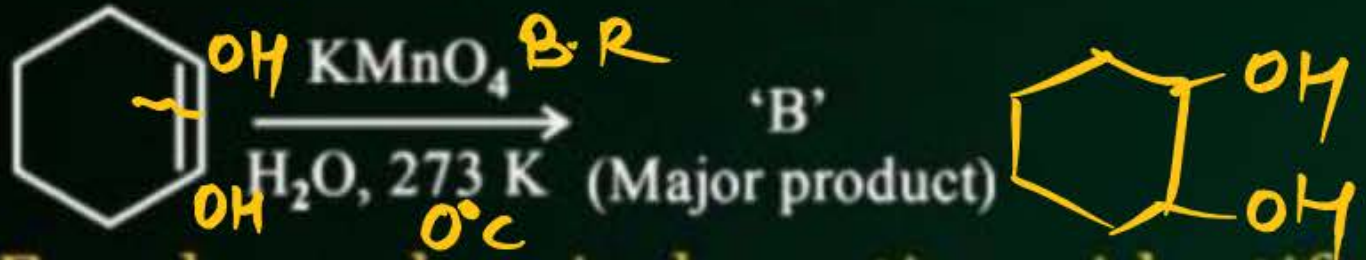


[✓ D]



QUESTION 03


O
H
oxiozono
KMnO$_4$
H$_2$SO$_4$, Δ
O
H
'A'
(Major product)
COOH
COOH


OH
KMnO$_4$
B.R
H$_2$O, 273 K
OH
0°C
'B'
(Major product)
OH
OH

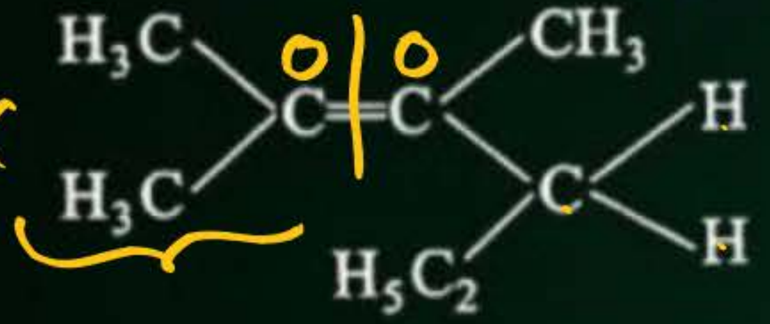
For above chemical reactions, identify the correct statement from the following.

- A Compound 'A' is diol and compound 'B' is dicarboxylic acid.
- B Both compound 'A' and compound 'B' as dicarboxylic acids.
- [✓ C] Compound 'A' is dicarboxylic acid and compound 'B' is diol.
- D Both compound 'A' and compound 'B' are diol.

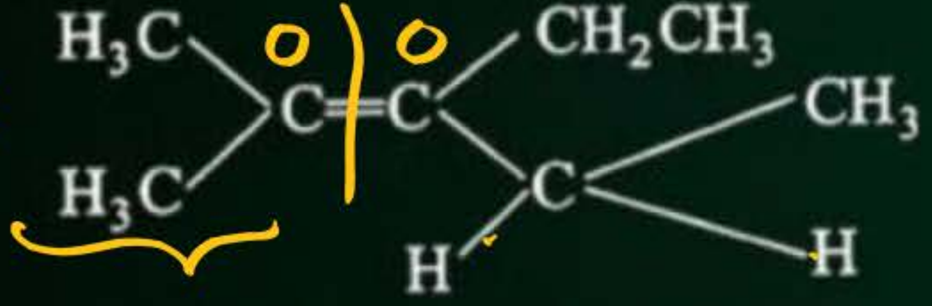
QUESTION 04

An optically active compound having molecular formula C_8H_{16} on ozonolysis gives acetone as one of the products. The structure of the compound is:

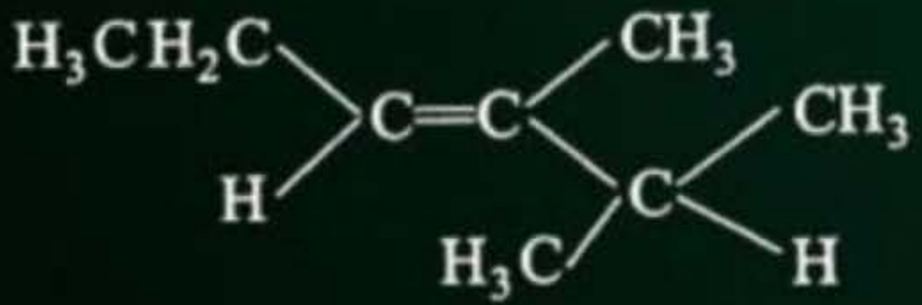
A ✗


H3C
H3C
C=C
CH3
H
C
H
H5C2
O
O

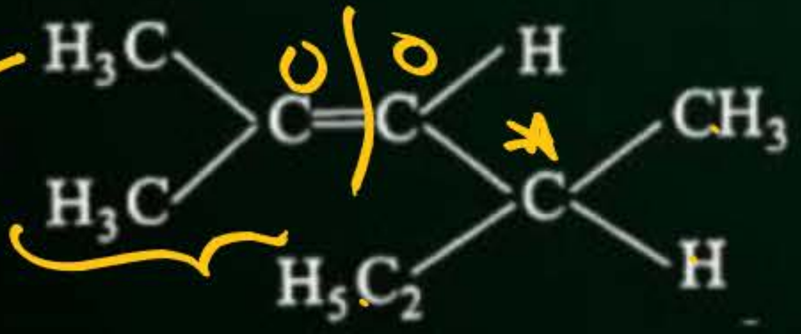
B ✗


H3C
H3C
C=C
CH2CH3
CH3
C
H
H
O
O

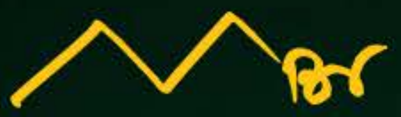
C ✗

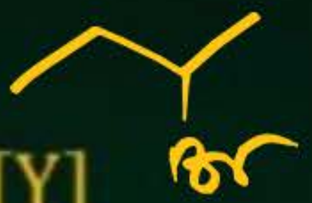

H3CH2C
H
C=C
CH3
CH3
C
H3C
H

D ✓


H3C
H3C
C=C
H
CH3
C
H5C2
H
O
O
*

QUESTION 05





$$CH_3CH_2-CH=CH_2 + HBr \xrightarrow{ROOR} \underset{Major}{[X]} + \underset{Minor}{[Y]}$$

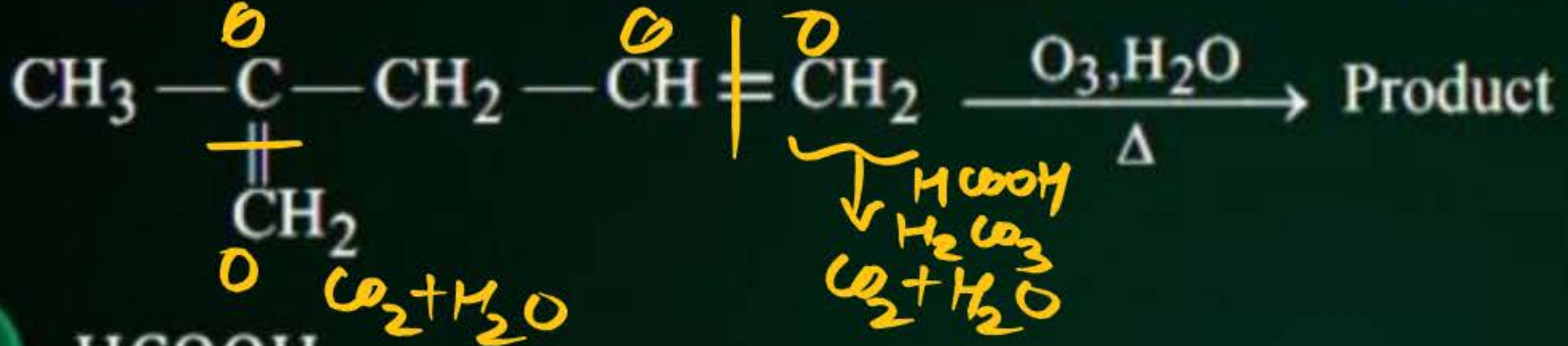
[X] and [Y] respectively are:

- **A** $BrCH_2CH_2CH=CH_2$ and $C_2H_5-CHBr-CH_3$
- **B** $C_2H_5-CH_2CH_2-Br$ and $Br-CH_2CH_2-CH=CH_2$
- [✓ **C**] $C_2H_5-CH_2-CH_2Br$ and $C_2H_5-CHBr-CH_3$
- **D** $C_2H_5CHBr-CH_3$ and $C_2H_5-CH_2-CH_2Br$

QUESTION 06

$CH_3-\overset{O}{\overset{\|}{C}}-CH_2-COOH$

Which product will not form in the following reaction?



$$CH_3-\underset{\underset{CH_2}{\|}}{C}-CH_2-CH=CH_2 \xrightarrow[\Delta]{O_3,H_2O} \text{Product}$$

HCOOH

H_2CO_3

CO_2+H_2O

CO_2+H_2O

A HCOOH

B CH_3COCH_2COOH

[✓ **C**] Me_2CO

D All are possible

QUESTION 07

Products of the following reaction

$$\underline{Me_2\overset{0}{C}} \cancel{=} \underline{\overset{0}{C}HCH_3} \xrightarrow[\text{(ii) } \underline{(CH_3)_2S}]{(i)\, O_3} \text{? are}$$

(A) $CH_3CHO + CH_3COOH$

[✓ (B)] $Me_2CO + CH_3CHO$

(C) $Me_2CO + CH_3COOH$

(D) $2\ Me_2CO$

QUESTION 08

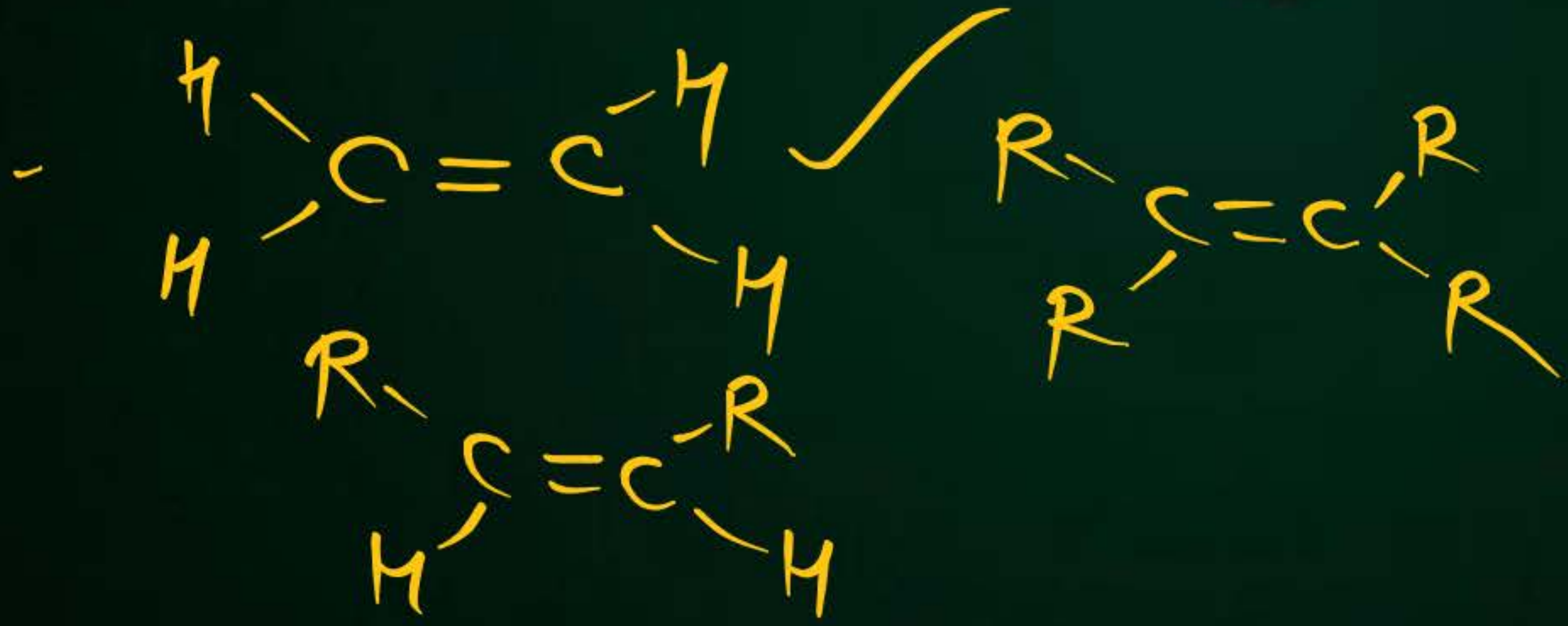
Unbranched alkenes on ozonolysis give

A Only ketone

[✓ B] Only aldehydes

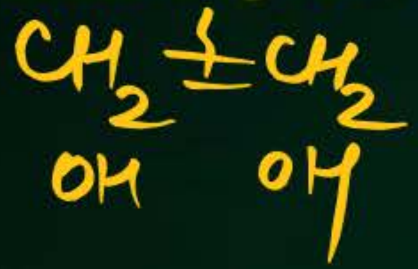
C Aldehydes & ketone

D All of the above


H
H
C=C
H
H
R
H
C=C
R
H
R
R
C=C
R
R

QUESTION 09

Ethylene reacts with Baeyer's reagent to give



$\underset{OH}{CH_2}-\underset{OH}{CH_2}$

A ethane

B ethyl alcohol

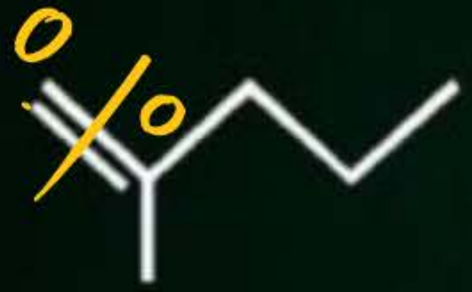
[✓ C] ethylene glycol

D None of these

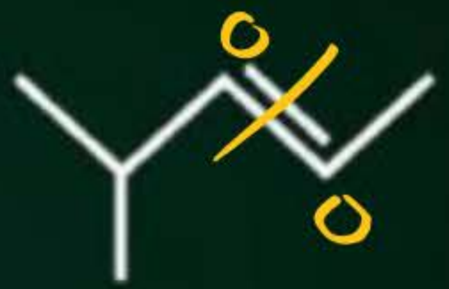
QUESTION 10

Which one of the following compound gives acetone $(CH_3)_2C=O$ as one of the product of its ozonolysis?

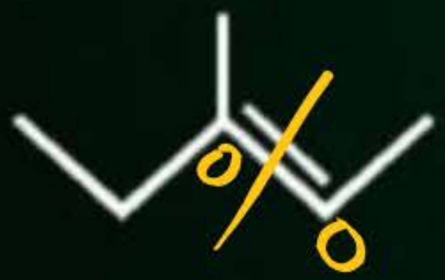
A ×



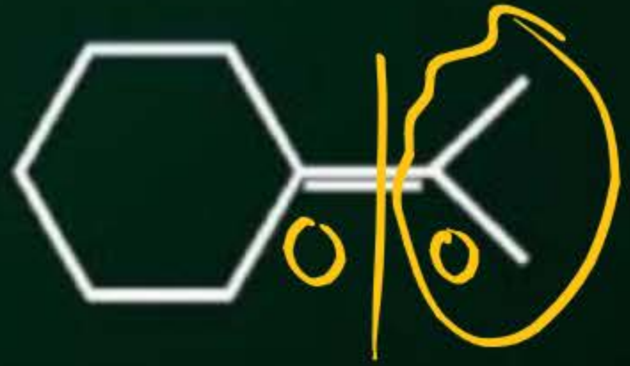
B



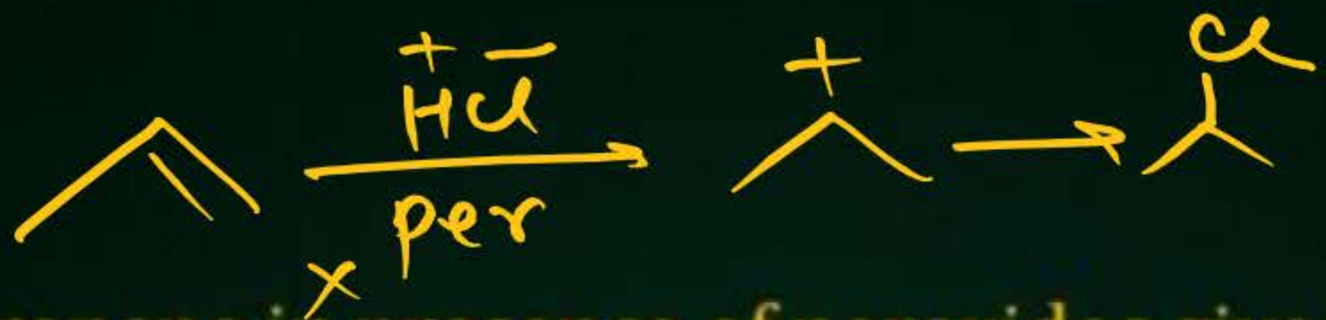
C ×



[✓ D]



QUESTION 11



$\overset{+}{H}\overset{-}{Cl}$
per
×
+
Cl

Addition of HCl to propene in presence of peroxides gives

Ⓐ 1-Chloropropane

[✓ Ⓑ] 2-Chloropropane

Ⓒ 3-Chloropropane

Ⓓ Propene dichloride

ANSWER KEY

1. D
2. D
3. C
4. D
5. C
6. C
7. B
8. B
9. C
10. D
11. B

AAJ KA GYAN

Never be a prisoner of your past its just a lesson not your life sentence

Thank you "

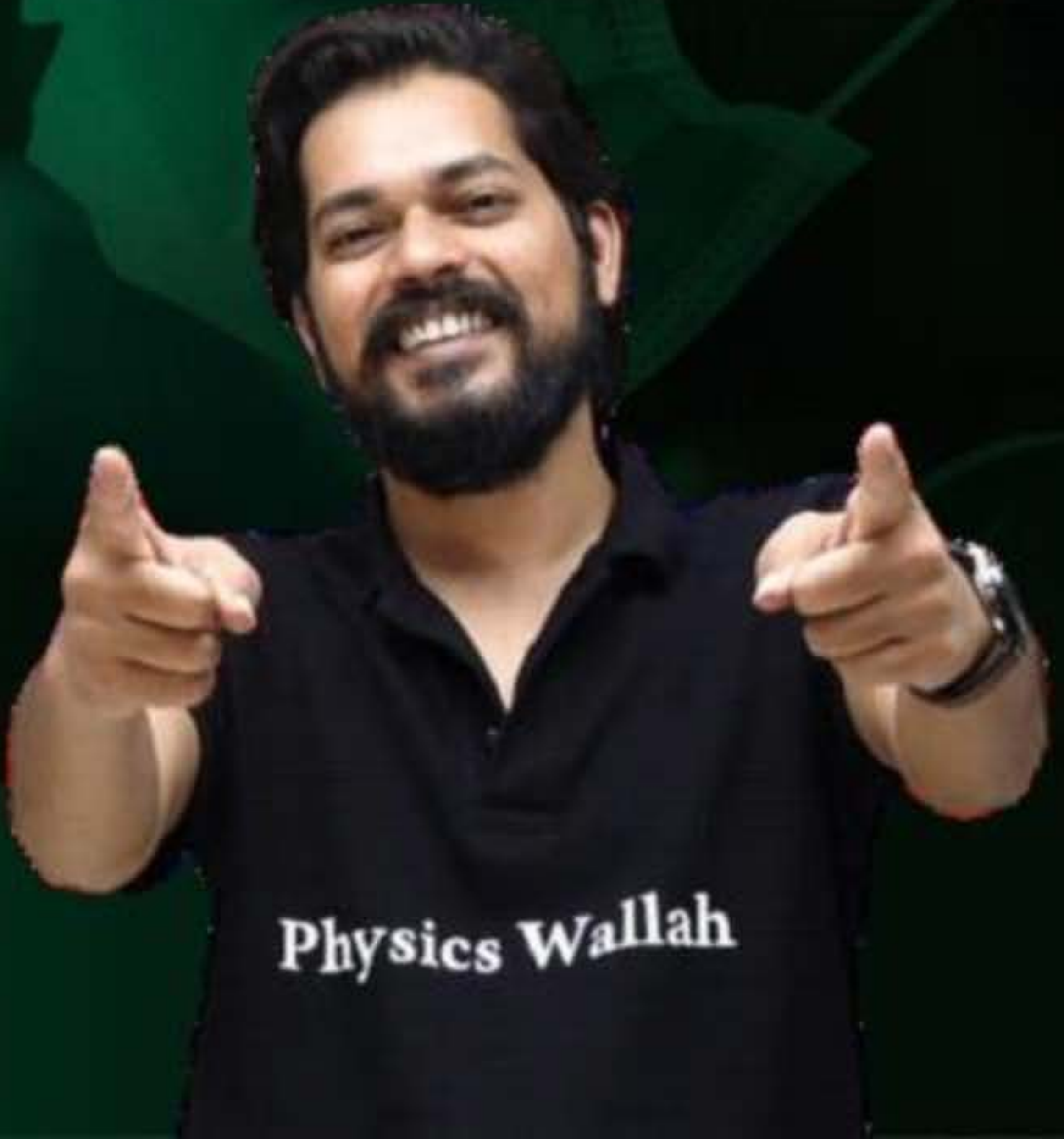
YAKEEN 2.0

FOR NEET 2025

Lecture- 12 | **Organic Chemistry**

HYDROCARBONS

By- Pankaj Sir(POPU MAMA)


Physics Wallah

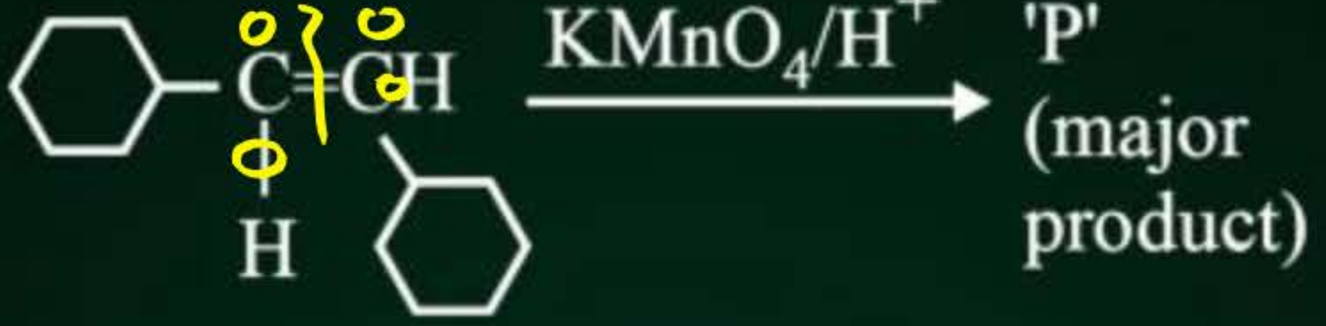
Topics *to be covered*

1. NEET/AIPMT & JEE Mains PYQs

NEET PYQs

QUESTION [NEET 2024]

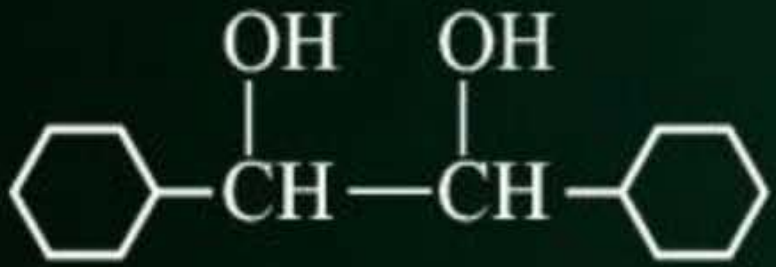
For the given reaction:



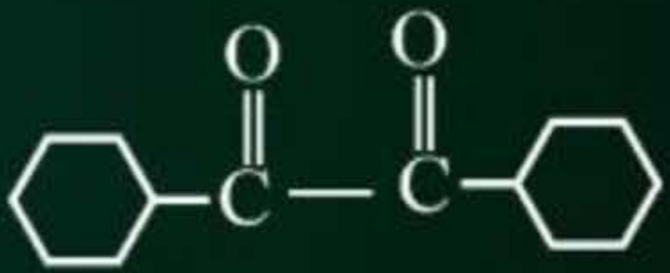
$KMnO_4/H^+$
'P'
(major
product)

'P' is:

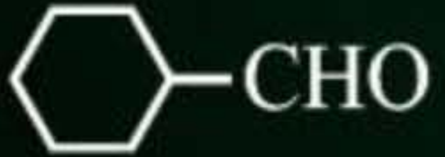
A



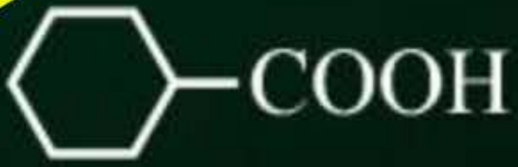
B



C

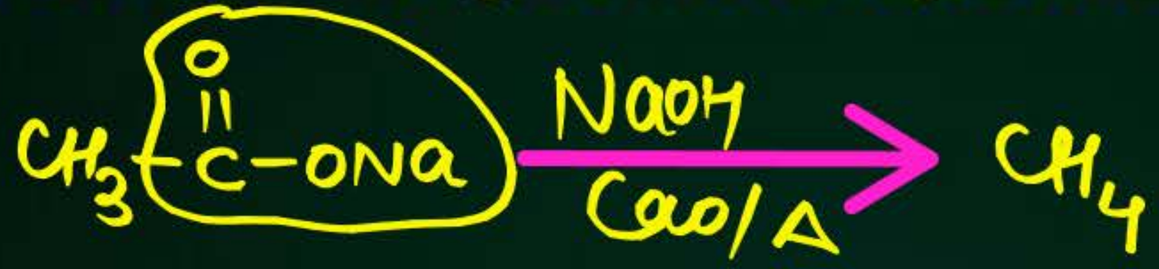


D



QUESTION [NEET 2023]

Weight (g) of two moles of the organic compound, which is obtained by heating sodium ethanoate with sodium hydroxide in presence of calcium oxide is:



$$CH_3-\overset{\overset{O}{\|}}{C}-ONa \xrightarrow[CaO/\Delta]{NaOH} CH_4$$

$$n_{CH_4} = 2$$

$$w_{CH_4} = 2 \times 16 = 32$$

- **A** 18
- **B** 16
- **C** [✓ 32]
- **D** 30

QUESTION [NEET 2022]

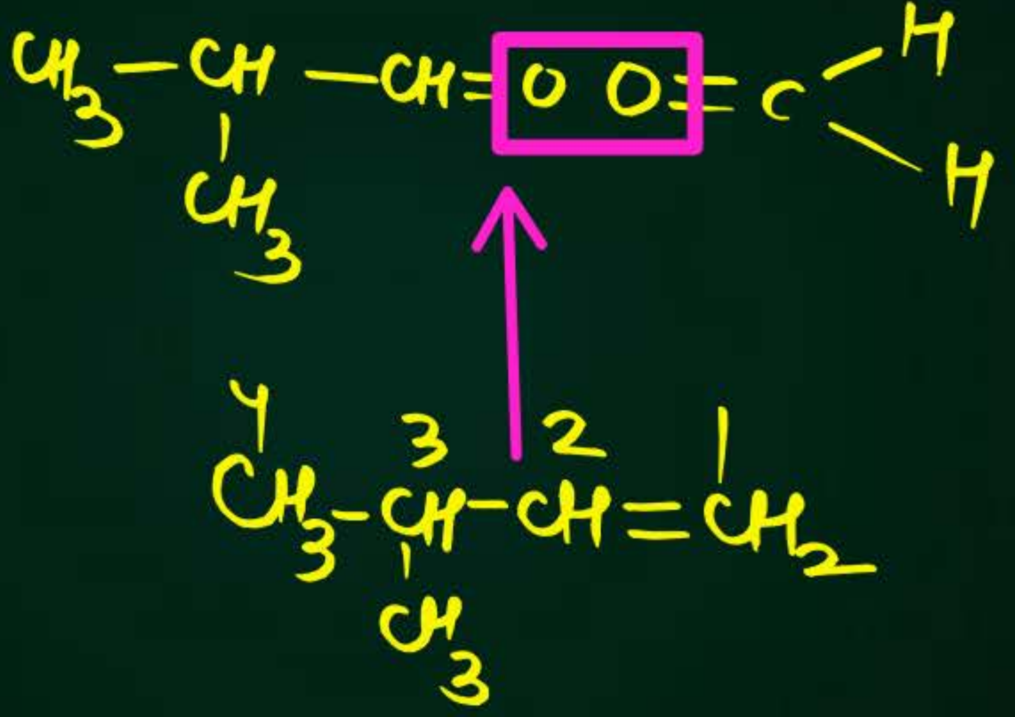
Compound X on reaction with O_3 followed by Zn/H_2O gives formaldehyde and 2-methyl propanal as products. The compound X is:

A Pent-2-ene

[✓ B] 3-Methylbut-1-ene

C 2-Methylbut-1-ene

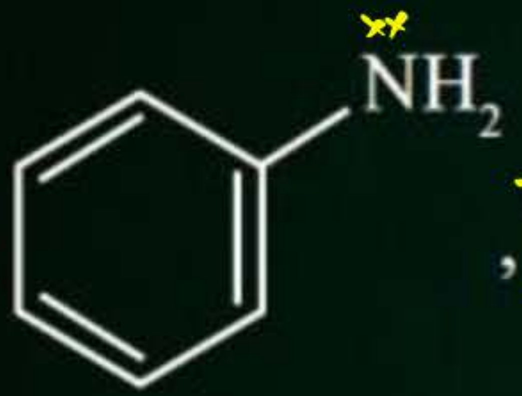
D 2-Methylbut-2-ene



CH3–CH–CH=O O=C–H, H
CH3
4 3 2 1
CH3–CH–CH=CH2
CH3

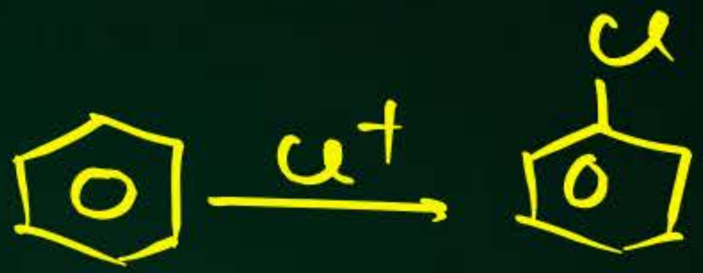
QUESTION [NEET 2022]

Which of the following is suitable to synthesize chlorobenzene?

(A) 

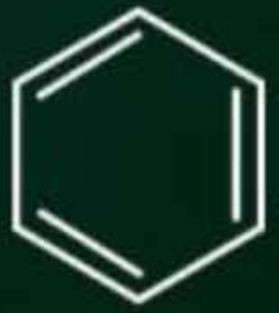
$PhNH_3^+Cl^-$

, $\overset{+}{H}Cl$ Heating



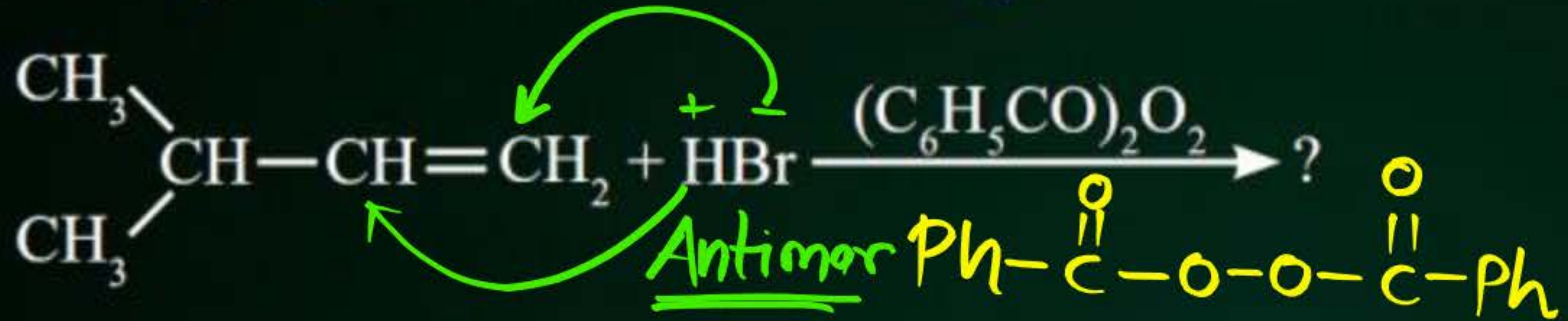
[✓ B] Benzene, Cl_2, anhydrous $FeCl_3$

(C) Phenol, $NaNO_2$, HCl, CuCl

(D)  , HCl

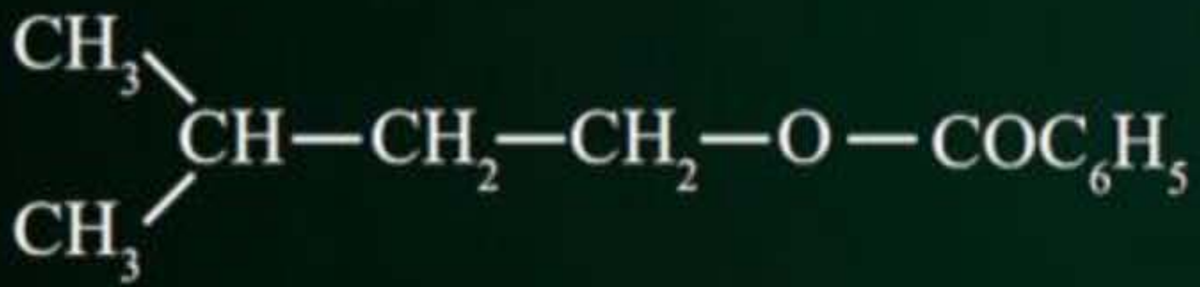
QUESTION [NEET 2021]

The major product of the following chemical reaction is:

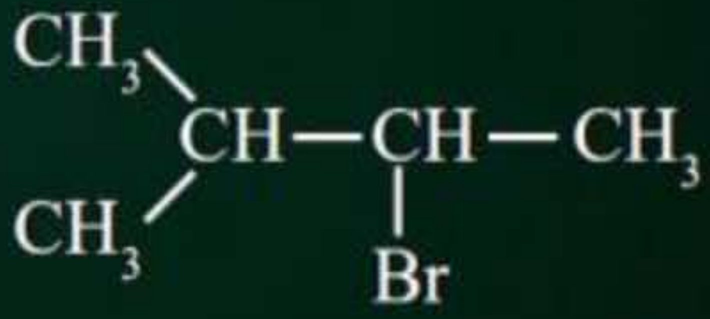


$$(CH_3)_2CH-CH=CH_2 + \overset{+\ -}{HBr} \xrightarrow{(C_6H_5CO)_2O_2} ?$$

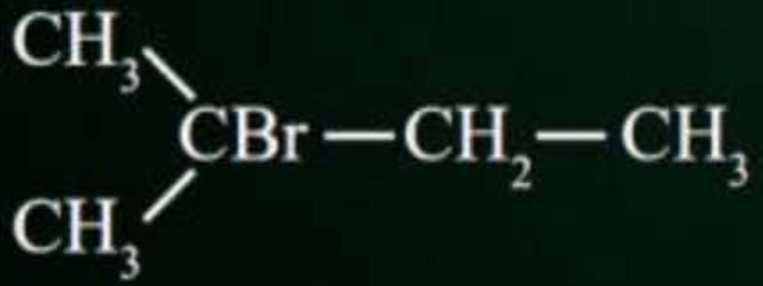
Antimar $Ph-\overset{O}{\overset{\|}{C}}-O-O-\overset{O}{\overset{\|}{C}}-Ph$

Ⓐ


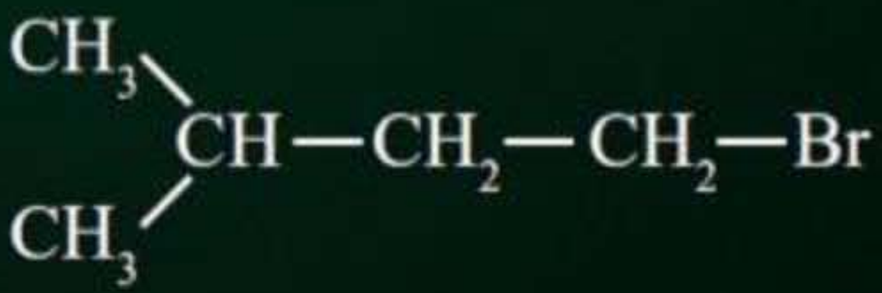
$(CH_3)_2CH-CH_2-CH_2-O-COC_6H_5$

Ⓑ


$(CH_3)_2CH-CH(Br)-CH_3$

Ⓒ


$(CH_3)_2CBr-CH_2-CH_3$

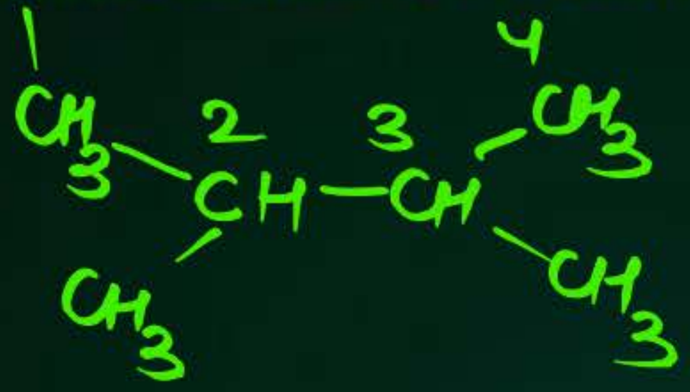
✓ Ⓓ


$(CH_3)_2CH-CH_2-CH_2-Br$

QUESTION [NEET 2020]

Which of the following alkane cannot be made in good yield by Wurtz reaction?

A 2, 3-Dimethylbutane


1
4
2
3
CH3
CH
CH
CH3
CH3
CH3

odd no.

[✓ **B**] n-Heptane

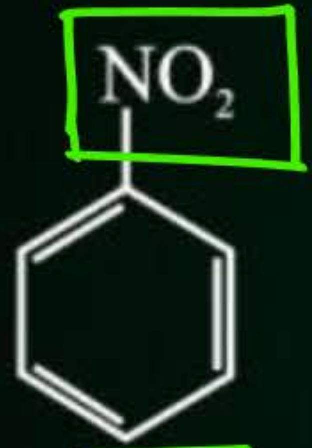
C n-Butane

D n-Hexane

QUESTION [2020-Covid]

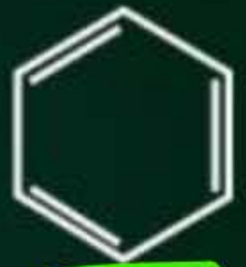
Which of the following compound is most reactive in electrophilic aromatic substitution?

A

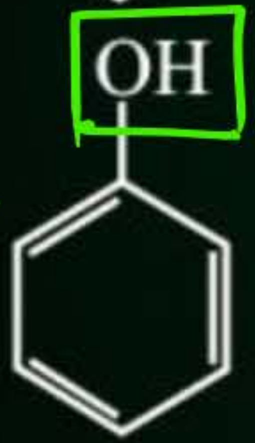


$-M > \cancel{-I}$

B



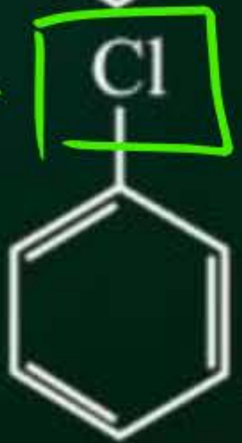
[✓ **C**]



$+M > \cancel{-I}$

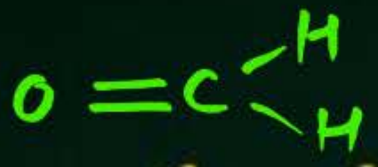
D

$-I > \cancel{+M}$



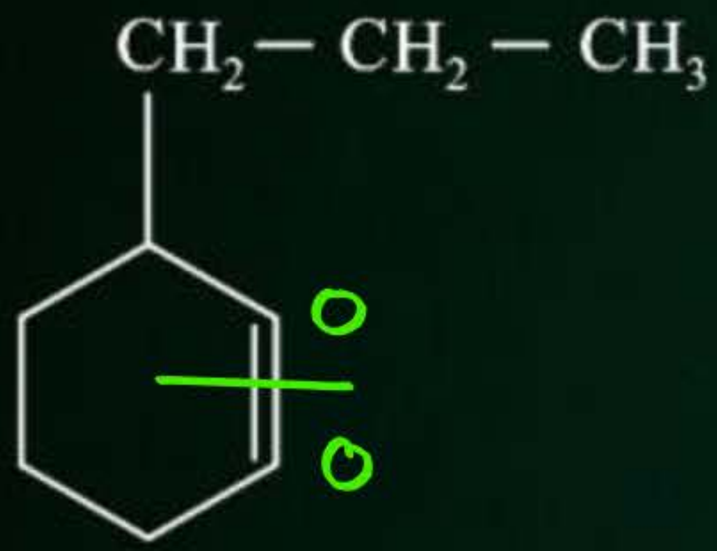
C > B > D > A

QUESTION [NEET 2020]

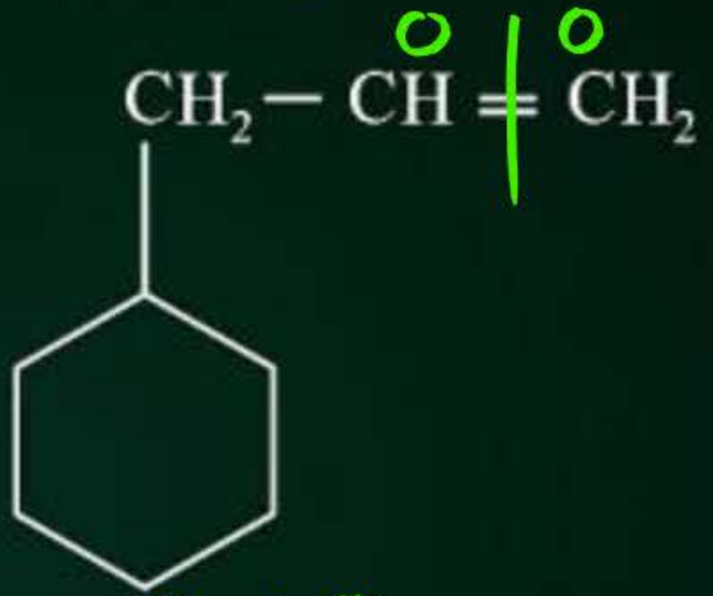


An alkene on ozonolysis gives methanal as one of the product. Its structure is:

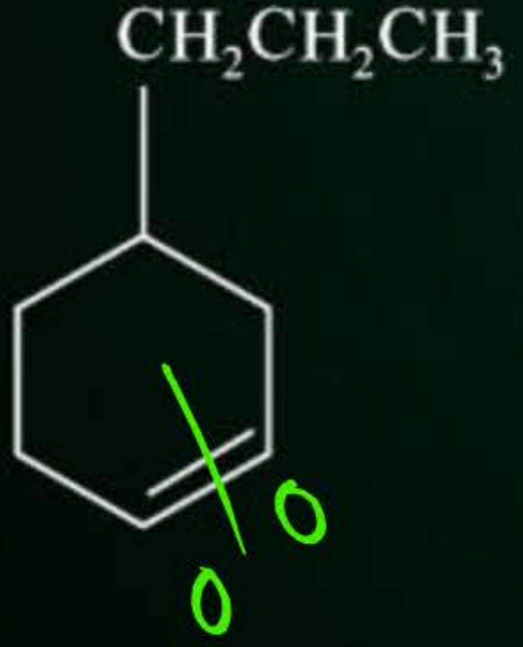
(A)



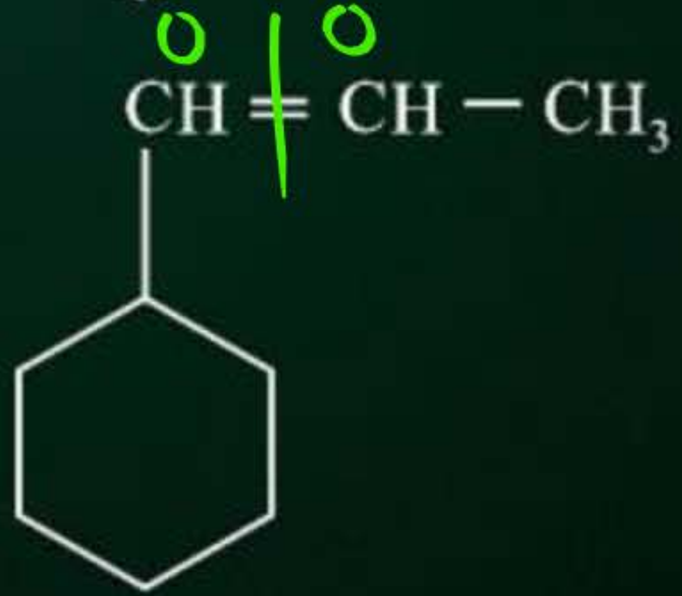
[✓ B]



(C)



(D)



QUESTION [NEET 2020-Covid]

Which of the following is a free radical substitution reaction?

$CH\equiv CH \xrightarrow{HBr} \underset{\displaystyle Br}{\underset{|}{CH}}=CH_2$

FRSR

A Acetylene with HBr

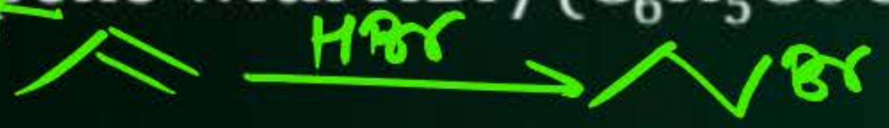
$\overset{\bullet}{Br}$

B ✓ Methane with Br_2/hv

$CH_4 + Br_2/hv \longrightarrow CH_3-Br + HBr$

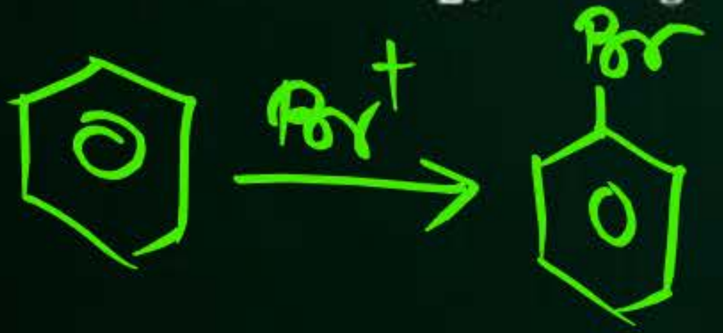
C Propene with $HBr/(C_6H_5COO)_2$

FRAR



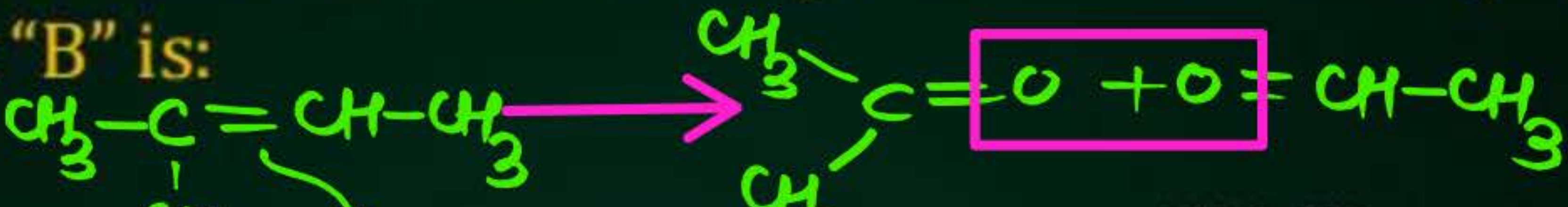
D Benzene with $Br_2/AlCl_3$

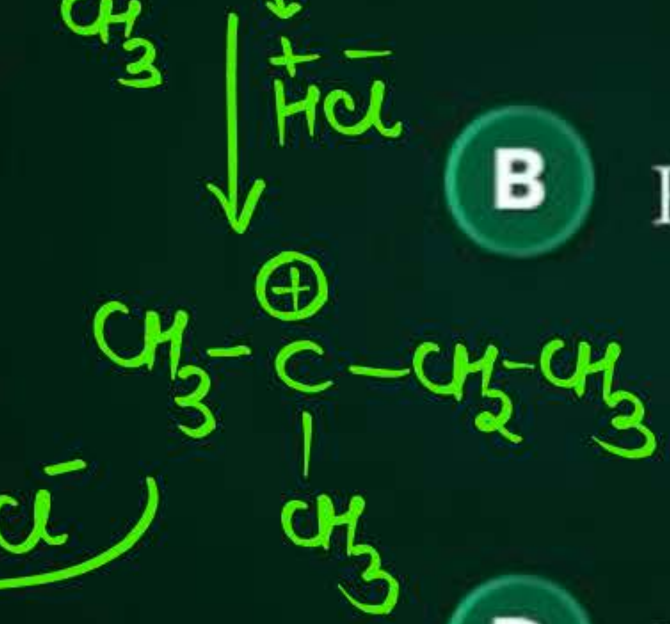
ESR

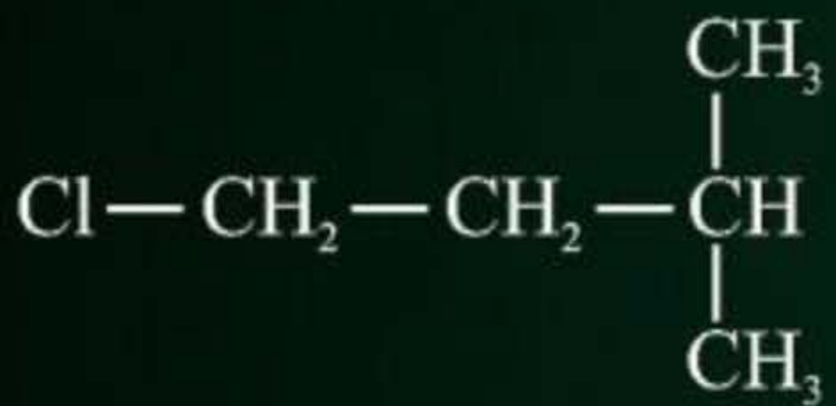


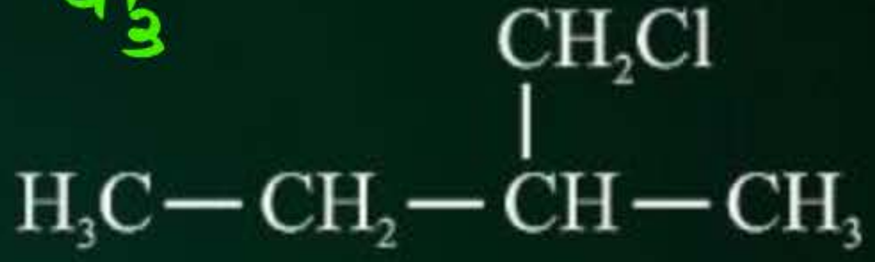
QUESTION [NEET 2019]

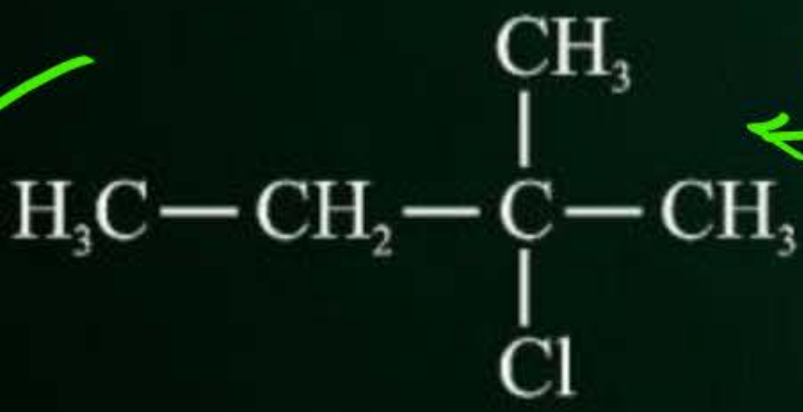
An alkene "A" on reaction with O_3 and Zn - H_2O gives propanone and ethanal in equimolar ratio. Addition of HCl to alkene "A" gives "B" as the major product. The structure of product "B" is:

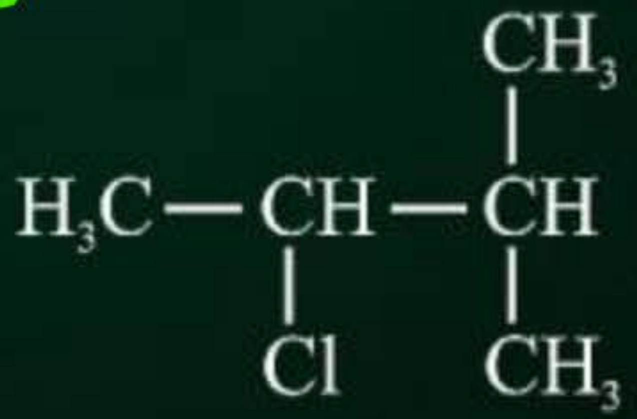

$CH_3-\underset{CH_3}{C}=CH-CH_3$
$\underset{CH_3}{\overset{CH_3}{}}C=O + O=CH-CH_3$


HCl
$CH_3-\underset{CH_3}{\overset{\oplus}{C}}-CH_2-CH_3$
Cl^-

(A) 
$Cl-CH_2-CH_2-\underset{CH_3}{\overset{CH_3}{CH}}$

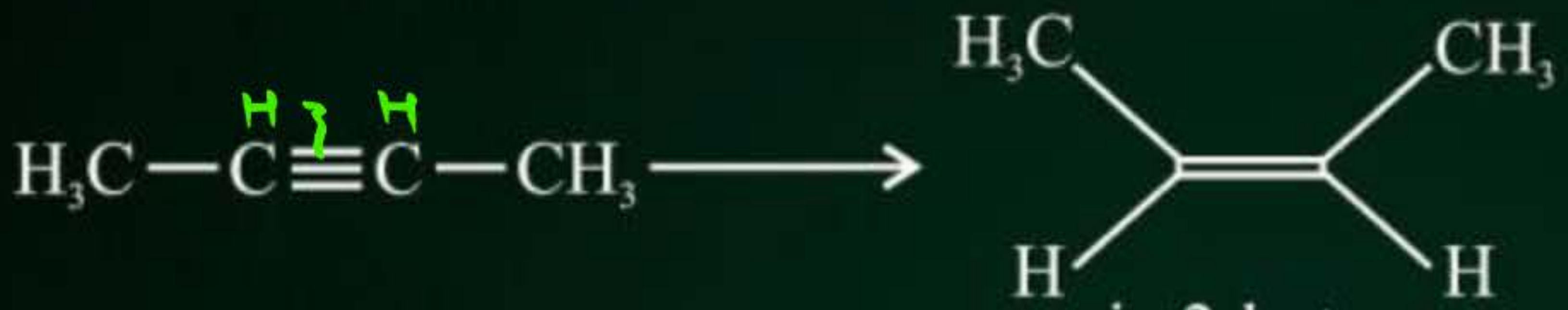
(B) 
$H_3C-CH_2-\overset{CH_2Cl}{CH}-CH_3$

[✓ (C)] 
$H_3C-CH_2-\underset{Cl}{\overset{CH_3}{C}}-CH_3$

(D) 
$H_3C-\underset{Cl}{CH}-\underset{CH_3}{\overset{CH_3}{CH}}$

QUESTION [NEET 2019]

The most suitable reagent for the following conversion is:


H
H
$H_3C-C\equiv C-CH_3$
H_3C
CH_3
H
H

cis-2-butene

- **A** Na/liquid NH_3
- **B** [✓ H_2, Pd/C, quinoline]
- **C** Zn/HCl ×
- **D** Hg^{2+}/H^+, H_2O $CH_3-\underset{OH}{\underset{|}{C}}=CH-CH_3 \rightleftharpoons CH_3-\underset{O}{\underset{\|}{C}}-CH_2-CH_3$

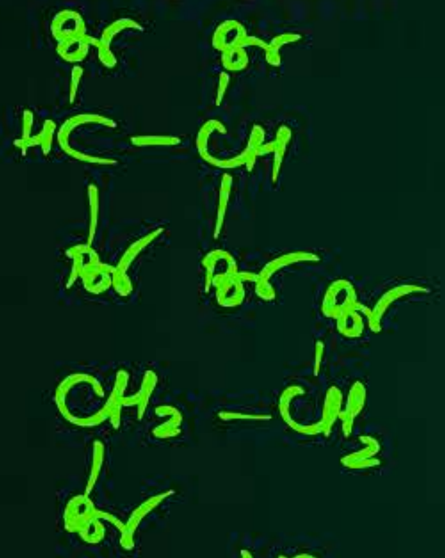
QUESTION [NEET 2018]

Br_2 Subs

Hydrocarbon (A) reacts with bromine by substitution to form an alkyl bromide which by Wurtz reaction is converted to gaseous hydrocarbon containing less than four carbon atoms. (A) is:

A $CH \equiv CH$ ✗

B $CH_2 = CH_2$ ✗



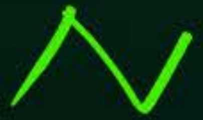
$\overset{Br}{\underset{Br}{HC}}-\overset{Br}{\underset{Br}{CH}}$

$\underset{Br}{CH_2}-\overset{Br}{CH_2}$

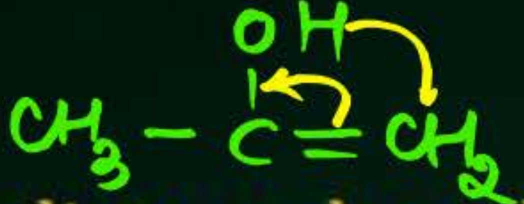
C $CH_4 \xrightarrow[h\nu]{Br_2} CH_3-Br \xrightarrow[\text{dry ether}]{Na} CH_3-CH_3$ ✓

D $CH_3 - CH_3$

$\xrightarrow[h\nu]{Br_2} CH_3-CH_2-Br \xrightarrow[\text{dry ether}]{Na}$

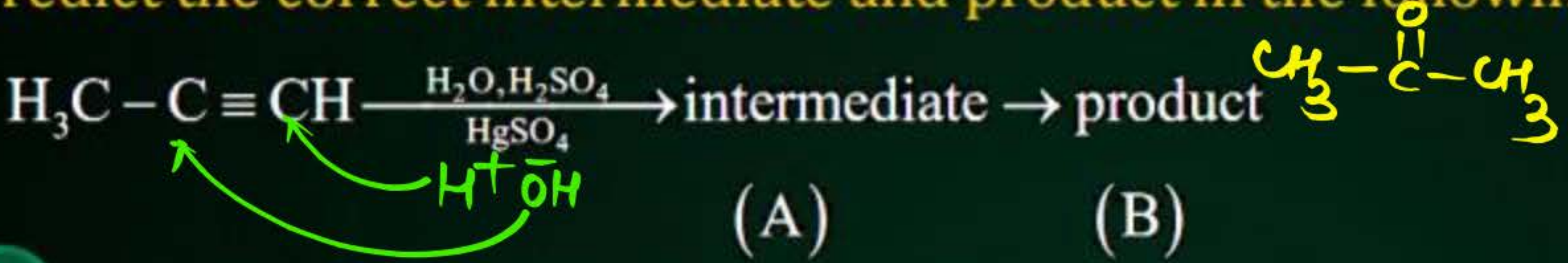


QUESTION [NEET 2017]



$CH_3-\overset{OH}{\overset{|}{C}}=CH_2$

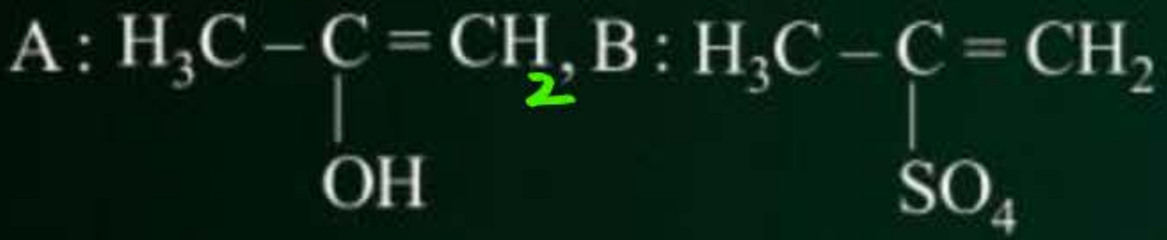
Predict the correct intermediate and product in the following reaction.



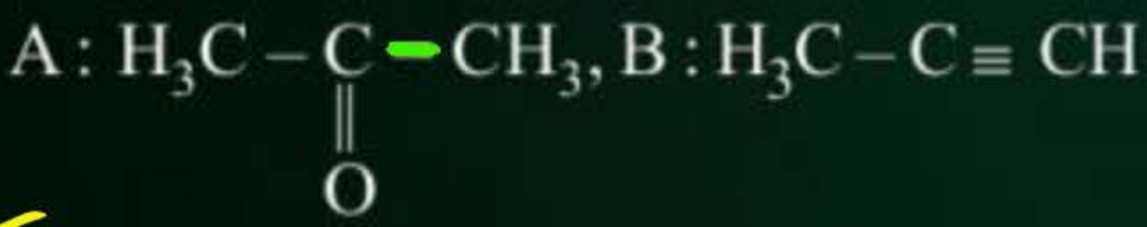
$H_3C-C\equiv CH \xrightarrow[HgSO_4]{H_2O,H_2SO_4}$ intermediate $\rightarrow$ product $CH_3-\overset{O}{\overset{\|}{C}}-CH_3$

$H^+\ \bar{O}H$

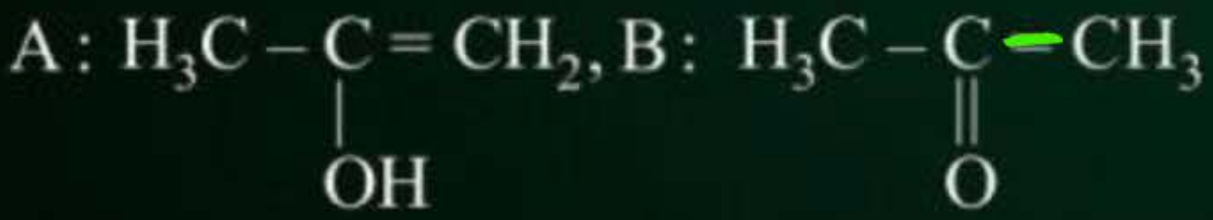
(A) (B)



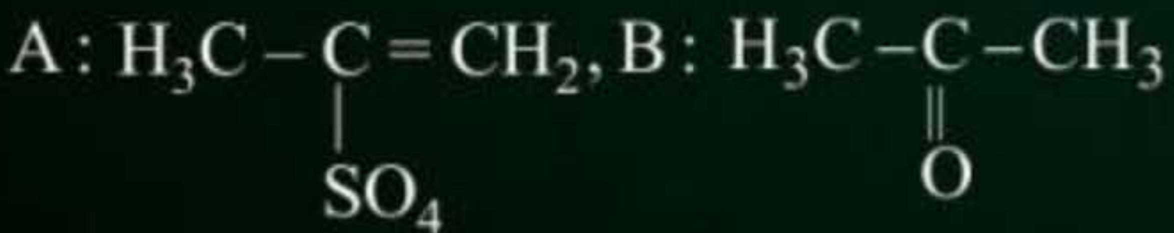
A A: $H_3C-\underset{OH}{\underset{|}{C}}=CH_2$, B: $H_3C-\underset{SO_4}{\underset{|}{C}}=CH_2$



B A: $H_3C-\underset{O}{\underset{\|}{C}}-CH_3$, B: $H_3C-C\equiv CH$



[✓ C] A: $H_3C-\underset{OH}{\underset{|}{C}}=CH_2$, B: $H_3C-\underset{O}{\underset{\|}{C}}-CH_3$



D A: $H_3C-\underset{SO_4}{\underset{|}{C}}=CH_2$, B: $H_3C-\underset{O}{\underset{\|}{C}}-CH_3$

QUESTION [NEET 2016]

$\overset{+}{Na}\overset{\ominus}{C}\equiv CH$

$CH_3CH_2C\equiv\bar{C}\overset{+}{Na}$

In the reaction $H-C\equiv CH \xrightarrow[(2)CH_3CH_2Br]{(1)NaNH_2/liq.NH_3} X \xrightarrow[(2)CH_3CH_2Br]{(1)\overset{+}{Na}\overset{-}{N}H_2/liq.NH_3} Y$ $\overset{1}{CH_3}\overset{2}{CH_2}-\overset{3}{C}\equiv\overset{4}{C}-\overset{5}{CH_2}-\overset{6}{CH_3}$

X and Y are:

$\underbrace{\overset{4}{CH_3}\overset{3}{CH_2}\overset{2}{C}\equiv\overset{1}{CH}}$

[✓ A] X=1-Butyne; Y=3-Hexyne

B X=2-Butyne; Y=3-Hexyne

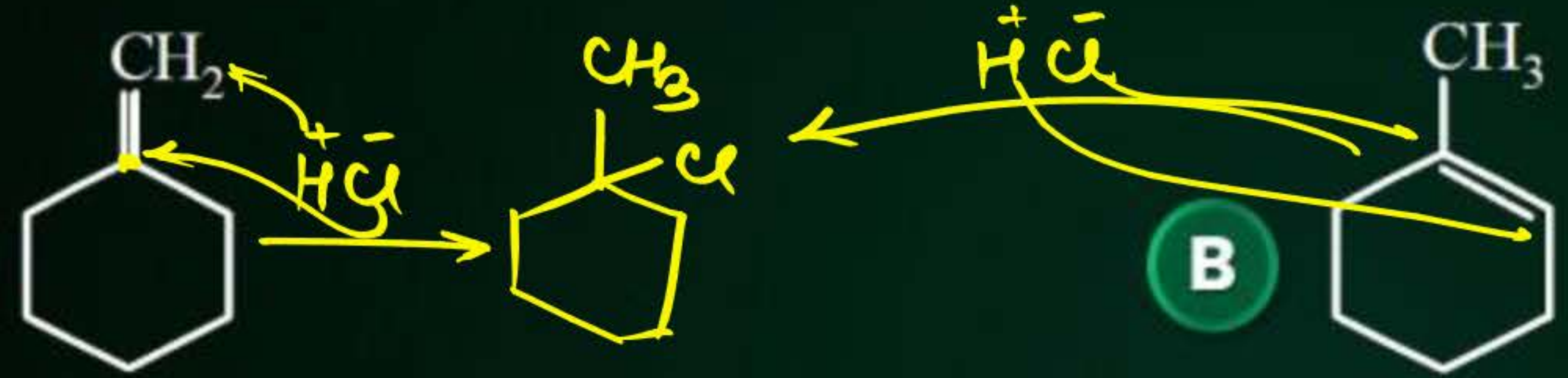
C X=2-Butyne; Y=2-Hexyne

D X=1-Butyne; Y=2-Hexyne

QUESTION [NEET 2015 RS]

In the reaction with HCl, an alkene reacts in accordance with the Markovnikov's rule, to give a product 1-chloro-1-methylcyclohexane. The possible alkene is:

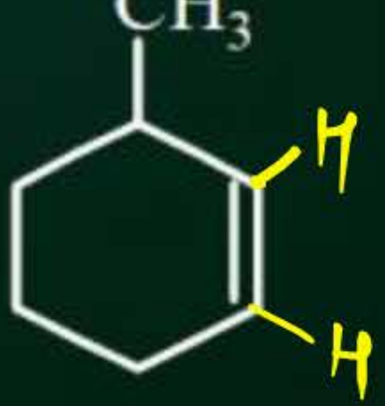
(A)


CH2
$\overset{+}{H}\overset{-}{Cl}$
CH3
Cl
$\overset{+}{H}\overset{-}{Cl}$
CH3

(B)

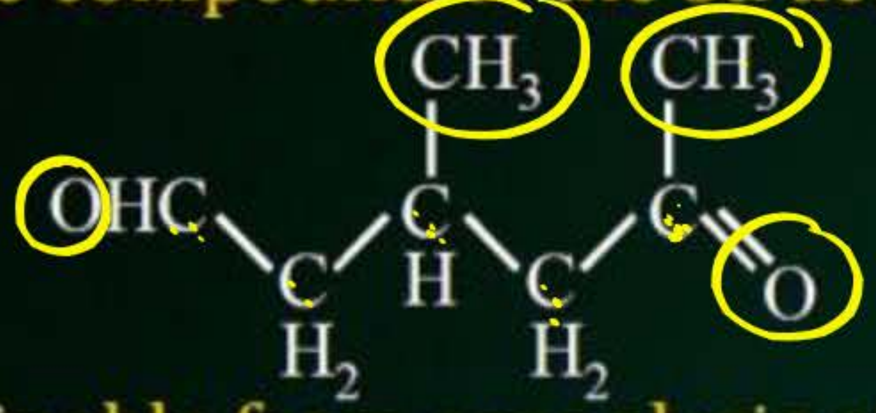
(C) Both(A) and (B)

(D)

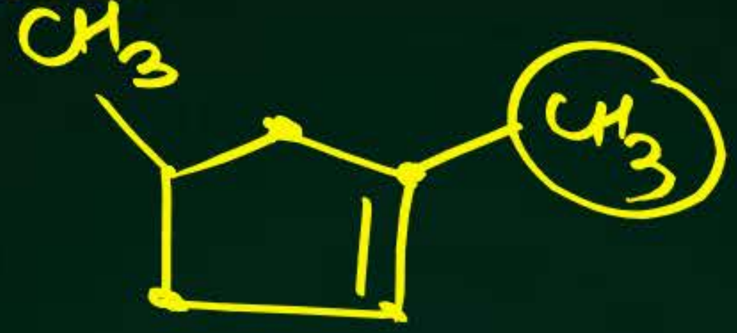


QUESTION [NEET 2015]

A single compound of the structure:

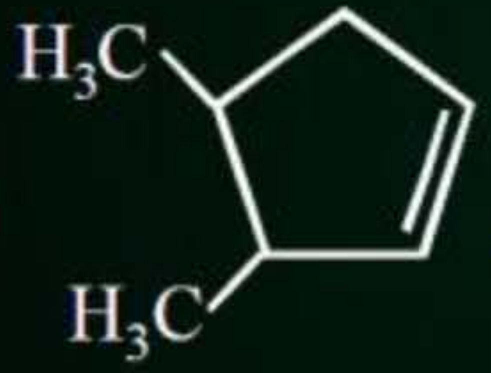


$OHC-CH_2-CH(CH_3)-CH_2-C(CH_3)=O$



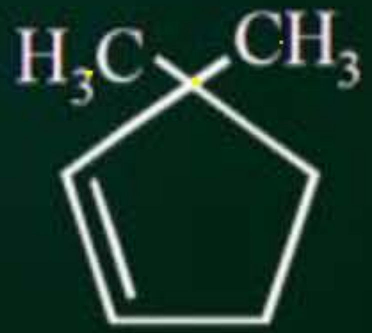
Is obtainable from ozonolysis of which of the following cyclic compounds?

(A)

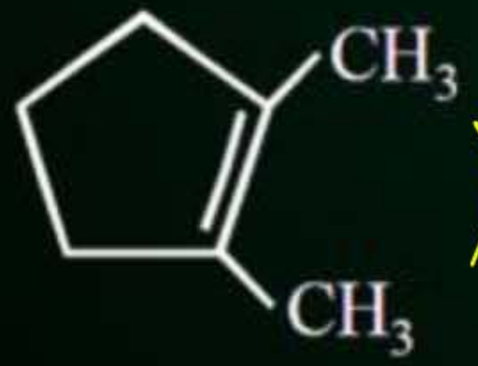


✗

(B)



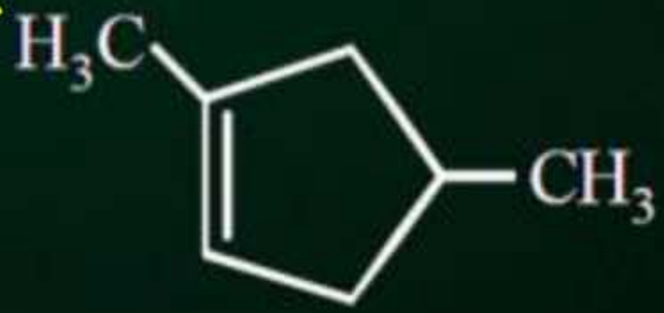
(C)



✗

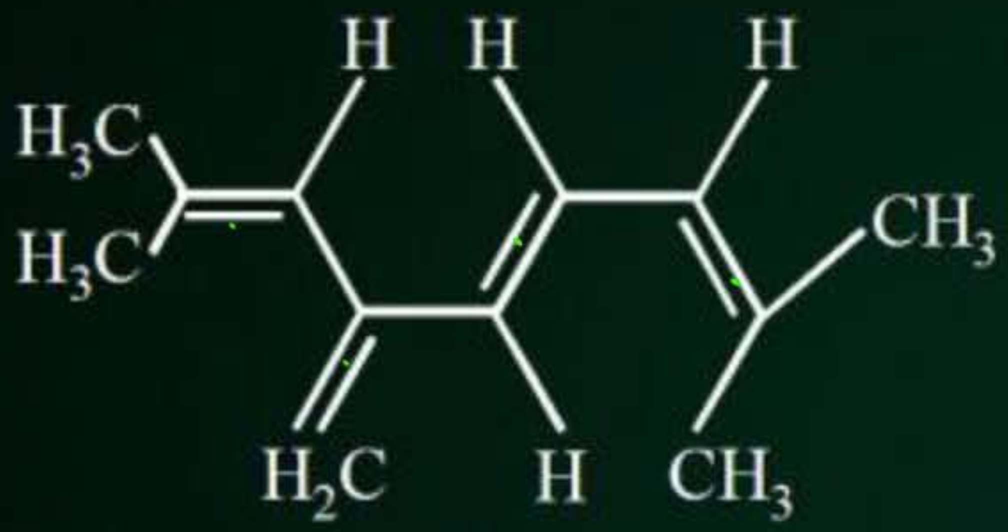
✓

(D)



QUESTION [NEET 2015]

The total number of pi-bond electrons in the following structure is:



H
H
H
H_3C
H_3C
CH_3
H_2C
H
CH_3

4π Bonds

$4 \times 2 = 8\pi e^{\ominus}s$

[✓ A 8]

B 12

C 16

D 4

QUESTION [NEET 2015]

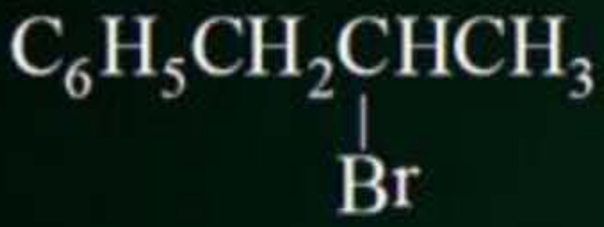
The reaction of $C_6H_5CH=CHCH_3$ with HBr produces:

H^+

$C_6H_5\overset{\oplus}{C}H-CH_2-CH_3$

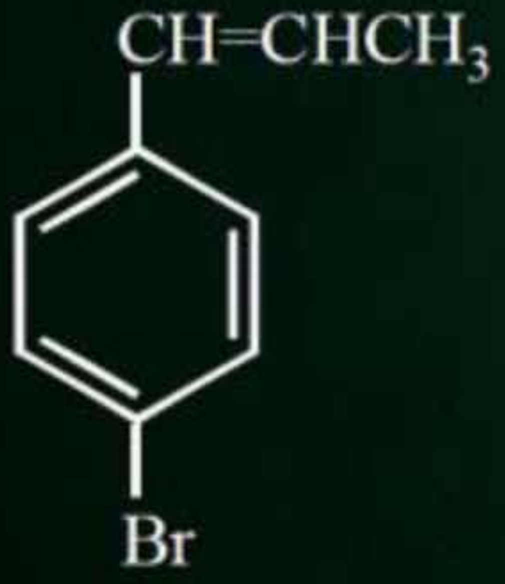
Reso

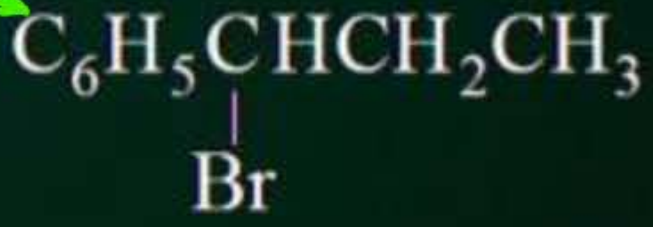
Br^-

A 

$C_6H_5CH_2\underset{\displaystyle Br}{\underset{|}{C}}HCH_3$

B $C_6H_5CH_2CH_2CH_2Br$

C 

D 

$C_6H_5\underset{\displaystyle Br}{\underset{|}{C}}HCH_2CH_3$

QUESTION [NEET 2014]

Which of the following organic compounds has same hybridization as its combustion product (CO_2)?

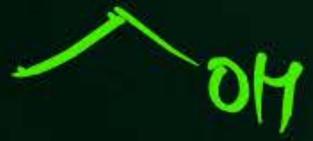
↓
sp

A Ethane CH_3-CH_3

[✓ B] Ethyne $CH\equiv CH$

C Ethene $CH_2=CH_2$

D Ethanol



QUESTION [NEET 2013]

Some meta-directing substituents in aromatic substitution are given. Which one is most deactivating?

A $-SO_3H$

B $-COOH$

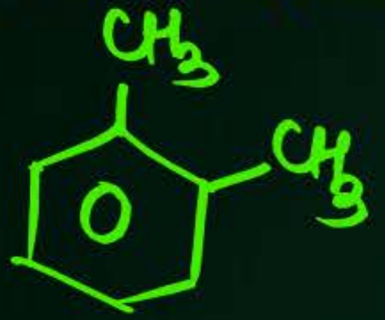
C [✓ $-NO_2$]

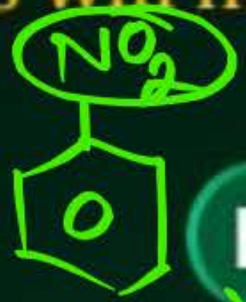
D $-C{\equiv}N$

QUESTION [NEET 2013]

Which of the following compounds will not undergo Friedal-Craft's reaction easily:

A Xylene



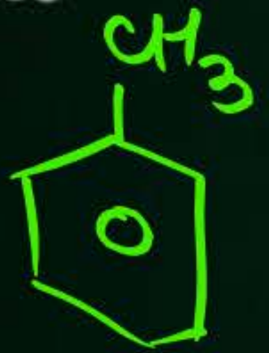


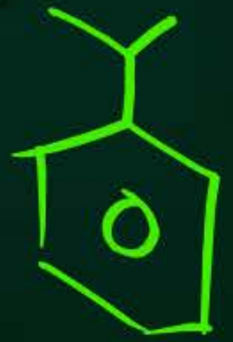
ewg

[✓ **B**] Nitrobenzene

C Toluene

D Cumene

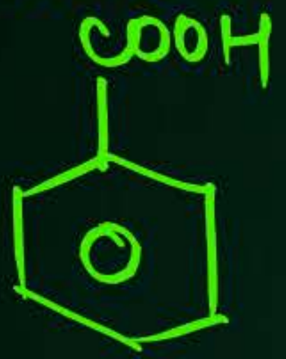




QUESTION [AIPMT 2012]

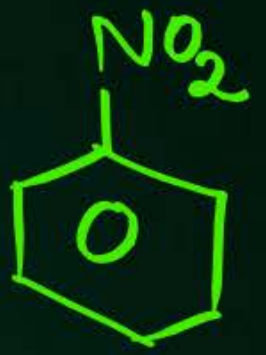
Among the following compounds the one that is most reactive towards electrophilic nitration is:

A Benzoic acid



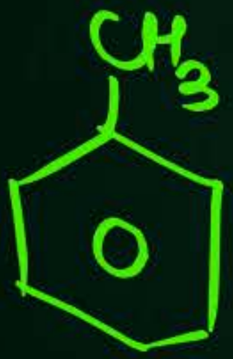
$-M > -I$

B Nitrobenzene



$-M > -I$

C [✓ Toluene]



$+H > +I$

D Benzene

C > D > A > B

QUESTION [AIPMT 2012]

Which of the following reagents will be able to distinguish between 1-butyne and 2-butyne?

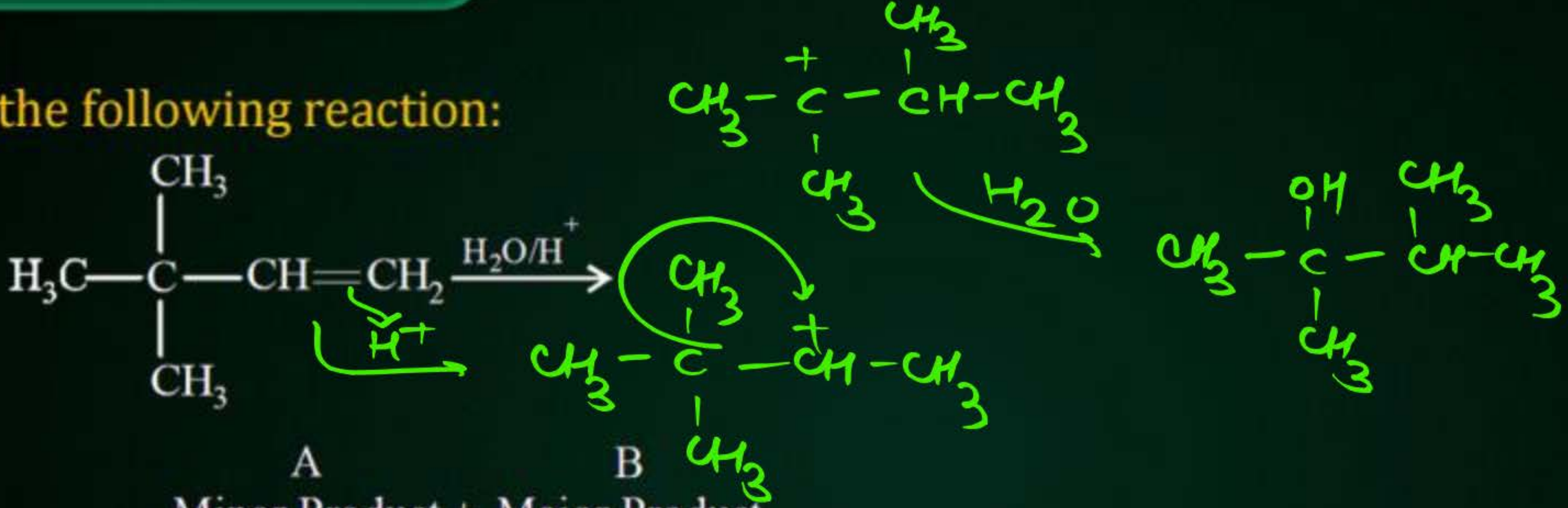
$CH_3-CH_2-C\equiv\bar{C}-H^+$ Terminal alkyne

$CH_3-C\equiv C-CH_3$
Internal

- [✓ A] $\overset{+}{Na}\overset{-}{NH_2}$
- ✗ B HCl
- ✗ C O_2
- ✗ D Br_2

QUESTION [AIPMT 2012]

In the following reaction:



$$H_3C-\overset{CH_3}{\underset{CH_3}{C}}-CH=CH_2 \xrightarrow{H_2O/H^+}$$

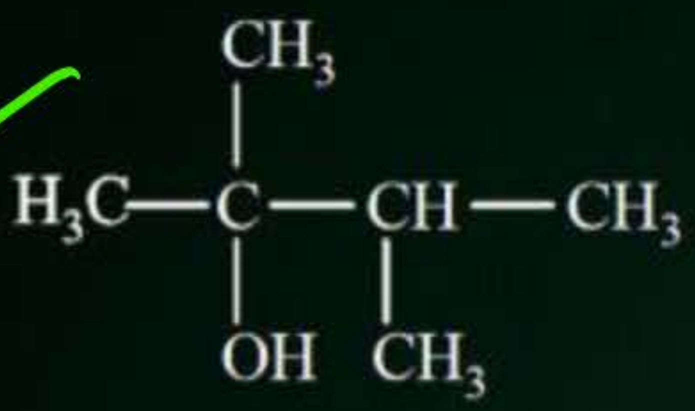
H^+
$CH_3-\overset{CH_3}{\underset{CH_3}{C}}-\overset{+}{C}H-CH_3$
$CH_3-\overset{+}{\underset{CH_3}{C}}-\overset{CH_3}{C}H-CH_3$
H_2O
$CH_3-\overset{OH}{\underset{CH_3}{C}}-\overset{CH_3}{C}H-CH_3$

A B

Minor Product + Major Product

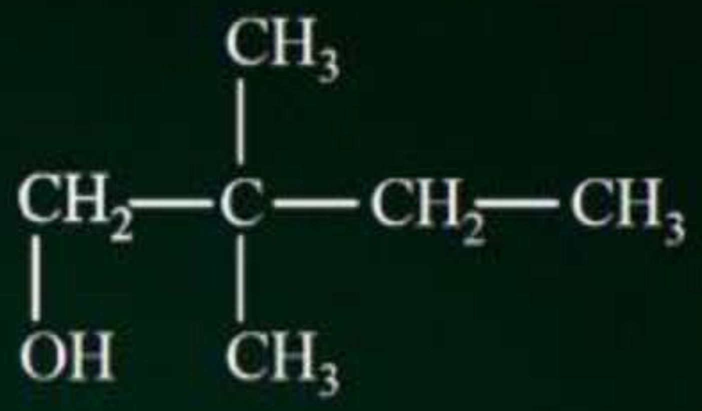
The Major product is:

[✓ A]



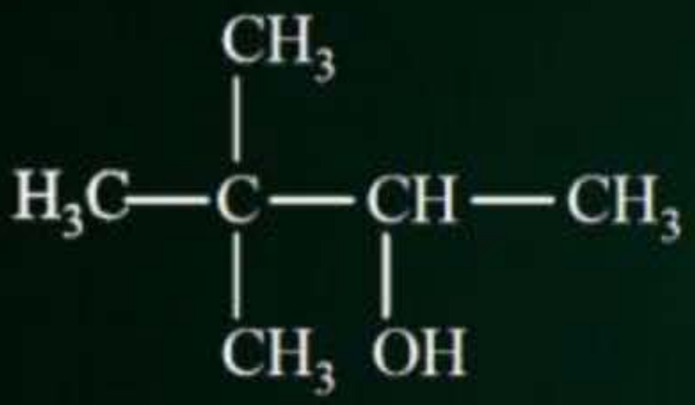
$H_3C-\overset{CH_3}{\underset{OH}{C}}-\underset{CH_3}{CH}-CH_3$

B



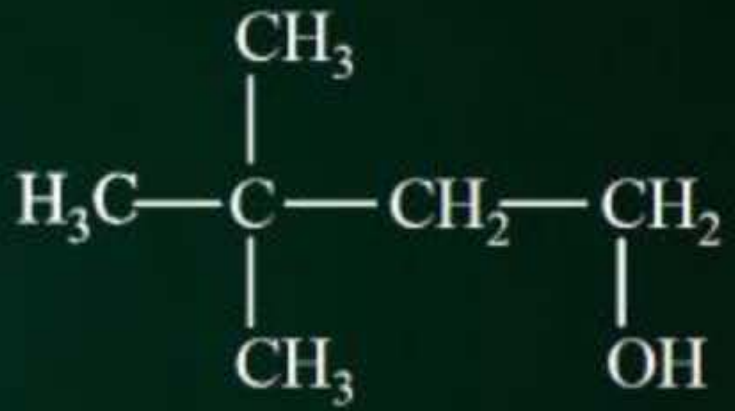
$\underset{OH}{CH_2}-\overset{CH_3}{\underset{CH_3}{C}}-CH_2-CH_3$

C



$H_3C-\overset{CH_3}{\underset{CH_3}{C}}-\underset{OH}{CH}-CH_3$

D



$H_3C-\overset{CH_3}{\underset{CH_3}{C}}-CH_2-\underset{OH}{CH_2}$

QUESTION [AIPMT 2011]

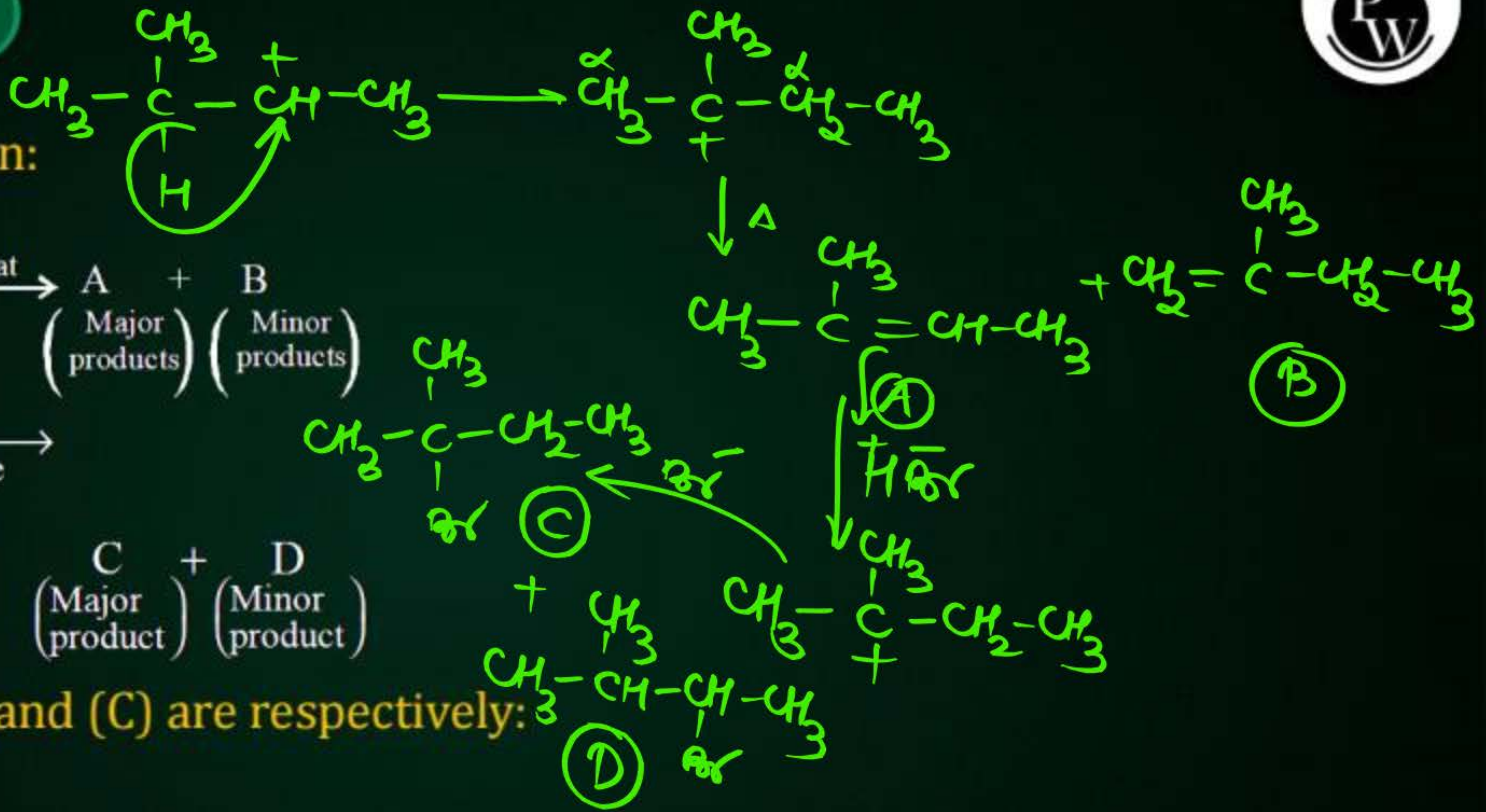
In the following reaction:

(i) $CH_3-\overset{CH_3}{\overset{|}{C}H}-\overset{+}{\underset{\underset{+OH_2}{|}}{C}H}-CH_3 \xrightarrow{H^+/Heat} \underset{\left(\begin{smallmatrix}\text{Major}\\ \text{products}\end{smallmatrix}\right)}{A} + \underset{\left(\begin{smallmatrix}\text{Minor}\\ \text{products}\end{smallmatrix}\right)}{B}$

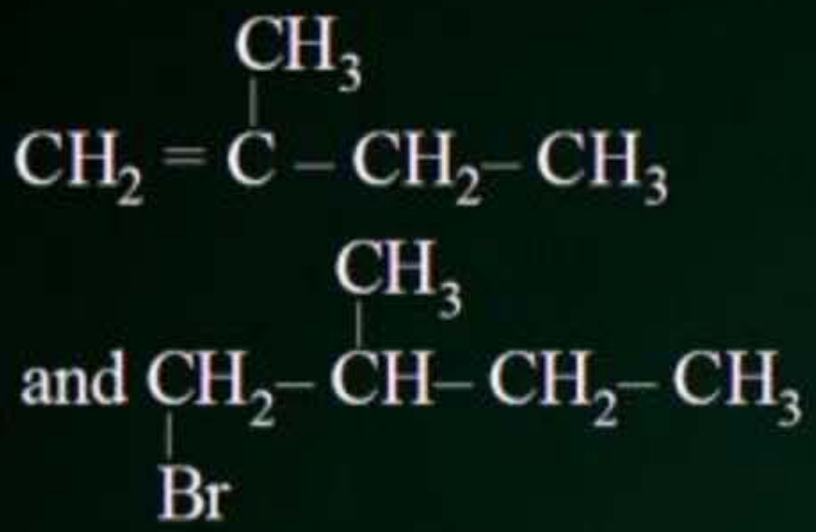
(ii) $A \xrightarrow[\text{in absence of peroxide}]{\text{HBr, dark}}$

$\underset{\left(\begin{smallmatrix}\text{Major}\\ \text{product}\end{smallmatrix}\right)}{C} + \underset{\left(\begin{smallmatrix}\text{Minor}\\ \text{product}\end{smallmatrix}\right)}{D}$

The Major product (A) and (C) are respectively:



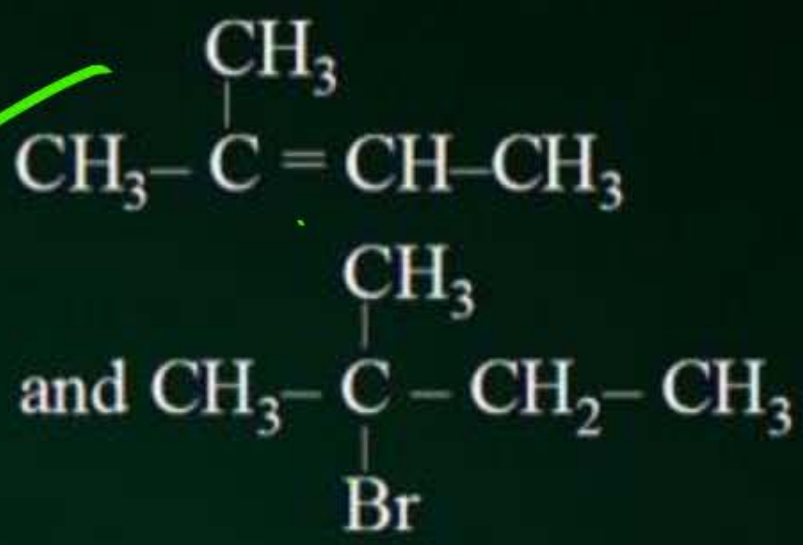
A



$\mathrm{CH_2=\overset{CH_3}{\overset{|}{C}}-CH_2-CH_3}$

and $\mathrm{\underset{Br}{\underset{|}{CH_2}}-\overset{CH_3}{\overset{|}{CH}}-CH_2-CH_3}$

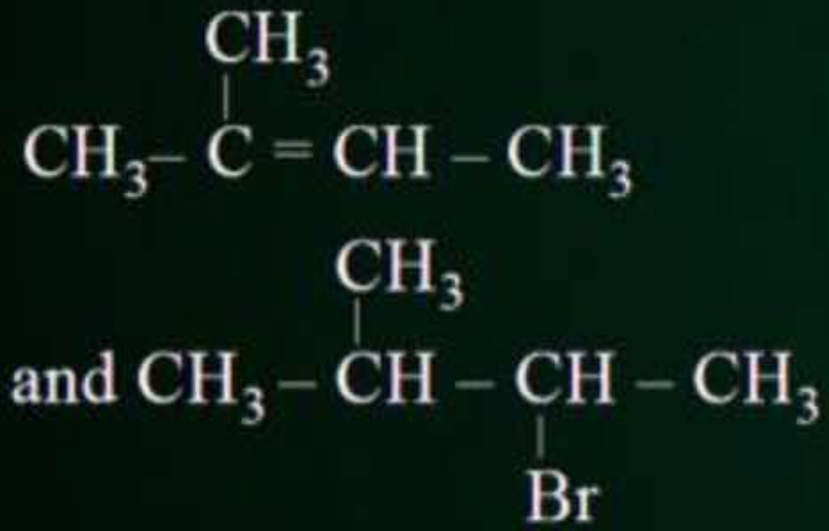
[✓ B]



$\mathrm{CH_3-\overset{CH_3}{\overset{|}{C}}=CH-CH_3}$

and $\mathrm{CH_3-\underset{Br}{\underset{|}{\overset{CH_3}{\overset{|}{C}}}}-CH_2-CH_3}$

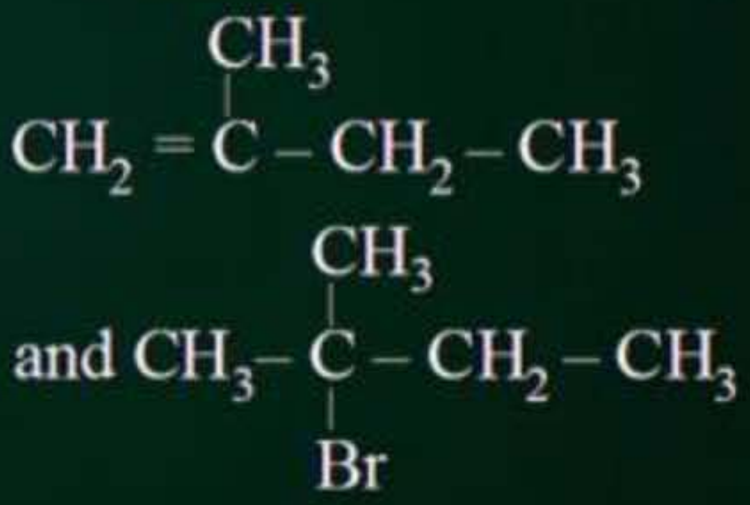
C



$\mathrm{CH_3-\overset{CH_3}{\overset{|}{C}}=CH-CH_3}$

and $\mathrm{CH_3-\overset{CH_3}{\overset{|}{CH}}-\underset{Br}{\underset{|}{CH}}-CH_3}$

D



$\mathrm{CH_2=\overset{CH_3}{\overset{|}{C}}-CH_2-CH_3}$

and $\mathrm{CH_3-\underset{Br}{\underset{|}{\overset{CH_3}{\overset{|}{C}}}}-CH_2-CH_3}$

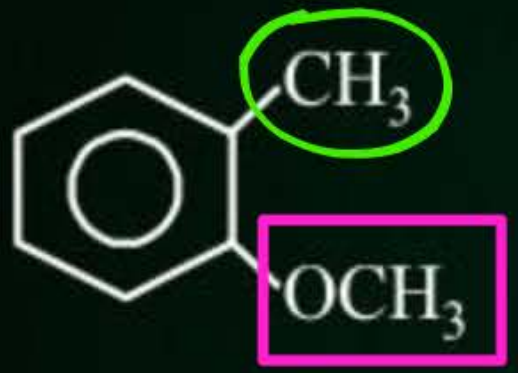
QUESTION [AIPMT 2011]

Which one of the following is most reactive towards electrophilic reagent?

$+M$

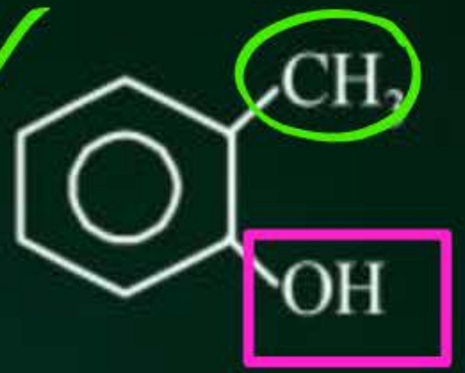
$-OH > -OCH_3$

(A)



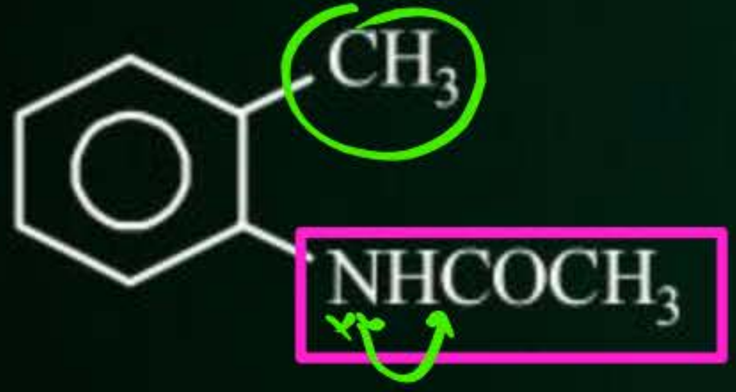
$+M > -\cancel{I}$

(B)



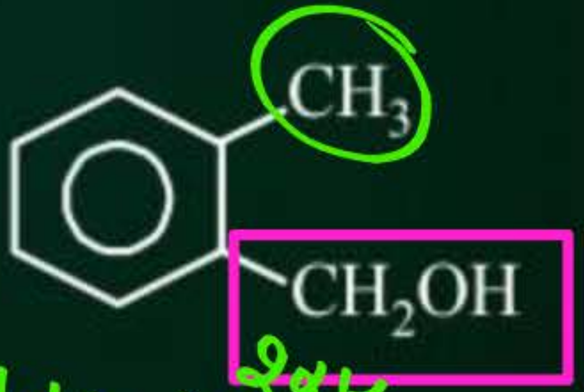
$+M > -\cancel{I}$

(C)



$+M > -\cancel{I}$

(D)

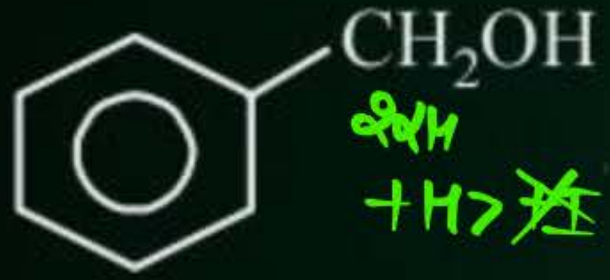


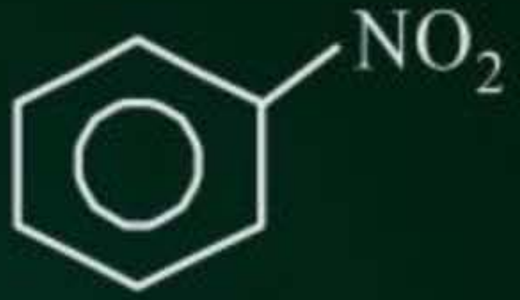
$+H > -\cancel{I}$ [illegible]

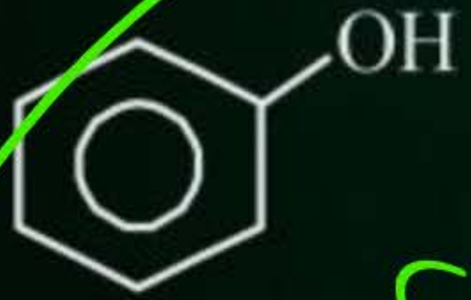
$B > A > C > D$

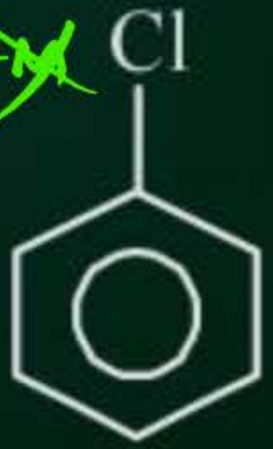
QUESTION [AIPMT 2008]

Which one of the following is most reactive towards electrophilic attack?

A

[illegible]
+H > ~~I~~

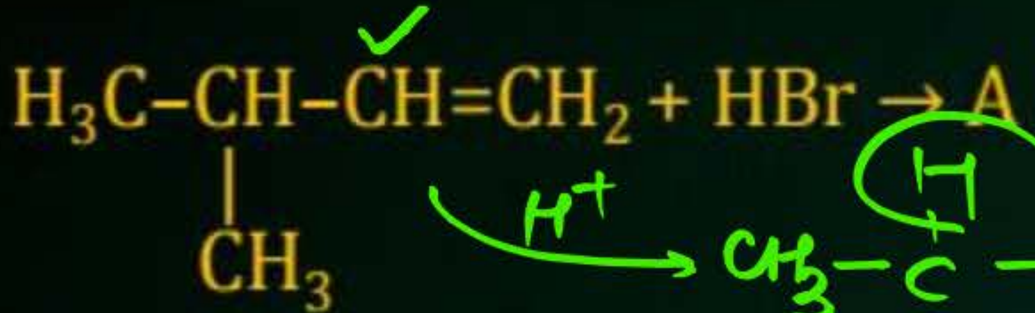
B

-M > ~~-I~~

C

+M > ~~-I~~

D

-I > ~~+M~~

C > A > D > B

QUESTION [AIPMT 2008]



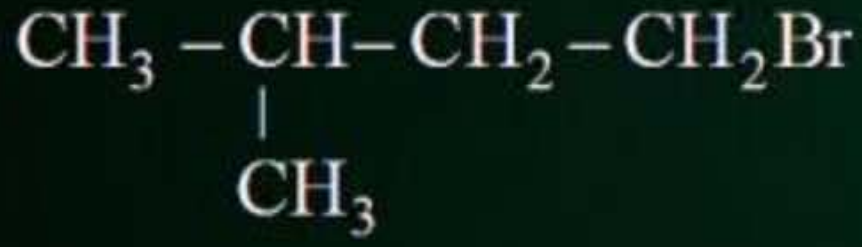
$$H_3C-\underset{CH_3}{\underset{|}{CH}}-\overset{\checkmark}{C}H=CH_2 + HBr \rightarrow A$$

$$\xrightarrow{H^+} CH_3-\underset{CH_3}{\underset{|}{\overset{H}{\overset{|}{C}}}}-\overset{+}{C}H-CH_3$$

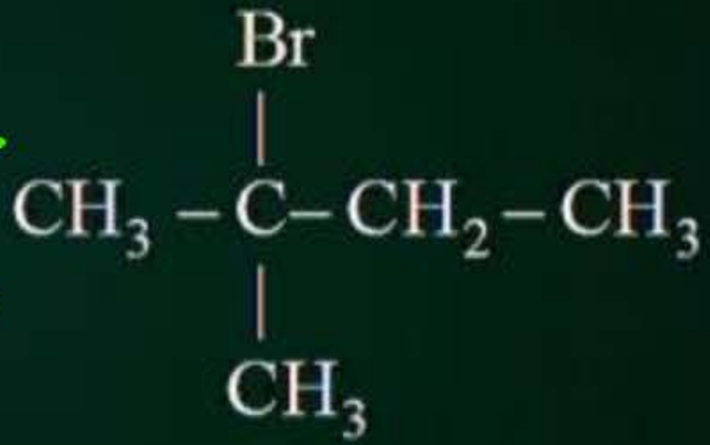
$$\downarrow$$

$$CH_3-\underset{CH_3}{\underset{|}{\overset{+}{C}}}-CH_2-CH_3 \xrightarrow{Br^-}$$

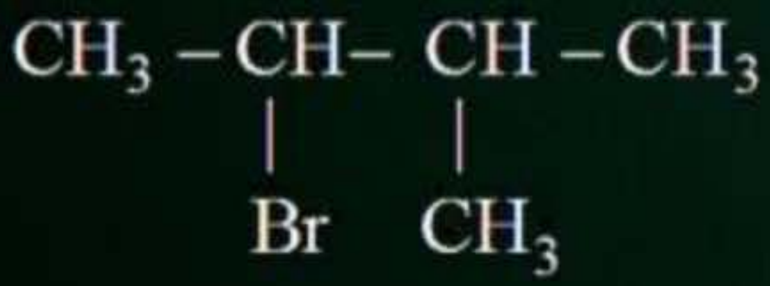
A (Predominantly) is:
Major

A 

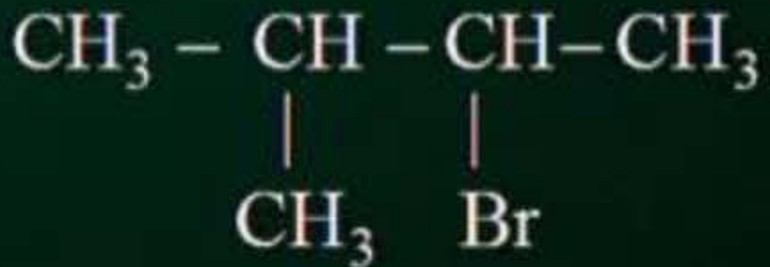
$$CH_3-\underset{CH_3}{\underset{|}{CH}}-CH_2-CH_2Br$$

B ✓ 

$$CH_3-\underset{CH_3}{\underset{|}{\overset{Br}{\overset{|}{C}}}}-CH_2-CH_3$$

C 

$$CH_3-\underset{Br}{\underset{|}{CH}}-\underset{CH_3}{\underset{|}{CH}}-CH_3$$

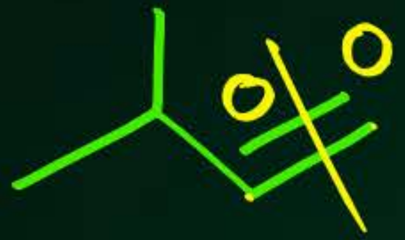
D 

$$CH_3-\underset{CH_3}{\underset{|}{CH}}-\underset{Br}{\underset{|}{CH}}-CH_3$$

QUESTION [AIPMT 2007]

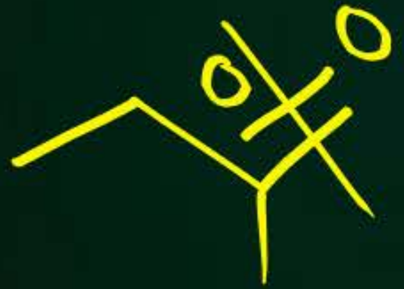
Which of the compounds with molecular formula C_5H_{10} yields acetone on ozonolysis?

A 3-methyl-1-butene

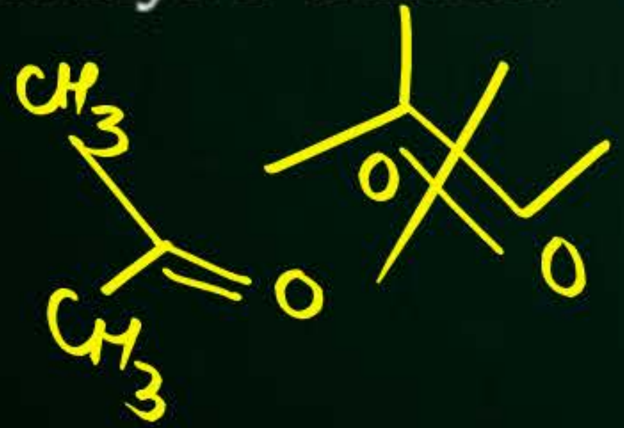


B cyclopentane

C 2-methyl-1-butene



[✓ D] 2-methyl-2-butene



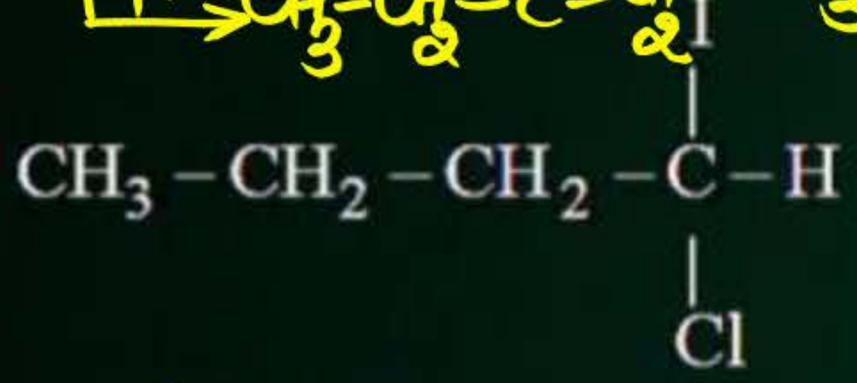
QUESTION [AIPMT 2007]

Predict the product C obtained in the following reaction of butyne-1:

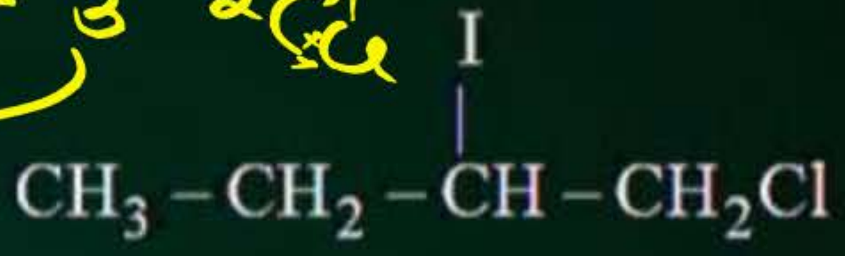
$CH_3CH_2-C\equiv CH + HCl \longrightarrow B \xrightarrow{HI} C$

$\xrightarrow{H^+} CH_3-CH_2-\overset{+}{C}=CH_2$ $\quad CH_3-CH_2-\underset{Cl}{\underset{|}{C}}=CH_2 \xrightarrow{H^+} CH_3-CH_2-\underset{Cl}{\overset{+}{C}}-CH_3$

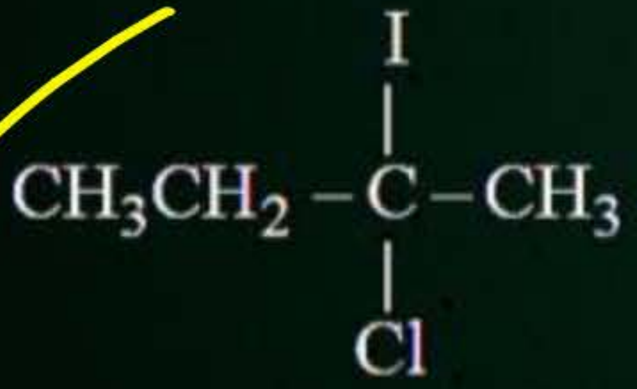
I^-

Ⓐ 

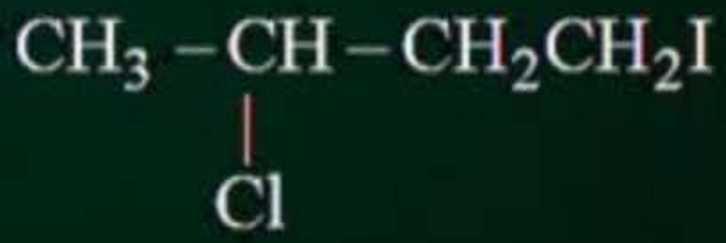
$CH_3-CH_2-CH_2-\underset{Cl}{\overset{I}{C}}-H$

Ⓑ 

$CH_3-CH_2-\overset{I}{CH}-CH_2Cl$

Ⓒ ✓ 

$CH_3CH_2-\underset{Cl}{\overset{I}{C}}-CH_3$

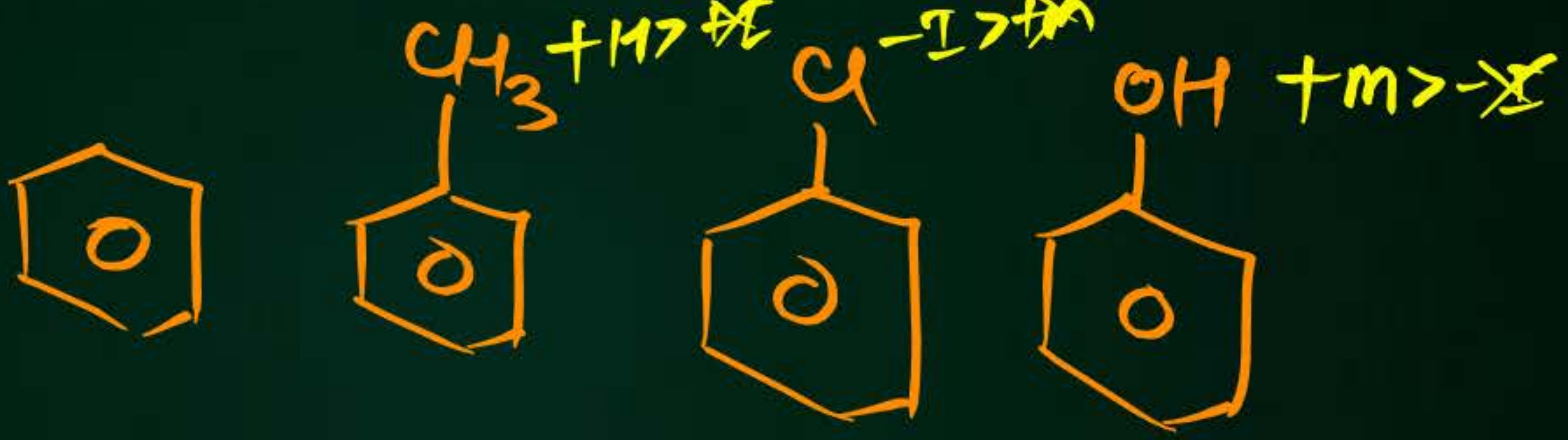
Ⓓ 

$CH_3-\underset{Cl}{CH}-CH_2CH_2I$

QUESTION [AIPMT 2007]

The order of decreasing reactivity towards an electrophilic reagent, for the following would be

(i) Benzene (ii) toluene (iii) chlorobenzene (iv) phenol



A (ii) > (iv) > (i) > (iii)

B (iv) > (iii) > (ii) > (i)

[✓ **C** (iv) > (ii) > (i) > (iii)]

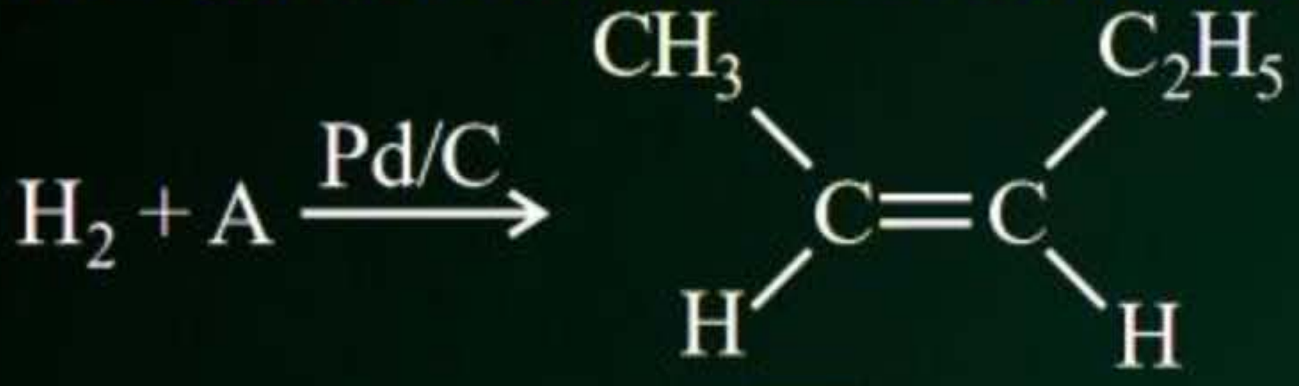
D (i) > (ii) > (iii) > (iv)

JEE Mains PYQs

Home work

QUESTION (JEE Mains 1st Feb 2024, Evening Shift)

In the given reactions identify A and B.


$H_2 + A \xrightarrow{Pd/C}$
CH_3
C_2H_5
C=C
H
H

$$CH_3-C\equiv C-CH_3+H_2 \xrightarrow{Na/Liquid\,NH_3} \text{"B"}$$

[✓ A] A : 2 – Pentyne B : trans – 2 – butene

B A : n – Pentane B : trans – 2 – butene

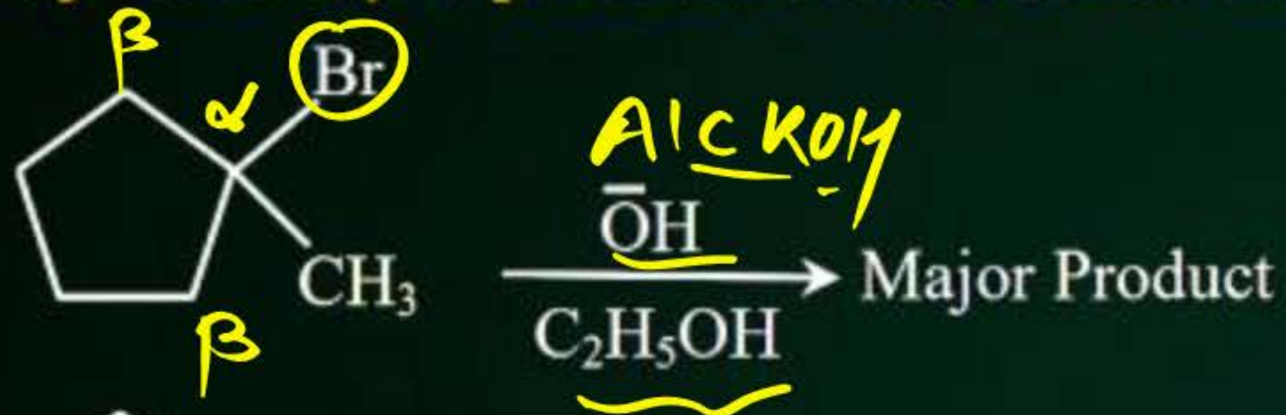
C A : 2– Pentyne B : Cis – 2 – butene

D A : n – Pentane B : Cis – 2 – butene

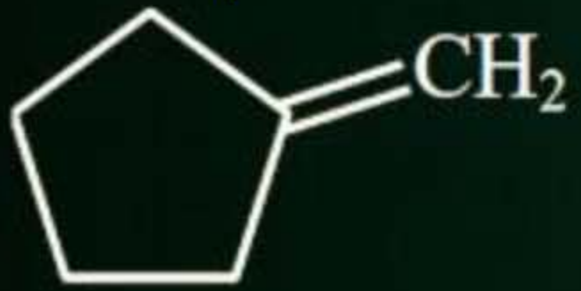
Ans : (A)

QUESTION (JEE Mains 5th April 2024, Evening Shift)

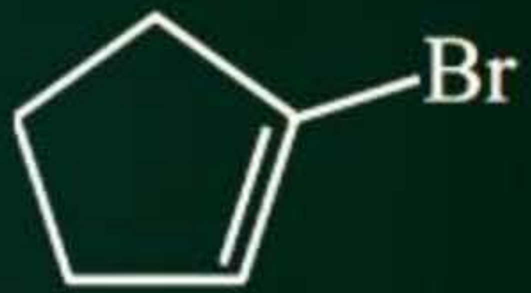
Identify the major product in the following reaction.


β
Br
α
CH3
β
Alc KOH
$\bar{O}H$
C_2H_5OH
Major Product

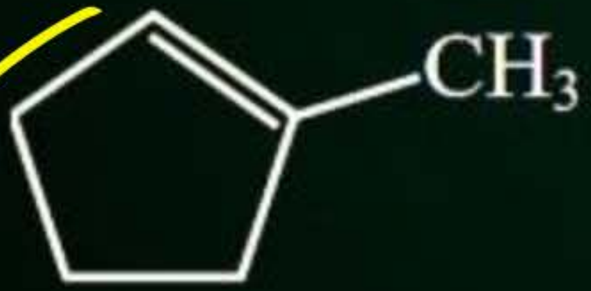
(A)



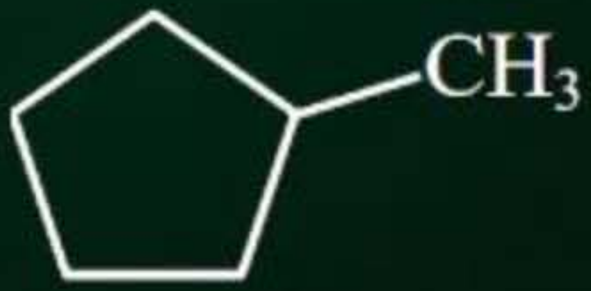
(B)



(C) ✓

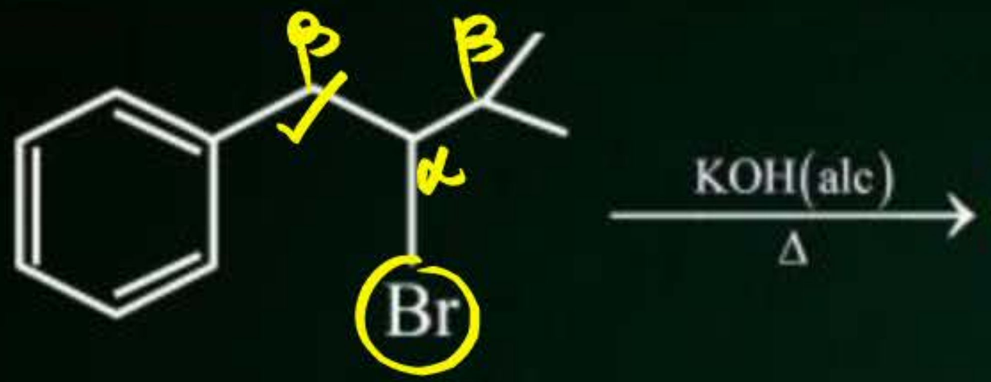


(D)



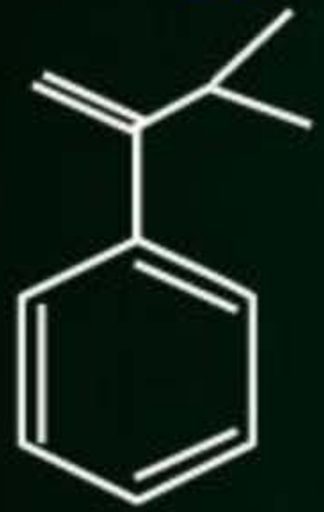
Ans. (C)

QUESTION (JEE Mains 4th April 2024, Evening Shift)

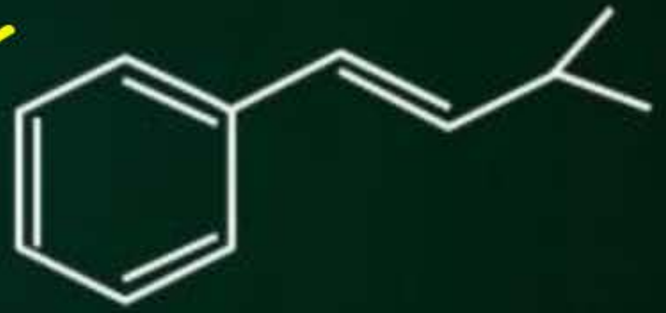

β
β
α
Br
KOH(alc)
Δ

major product "P". Product P is:

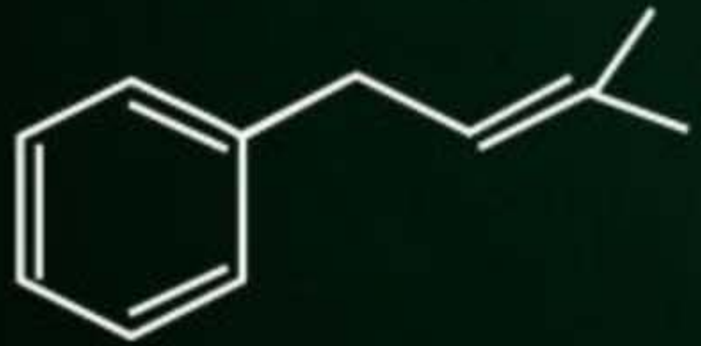
A



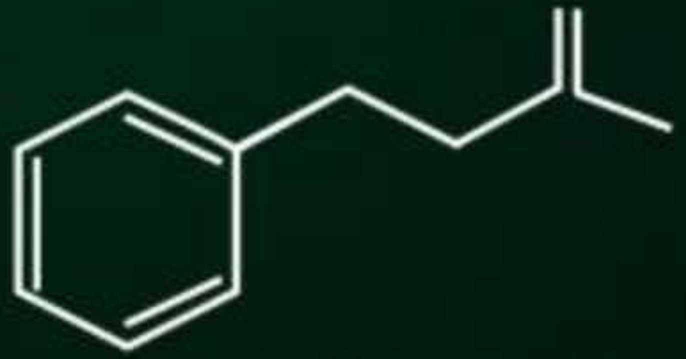
B



C



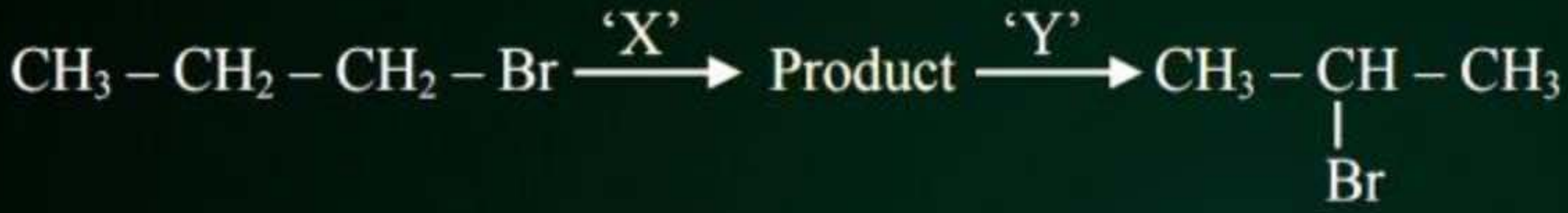
D



Ans. (B)

QUESTION (JEE Mains 4th April 2024, Morning Shift)

Identify the correct set of reagents or reaction conditions ‘X’ and ‘Y’ in the following set of transformation.



$$CH_3-CH_2-CH_2-Br \xrightarrow{\text{‘X’}} \text{Product} \xrightarrow{\text{‘Y’}} CH_3-\underset{\underset{Br}{|}}{CH}-CH_3$$

A X = conc. alc. NaOH, 80°C, Y = $Br_2/CHCl_3$

B X = dil. aq. NaOH, 20°C, Y = HBr/acetic acid

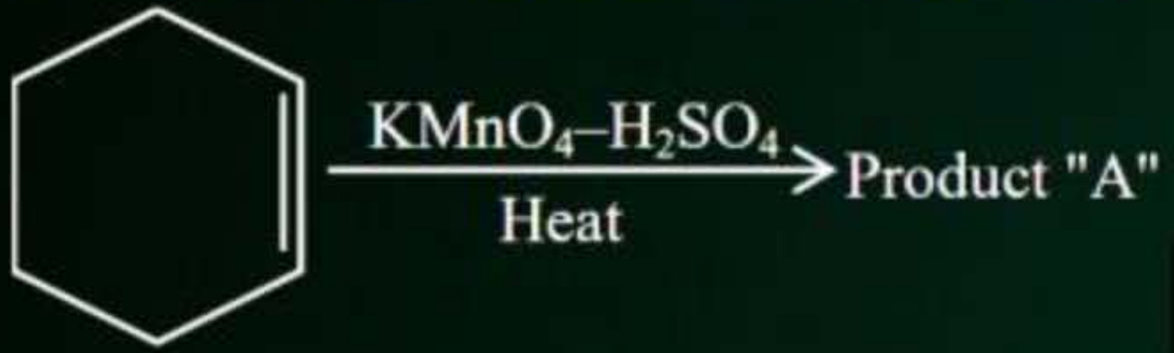
C X = conc. alc. NaOH, 80°C, Y = HBr/acetic acid

D X = dil. aq. NaOH, 20°C, Y = $Br_2/CHCl_3$

Ans. (C)

QUESTION (JEE Mains 5th April 2024, Evening Shift)

Consider the given chemical reaction:


$KMnO_4$–H_2SO_4
Heat
Product "A"

Product "A" is:

- (A) picric acid
- (B) oxalic acid
- (C) acetic acid
- (D) adipic acid

Ans. (D)

QUESTION (JEE Mains 5th April 2024, Morning Shift)

Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).

Assertion (A): Cis form of alkene is found to be more polar than the trans form.

Reason (R): Dipole moment of trans isomer of 2-butene is zero.

In the light of the above statements, choose the correct answer from the options given below:

- **A** Both (A) and (R) are true but (R) is NOT the correct explanation of (A).
- **B** (A) is true but (R) is false.
- **C** Both (A) and (R) are true and (R) is the correct explanation of (A).
- **D** (A) is false but (R) is true.

Ans. (C)

QUESTION (JEE Mains 6th April 2024, Evening Shift)

The incorrect statement regarding the geometrical isomers of 2-butene is:

Ⓐ cis-2-butene and trans-2-butene are not interconvertible at room temperature.

Ⓑ cis-2-butene has less dipole moment than trans-2-butene.

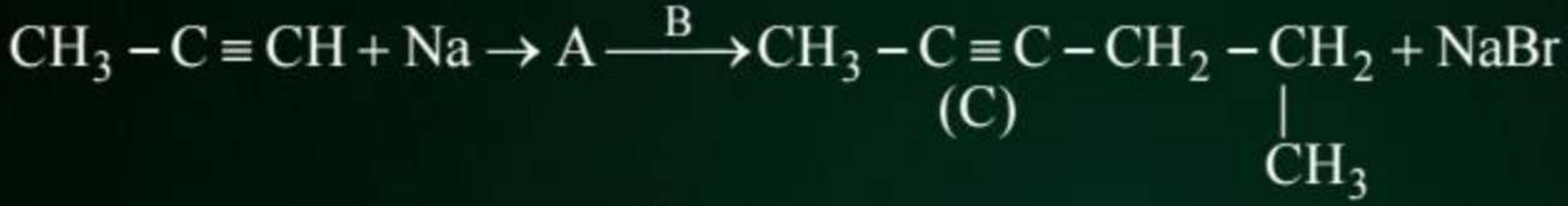
Ⓒ trans-2-butene is more stable than cis-2-butene.

Ⓓ cis-2-butene and trans-2-butene are stereoisomers.

Ans. (B)

QUESTION (JEE Mains 30 January 2024, Morning Shift)

Compound A formed in the following reaction reacts with B gives the product C. Find out A and B.



$$CH_3-C\equiv CH+Na\rightarrow A\xrightarrow{B}\underset{(C)}{CH_3-C\equiv C}-CH_2-\underset{\underset{\displaystyle CH_3}{|}}{CH_2}+NaBr$$

(A) $A=CH_3-C\equiv\overset{-}{C}\overset{+}{Na}, B=CH_3-CH_2-CH_2-Br$

(B) $A=CH_3-CH=CH_2, B=CH_3-CH_2-CH_2-Br$

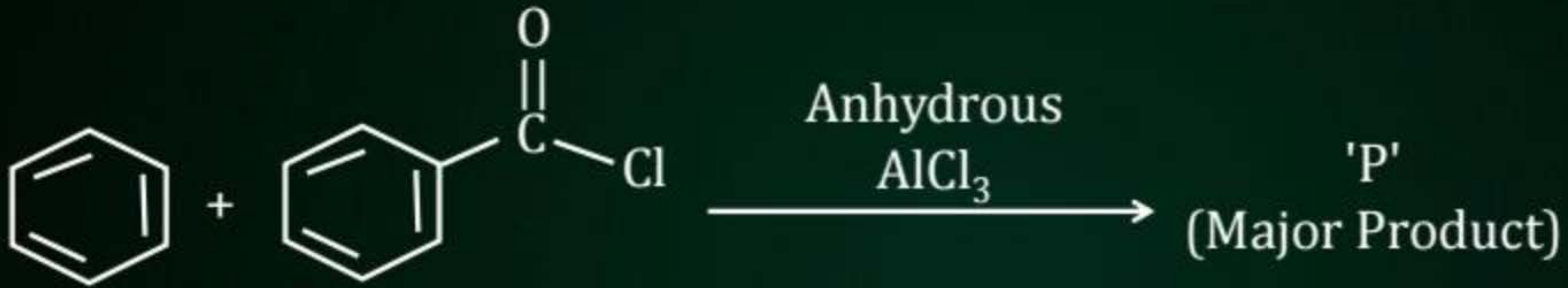
(C) $A=CH_3-CH_2-CH_3, B=CH_3-C\equiv CH$

(D) $A=CH_3-C\equiv\overset{-}{C}\overset{+}{Na}, B=CH_3-CH_2-CH_3$

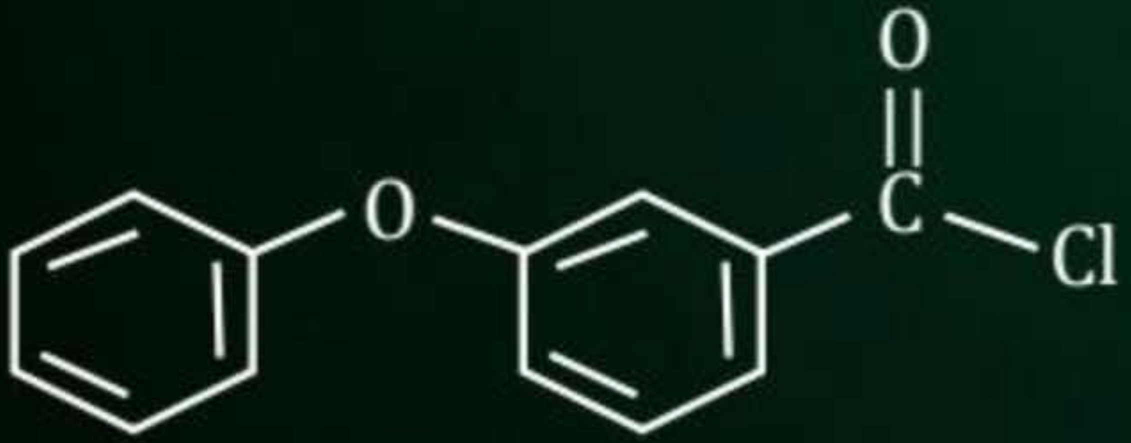
Ans. (A)

QUESTION (JEE Mains 31 January 2024, Evening Shift)

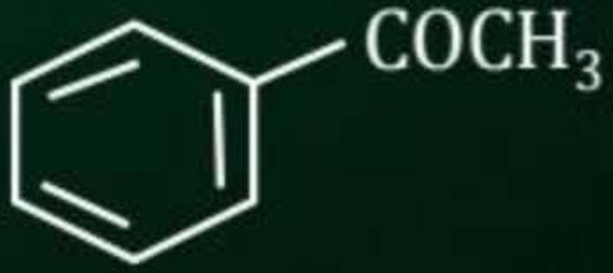
Identify major product 'P' formed in the following reaction.


O
C
Cl
+
Anhydrous
AlCl$_3$
'P'
(Major Product)

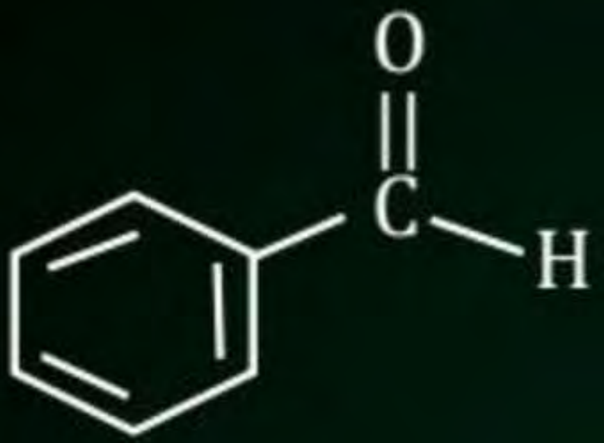
A



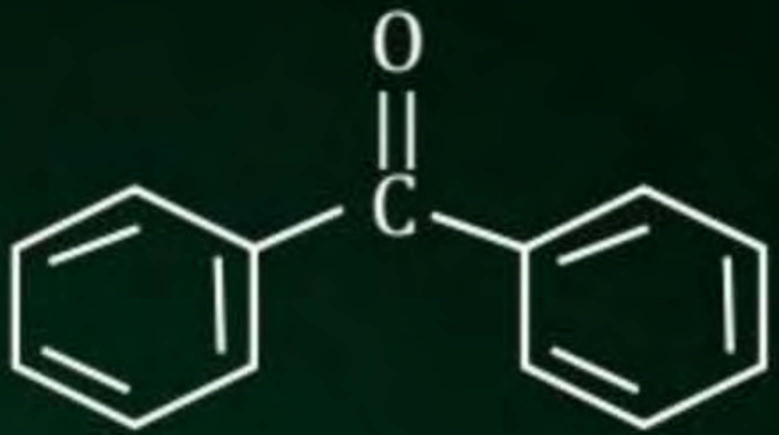
B



C



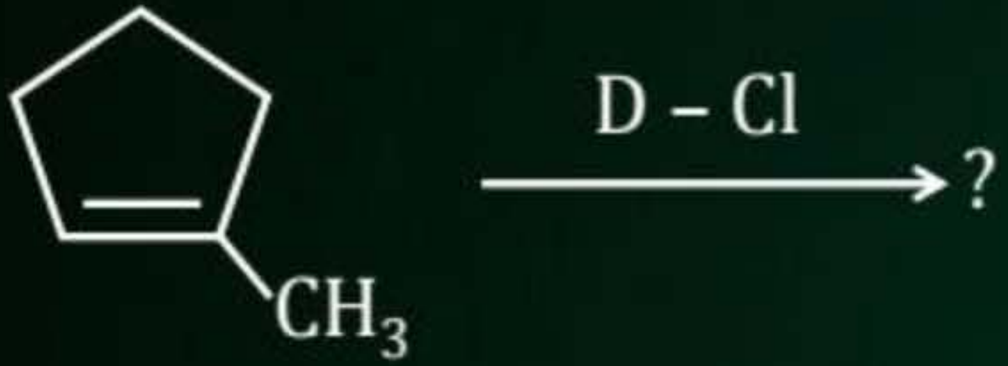
D



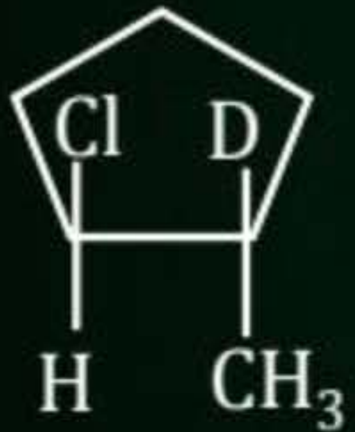
Ans. (D)

QUESTION* (JEE Mains 31 January 2024, Evening Shift)

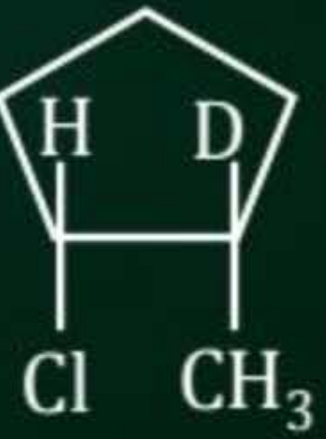
Major product of the following reaction is:



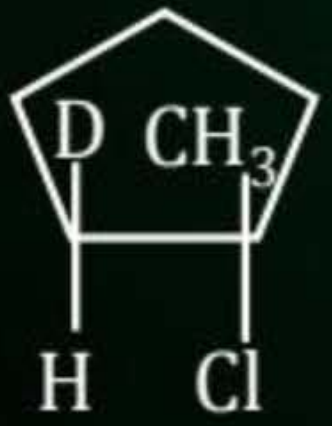
A



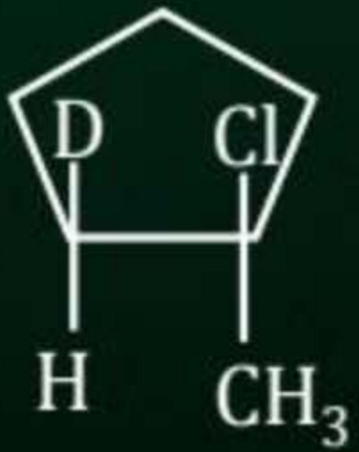
B



C



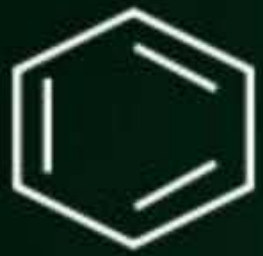
D



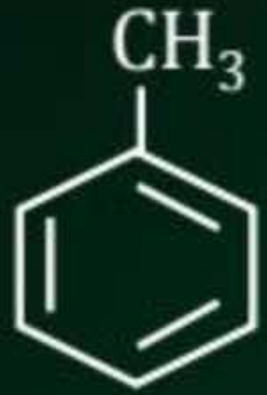
Ans. (C & D)

QUESTION (JEE Mains 31 January 2024, Evening Shift)

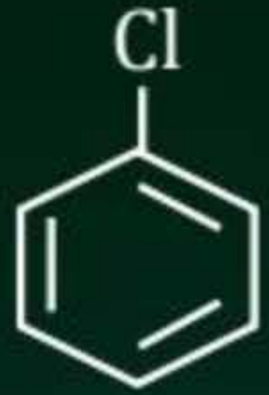
The correct order of reactivity in electrophilic substitution reaction of the following compounds is:



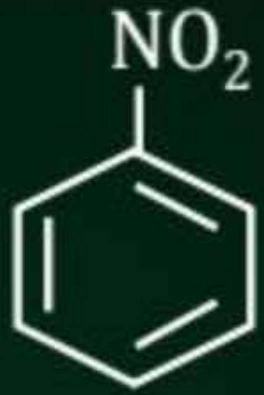
A



B



C



D

A B > C > A > D

B D > C > B > A

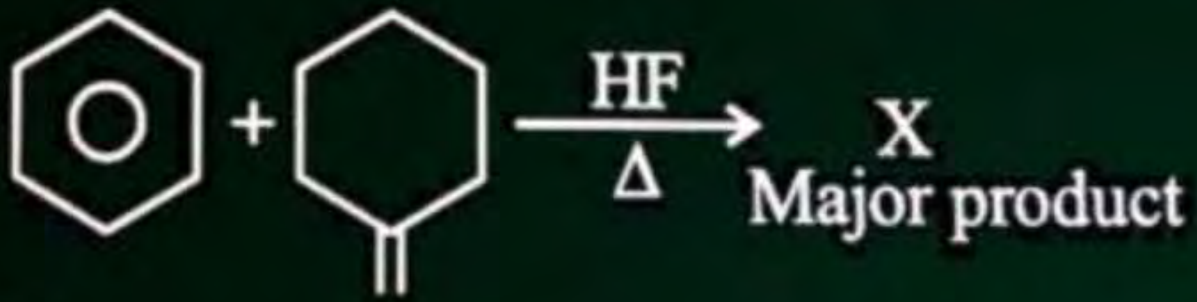
C A > B > C > D

D B > A > C > D

Ans. (D)

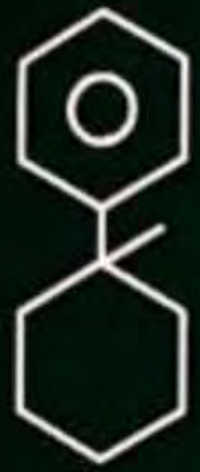
QUESTION (01 Feb, JEE Mains 2023 Shift-I)

'X' is :

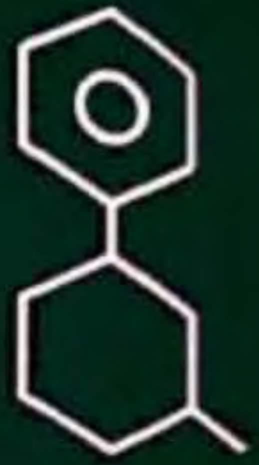


HF
Δ
X
Major product

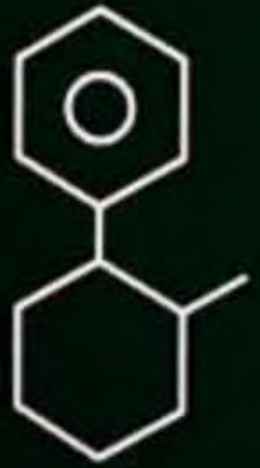
A



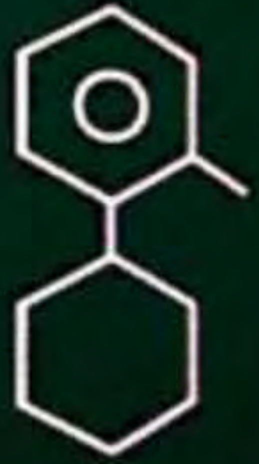
B



C



D



Ans. A

QUESTION (13 April, JEE Mains 2023 Shift-I)

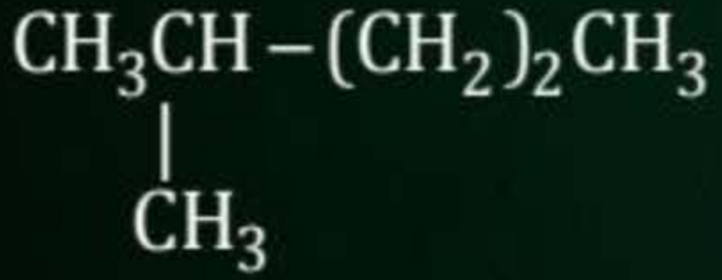
In the following reaction, 'X' is:

$$CH_3(CH_2)_4CH_3 \xrightarrow[\text{HCl},\Delta]{\text{Anhy.AlCl}_3} \underset{\text{major product}}{'X'}$$

(A) $CH_3(CH_2)_4\,CH_2Cl$

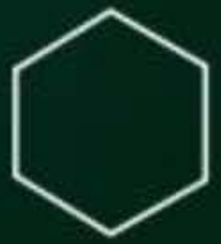
(B) $Cl-CH_2-(CH_2)_4-CH_2-Cl$

(C)



$CH_3\underset{\displaystyle CH_3}{\underset{|}{CH}}-(CH_2)_2CH_3$

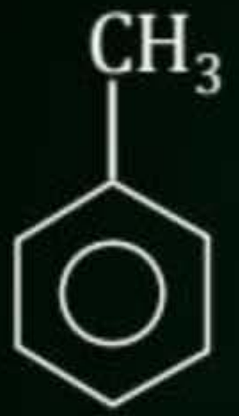
(D)



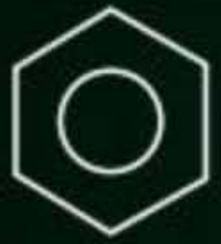
Ans : (C)

QUESTION (15 April, JEE Mains 2023 Shift-I)

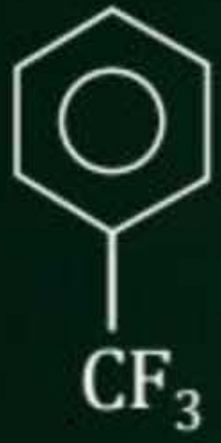
Decreasing order of reactivity towards electrophilic substitution for the following compounds is:



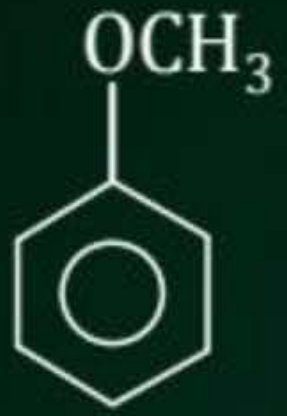
(a)



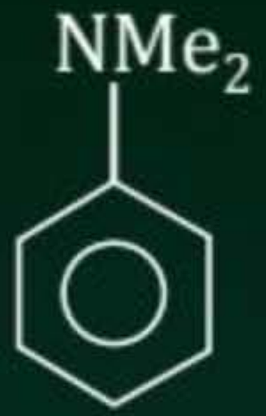
(b)



(c)



(d)



(e)

A $c > b > a > d > e$

B $e > d > a > b > c$

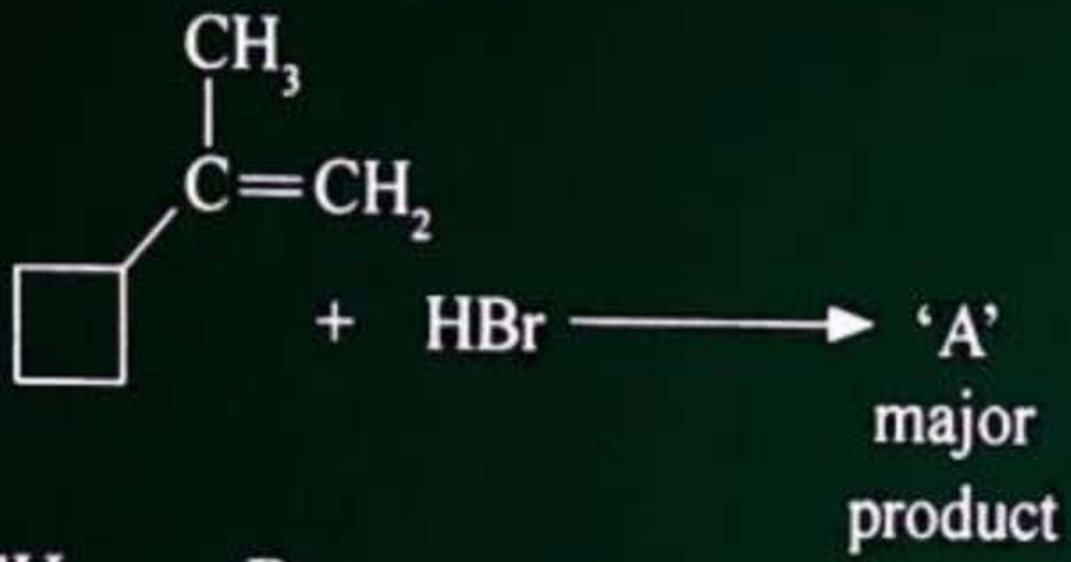
C $a > d > e > b > c$

D $d > a > e > c > b$

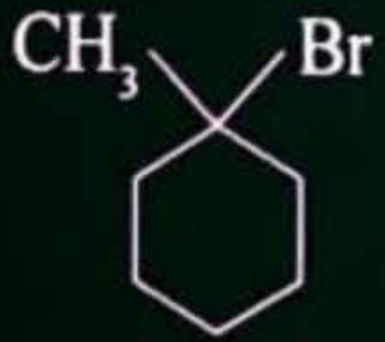
Ans : (B)

QUESTION (24 Jan, JEE Mains 2023)

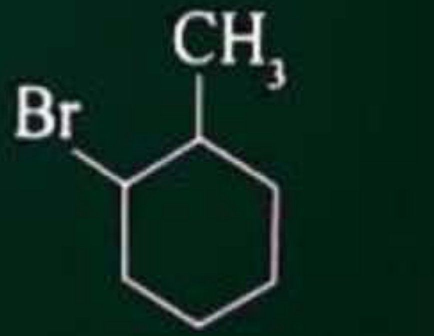
Int he following given reaction 'A' is:


CH3
C=CH2
+ HBr
'A'
major
product

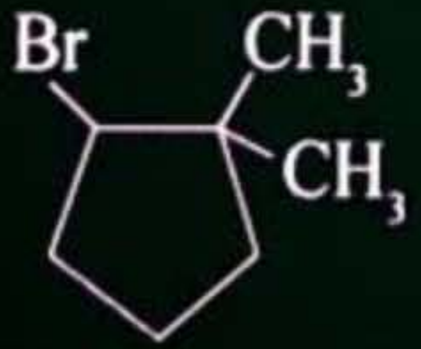
A



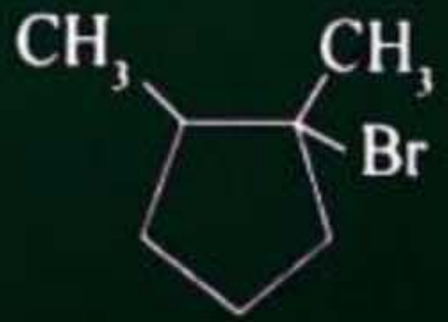
B



C



D



Ans. D

QUESTION (31 Jan, JEE Mains 2023)

A hydrocarbon 'X' with formula C_6H_8 uses to moles of H_2 on catalytic hydrogenation of its one mole. On ozonolysis. 'X' yields two moles of methane carbaldehyde. The hydrocarbon 'X' is:

(A) Hexa-1, 3, 5-triene

(B) 1-methyl cyclopenta-1, 4-diene

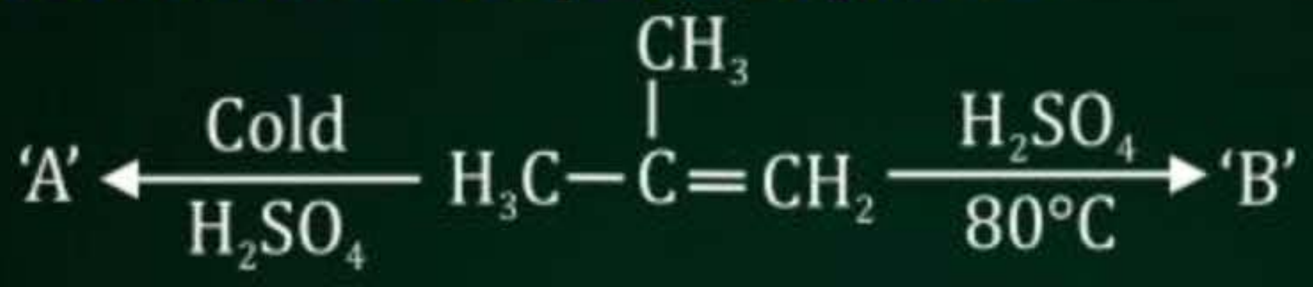
(C) Cyclohexa-1, 3-diene

(D) Cyclohexan-1, 4-diene

Ans. D

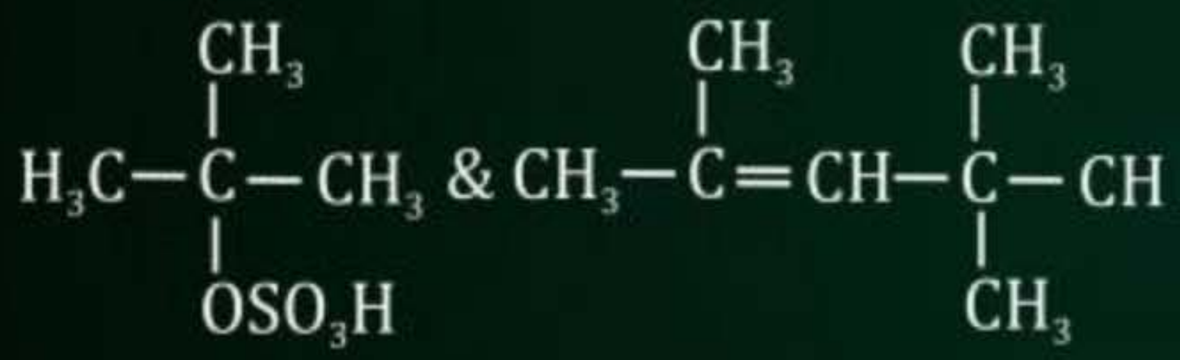
QUESTION (30 Jan, JEE Mains 2023)

The major products ‘A’ and ‘B’ respectively are:



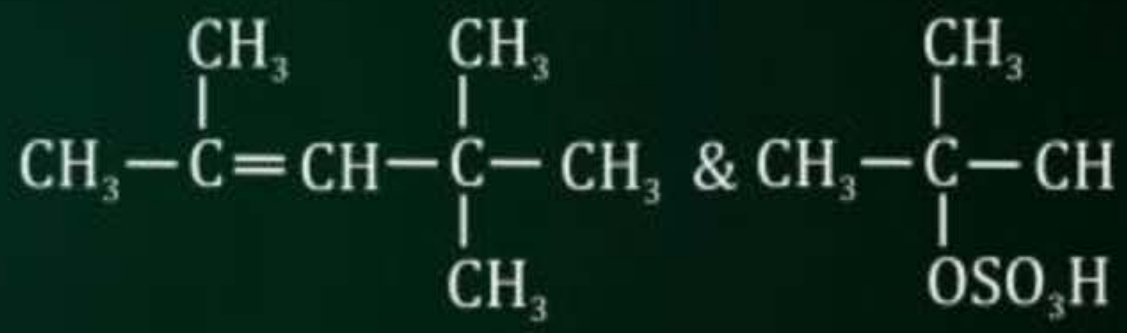
$$\text{‘A’} \xleftarrow[H_2SO_4]{\text{Cold}} H_3C-\overset{\displaystyle CH_3}{\overset{|}{C}}=CH_2 \xrightarrow[80°C]{H_2SO_4} \text{‘B’}$$

A



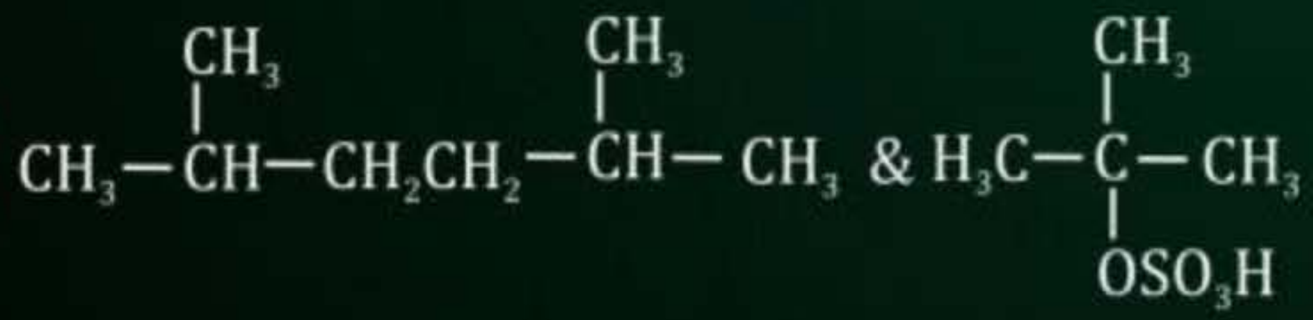
$$H_3C-\overset{\displaystyle CH_3}{\underset{\displaystyle OSO_3H}{C}}-CH_3 \;\&\; CH_3-\overset{\displaystyle CH_3}{C}=CH-\overset{\displaystyle CH_3}{\underset{\displaystyle CH_3}{C}}-CH$$

B



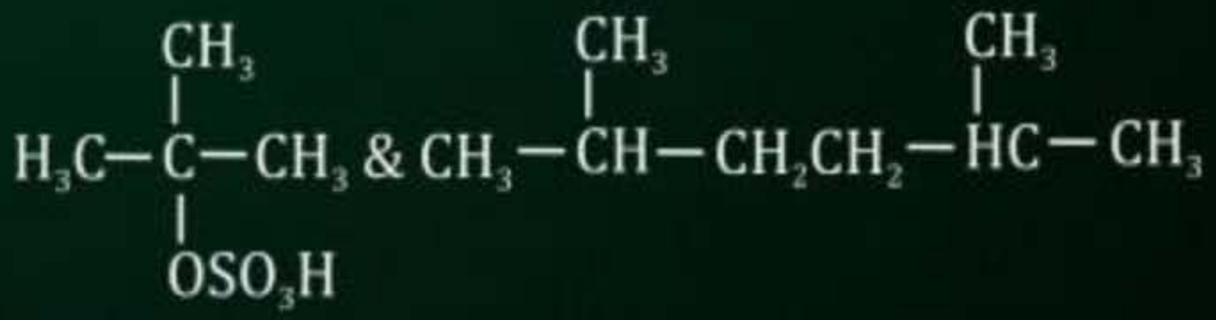
$$CH_3-\overset{\displaystyle CH_3}{C}=CH-\overset{\displaystyle CH_3}{\underset{\displaystyle CH_3}{C}}-CH_3 \;\&\; CH_3-\overset{\displaystyle CH_3}{\underset{\displaystyle OSO_3H}{C}}-CH$$

C



$$CH_3-\overset{\displaystyle CH_3}{CH}-CH_2CH_2-\overset{\displaystyle CH_3}{CH}-CH_3 \;\&\; H_3C-\overset{\displaystyle CH_3}{\underset{\displaystyle OSO_3H}{C}}-CH_3$$

D



$$H_3C-\overset{\displaystyle CH_3}{\underset{\displaystyle OSO_3H}{C}}-CH_3 \;\&\; CH_3-\overset{\displaystyle CH_3}{CH}-CH_2CH_2-\overset{\displaystyle CH_3}{HC}-CH_3$$

Ans. A

QUESTION (12 April, JEE Mains 2023)

2–hexene $\xrightarrow[\text{(ii)}H_2O]{\text{(i)}O_3}$ Product

Two product formed in above reaction are:

(A) Butanoic acid and acetic acid

(B) Butanal and acetic acid

(C) Butanal and acetaldehyde

(D) Butanoic acid and acetaldehyde

Ans. A

QUESTION (31 Jan, JEE Mains 2023)

Choose the correct set of reagents for the following conversion trans $(Ph{-}CH \equiv CH - CH_3) \rightarrow$ cis $(Ph - CH = CH{-}CCH_3)$

Two product formed in above reaction are:

A Br_2, alc. KOH, $NaNH_2$, Na(Liq. NH_3)

B Br_2, alc. KOH, $NaNH_2$, H_2, Lindlar Catalyst

C Br_2, aq. KOH, $NaNH_2$, H_2, Lindlar Catalyst

D Br_2, aq. KOH, KOH $NaNH_2$, Na(Liq. NH_3)

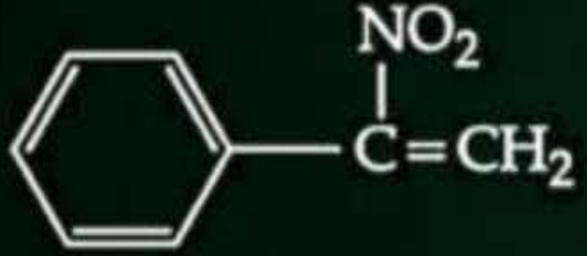
Ans. B

QUESTION (24 June, JEE Mains 2022 Shift II)

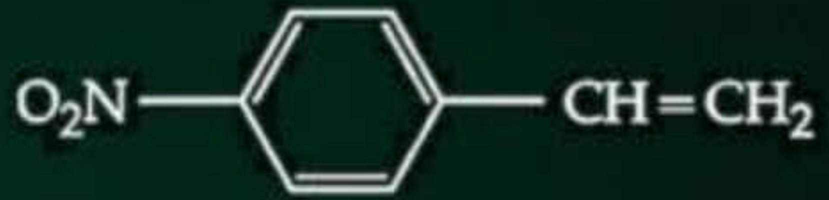
In the given reaction sequence, the major product 'C' is:

$$C_8H_{10} \xrightarrow[H_2SO_4]{HNO_3} A \xrightarrow[\Delta]{Br_2} B \xrightarrow[KOH]{\text{alcoholic}} C$$

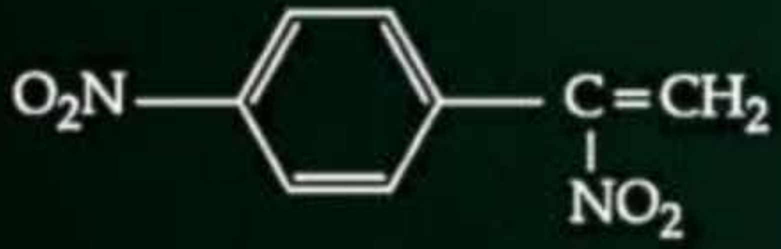
(A)



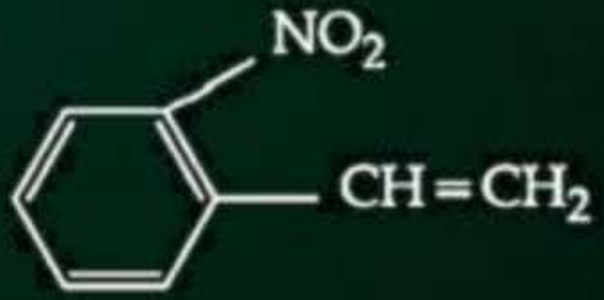
(B)



(C)


O2N
C=CH2
NO2

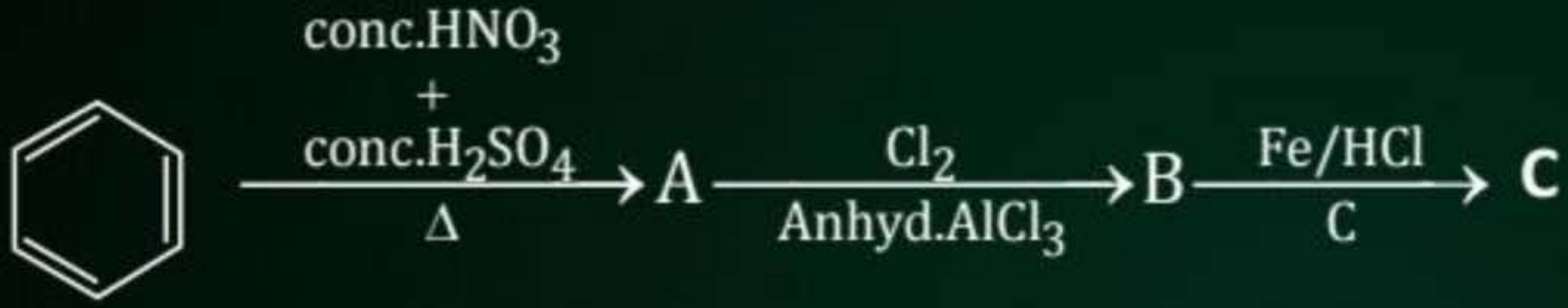
(D)



Ans. (B)

QUESTION (31 Aug, JEE Mains 2021)

Identify correct A, B and C in the reaction sequence given below:



$$\xrightarrow[\Delta]{\text{conc.HNO}_3 + \text{conc.H}_2\text{SO}_4} \text{A} \xrightarrow[\text{Anhyd.AlCl}_3]{\text{Cl}_2} \text{B} \xrightarrow[\text{C}]{\text{Fe/HCl}} \text{C}$$

QUESTION (20 July, JEE Mains 2021)

Benzene on nitration gives nitrobenzene in presence of HNO_3 and H_2SO_4 mixture where:

Ⓐ Both H_2SO_4 and HNO_3 act as a bases

Ⓑ Both H_2SO_4 and HNO_3 act as an acids

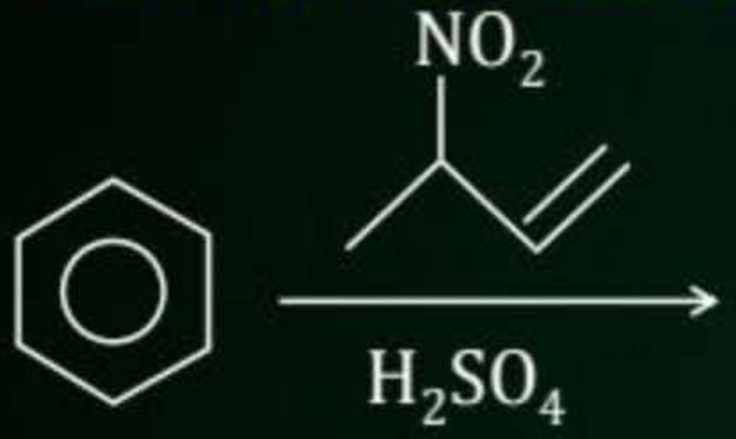
Ⓒ HNO_3 acts as a base and H_2SO_4 acts as an acid

Ⓓ HNO_3 acts as an acid and H_2SO_4 acts as a base

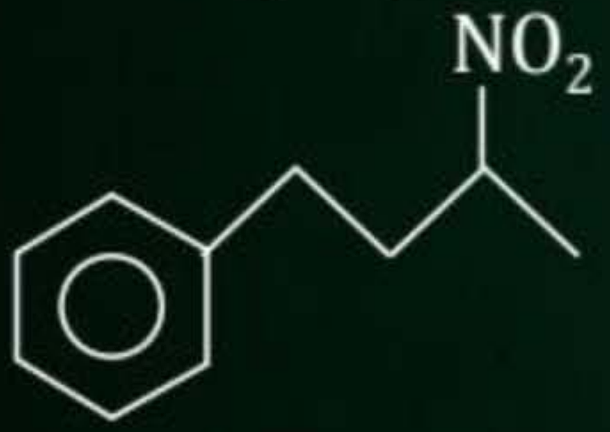
Ans : (C)

QUESTION (25 Feb, JEE Mains 2021)

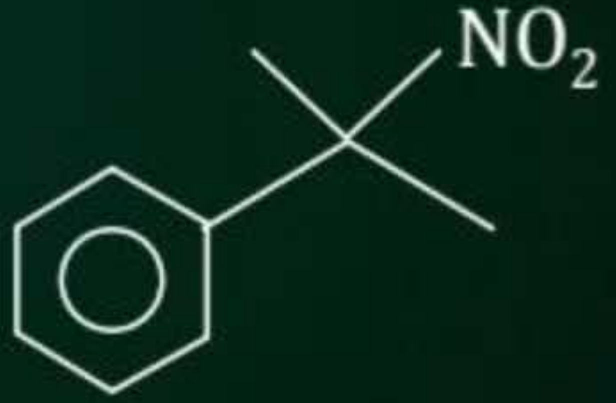
The major product of the following reaction is:



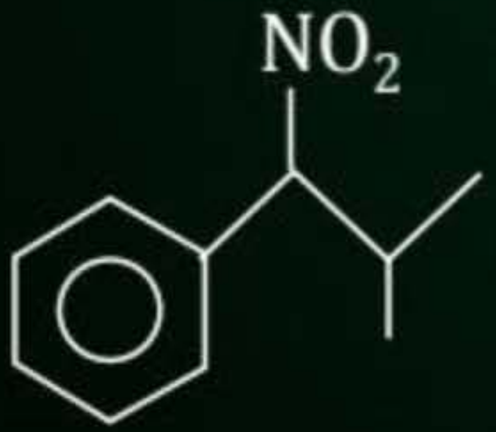
A



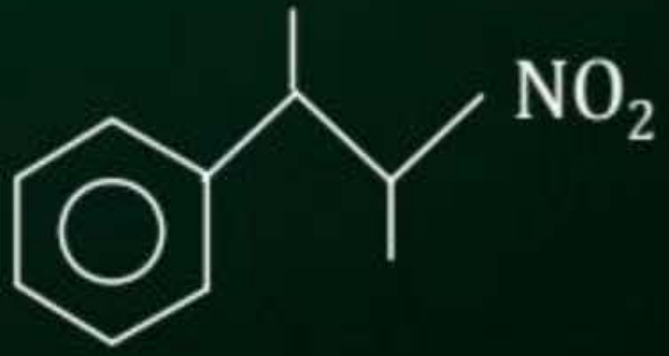
B



C



D



Ans : (D)

QUESTION (27 July, JEE Mains 2021)

Presence of which reagent will affect the reversibility of the following reaction and change it to a irreversible reaction?

$$CH_4 + I_2 \underset{\text{Reversible}}{\overset{\text{hy}}{\rightleftharpoons}} CH_3I + HI$$

A HOCl

B Liquid NH_3

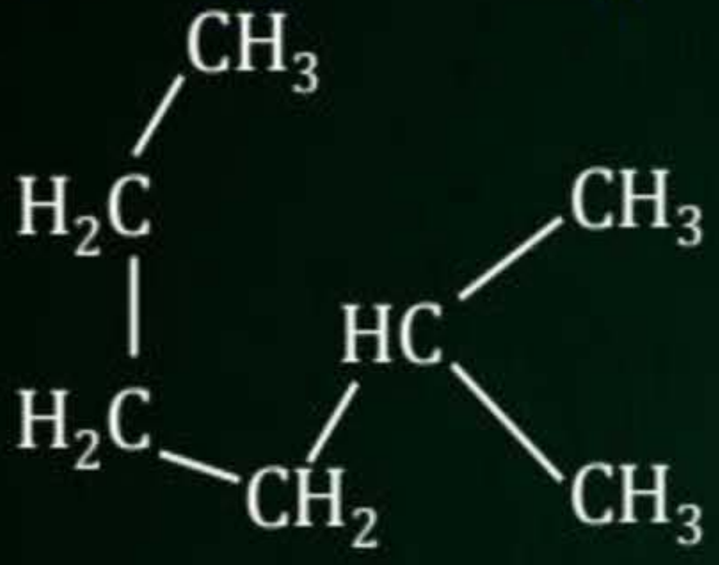
C dilute HNO_2

D Concentrated HIO_3

Ans : (D)

QUESTION (25 Feb, JEE Mains 2021)

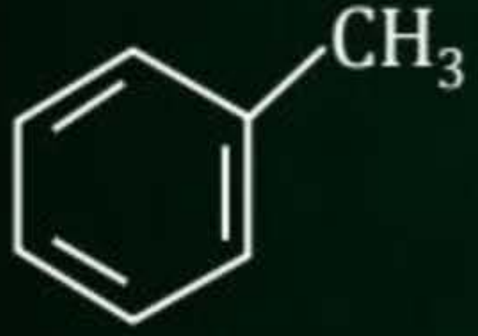
Identify A in the given chemical reaction.


CH3
H2C
H2C
CH2
HC
CH3
CH3

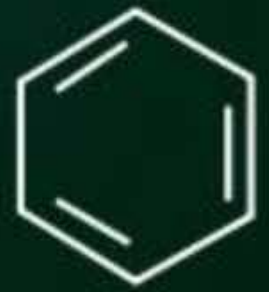
$\xrightarrow[773K, 10-20\,atm]{Mo_2O_3}$ 'A'

major product

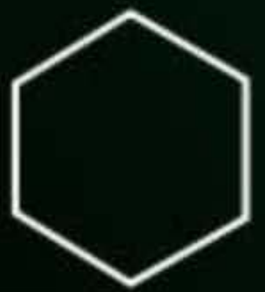
(A)



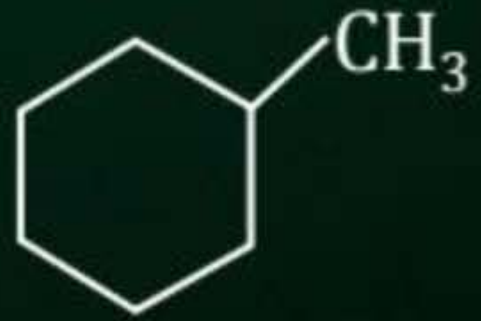
(B)



(C)



(D)



Ans : (A)

QUESTION (25 Feb, JEE Mains 2021)

The correct sequence of reagents used in the preparation of 4-bromo-2-nitroethyl benzene from benzene is:

A $HNO_3/H_2SO_4, Br_2/AlCl_3, CH_3COCl/AlCl_3, Zn - Hg/HCl$

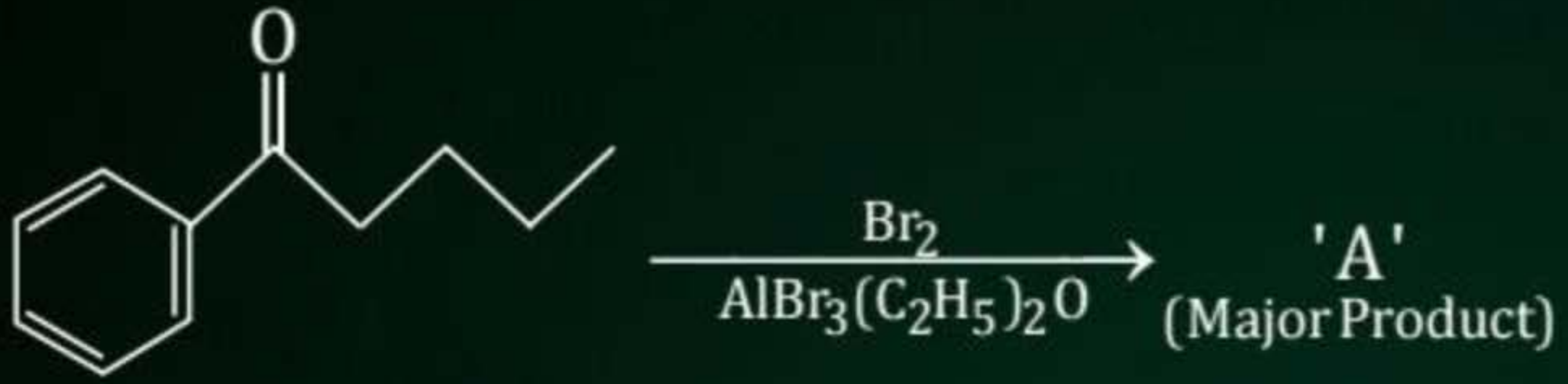
B $CH_3COCl/AlCl_3, Br_2/AlBr_3, HNO_3/H_2SO_4, Zn/HCl$

C $Br_2/AlBr_3, CH_3COCl/AlCl_3, HNO_3/H_2SO_4, Zn/HCl$

D $CH_3COCl/AlCl_3, Zn - Hg/HCl, Br_2/AlBr_3, HNO_3/H_2SO_4$

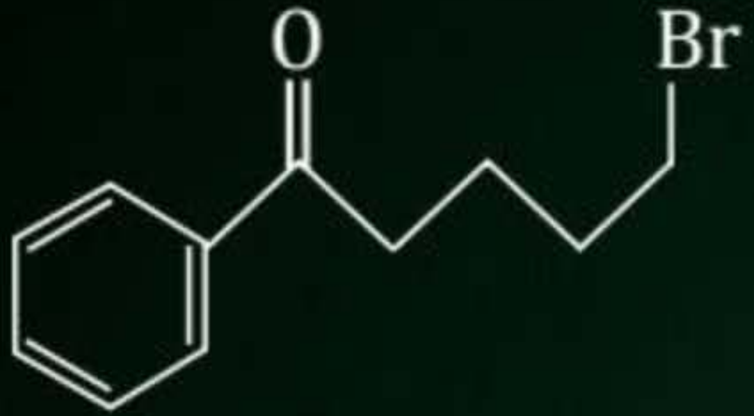
Ans : (D)

QUESTION (26 Aug, JEE Mains 2021)

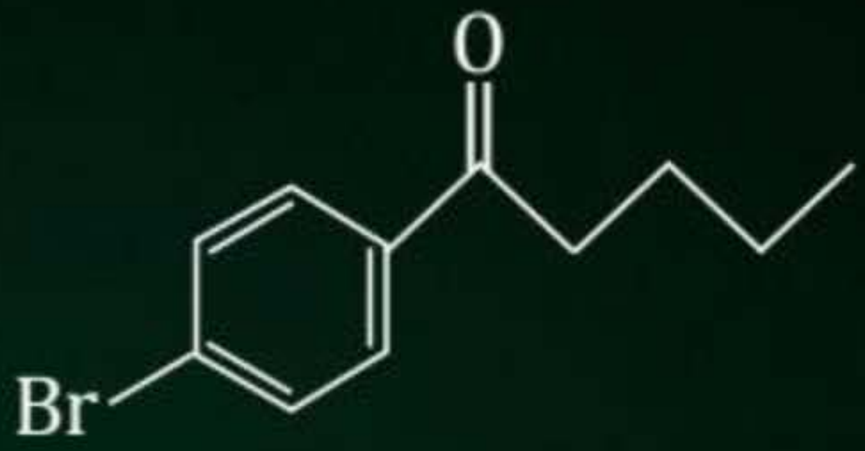

O
Br2
AlBr3(C2H5)2O
'A'
(Major Product)

Consider the given reaction, the Product A is:

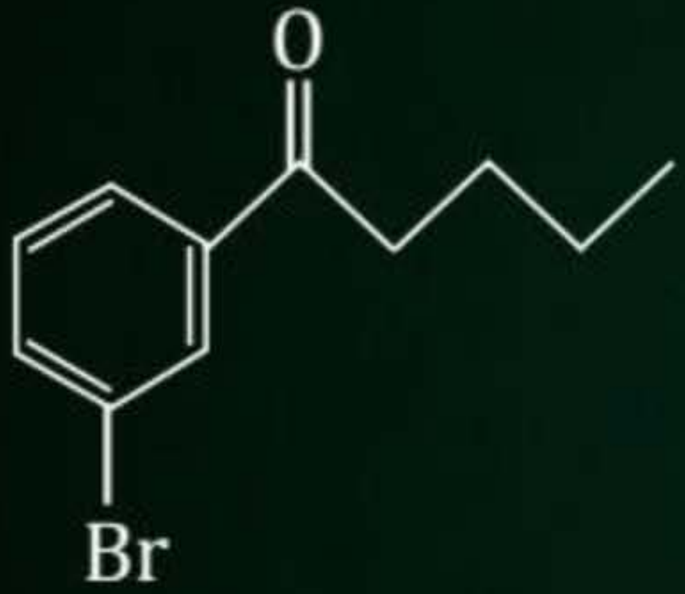
A



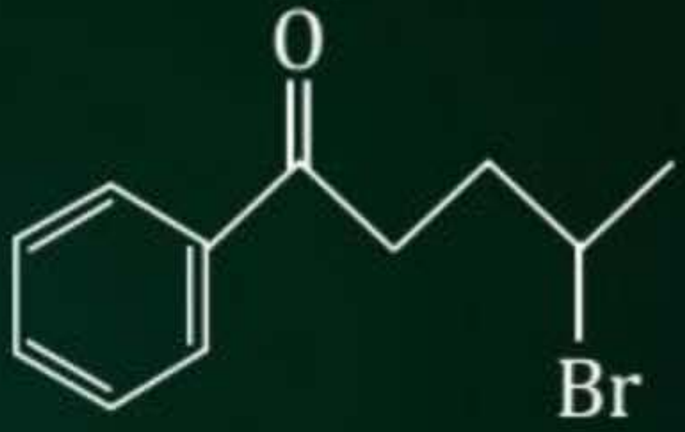
B



C



D



Ans : (C)

QUESTION (20 July, JEE Mains 2021)

Metallic sodium does not react normally with:

- (A) Gaseous ammonia
- (B) Tert-butyl alcohol
- (C) But-2-yne
- (D) Ethyne

Ans : (C)

QUESTION (16 March, JEE Mains 2021)

Which of the following is Lindlar catalyst?

Ⓐ Partially deactivated palladised charcoal

Ⓑ Cold dilute solution of $KMnO_4$

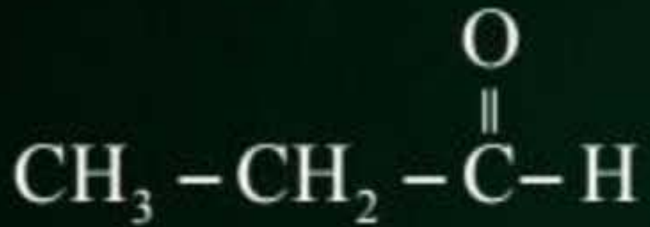
Ⓒ Zinc chloride and HCl

Ⓓ Sodium and Liquid NH_3

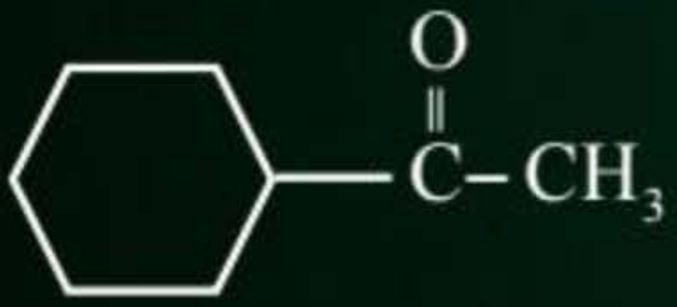
Ans : (A)

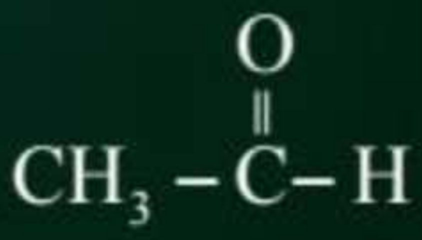
QUESTION (24 Feb, JEE Mains 2021)

Which one of the following carbonyl compound cannot be prepared by addition of water on an alkyne in the presence of $HgSO_4$ and H_2SO_4?

(A) 
$CH_3-CH_2-\overset{\overset{O}{\|}}{C}-H$

(B) $CH_3COCH_2CH_3$

(C) 

(D) 
$CH_3-\overset{\overset{O}{\|}}{C}-H$

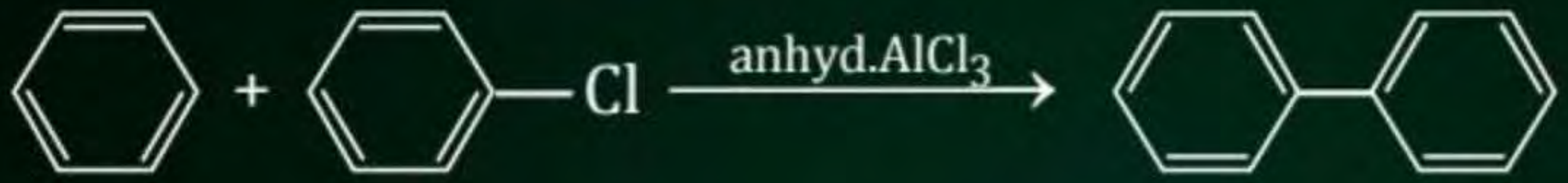
Ans : (A)

QUESTION (07 Jan, JEE Mains 2020)

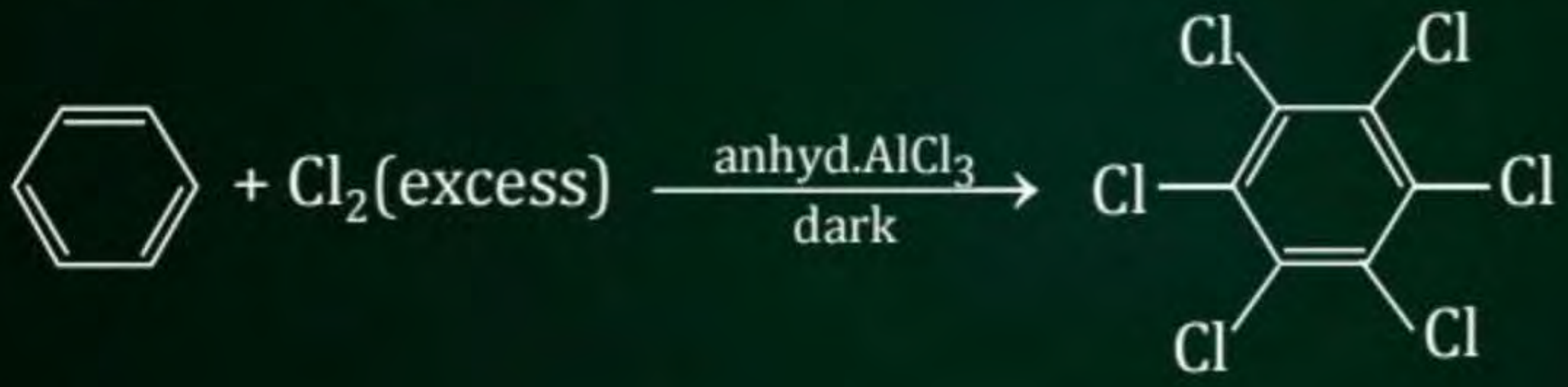
Consider the following reactions:

Which of these reactions are possible?

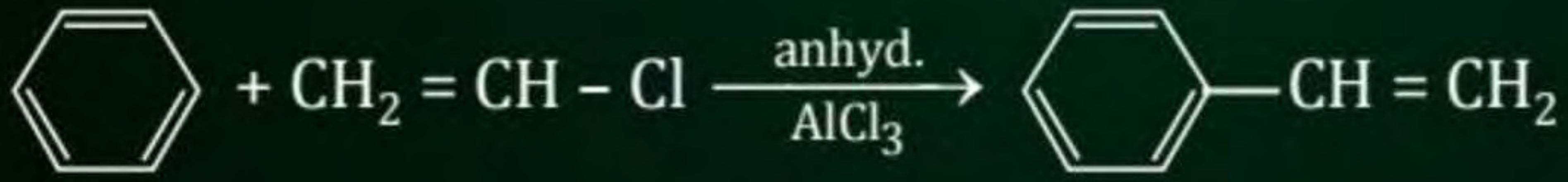
(A)


Cl
anhyd.AlCl3

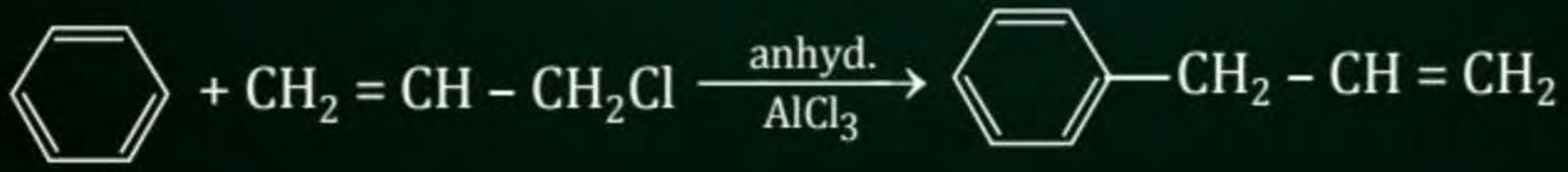
(B)


+ Cl2(excess)
anhyd.AlCl3
dark
Cl
Cl
Cl
Cl
Cl
Cl

(C)


+ CH2 = CH – Cl
anhyd.
AlCl3
CH = CH2

(D)


+ CH2 = CH – CH2Cl
anhyd.
AlCl3
CH2 – CH = CH2

A (B) and (D)

B (A) and (D)

C (A) and (B)

D (B), (C) and (D)

Ans : (A)

Home Work

Discussion of L-09

QUESTION 01

In the following reaction:

$$\overset{CH\equiv CH}{C_2H_2} \xrightarrow[HgSO_4/H_2SO_4]{H_2O} X \rightleftharpoons CH_3CHO$$

What is X?

- (A) CH_3CH_2OH
- (B) CH_3CH_2CHO
- (C) $CH_3{-}O{-}CH_3$
- [✓ (D)] $CH_2{=}CHOH$

QUESTION 02

$$C_nH_{2n-2} + H_2 \xrightarrow{Pt/Pd/Ni} \underset{C_nH_{2n}}{P} \xrightarrow[Pt/Pd/Ni]{H_2} \underset{C_nH_{2n+2}}{Q}.$$ P is:

- A $C_nH_{2n}+2$
- [✓ B C_nH_{2n}]
- C Both (A) and (B)
- D None of these

QUESTION 03

$CH_3-CH_2-\boxed{COONa} \xrightarrow[CaO,\Delta]{NaOH} (A)$ CH_3-CH_3

Cl $\xrightarrow[(ii)\ Alc.KOH]{(i)\ Cl_2/UV} (B) \xrightarrow[CCl_4]{Br_2} (C) \xrightarrow[(ii)\ NaNH_2]{(i)\ Alc.KOH} (D)$

$CH_2=CH_2$ $\quad \underset{\underset{Br}{|}}{CH_2}-CH_2-Br$ $\quad CH\equiv CH$

Compound (D) is:

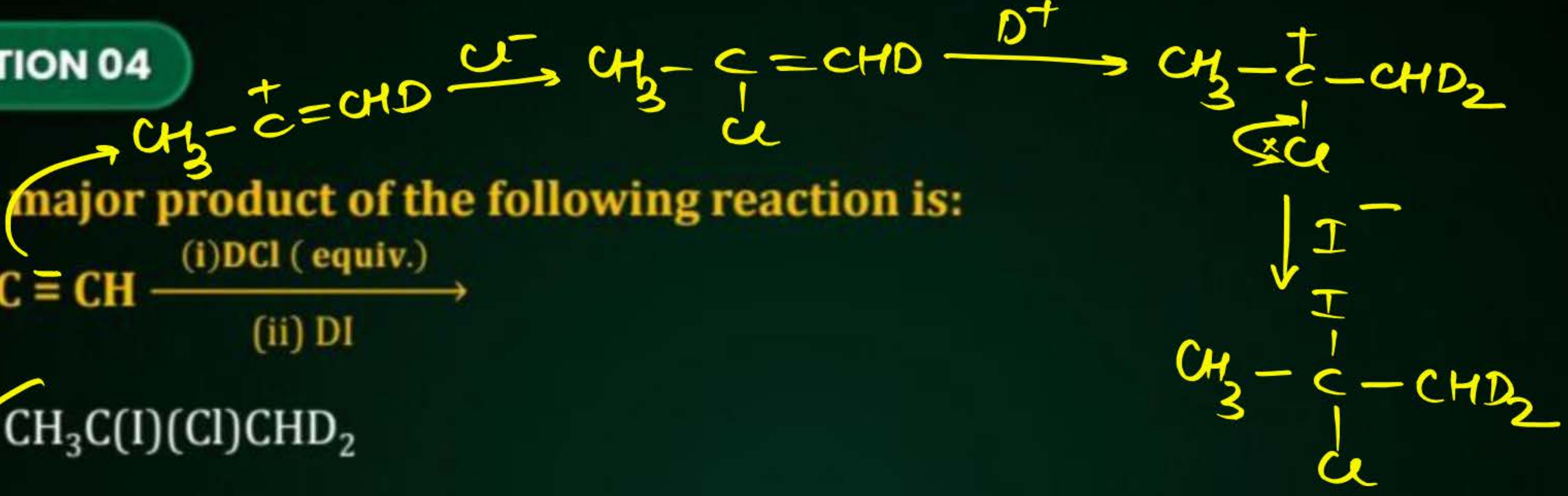
A C_2H_4

B C_2H_6

[✓ C] C_2H_2

D C_4H_8

QUESTION 04



$$CH_3C\equiv CH \rightarrow CH_3-\overset{+}{C}=CHD \xrightarrow{Cl^-} CH_3-\underset{Cl}{C}=CHD \xrightarrow{D^+} CH_3-\underset{Cl}{\overset{+}{C}}-CHD_2 \xrightarrow{I^-} CH_3-\underset{Cl}{\overset{I}{C}}-CHD_2$$

The major product of the following reaction is:

$$CH_3C\equiv CH \xrightarrow[\text{(ii) DI}]{\text{(i)DCl (equiv.)}}$$

[✓ A] $CH_3C(I)(Cl)CHD_2$

B $CH_3CD_2(Cl)(I)$

C $CH_3CD(I)CHD(Cl)$

D $CH_3CD(Cl)CHD(I)$

QUESTION 05

Na+liq NH_3

The hydrocarbon which can not react with sodium in liquid ammonia is:

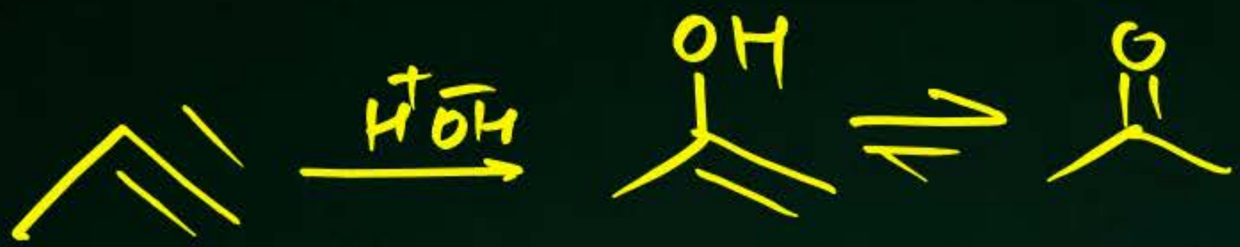
(A) $CH_3CH_2C{\equiv}CCH_2CH_3$

(B) $CH_3CH_2CH_2C \equiv CCH_2CH_2CH_3$

(C) $CH_3CH_2C \equiv CH$

[✓ (D)] $CH_3CH{=}CHCH_3$

QUESTION 06



Hydration of propyne gives:

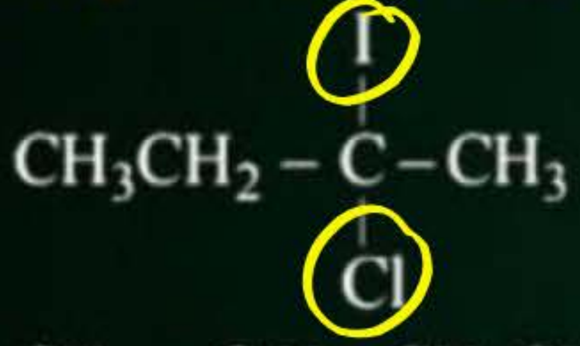
- A 1-Propanol
- B 2-Propanol
- C Propanal
- [✓ D Propanone]

QUESTION 07

Predict the product C obtained in the following reaction of butyne-1

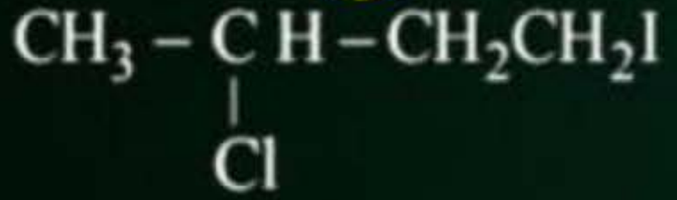
$$\mathrm{CH_3CH_2-\overset{\downarrow}{C}\equiv CH + HCl \longrightarrow B \xrightarrow{HI} C}$$

[✓ A]



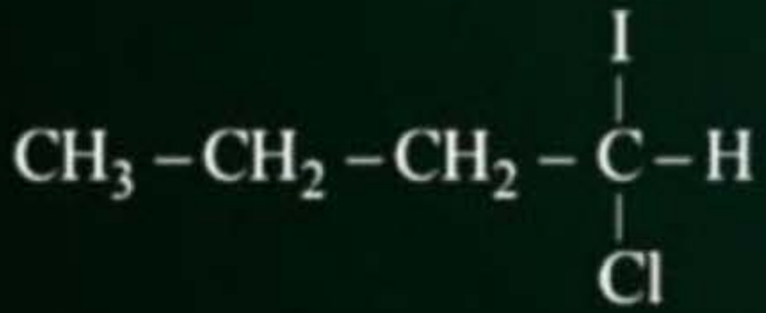
$$\mathrm{CH_3CH_2-\overset{\displaystyle I}{\underset{\displaystyle Cl}{C}}-CH_3}$$

B



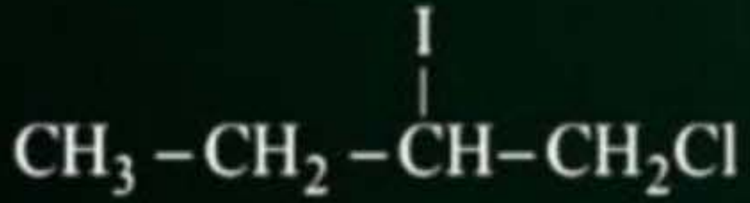
$$\mathrm{CH_3-\underset{\displaystyle Cl}{C}H-CH_2CH_2I}$$

C



$$\mathrm{CH_3-CH_2-CH_2-\overset{\displaystyle I}{\underset{\displaystyle Cl}{C}}-H}$$

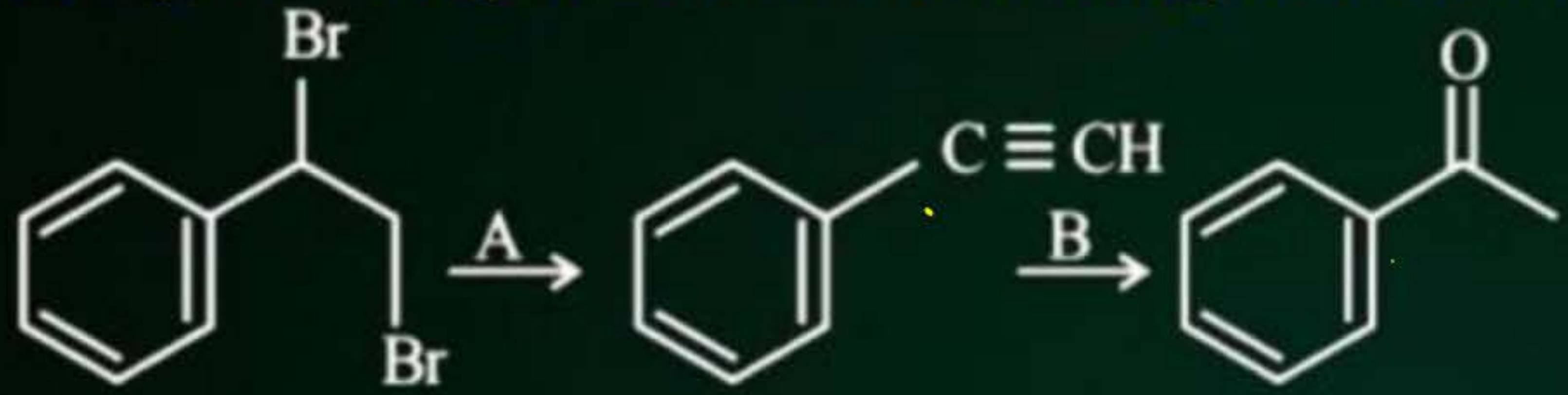
D



$$\mathrm{CH_3-CH_2-\overset{\displaystyle I}{C}H-CH_2Cl}$$

QUESTION 08

Identify the reagents in the following transformations:



- A Aq. KOH and H_2O, $HgSO_4$, H_2SO_4
- B ✗ Alc. KOH and $KMnO_4/H^+$
- [✓ C] $NaNH_2$ and H_2O, $HgSO_4$, H_2SO_4
- D $NaNH_2$ and $KMnO_4/H^+$

QUESTION 09

$3CH \equiv CH \xrightarrow[\text{red hot iron tube}]{873\ K}$ Product. The Product is:

- (A) Hexyne
- (B) Hexene
- (C) [✓ Benzene]
- (D) Hexane

QUESTION 10

In the reaction:

$CH_3CH_2CCl_2CH_3 \xrightarrow{x} CH_3C \equiv CCH_3$ the reagent x is:

[✓ A KOH/C_2H_5OH]

B Zn

C HCl/H_2O

D Na

ANSWER KEY

1. D
2. B
3. C
4. A
5. D
6. D
7. A
8. C
9. C
10. A

Home Work

Discussion of L-10

QUESTION 01

Attacking of reactive or electrophilic species in nitration of benzene is or In the nitration of benzene with concentrated $H_2SO_4 + HNO_3$, the attack on ring is made by

(A) NO_2^-

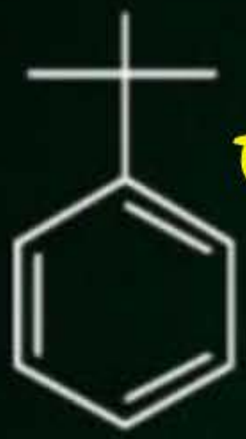
[✓ (B)] NO_2^+

(C) NO_3^-

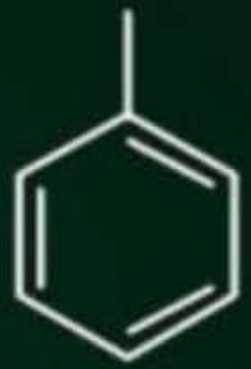
(D) NO_2

QUESTION 02

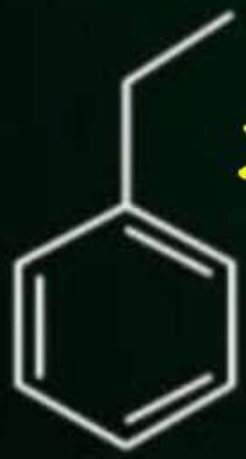
Which of the following will undergo sulphonation at the fastest rate?

A


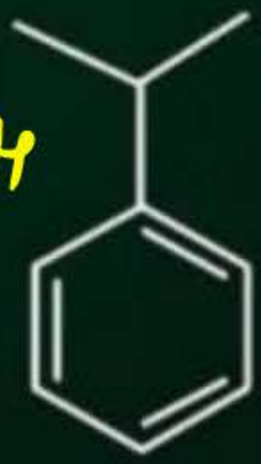
0α H

✓ B


3α H

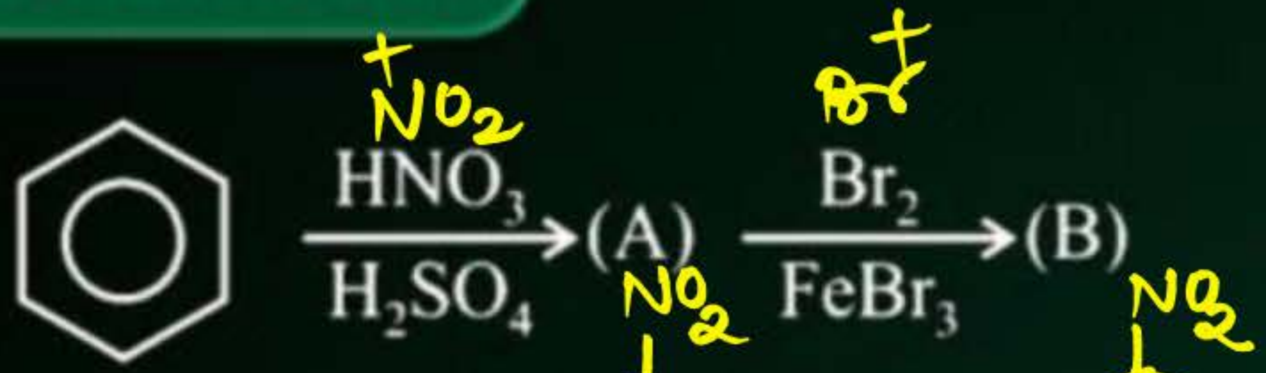
C


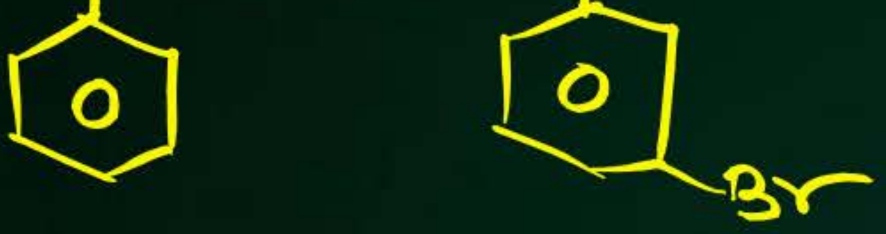
2αH

D


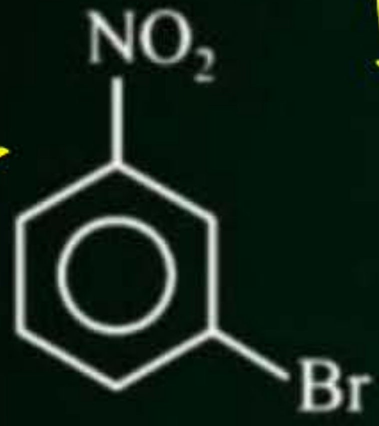
1αH

QUESTION 03

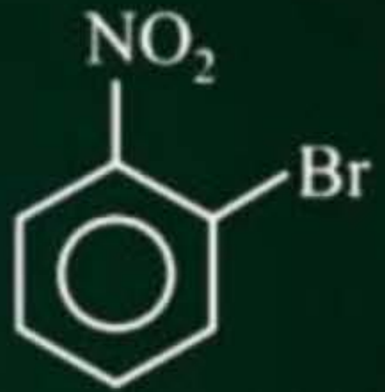

$\overset{+}{N}O_2$
HNO_3
H_2SO_4
(A)
NO_2
Br^+
Br_2
$FeBr_3$
(B)
NO_2



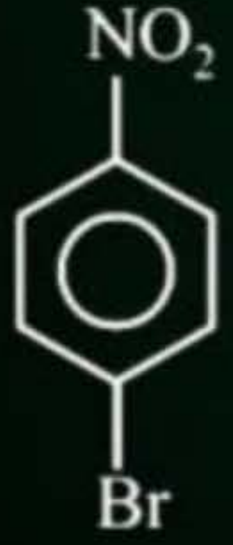
A ✓



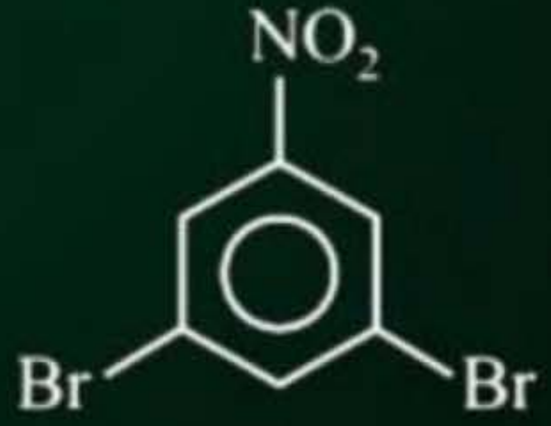
B



C



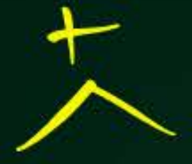
D

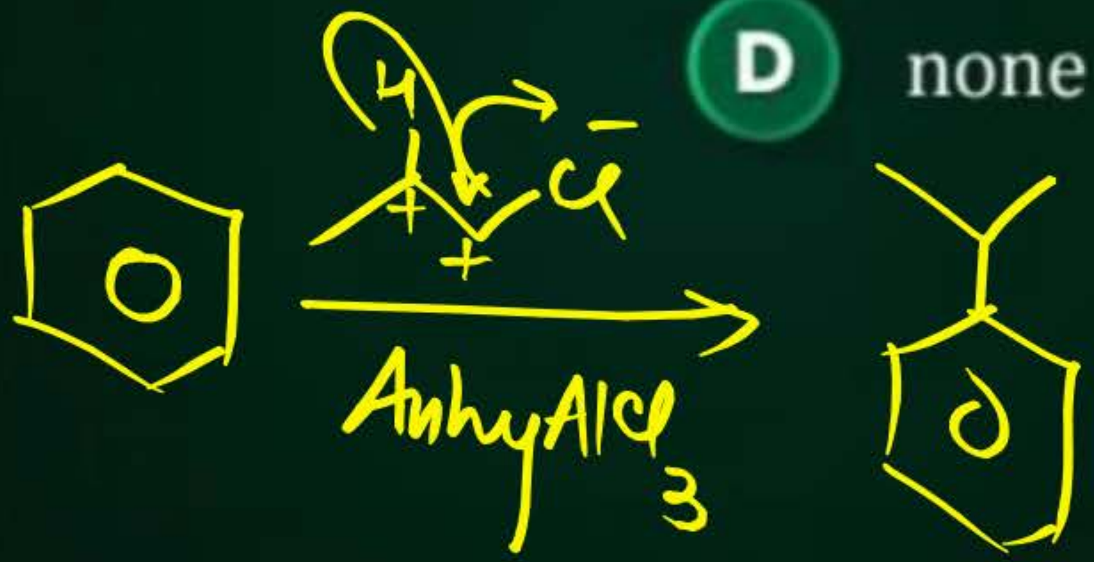


QUESTION 04

When Friedel-Craft alkylation of benzene is carried out with *n*-propyl bromide, the major product is:

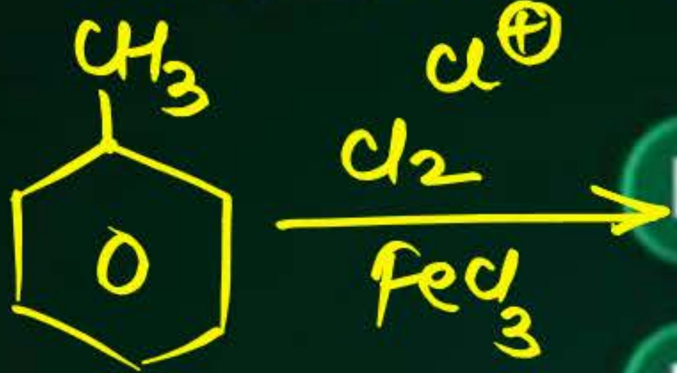
- **A** *n*-propyl benzene
- [✓ **B**] isopropyl benzene
- **C** 2-ethyl benzene
- **D** none of the above





QUESTION 05

The reaction of toluene with Cl_2 in presence of $FeCl_3$ gives predominantly.


CH_3
$Cl^{\oplus}$
Cl_2
$FeCl_3$

- (A) benzyl chloride
- [✓ (B) o- and p-chlorotoluene]
- (C) m-chlorotoluene
- (D) benzoyl chloride

QUESTION 06

Which of the following organic chlorides will not give a Friedel-Craft alkylation product when heated with benzene and $AlCl_3$?

Ⓐ $(CH_3)_3CCl$

Ⓑ $CH_2=CHCH_2Cl$

Ⓒ CH_3CH_2Cl

[✓ Ⓓ] $CH_2=CHCl$

QUESTION 07

Among the following groups, the group that deactivates the benzene ring for further electrophilic substitution is:

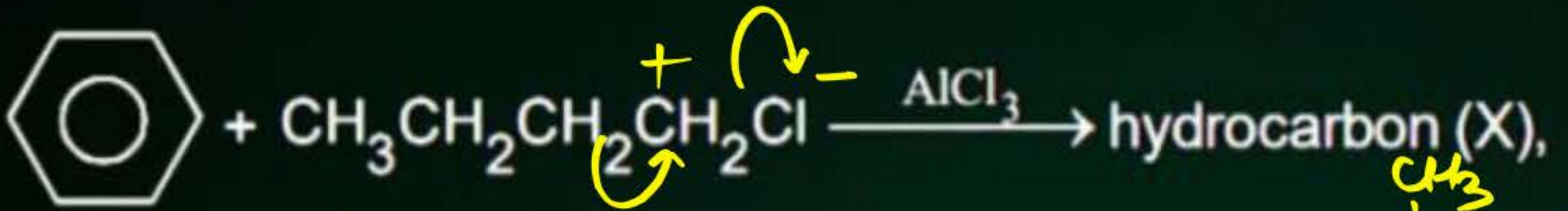
(A) Hydroxyl $-OH$

(B) Methyl $-CH_3$

[✓ (C)] Nitro $-NO_2$

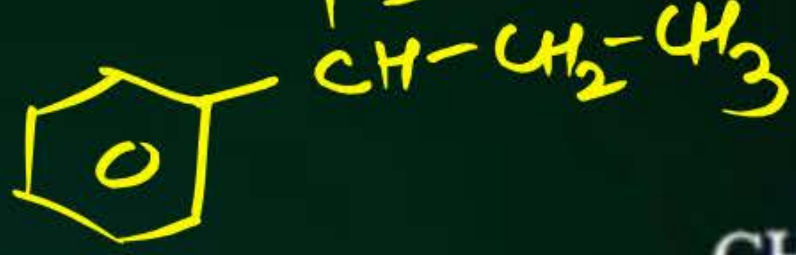
(D) Amino $-NH_2$

QUESTION 08



$+\ CH_3CH_2CH_2CH_2Cl \xrightarrow{AlCl_3}$ hydrocarbon (X),

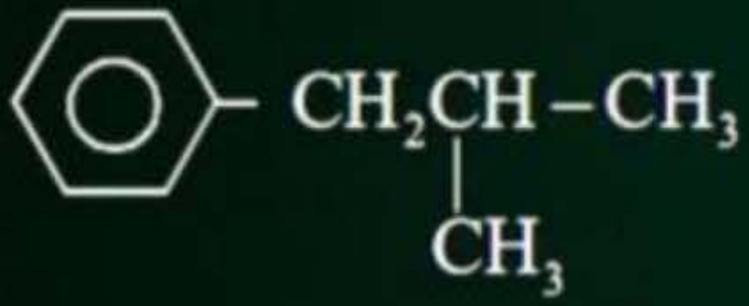
$CH_3-CH_2-\underset{+}{CH}-CH_3$



$\overset{CH_3}{CH}-CH_2-CH_3$

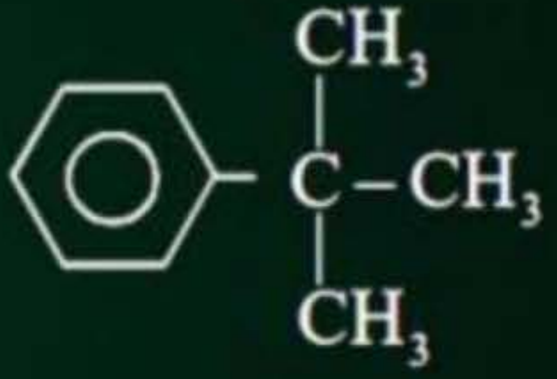
Major Product X is:

A ✗



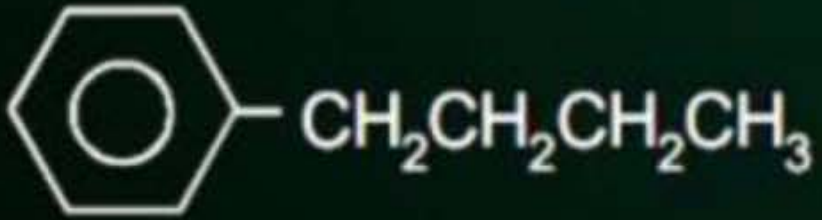
$CH_2CH(CH_3)-CH_3$

B ✗



$C(CH_3)_3$

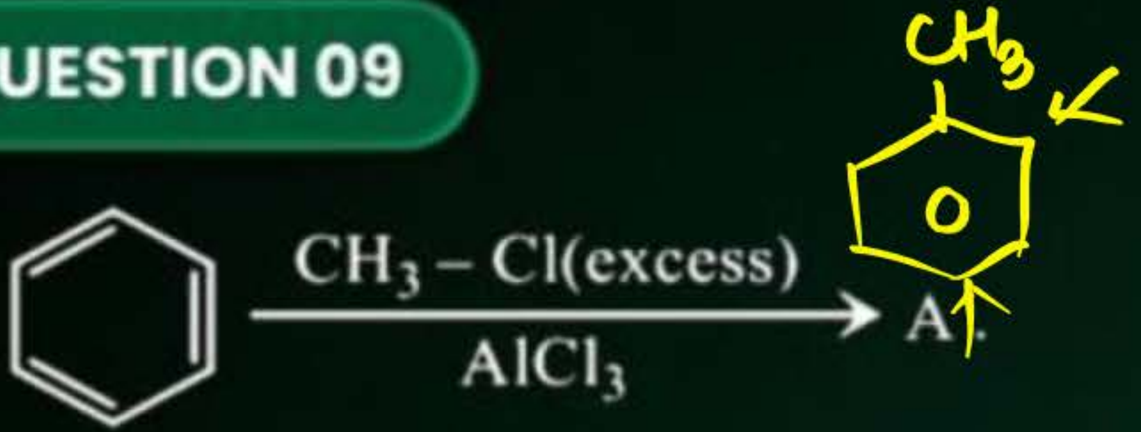
C ✗



$CH_2CH_2CH_2CH_3$

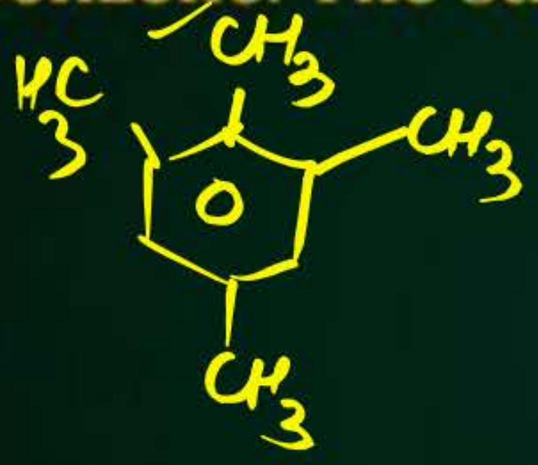
✓ D None is correct

QUESTION 09



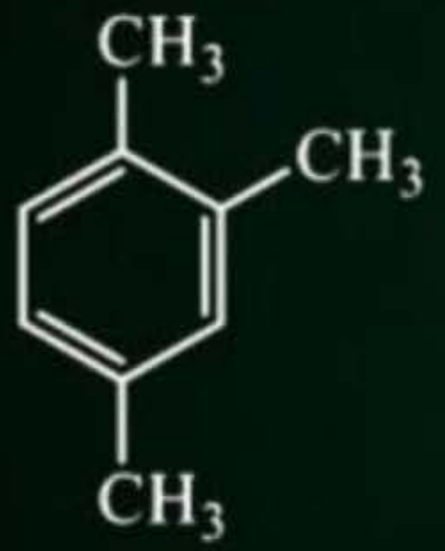
$CH_3 - Cl(excess)$
$AlCl_3$
A
CH_3

A is a trisubstituted benzene. The structure of 'A' is:

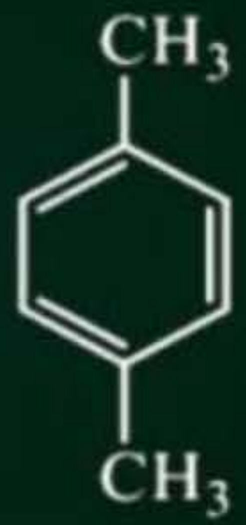


CH_3
H_3C
CH_3
CH_3

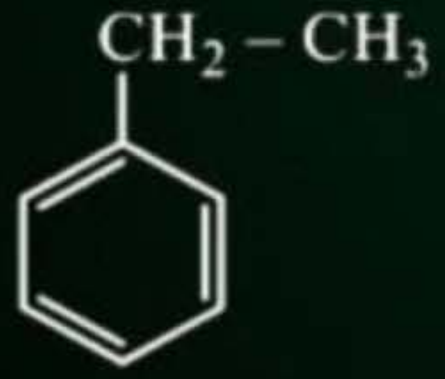
[✓ A]



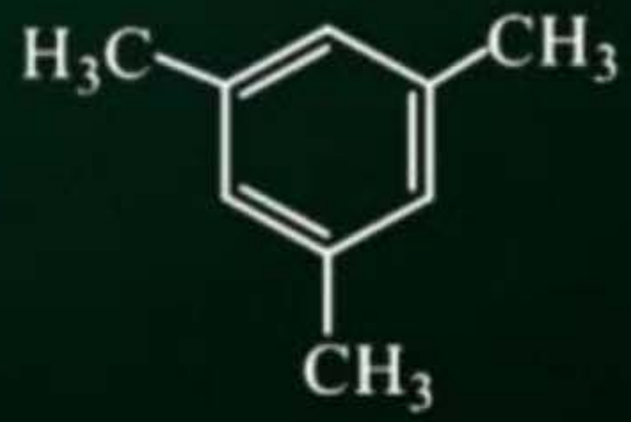
B



C



D



QUESTION 10

Which of equations does not represent an example of Friedal-crafts reaction?

A. $C_6H_6 + C_2H_5Cl \xrightarrow[\text{(Anhy)}]{AlCl_3} C_6H_5C_2H_5 + HCl$

[✓ B.] $C_2H_5OH + HCl \xrightarrow{ZnCl_2} C_2H_5Cl + H_2O$

C. $\underset{\text{(Excess)}}{C_6H_6} + CHCl_3 \xrightarrow[\text{(Anhy)}]{AlCl_3} (C_6H_5)_3CH$

D. $C_6H_6 + CH_3CH_2COCl \xrightarrow[AlCl_3]{\text{Anhy}} C_6H_5COCH_2CH_3 + HCl$

ANSWER KEY

1. B
2. B
3. A
4. B
5. B
6. D
7. C
8. D
9. A
10. B

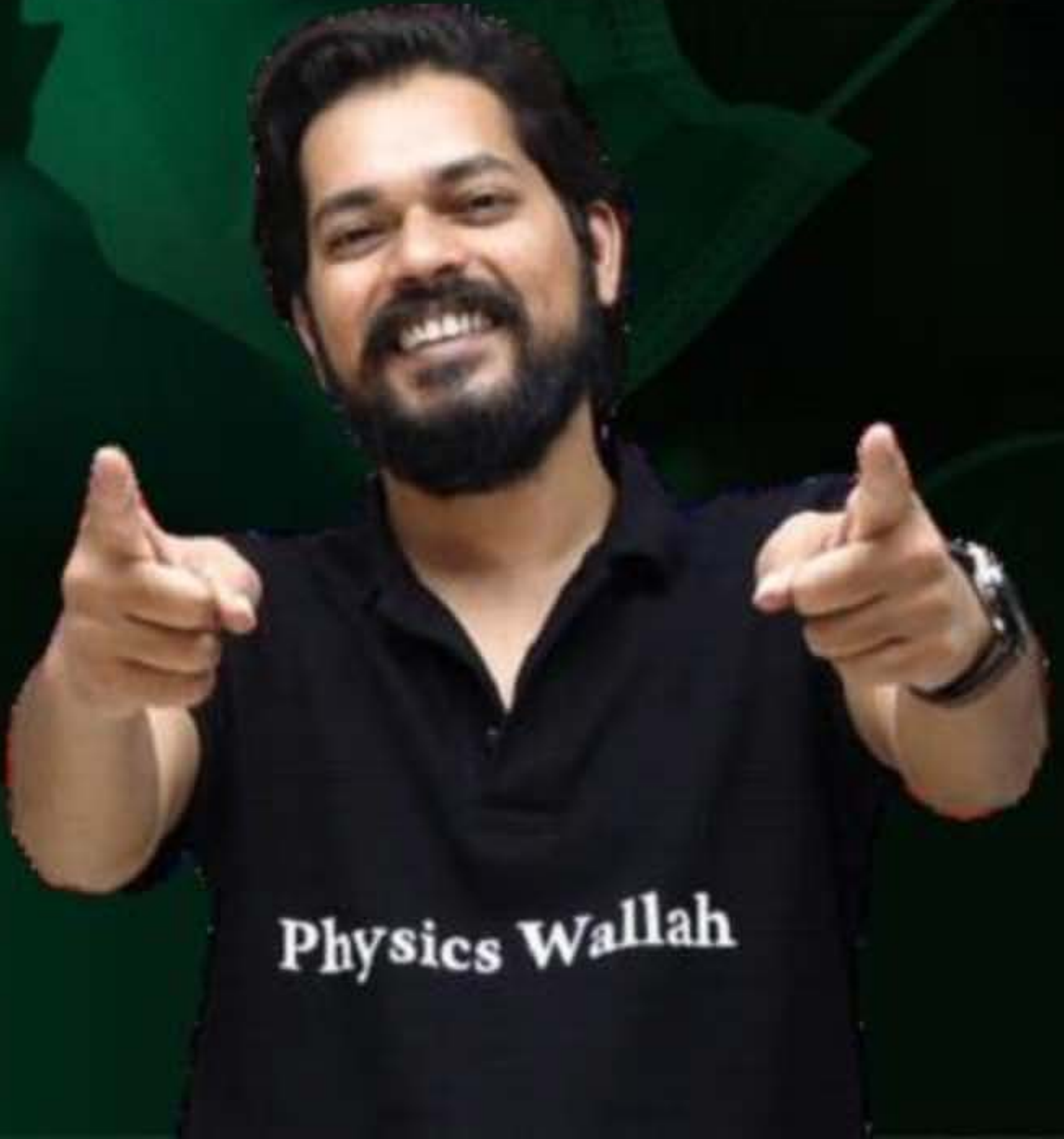
Thankyou!!

YAKEEN 2.0

FOR NEET 2025

Lecture- 01 | **Organic Chemistry**

Haloalkanes and Haloarenes


Physics Wallah

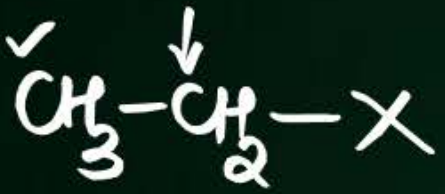
By- Pankaj Sir(POPU MAMA)

Topics *to be covered*

1. Basics/Introduction ✓
2. Methods of Preparation of Haloalkanes ✓
3. Practice

Basics

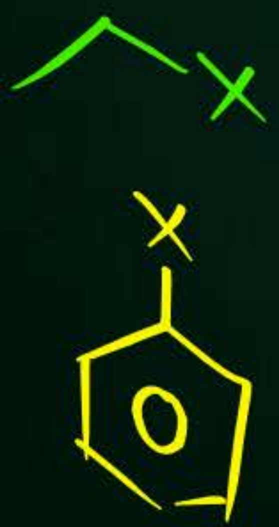
1° Halide



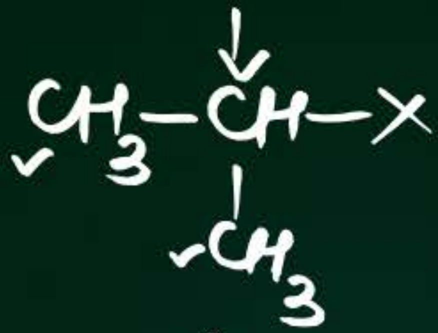
CH_3-CH_2-X

1°

Mono



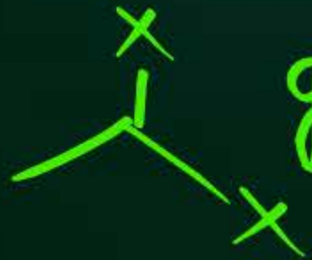
2° Halide



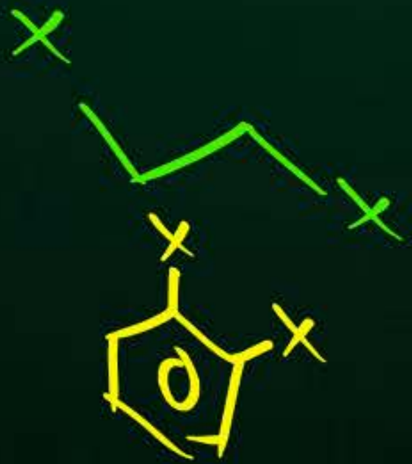
$CH_3-\underset{CH_3}{\underset{|}{CH}}-X$

2°

di

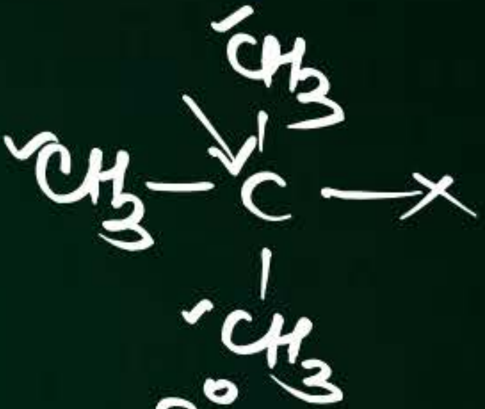


geminal



vicinal

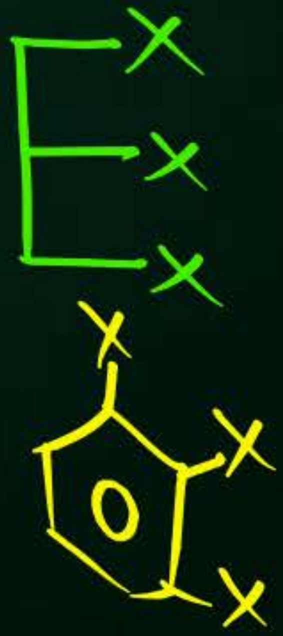
3° Halide



$CH_3-\overset{CH_3}{\overset{|}{\underset{CH_3}{\underset{|}{C}}}}-X$

3°

tri



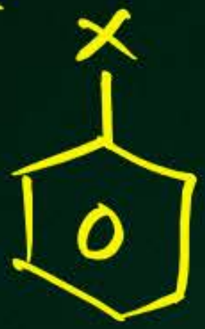
Allyl Halide $CH_2=CH-\overset{\downarrow}{CH_2}-X$

Vinyl Halide $CH_2=\overset{\downarrow}{CH}-X$

Phenyl Halide

Haloarene

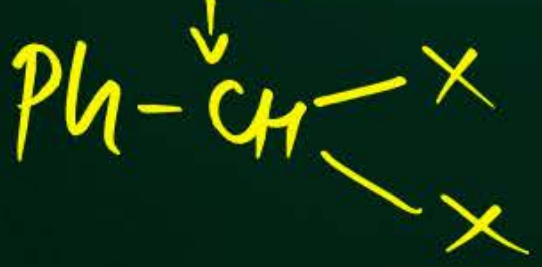
Aryl



$(Ph-X)$ or $(Ar-X)$

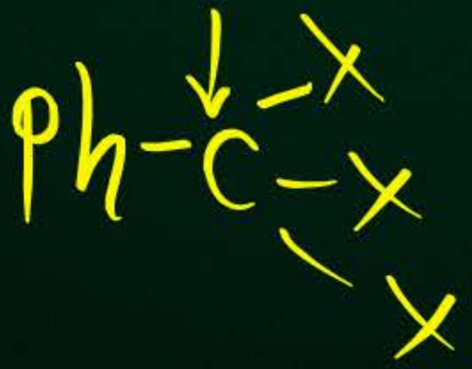
Benzyl Halide $Ph-\overset{\downarrow}{CH_2}-X$

Benzal Halide (Benzylidene)

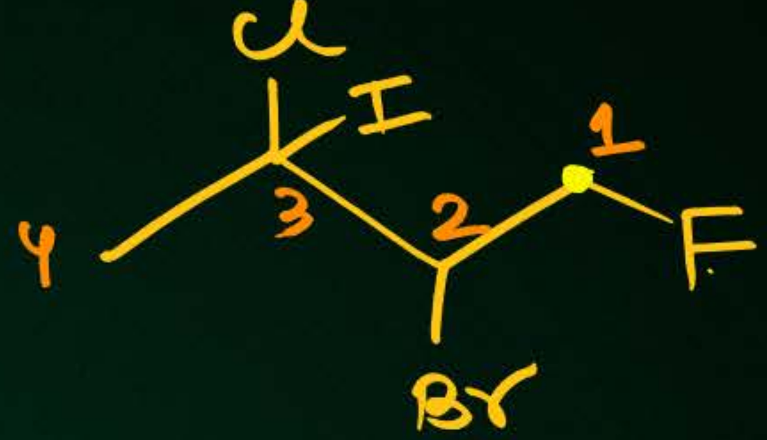


$Ph-\overset{\downarrow}{CH}(X)_2$

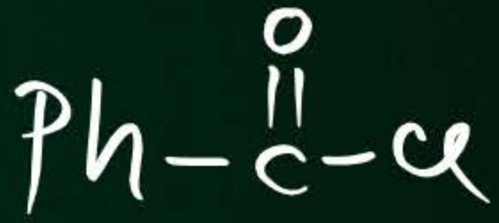
Benzylidyne



$Ph-\overset{\downarrow}{C}(X)_3$



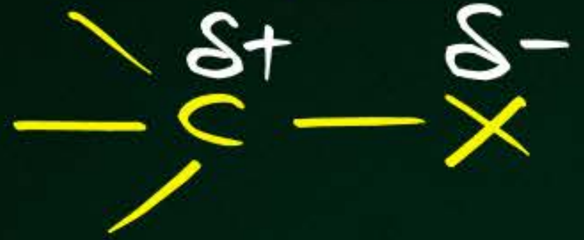
2-Bromo-3-chloro-1-fluoro-3-iodo butane



$Ph-\overset{O}{\overset{\|}{C}}-Cl$

Benzoyl chloride

Nature of C—X bond



$E\cdot N \quad C < X$

Bond energy $C-F \quad C-Cl \quad C-Br \quad C-I$

B·E $\overset{2p}{C}-\overset{2p}{F} > \overset{2p}{C}-\overset{3p}{Cl} > \overset{2p}{C}-\overset{4p}{Br} > \overset{2p}{C}-\overset{5p}{I}$ (size diff ↑ BE ↓)

B·L $C-F < C-Cl < C-Br < C-I$ (BE ↓ B·L ↑)

Bond length

D·M

(Dipole moment)

$CH_3-Cl > CH_3-F > CH_3-Br > CH_3-I$

~~$CH_3F > CH_3Cl > CH_3Br > CH_3I$~~

$D\cdot M(\mu) = \underbrace{q\times d}_{}$

$(q\times d)_{C-Cl} > (q\times d)_{C-F}$

Methods of Preparation of Haloalkanes

$H-X \rightarrow H^+ + X^-$

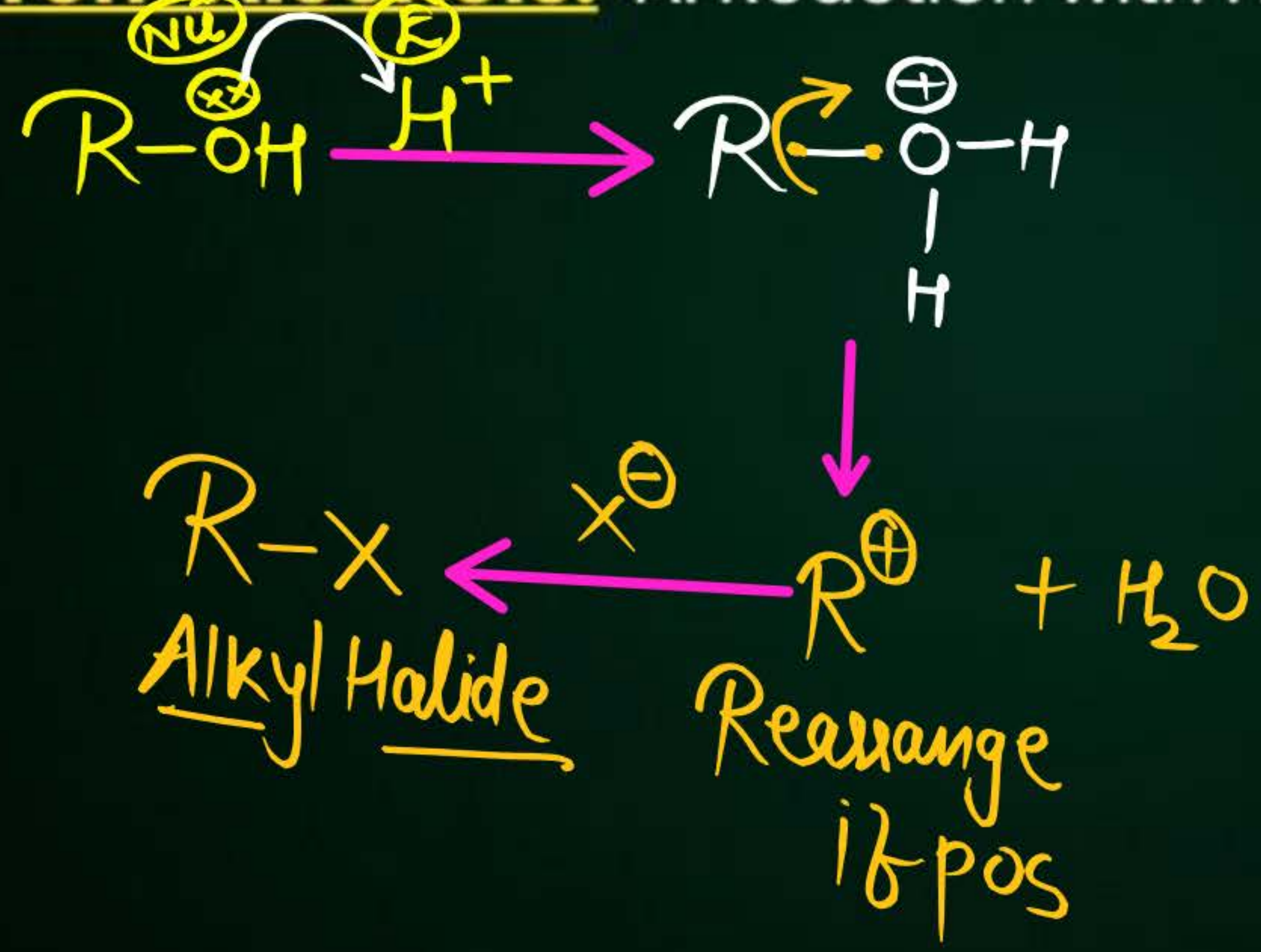
1. A. From Alcohols: A. Reaction with HX/ZnCl$_2$

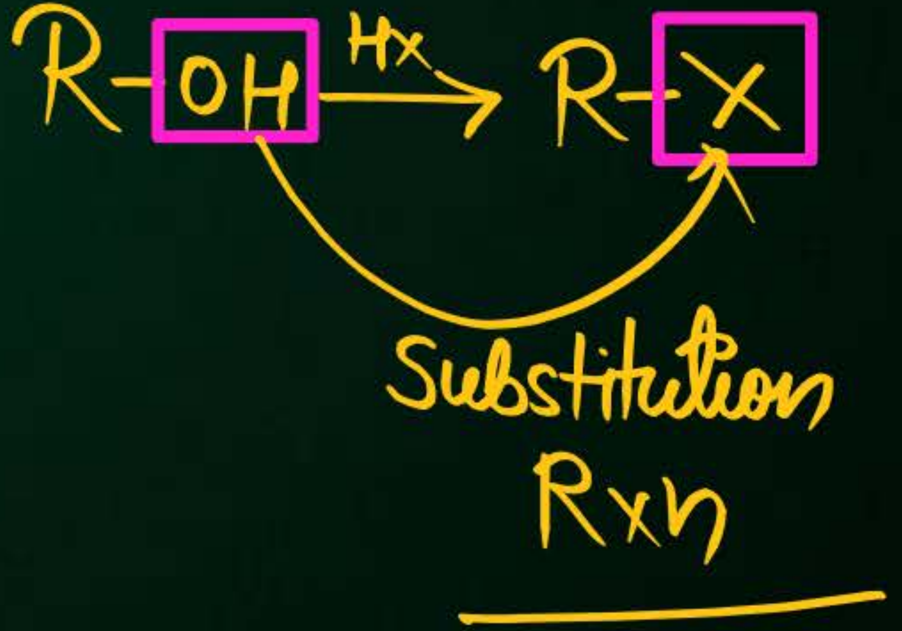
→ Catalyst used for (1° & 2° Alcohol)

↓ Catalyst Must

↘ kabhi kabhi na likhen toh bhi chalega.

Mech


Nu
E
R–OH
H^+
R–$\overset{\oplus}{O}$–H
H
R–X
$X^\ominus$
$R^\oplus$ + H_2O
Alkyl Halide
Rearrange if pos


R–OH
HX
R–X
Substitution Rxn

op point

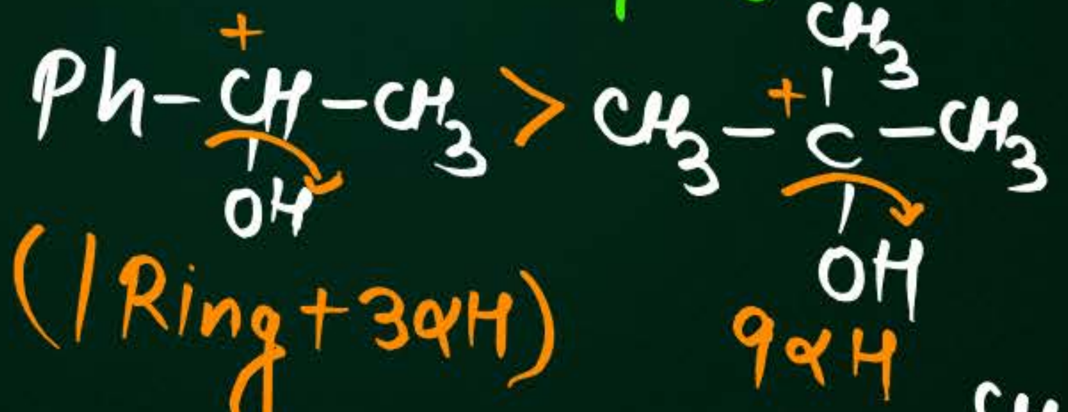
① Carbocation formation

② Rearrange if possible

③ R·O·R w·r·t HX $\overset{+}{H}I > \overset{+}{H}Br > \overset{+}{H}Cl$ HXF (HF is a weak acid)

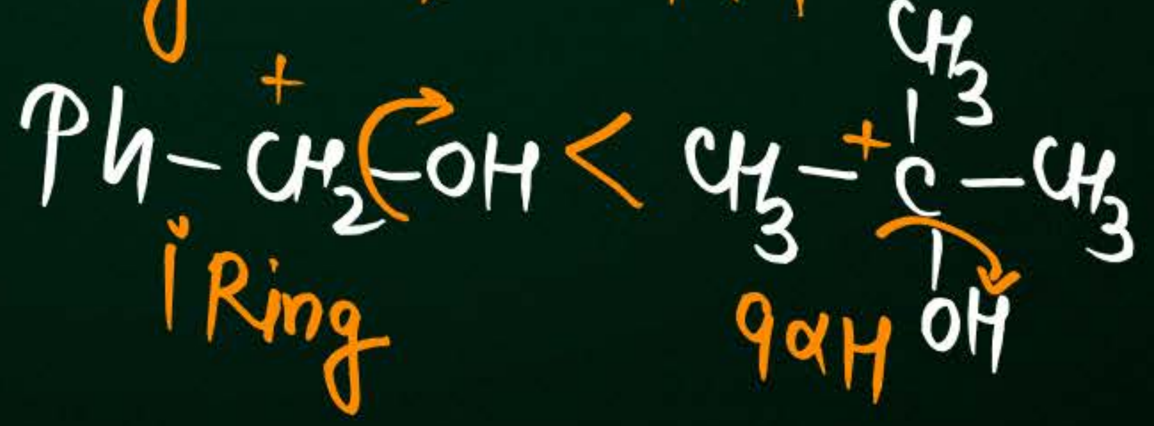
BE↓ ROR↑

④ R·O·R w·r·t R–OH   ROR ∝ stability of 1st C⊕   ($3° > 2° > 1°$) (Simple alkyl)



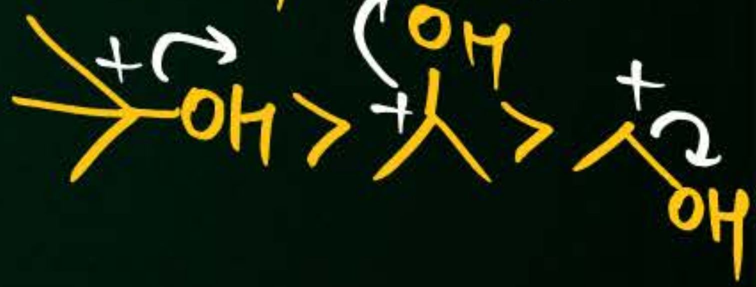
$$Ph-\underset{OH}{\overset{+}{C}H}-CH_3 > CH_3-\underset{OH}{\overset{CH_3}{\overset{+}{C}}}-CH_3$$

(1 Ring + 3αH)   9αH



$$Ph-\overset{+}{C}H_2-OH < CH_3-\underset{OH}{\overset{CH_3}{\overset{+}{C}}}-CH_3$$

1° Ring   9αH



⑤ Alkyl fluoride is not prep by this method.

⑥ for Alkyl chloride & bromide HCl , HBr

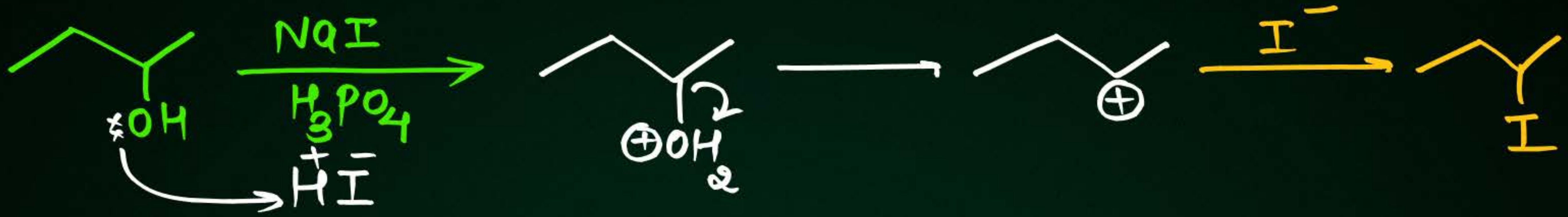
$$\left(\underbrace{NaBr + H_2SO_4}_{HBr + NaHSO_4}\right)$$

⑦ for Alkyl iodide $\underline{\underline{HI}}$

$$\left(\underbrace{\begin{matrix}NaI\\ \text{or}\\ KI\end{matrix} + H_3PO_4}_{\underline{\underline{HI}} + \underset{K}{Na}H_2PO_4}\right)$$

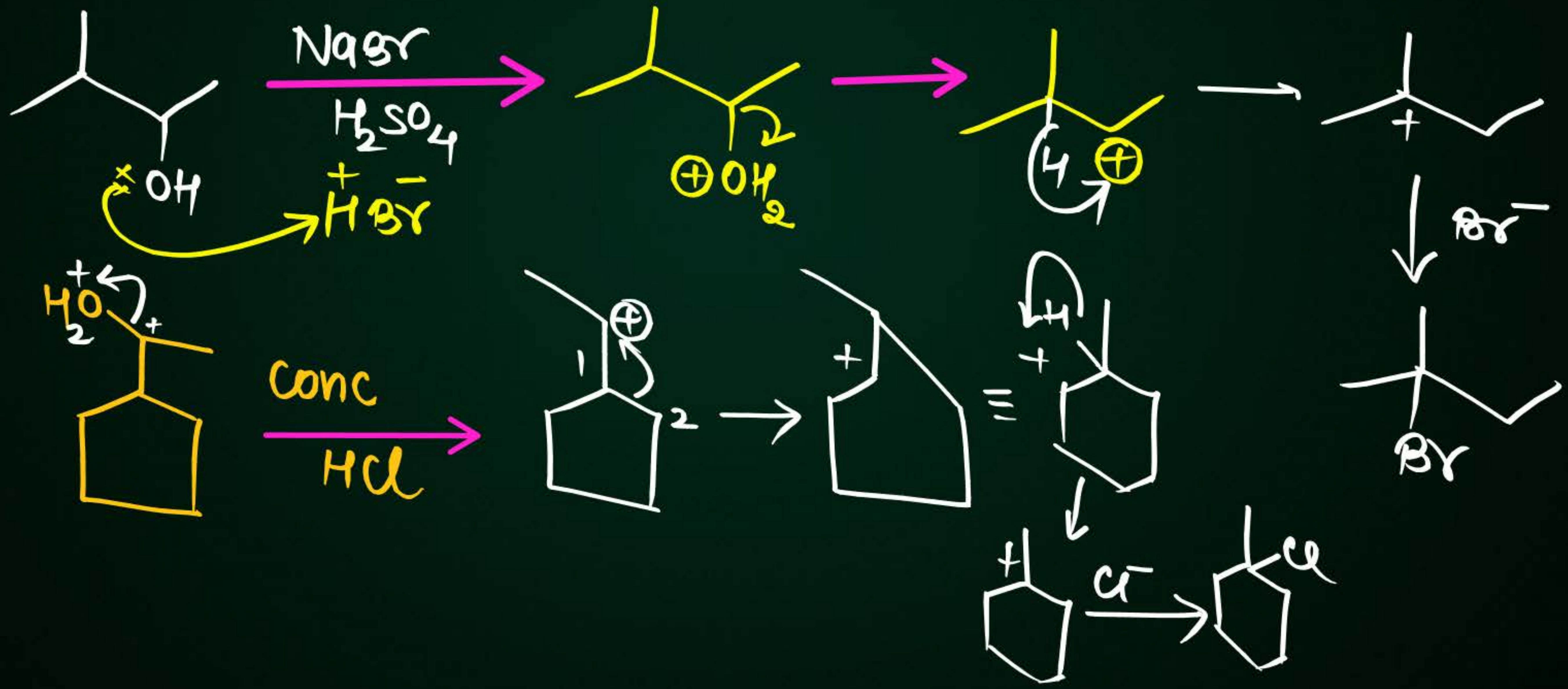
$$\# \quad \underbrace{\begin{matrix}KI\\ \text{or}\\ NaI\end{matrix} + H_2SO_4}_{I_2} \text{ is } \underline{\underline{\text{not}}} \text{ used}$$

Q


OH
NaI
H_3PO_4
$\overset{+}{H}\overset{-}{I}$
$\oplus OH_2$
⊕
I^-
I

Q

Q


OH
NaBr
H_2SO_4
$\overset{+}{H}\overset{-}{Br}$
$\oplus OH_2$
H
⊕
+
Br^-
Br
$H_2\overset{+}{O}$
+
conc
HCl
⊕
1
2
+
≡
H
+
+
Cl^-
Cl

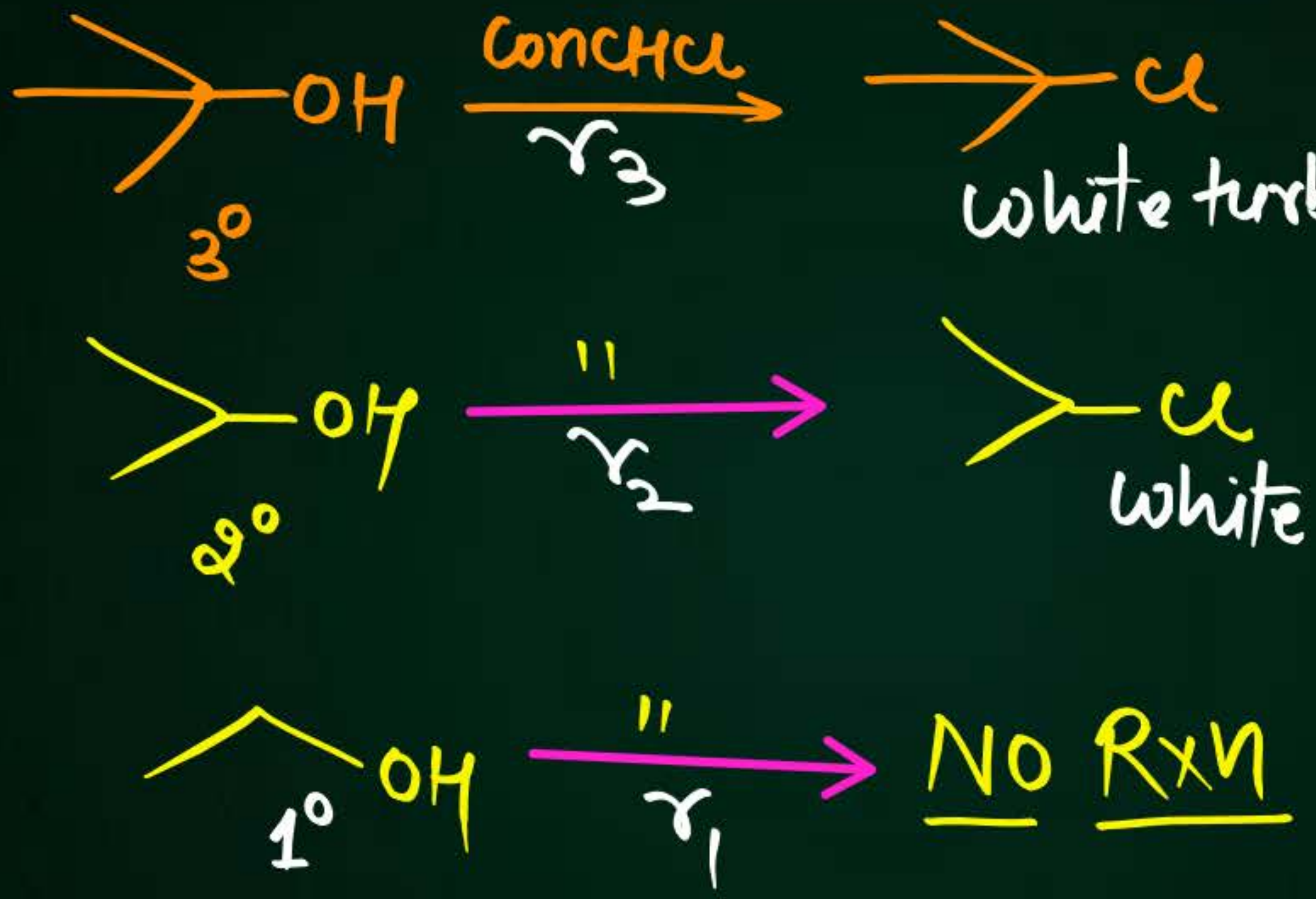
Lucas's Test: For Alcohols

To ditinguish b/w 1°, 2°, 3°

Lucas reagent: Conc. HCl / Anhyd. $ZnCl_2$

R.O.R

$(r_3 > r_2 > r_1)$


OH
conc HCl
r_3
Cl
3°
OH
"
r_2
Cl
2°
OH
1°
"
r_1

white turbidity in sec (immediate)

white turbidity in min

No Rxn or Long time

Q Turbidity in Lucas Test

1st check $C^{\oplus}$

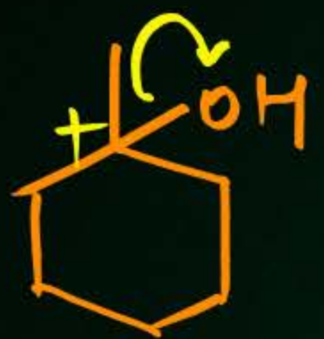
$3^\circ C^+$ sec

$2^\circ C^+$ min

$1^\circ C^+$ L.T

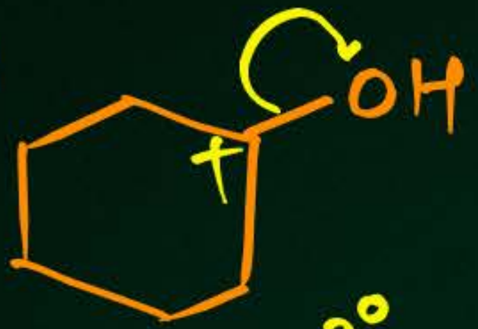
(No turbi)

1)



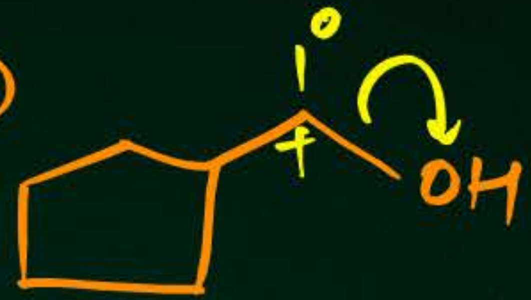
3° sec

2)



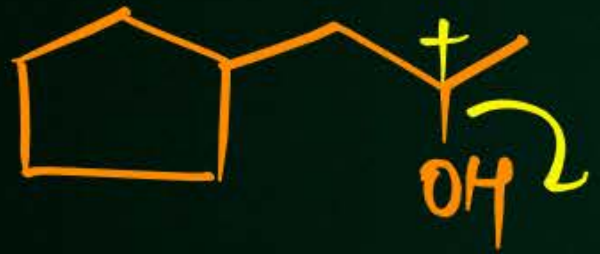
min 2°

3)



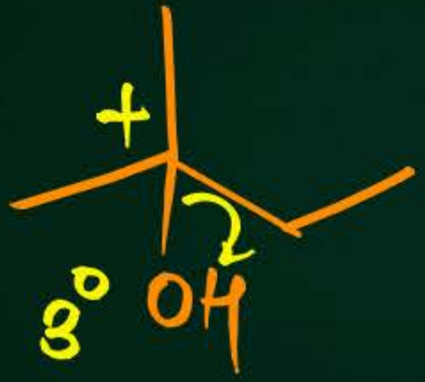
NO

4)



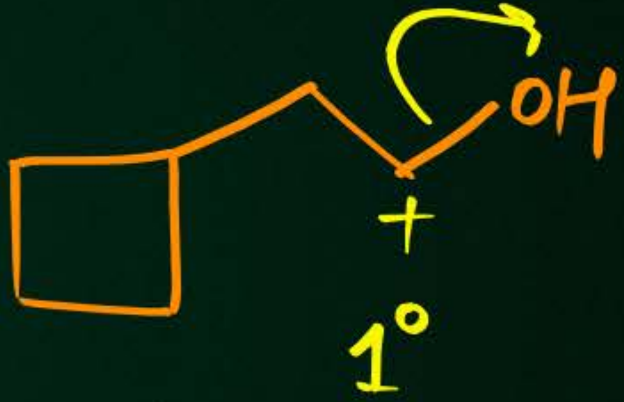
2° Min

5)



Sec

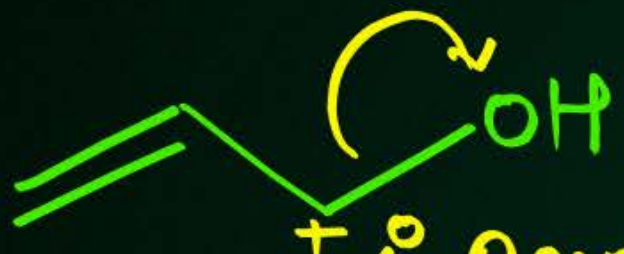
6)



NO

op point

① R.O.R ∝ stability of 1st $C^{\oplus}$

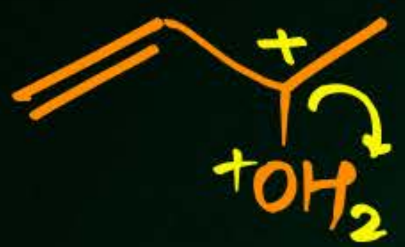


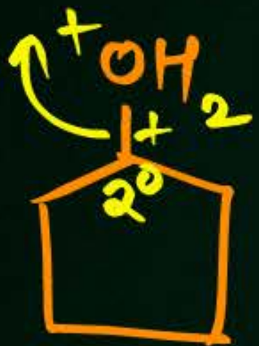
1° Reso

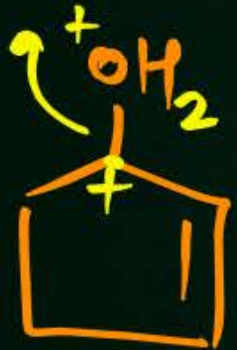
~~NO~~ Sec

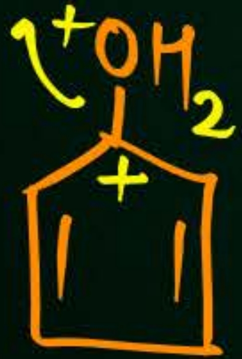
Sec	Min	NO
3° R simple Reso stabilized $3^{\circ}, 2^{\circ}$ & 1° $C^{\oplus}$	2° R simple	1° R simple

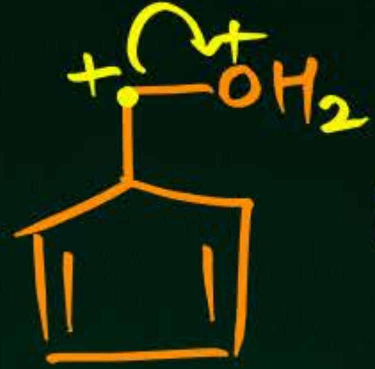
Q Turbidity in Lucas Test

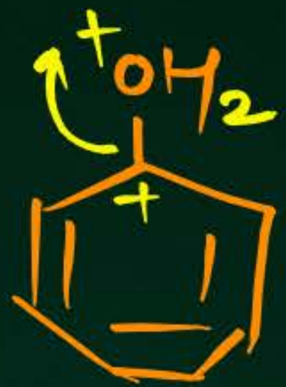
①

Reso 2°
sec

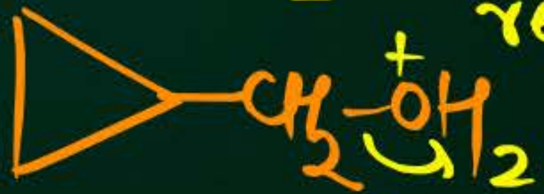
②

simple 2°
Min

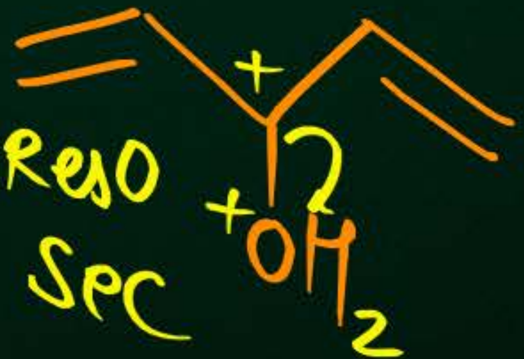
③

Reso 2°
sec

④

2°
Anti Aro
NO

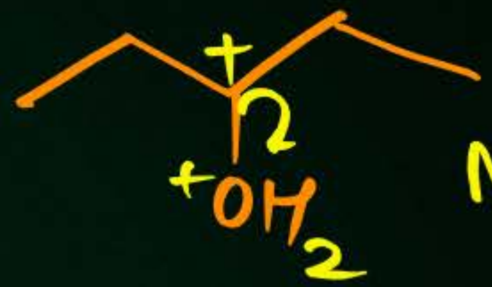
5)

simple 1°
NO

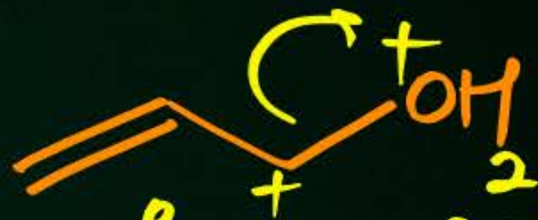
6)

2°
Aro
sec

7)

1° Dancing reso
sec

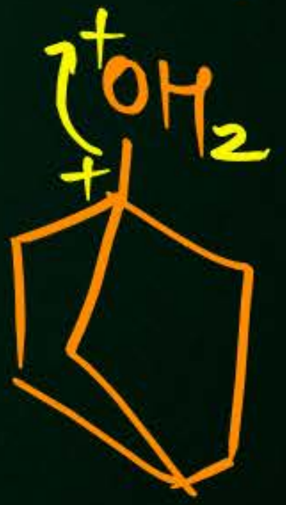
8)

2° Reso
sec

2° simple

9)

Min

10)

1° Reso sec

11) $Ph-\overset{+}{C}H_2-\overset{+}{O}H_2$
1° Reso
sec

12)

3°
Bredt's rule
NO

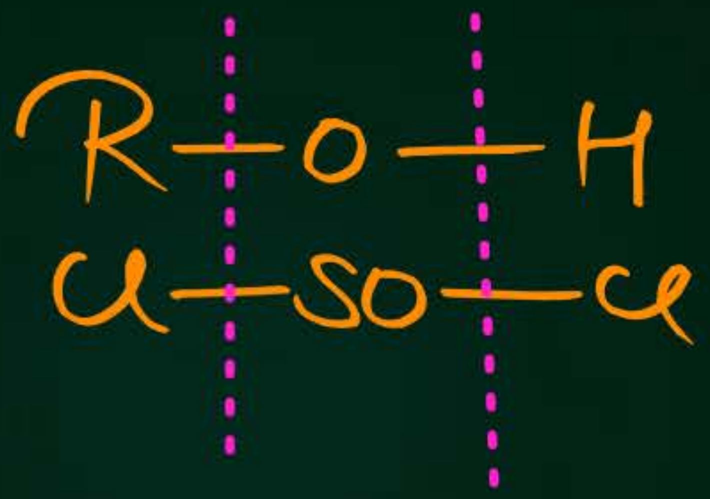
From Alcohol without rearrangement:

B. Darzen's Reaction:

$$R-OH \xrightarrow[\text{(Thionyl chloride)}]{SOCl_2} R-Cl + SO_2\uparrow + HCl\uparrow$$

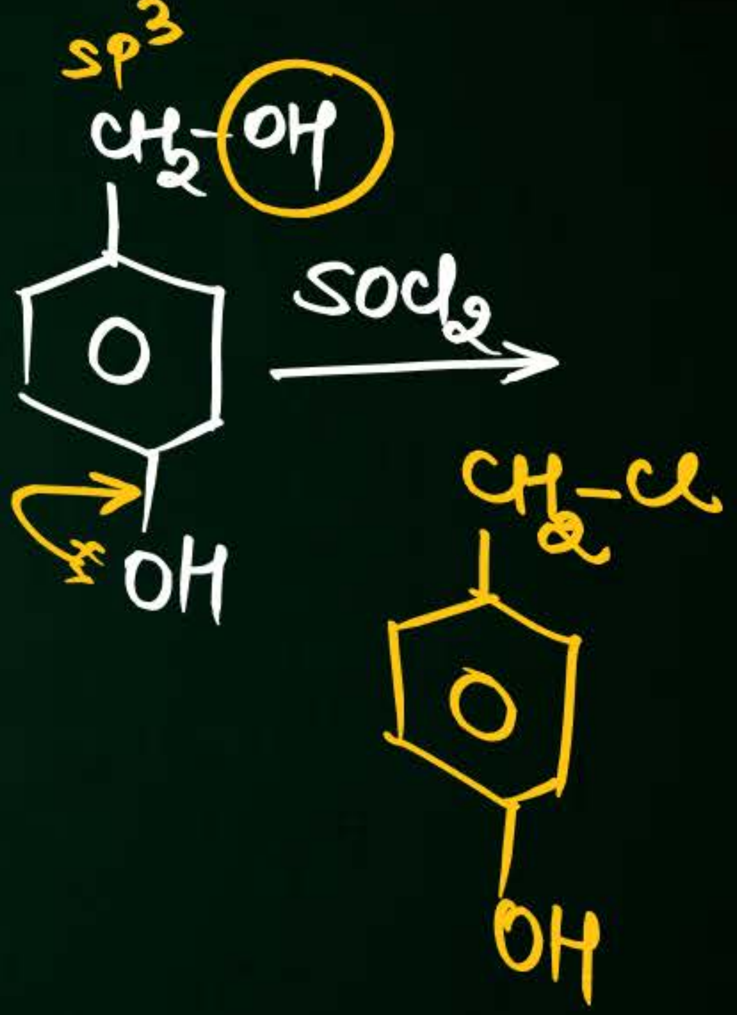
Best M.O.P of R–Cl

because SO_2 & HCl are gases & can easily escape out



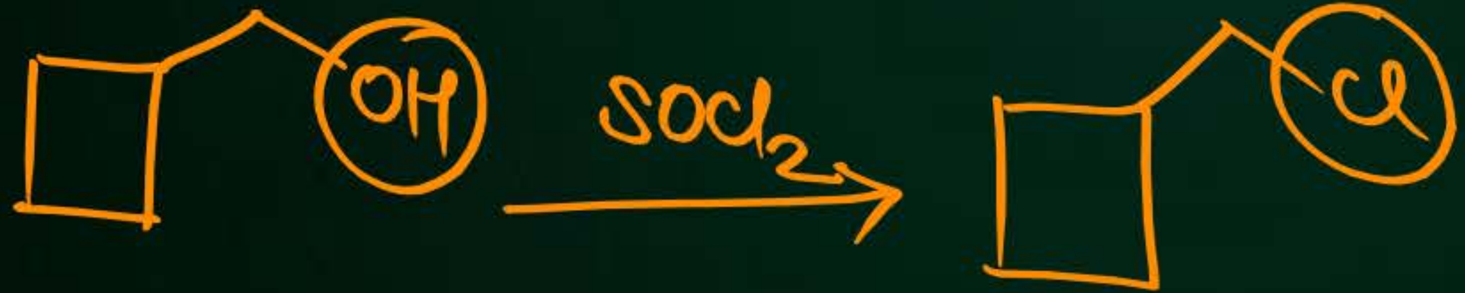
D.M :– $R-\boxed{OH} \longrightarrow R-\boxed{Cl}$

Q

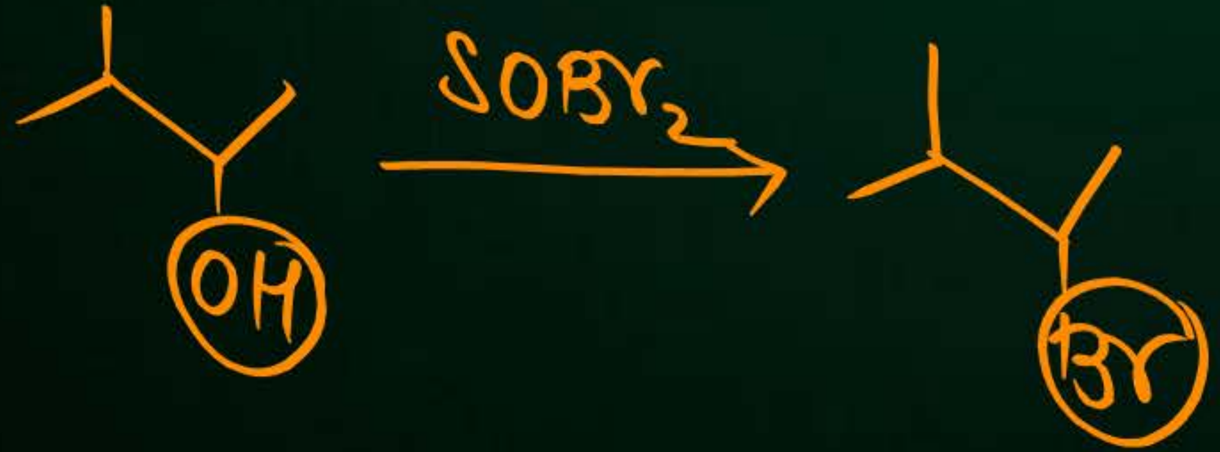


sp3
CH2–OH
SOCl2
OH
CH2–Cl
OH

Q 1)

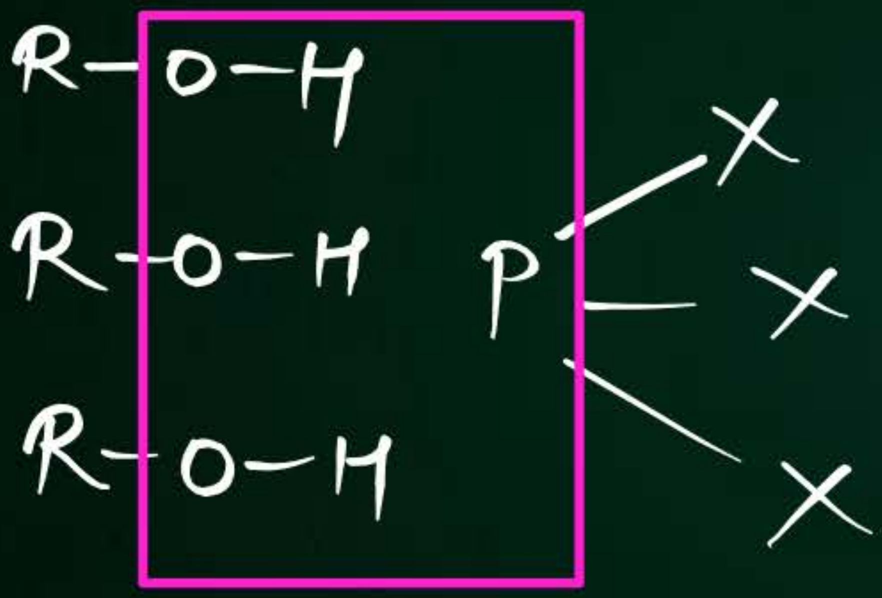


2)



C. Reaction with PX_3 and Red P/X_2:

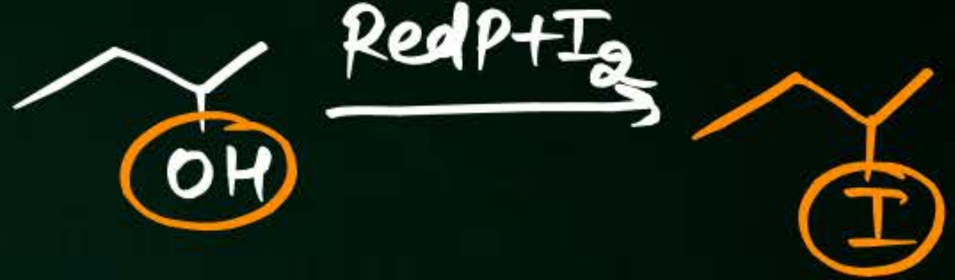
$$3R-OH \xrightarrow{PX_3} 3R-X + H_3PO_3$$

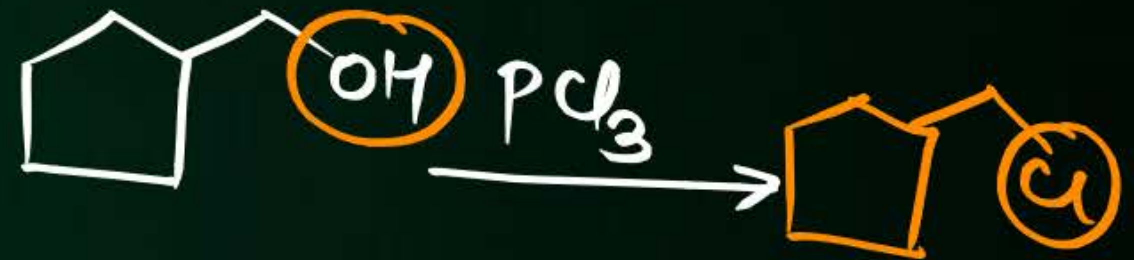


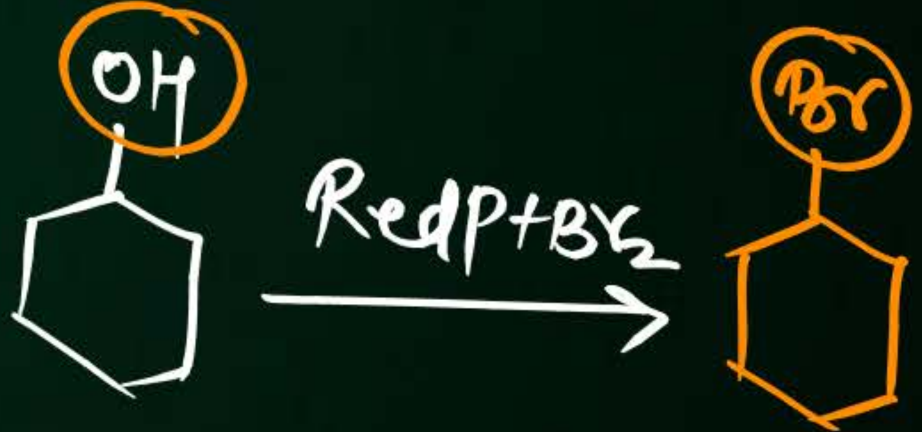
R–O–H
R–O–H
R–O–H
P
X
X
X

D·M $R-OH \longrightarrow R-X$

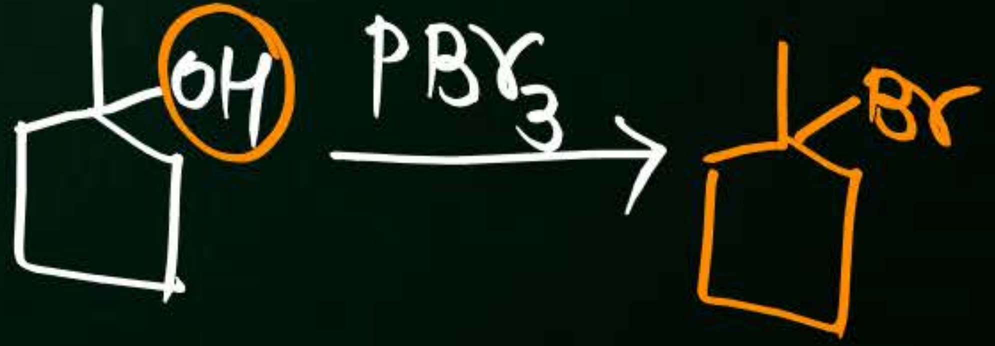
Q

1)


2)


3)


OH
Red P + Br_2
Br

4)


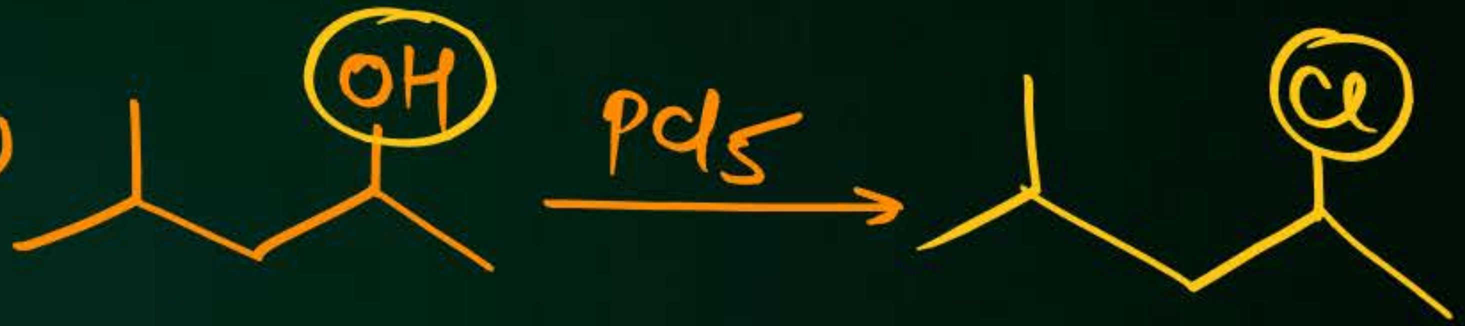
D. Reaction with PCl$_5$:

$$R-OH \xrightarrow{PCl_5} R-Cl + POCl_3 + HCl$$

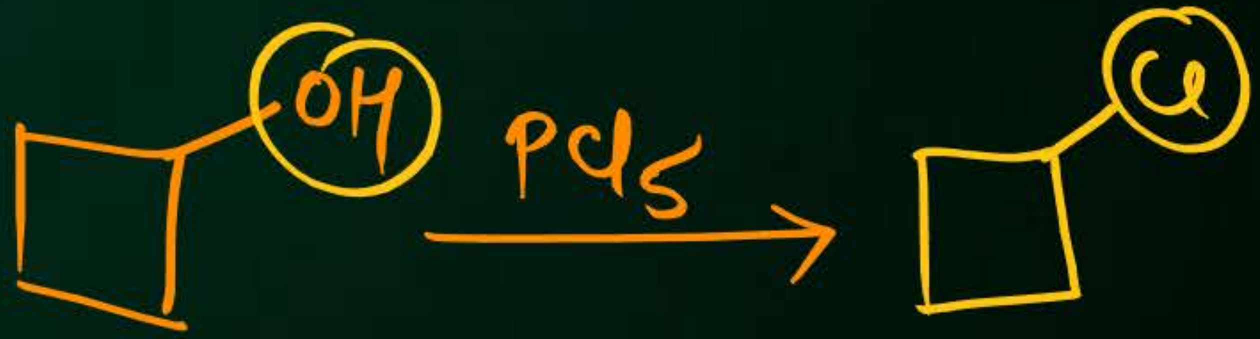
$$\begin{array}{c} R \vdots - O - \vdots H \\ Cl \vdots - PCl_3 - \vdots Cl \end{array}$$

D.M $\quad R-\boxed{OH} \longrightarrow R-\boxed{Cl}$

Q①



2)



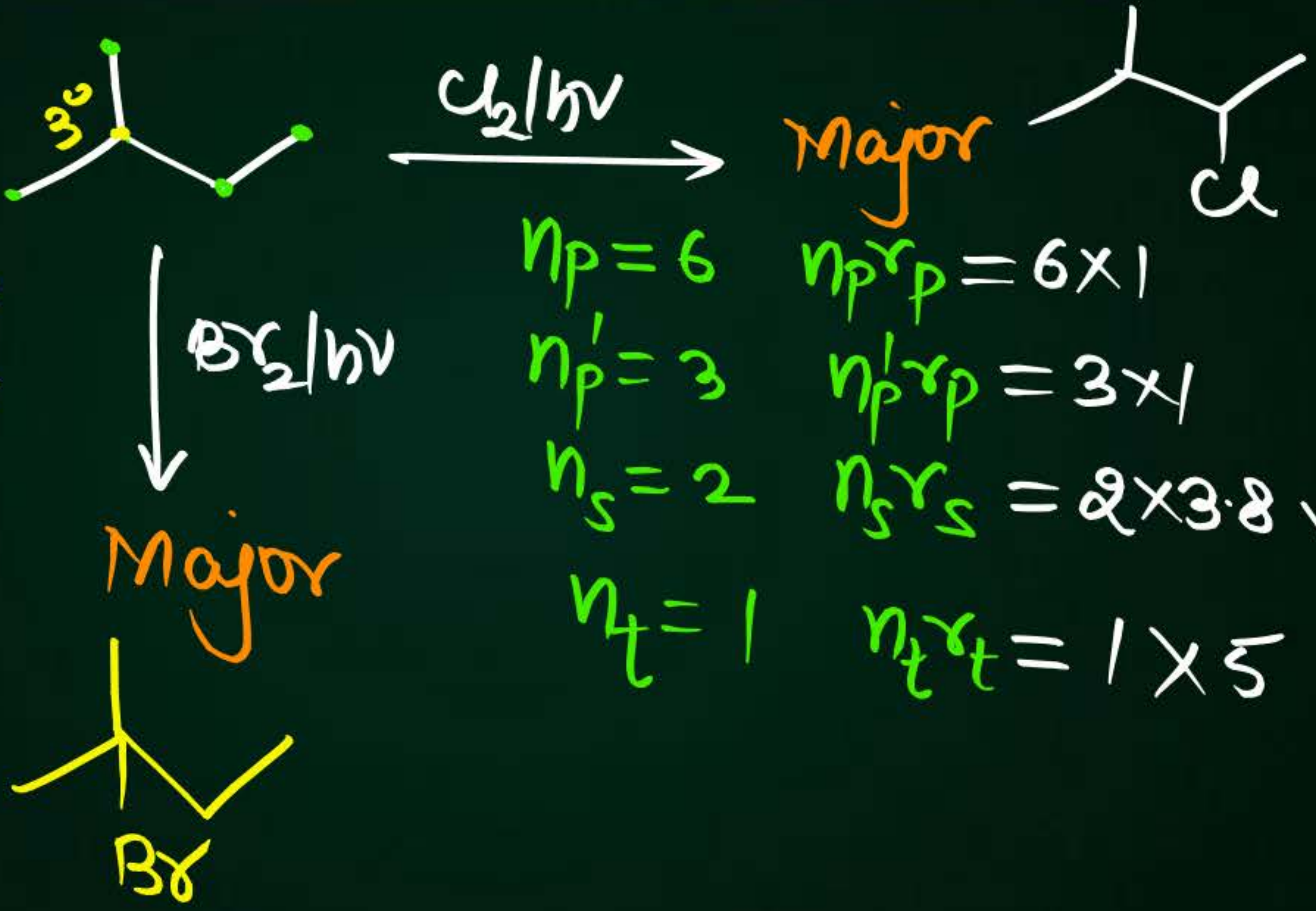
2. From Hydrocarbons:

$r_p = 1$ $r_s = 3.8$ $r_t = 5$

A. From alkanes by free radical halogenation:

Pad chukke ho

$3^\circ > 2^\circ > 1^\circ$



3°
$Cl_2/h\nu$
Major
Cl
$Br_2/h\nu$
Major
Br

$n_p = 6$ $n_p r_p = 6 \times 1$

$n_p' = 3$ $n_p' r_p = 3 \times 1$

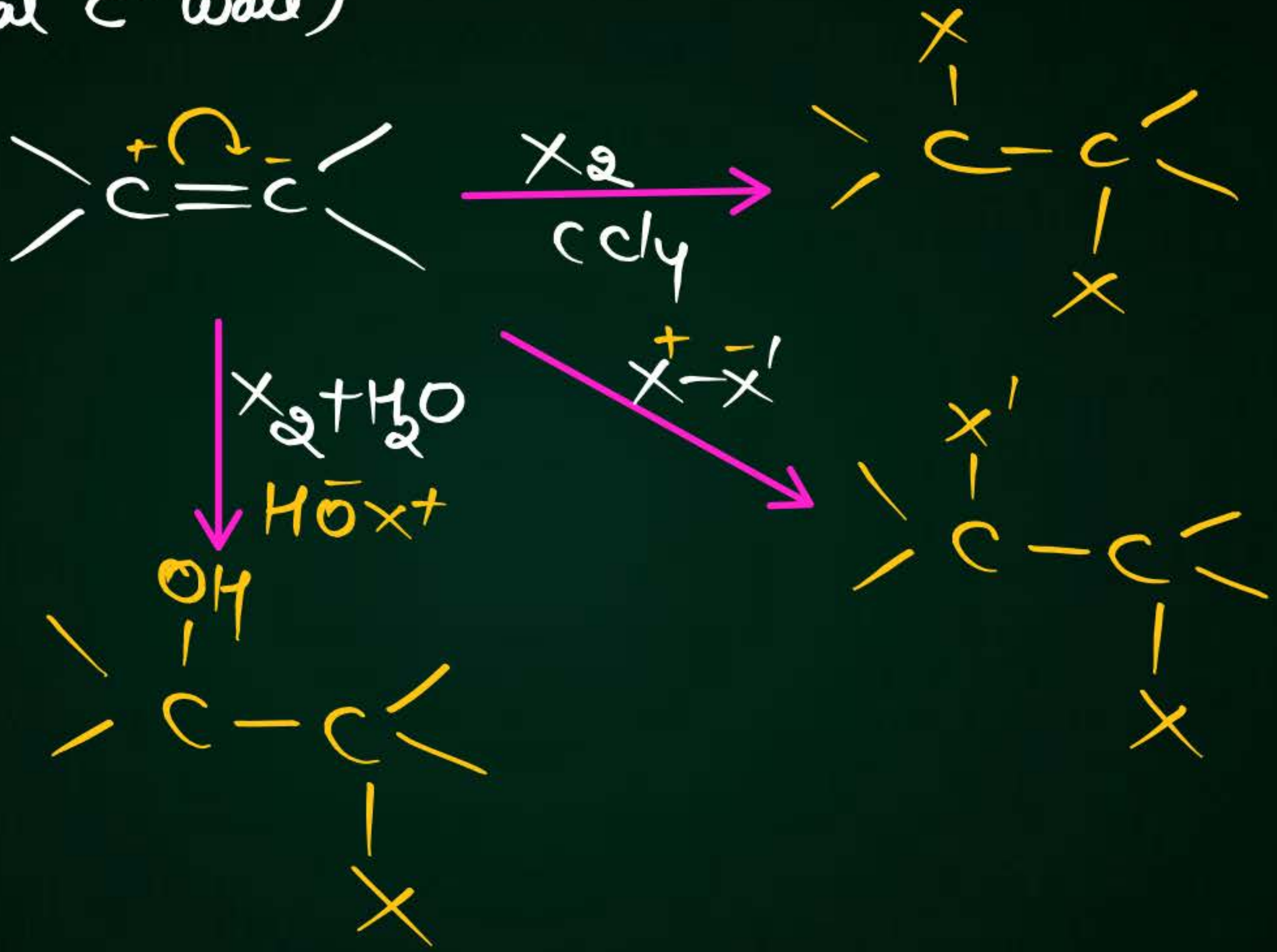
$n_s = 2$ $n_s r_s = 2 \times 3.8$ ✓

$n_t = 1$ $n_t r_t = 1 \times 5$

B. From Halogenation of Alkenes:

(Non classical $C^{\oplus}$ wali)

Pad chuka hain

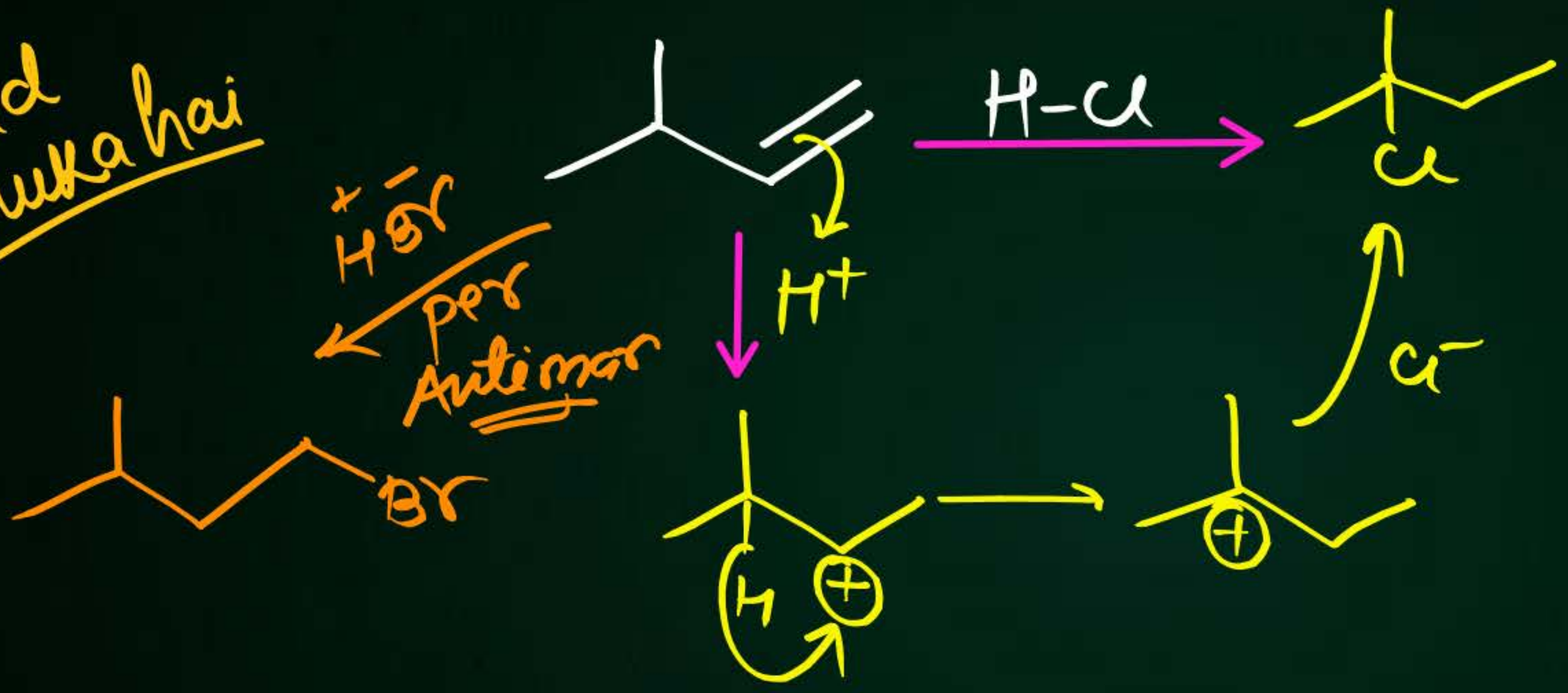


X_2
CCl_4
$X_2 + H_2O$
$H\bar{O}X^+$
$\overset{+}{X}-\overset{-}{X'}$
OH
X
X
X
X'
X

C. From Hydrohalogenation of Alkenes:

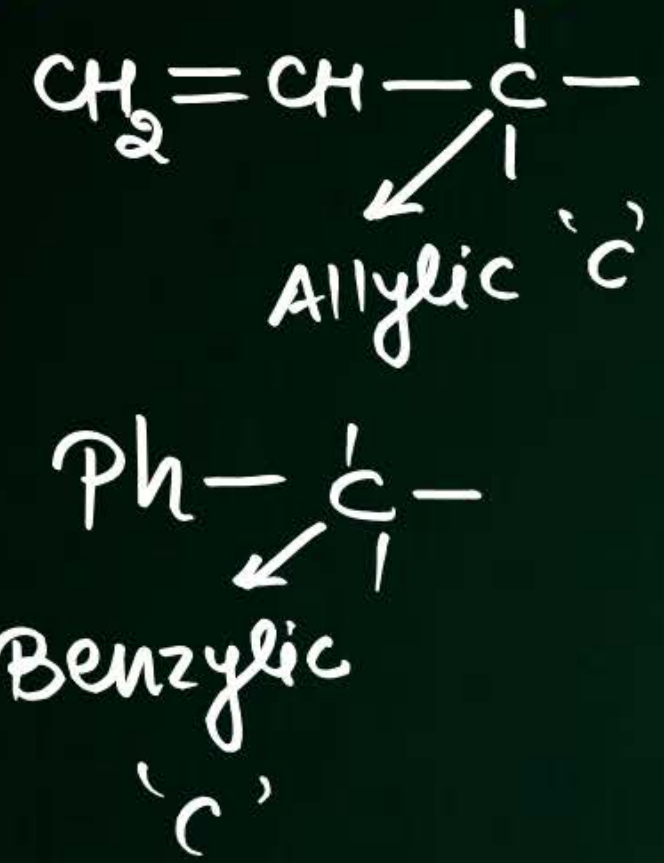
HX (Classical C^+ wali) (Rearrange if pos)

Pad chuka hai


H–Cl
H+
Cl
Cl−
H
+
+
$\overset{+}{H}\overset{-}{Br}$
per
Antimar
Br

D. Allylic & Benzylic Substitution

Reagent (Light, High temp)

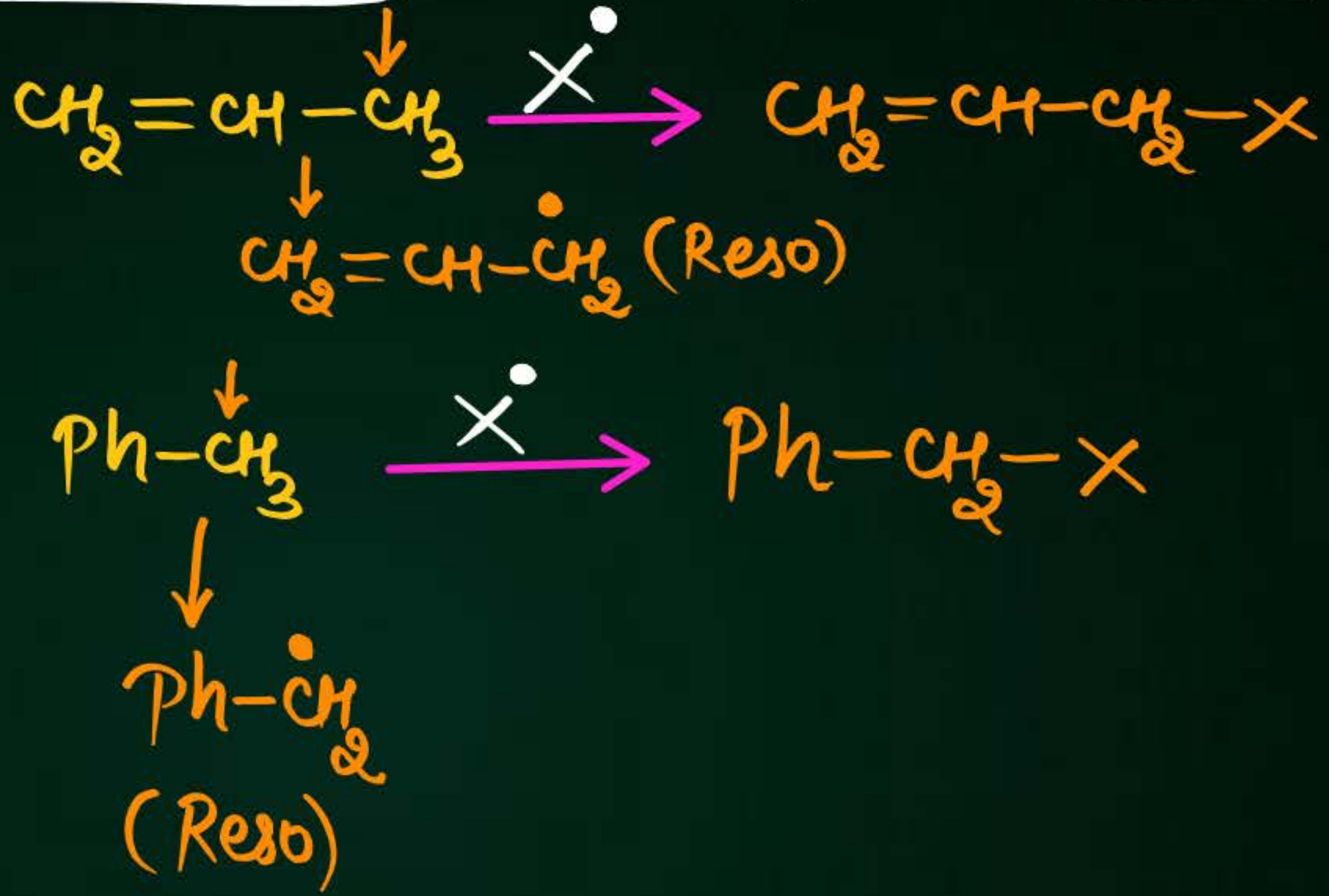


$CH_2=CH-\overset{|}{\underset{|}{C}}-$

Allylic 'C'

$Ph-\overset{|}{\underset{|}{C}}-$

Benzylic 'C'



$CH_2=CH-CH_3 \xrightarrow{X^\bullet} CH_2=CH-CH_2-X$

$CH_2=CH-\dot{C}H_2$ (Reso)

$Ph-CH_3 \xrightarrow{X^\bullet} Ph-CH_2-X$

$Ph-\dot{C}H_2$

(Reso)

FRAR

HBr/peroxide

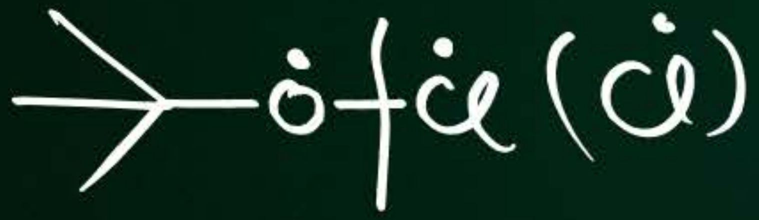
Reagents for Allylic or benzylic substitution

Chlorination

$Cl_2/h\nu$ ($\dot{Cl}$)

$Cl_2/500°C$ ($\dot{Cl}$)

tertiary Butyl oxychloride tBuO–Cl

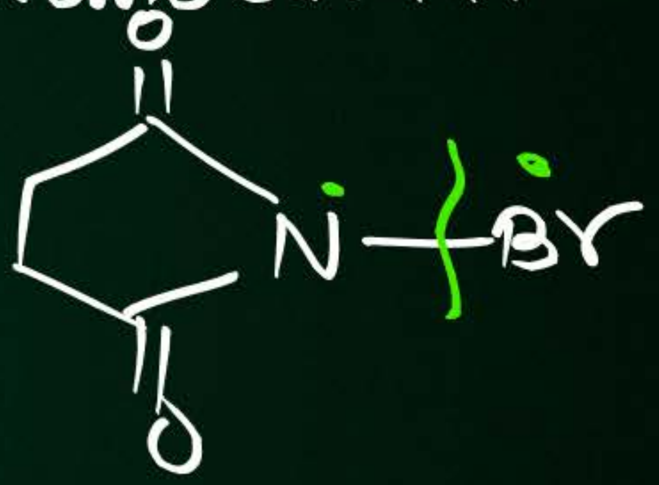


$\dot{O}$
$\dot{Cl}$
($\dot{Cl}$)

Bromination

$Br_2/h\nu$ ($\dot{Br}$)

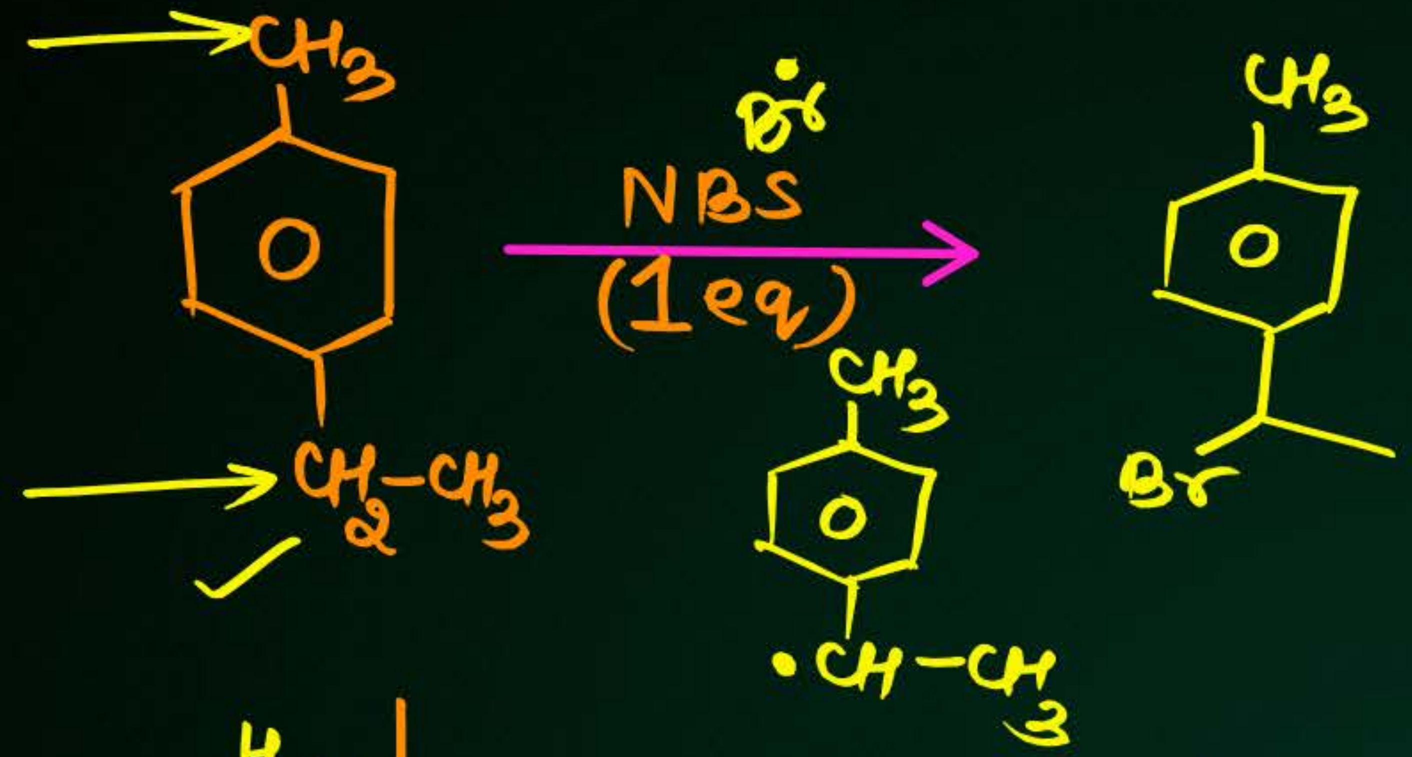
NBS (N-bromo succinamide)



O
O
$\dot{N}$
$\dot{Br}$

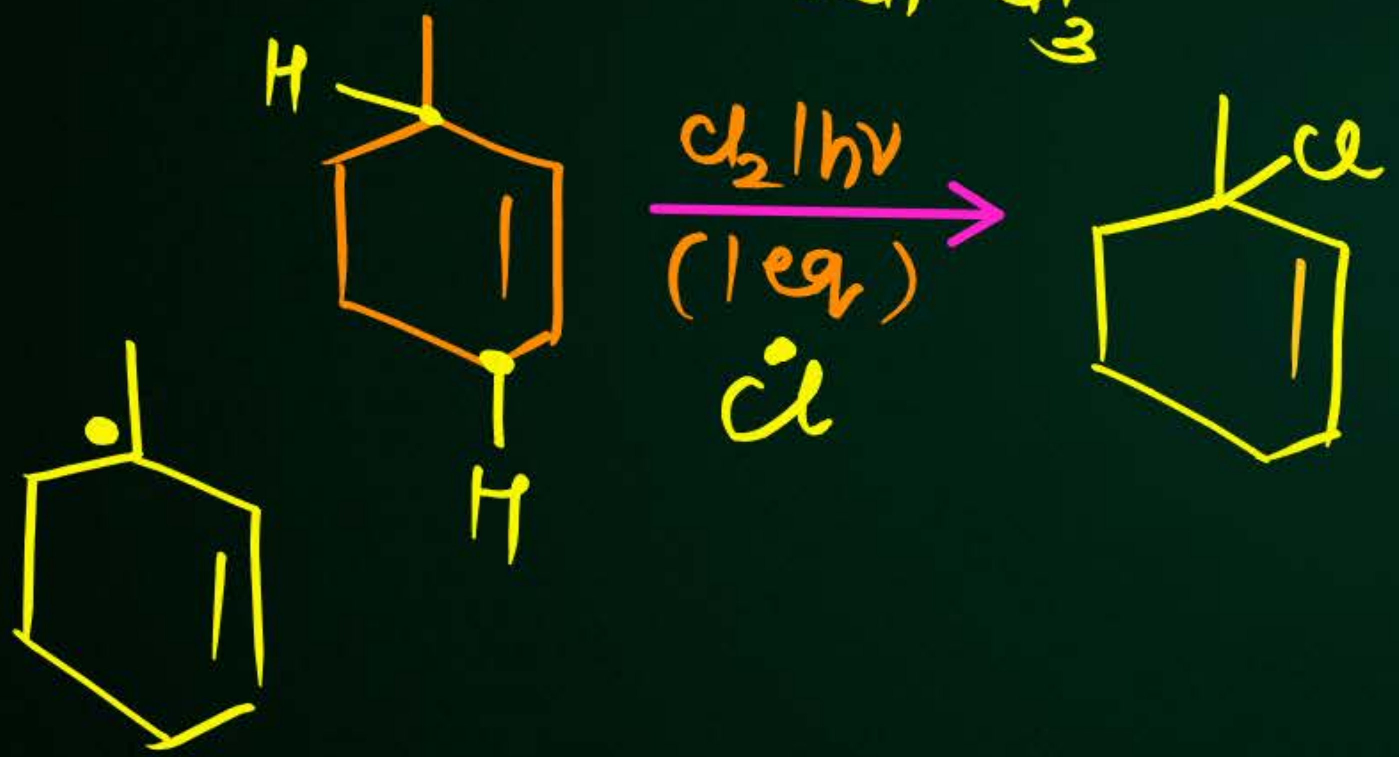
($\dot{Br}$)

Q



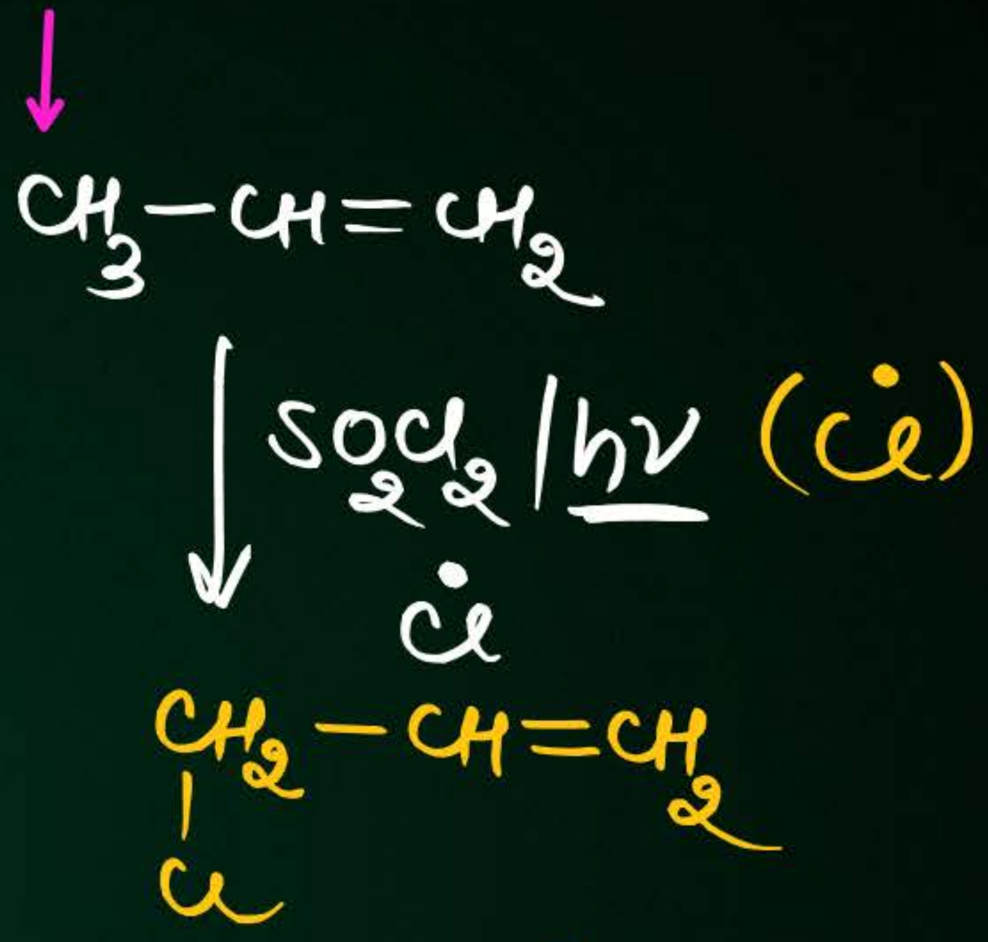
CH₃
CH₂–CH₃
Br•
NBS
(1eq)
CH₃
•CH–CH₃
CH₃
Br

Q



H
H
Cl₂/hν
(1eq)
Cl•
Cl

Q



$$CH_3-CH=CH_2 \xrightarrow[\dot{Cl}]{SO_2Cl_2/h\nu\ (\dot{Cl})} \underset{\displaystyle Cl}{CH_2}-CH=CH_2$$

(SO_2Cl_2
sulphuryl
chloride)

3. From Halogen Exchange: A. Finkelstein reaction

R–F ×
C–F BE ↑

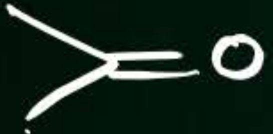
(X = Cl, Br)

for prep of Alkyl iodide

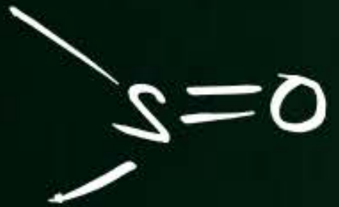
$$R-X \xrightarrow[\text{acetone or DMSO}]{NaI} R-I + NaX$$

acetone or DMSO } solvent

acetone



DMSO
dimethyl
sulfoxide

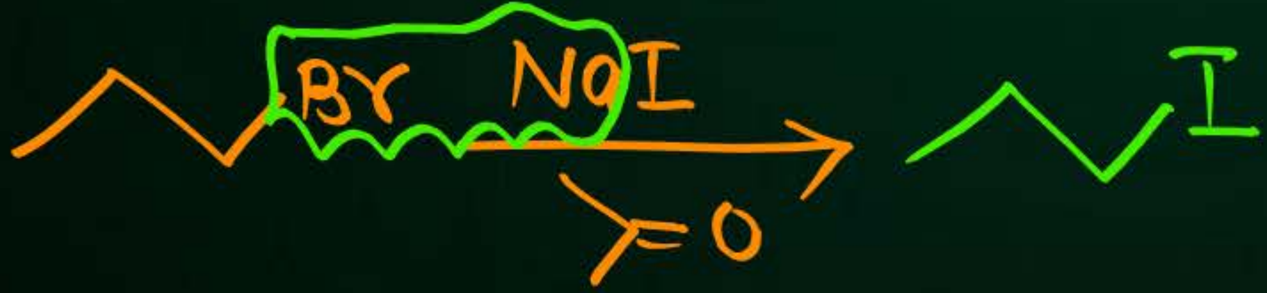


NaCl, NaBr are usually form ppt in dry acetone or DMSO

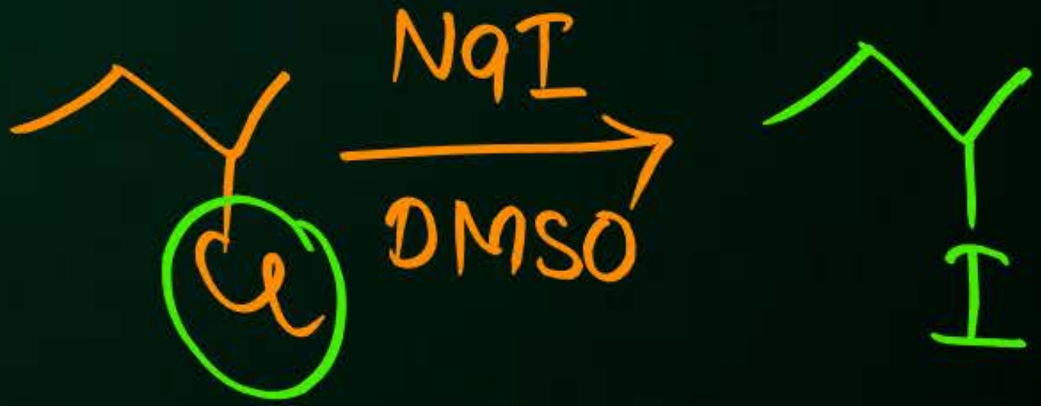
D.M

$R-X \longrightarrow R-I$

①



②



B. Swarts reaction

for Alkyl fluoride

$$R-\boxed{X \xrightarrow{Ag} F} \longrightarrow R-F + AgX\downarrow$$

ppt

$(X = Cl, Br, I)$

Other Reagents ÷ Inorganic fluoride

(p & d)

Hg_2F_2

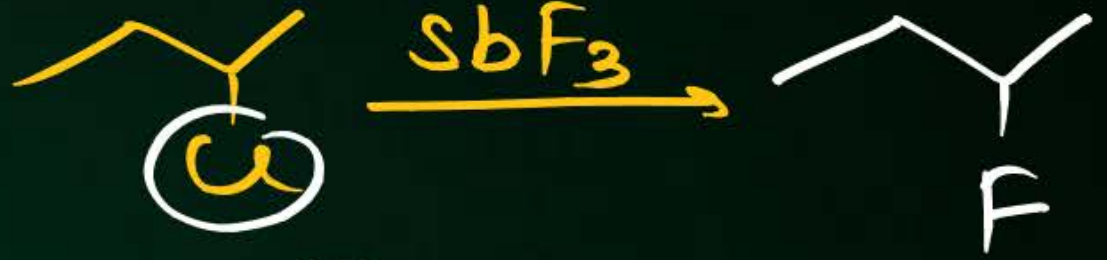
CoF_2

SbF_3

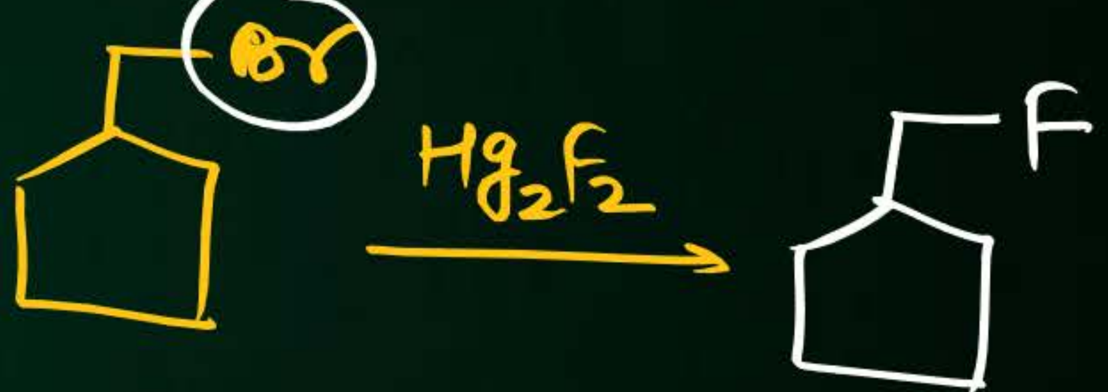
DM ÷ $R-\textcircled{X} \longrightarrow R-\textcircled{F}$

Q

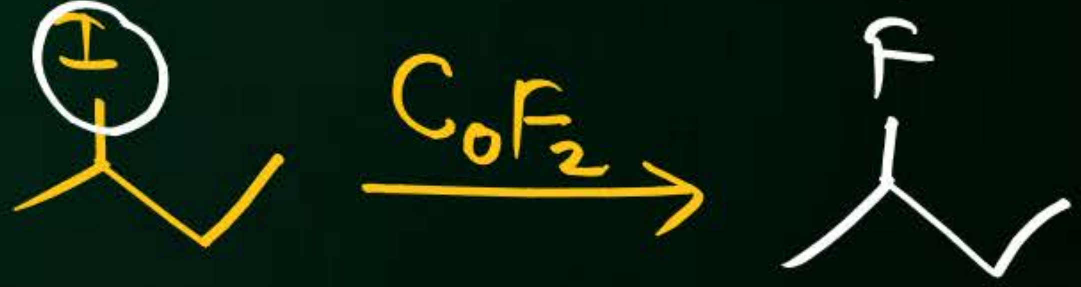
①



②



③



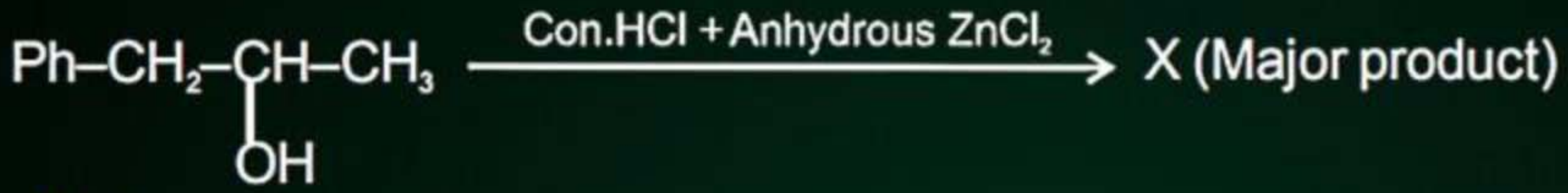
Home Work

QUESTION 01

2° halide among the following is:

- (A) isopropyl chloride
- (B) isobutyl chloride
- (C) n-propyl chloride
- (D) n-butyl chloride

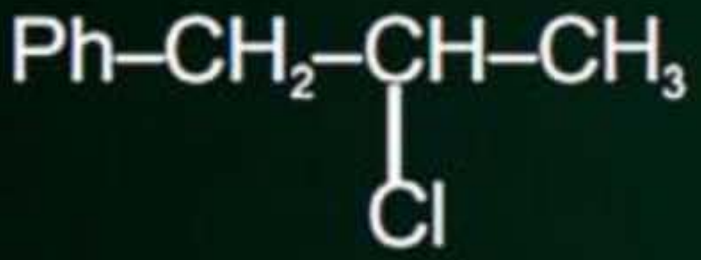
QUESTION 02



$$Ph{-}CH_2{-}\underset{\underset{OH}{|}}{C}H{-}CH_3 \xrightarrow{\text{Con.HCl + Anhydrous } ZnCl_2} X \text{ (Major product)}$$

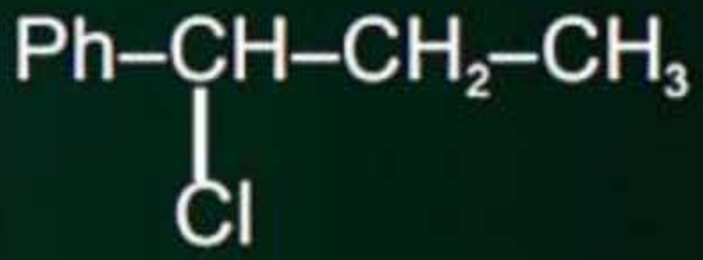
X is:

A



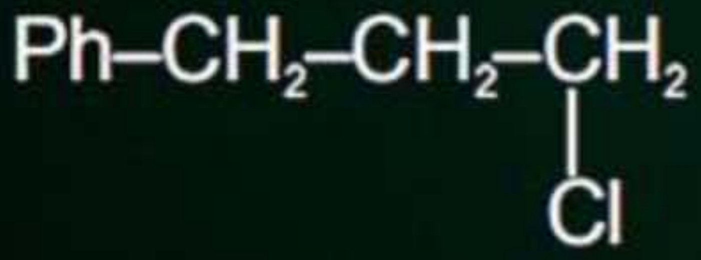
$$Ph{-}CH_2{-}\underset{\underset{Cl}{|}}{C}H{-}CH_3$$

B



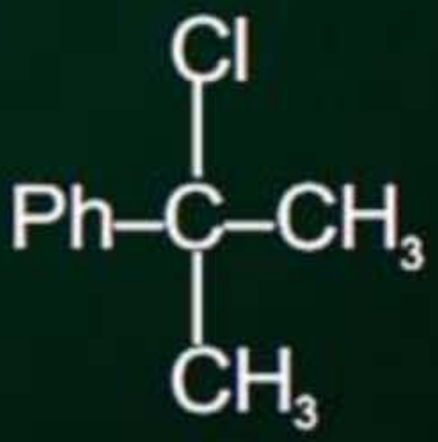
$$Ph{-}\underset{\underset{Cl}{|}}{C}H{-}CH_2{-}CH_3$$

C



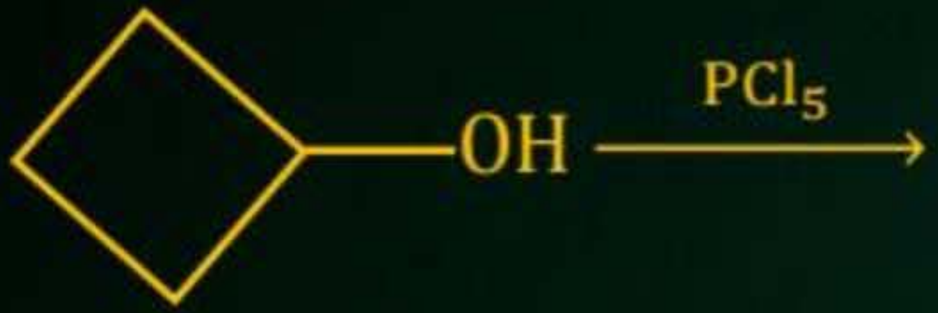
$$Ph{-}CH_2{-}CH_2{-}\underset{\underset{Cl}{|}}{C}H_2$$

D

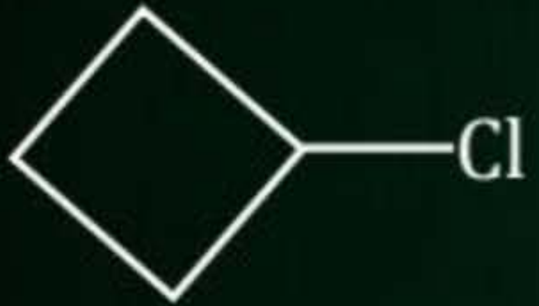


$$Ph{-}\overset{\overset{Cl}{|}}{\underset{\underset{CH_3}{|}}{C}}{-}CH_3$$

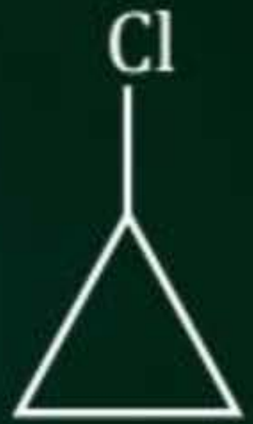
QUESTION 03



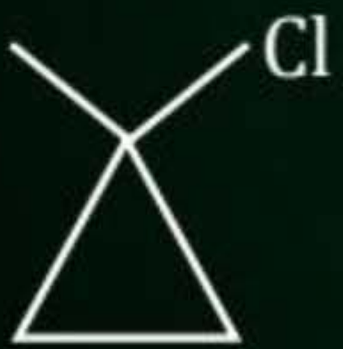
A



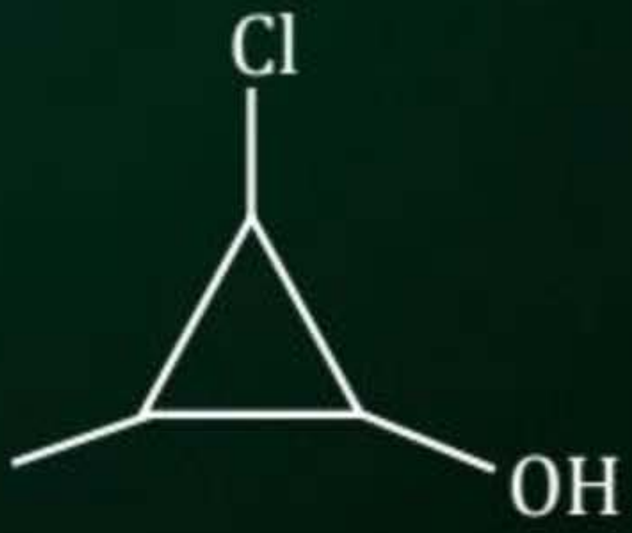
B



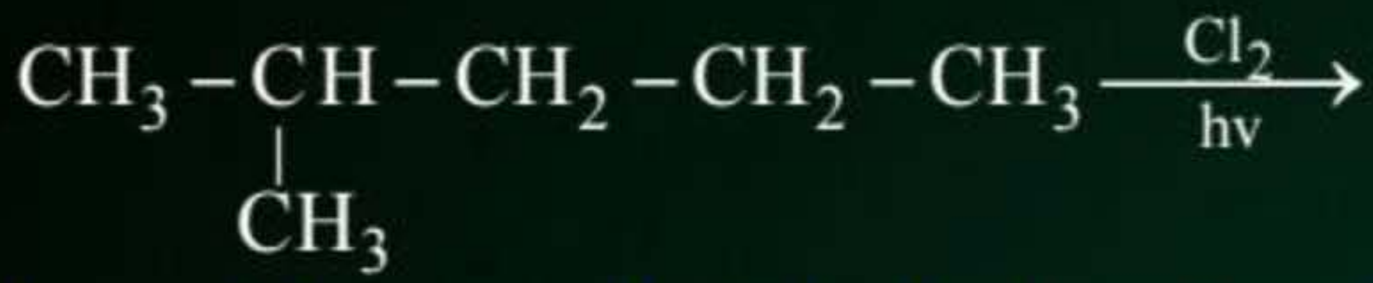
C



D



QUESTION 04



$$CH_3-\underset{\underset{CH_3}{|}}{C}H-CH_2-CH_2-CH_3 \xrightarrow[h\nu]{Cl_2}$$

Mono-chloro product (including stereoisomers) are:

- A 6
- B 7
- C 8
- D 9

QUESTION 05

The compound that reacts fastest with conc. HCl is:

- A butan-1-ol
- B butan-2-ol
- C 2-methyl propan-1-ol
- D 2-methyl propan-2-ol

QUESTION 06

Which one is the Swartz reaction from the following?

A $CH_3Cl + NaI \xrightarrow{\text{Dry Acetone}} CH_3I + NaCl$

B $CH_3Br + NaI \xrightarrow{\text{Dry Acetone}} CH_3I + NaBr$

C $CH_3Br + AgF \longrightarrow CH_3F + AgBr$

D $2CH_3Cl + 2Na \xrightarrow{\text{Dry Acetone}} CH_3—CH_3 + 2Na$

QUESTION 07

Which of the following is an example of vic dihalide?

- (A) Dichloromethane
- (B) 1, 2-dichloroethane
- (C) Ethylidene chloride
- (D) Allyl chloride

QUESTION 08

3-methyl-pent-2-ene on reaction with HBr in presence of peroxide forms an addition product. The number of possible stereoisomers for the product is:

(A) Six

(B) Zero

(C) Two

(D) Four

QUESTION 09

The reagent used to get alkyl halide from alcohol:

- (A) PCl_5
- (B) $SOCl_2$
- (C) Both (A) and (B)
- (D) Cl_2

QUESTION 10

When ethyl alcohol (C_2H_5OH) reacts with thionyl chloride, the product obtained is:

A $CH_3CH_2Cl + HBr$

B $C_2H_6 + HCl + SO_2$

C $CH_3CH_2Cl + H_2O + SO_2$

D $CH_3CH_2Cl + HCl + SO_2$

ANSWER KEY

1. A
2. B
3. A
4. C
5. D
6. C
7. B
8. D
9. C
10. D

Home Work From PW Module (Yakeen NEET)

Prarambh: Q 01, 02, 03, 04, 05, 06, 07, 08, 09, 10, 11, 14

Prabal: Q 01, 04, 05

Parikshit: Q 01, 15, 20

Thank you!!

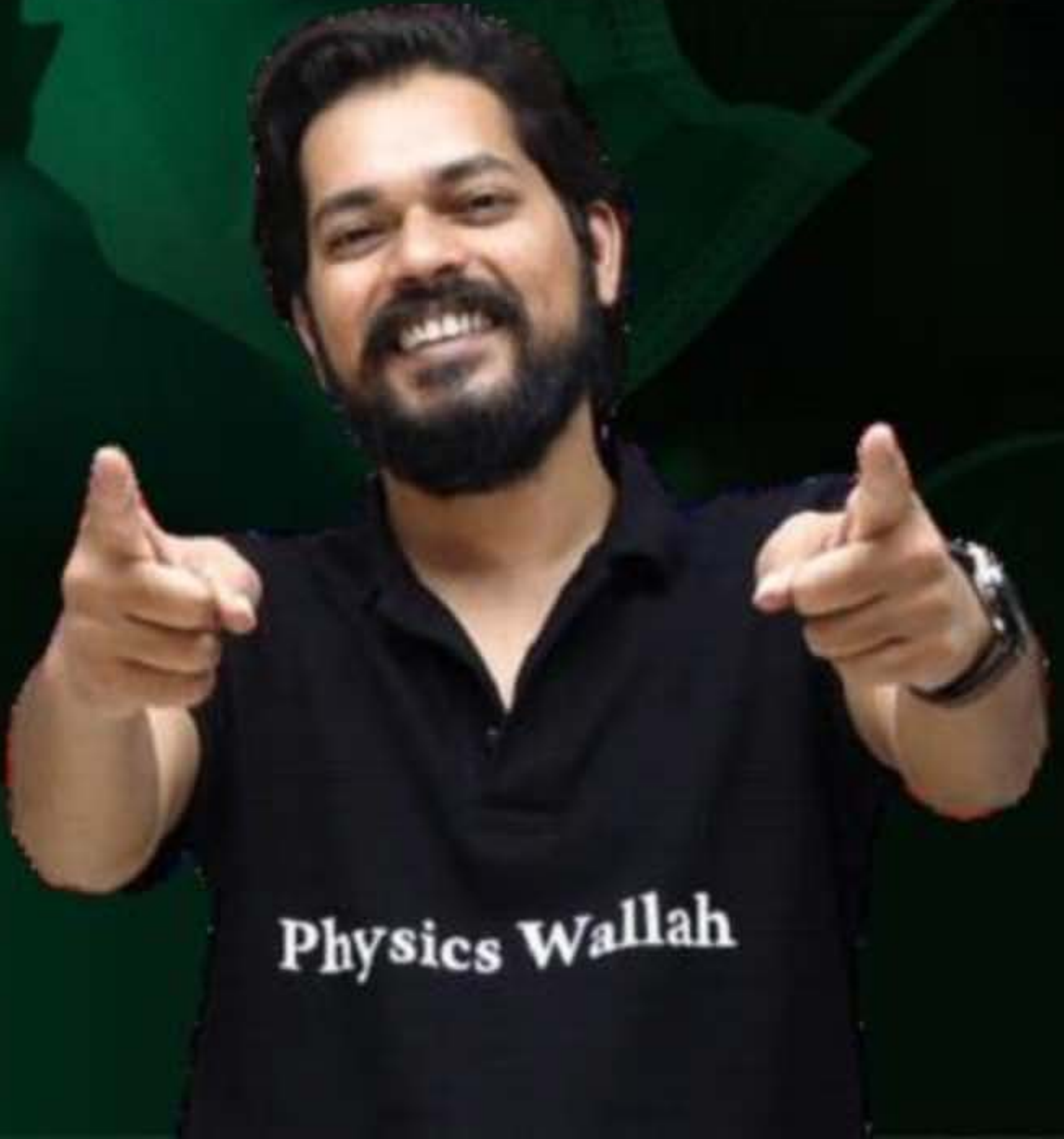
YAKEEN 2.0

FOR NEET 2025

Lecture- 02 **Organic Chemistry**

Haloalkanes and Haloarenes

By- Pankaj Sir(POPU MAMA)


Physics Wallah

Topics *to be covered*

1. Last Class Practice Session ✓
2. Methods of Preparation of Haloarenes ✓
3. Practice

LAST CLASS

PRACTICE SESSION

QUESTION (NCERT Exemplar)

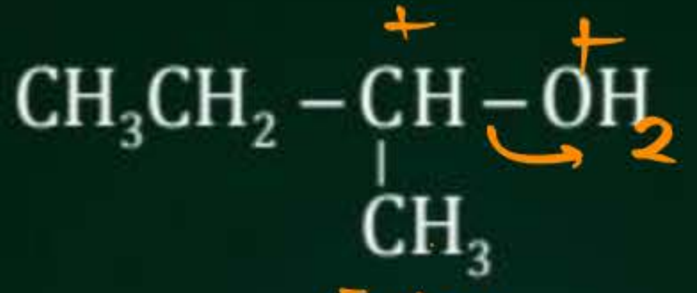
$\overset{+}{H}\overset{-}{X}$

The order of reactivity of following alcohols with halogen acids is ______.

(A) $CH_3CH_2-\overset{+}{C}H_2-\overset{+}{O}H_2$

2αH

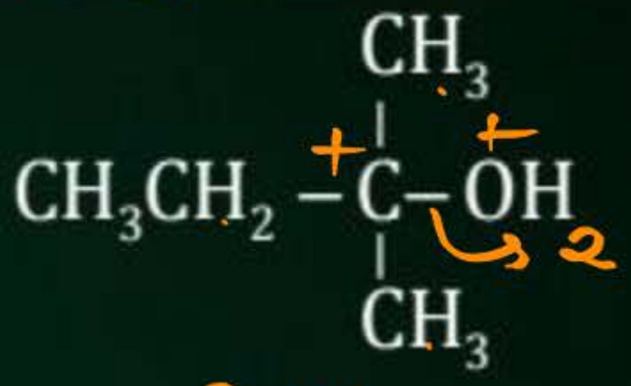
(B)



$CH_3CH_2-\underset{CH_3}{\overset{+}{C}H}-\overset{+}{O}H_2$

5αH

(C)



$CH_3CH_2-\overset{CH_3}{\underset{CH_3}{\overset{+}{C}}}-\overset{+}{O}H_2$

8αH

A (A) > (B) > (C)

[✓ B] (C) > (B) > (A)

C (B) > (A) > (C)

D (A) > (C) > (B)

QUESTION (NCERT Exemplar)

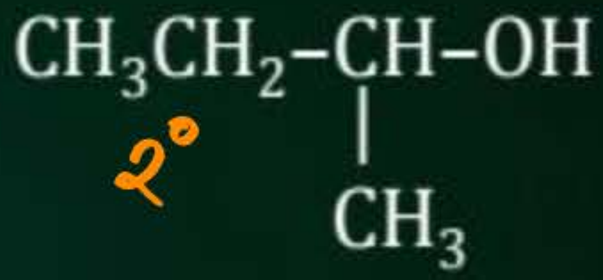
Which of the following alcohols will yield the corresponding alkyl chloride on reaction with concentrated HCl at room temperature?

max Reactive

A $CH_3CH_2-CH_2-OH$

1°

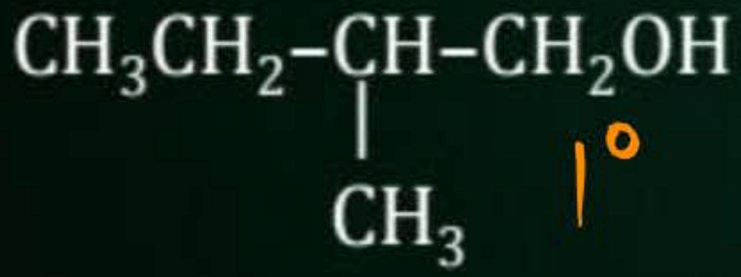
B



$CH_3CH_2-\underset{CH_3}{\underset{|}{CH}}-OH$

2°

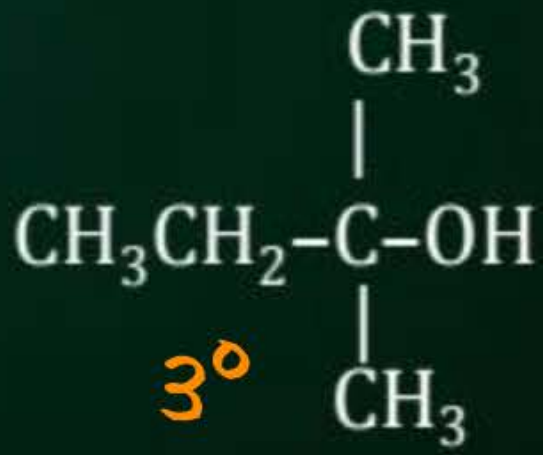
C



$CH_3CH_2-\underset{CH_3}{\underset{|}{CH}}-CH_2OH$

1°

[✓ **D**]

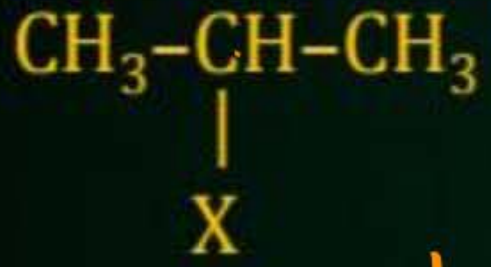
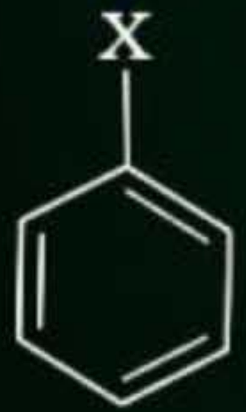


$CH_3CH_2-\overset{CH_3}{\overset{|}{\underset{CH_3}{\underset{|}{C}}}}-OH$

3°

QUESTION (NCERT Exemplar)

Match the structures of compounds given in Column I with the classes of compounds given in Column II.

Column I	Column II
(i)  $CH_3-\underset{X}{\underset{\vert}{CH}}-CH_3$ (b)	(a) Aryl halide
(ii) $CH_2=CH-\overset{\downarrow}{C}H_2-X$ (d)	(b) Alkyl halide
(iii)  (a)	(c) Vinyl halide
(iv) $CH_2=CH-X$ (c)	(d) Allyl halide

QUESTION (NCERT Exemplar)

PCl_3, PCl_5 $SOCl_2$

✗ **Assertion:** Phosphorus chlorides (tri and penta) are preferred over thionyl chloride for the preparation of alkyl chlorides from alcohols.

✗ **Reason:** Phosphorus chlorides give pure alkyl halides.

A Assertion and reason both are correct and reason is correct explanation of assertion.

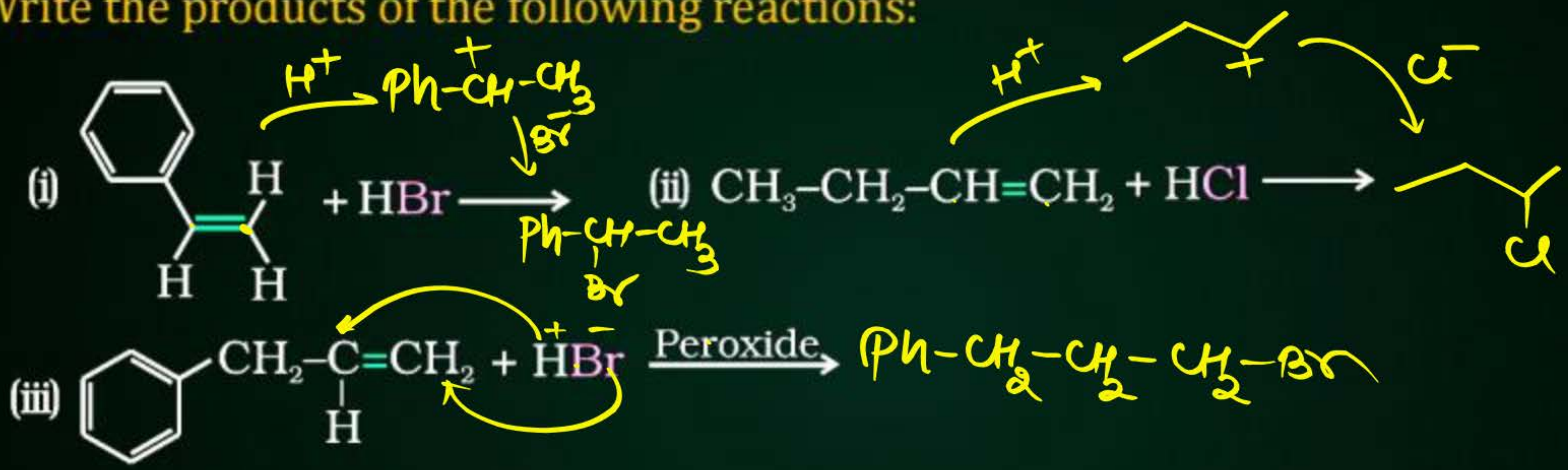
[✓ B] Assertion and reason both are wrong statements.

C Assertion is correct but reason is wrong statements

D Assertion is wrong but reason is correct statement.

QUESTION (NCERT Exemplar)

Write the products of the following reactions:



(i) $C_6H_5CH=CH_2 + HBr \longrightarrow$

$\xrightarrow{H^+} Ph-\overset{+}{C}H-CH_3 \xrightarrow{Br^-} Ph-\underset{Br}{\underset{|}{C}H}-CH_3$

(ii) $CH_3-CH_2-CH=CH_2 + HCl \longrightarrow$

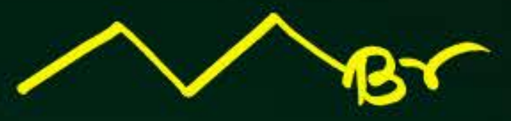
$\xrightarrow{H^+}$ carbocation $\xrightarrow{Cl^-}$ chloride

(iii) $C_6H_5CH_2-\underset{H}{\underset{|}{C}}=CH_2 + \overset{+}{H}\overset{-}{Br} \xrightarrow{\text{Peroxide}} Ph-CH_2-CH_2-CH_2-Br$

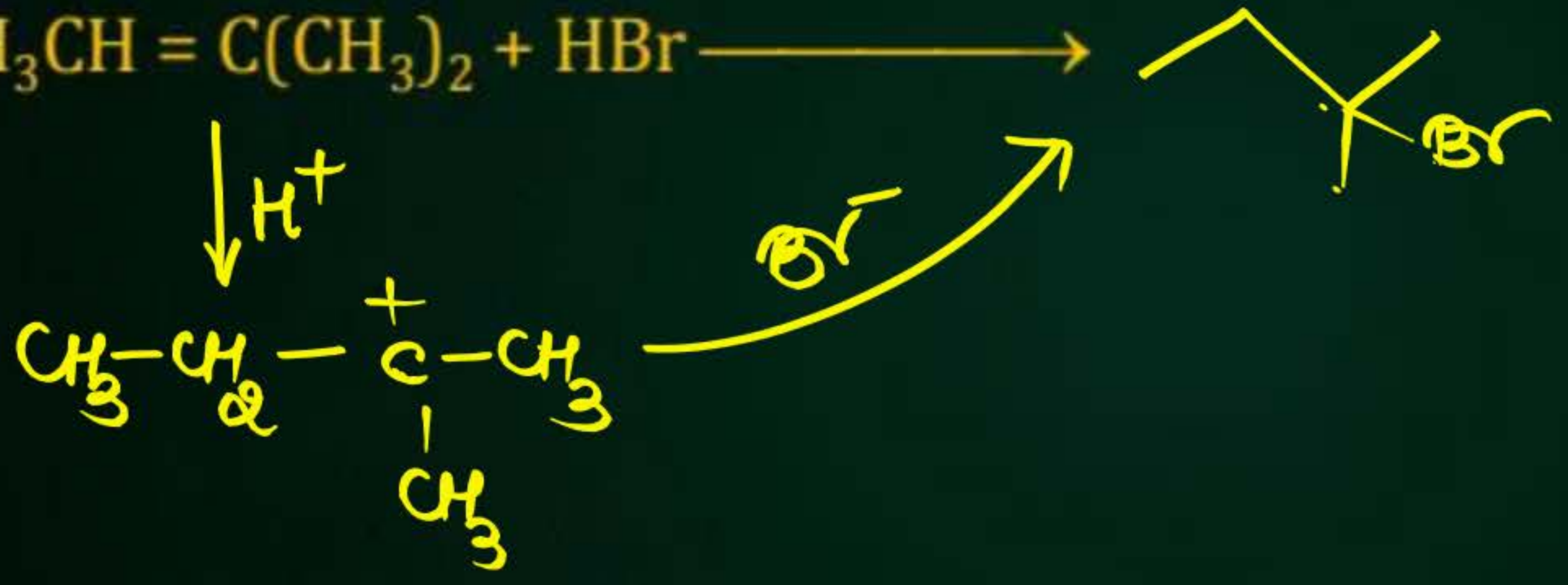
QUESTION (NCERT Exercise)

Write the structure of the major organic product in each of the following reactions:

(i) $CH_3CH_2CH = CH_2 + \overset{+}{H}\overset{-}{Br} \xrightarrow{\text{Peroxide}}$



(ii) $CH_3CH = C(CH_3)_2 + HBr \longrightarrow$



$$CH_3-CH_2-\underset{\substack{|\\ CH_3}}{\overset{+}{C}}-CH_3$$

QUESTION (NCERT Exemplar)

Which of the following is halogen exchange reaction?

(A) ✓ $R\boxed{X + Na}I \longrightarrow RI + NaX$

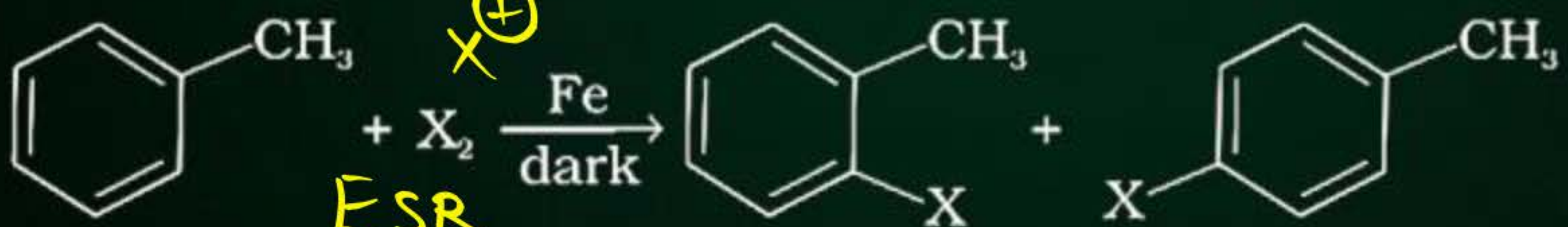
EAR

(B) $>C=C< + HX \longrightarrow >CH-CX<$

subs

(C) $R{-}OH + HX \xrightarrow{ZnCl_2} R{-}X + H_2O$

(D)


CH₃
+ X₂
Fe
dark
CH₃
X
+
X
CH₃

$X^{\oplus}$

ESR

QUESTION (NCERT Exemplar)

Which reagent will you use for the following reaction?

$$CH_3CH_2CH_2CH_3 \longrightarrow CH_3CH_2CH_2CH_2Cl + CH_3CH_2CHClCH_3$$

[✓ A] Cl_2/UV light $Cl^{\cdot}$

B $NaCl$ ~~+~~ H_2SO_4

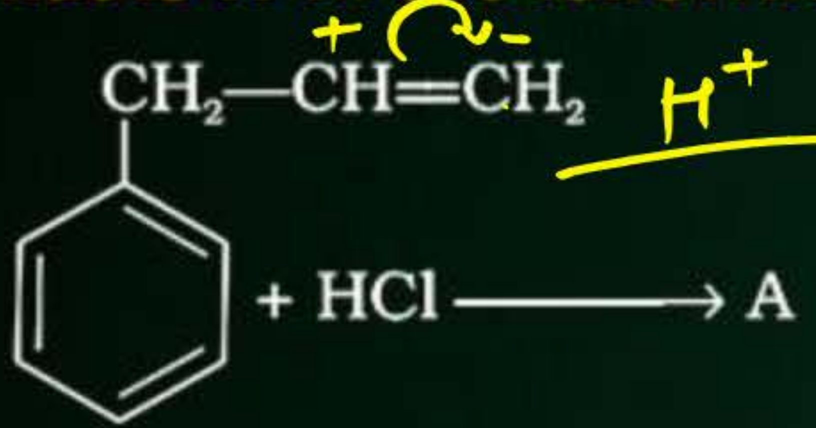
C Cl_2 gas ~~in~~ dark

D Cl_2 gas in the presence of iron in dark

$Cl^{\oplus}$

QUESTION (NCERT Exemplar)

What is 'A' in the following reaction?



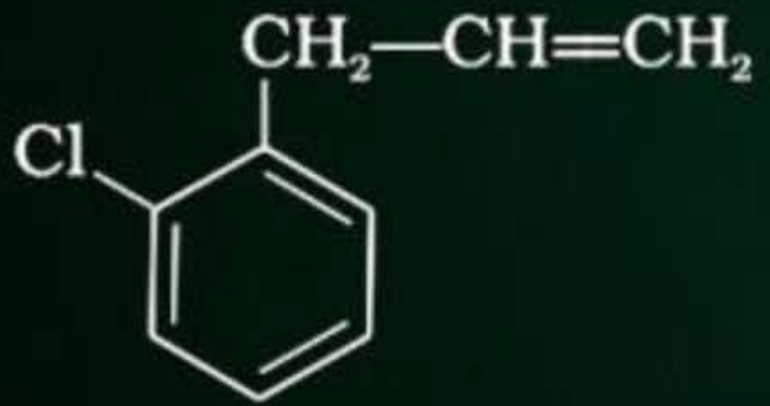
CH₂—CH=CH₂
+ HCl ⟶ A

$$\xrightarrow{H^+} Ph-\overset{H}{\underset{H}{C}}-\overset{+}{C}H-CH_3 \longrightarrow Ph-\overset{+}{C}H-CH_2-CH_3$$

$$\downarrow Cl^-$$

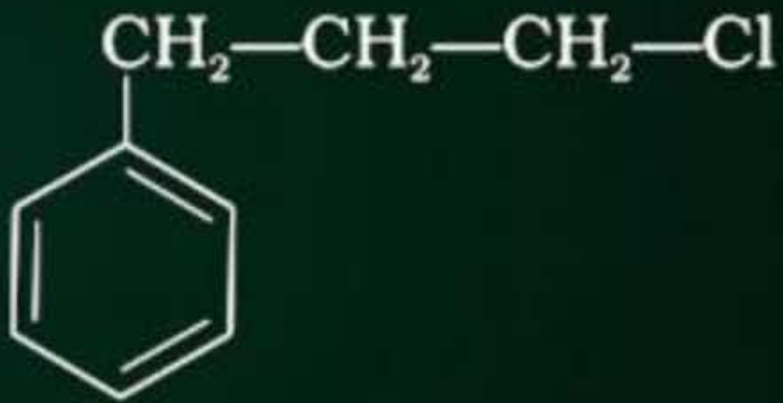
$$Ph-\underset{Cl}{CH}-CH_2-CH_3$$

A



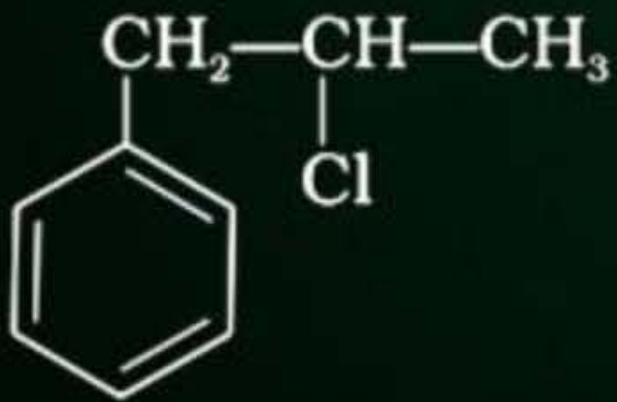
CH₂—CH=CH₂
Cl

B



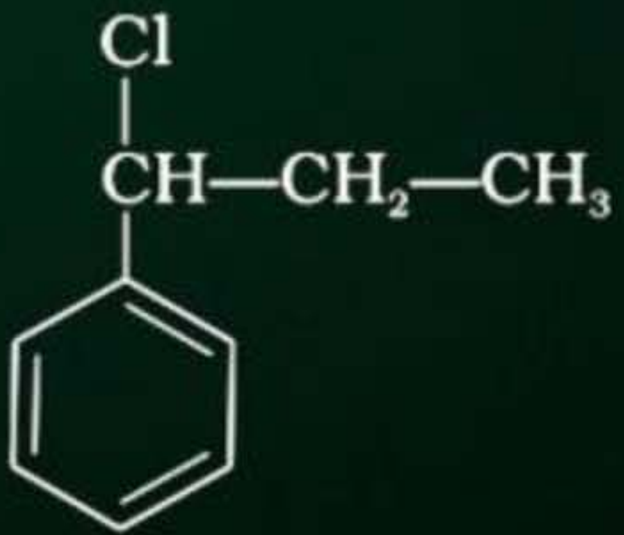
CH₂—CH₂—CH₂—Cl

C



CH₂—CH—CH₃
Cl

D ✓



Cl
CH—CH₂—CH₃

QUESTION (NCERT Exemplar)

Alkyl halides are prepared from alcohols by treating with

(A) $HCl + ZnCl_2$

(B) Red P + Br_2

×

(C) × $\boxed{H_2SO_4 + KI} \rightarrow \text{HI} \rightarrow \overset{\checkmark\checkmark}{I_2}$

[✓ (D)] Both (A) & (B)

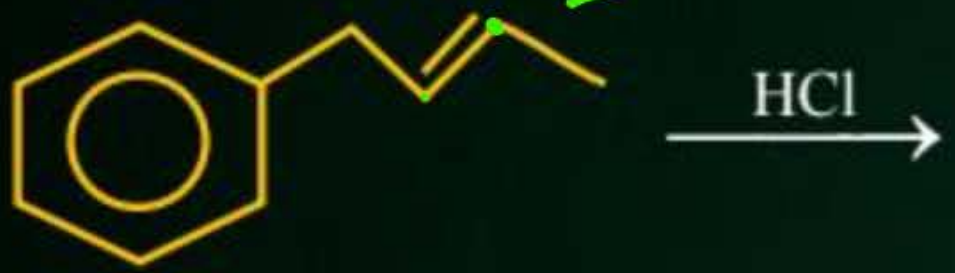
QUESTION (NCERT Exemplar)

Alkyl fluorides are synthesised by heating an alkyl chloride/bromide in presence of ________ or ________.

- A ✗ CaF_2
- B CoF_2
- C Hg_2F_2
- [✓ D] Both (B) & (C)

QUESTION (AIIMS 2018)

formation of 1^{st} $C^{\oplus}$

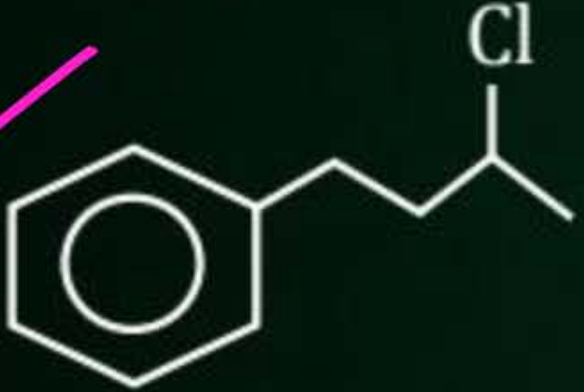


$\xrightarrow{H^+} Ph-CH_2-\overset{+}{C}H-CH_2-CH_3 + Ph-CH_2-CH_2-\overset{+}{C}H-CH_3$ ✓

4αH ✗

5αH ✓

[✓ A]



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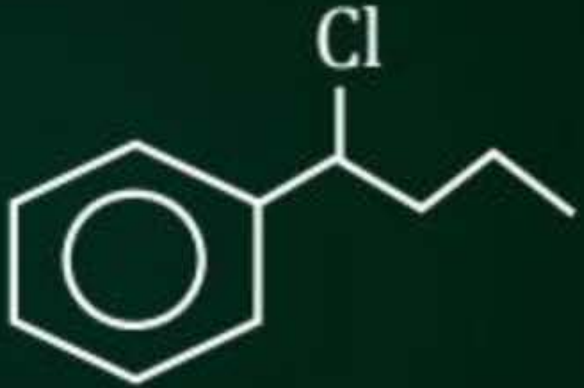

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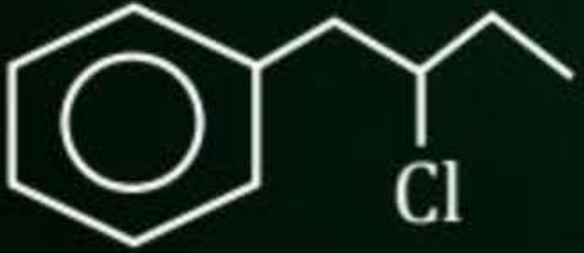

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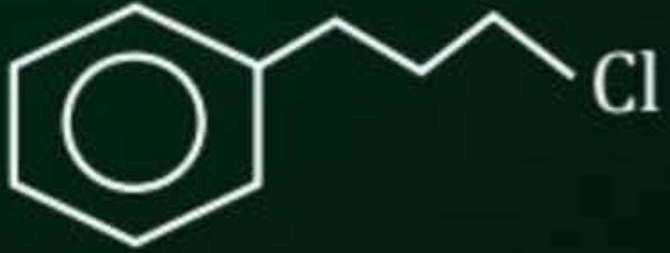


QUESTION (AIIMS 2017)

The synthesis of alkyl fluorides is best accomplished by:

- (A) Finkelstein reaction
- [✓ (B)] Swarts reaction
- (C) Free radical fluorination
- (D) Sandmeyer's reaction

QUESTION (AIIMS 2002)

The reaction:

$$C_2H_5OH + SOCl_2 \xrightarrow{\text{Pyridine}} C_2H_5Cl + SO_2 + HCl$$

is known as

(A) Kharasch effect

(B) Williamson's synthesis

[✓ C] Darzen's procedure

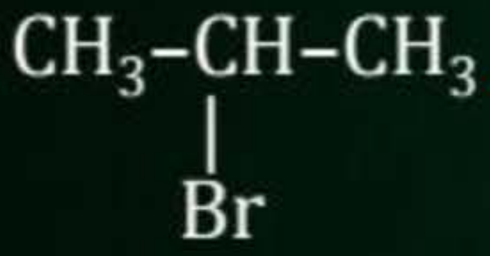
(D) Hunsdiecker reaction

QUESTION (AIIMS 1999)

The product obtained by treating

$CH_3{-}CH{=}CH_2 + \overset{+}{H}\overset{-}{Br} \longrightarrow ?$

A $CH_3{-}CH_2{-}CH_2Br$

B ✓ 

$CH_3{-}\underset{\displaystyle Br}{\underset{|}{CH}}{-}CH_3$

Br^-

C $CH_3BrCH{=}CH_2$

D $CH_3{-}CH{=}CHBr$

QUESTION

B.E ↓ A.S ↑ H^+ easily milega

Fro the reaction,

$$C_2H_5OH + \overset{+}{H}\overset{-}{X} \xrightarrow{ZnX_2} C_2H_5X$$

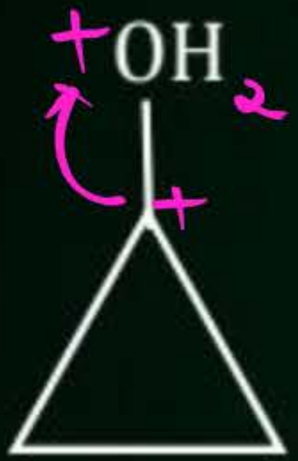
The decreasing order of reactivity of halogen acids is:

- A $HI > HCl > HBr$
- [✓ B] $HI > HBr > HCl$
- C $HCl > HBr > HI$
- D $HBr > HI > HCl$

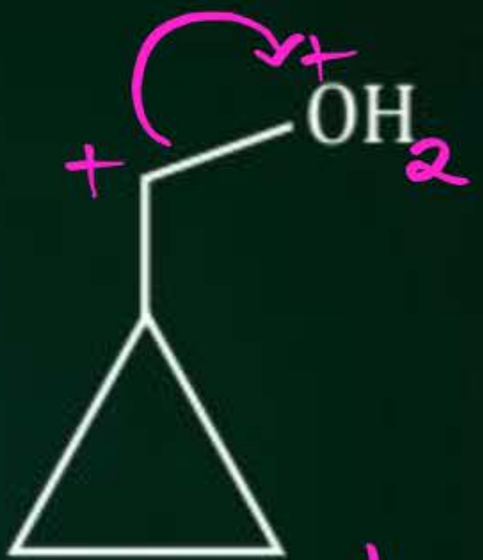
QUESTION

Which of the following alcohol shows fastest reaction with $\overset{+}{H}\overset{-}{I}$?

A



[✓ B]



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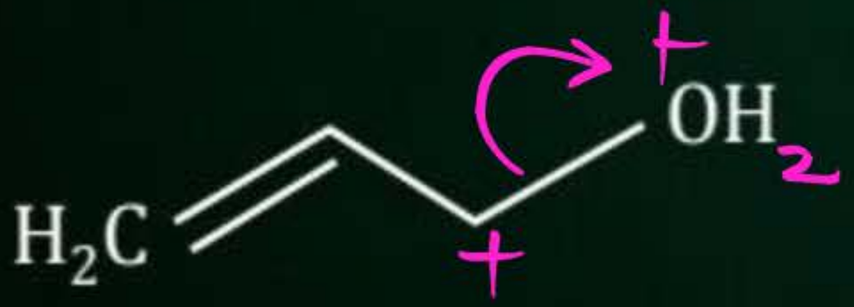
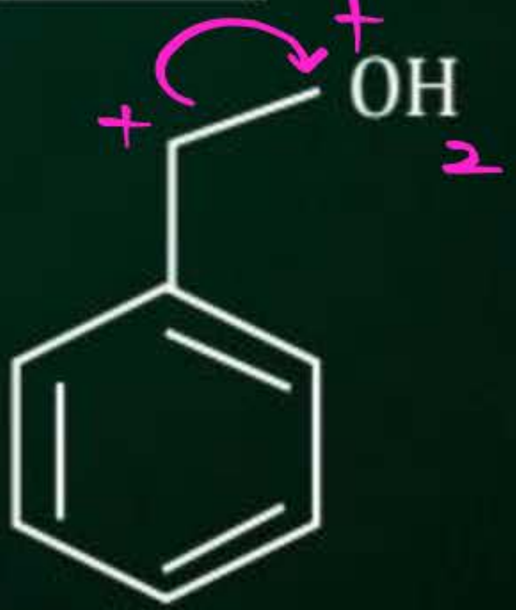


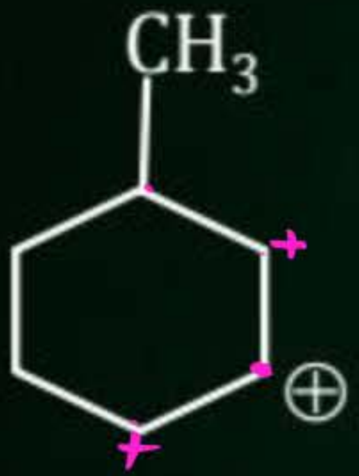
D



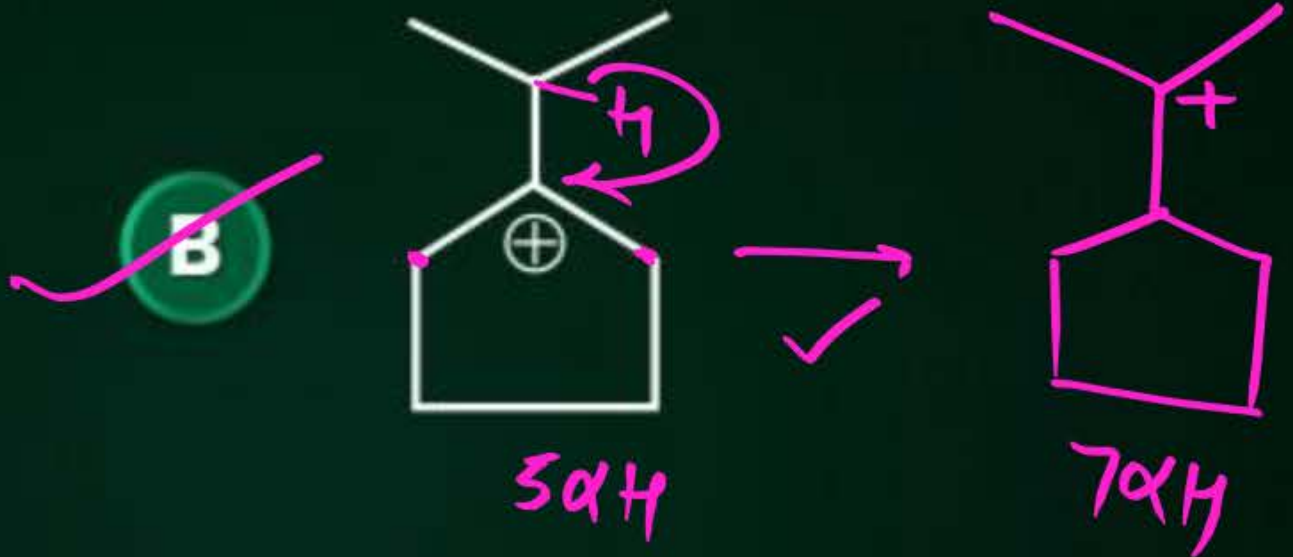
QUESTION

Which of the following carbocation will undergo rearrangement?

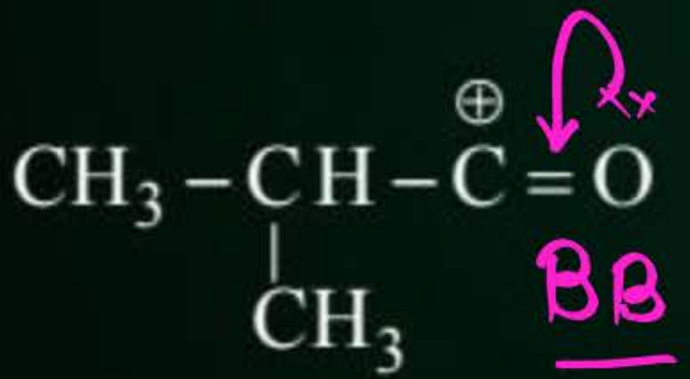
(A)



(B)



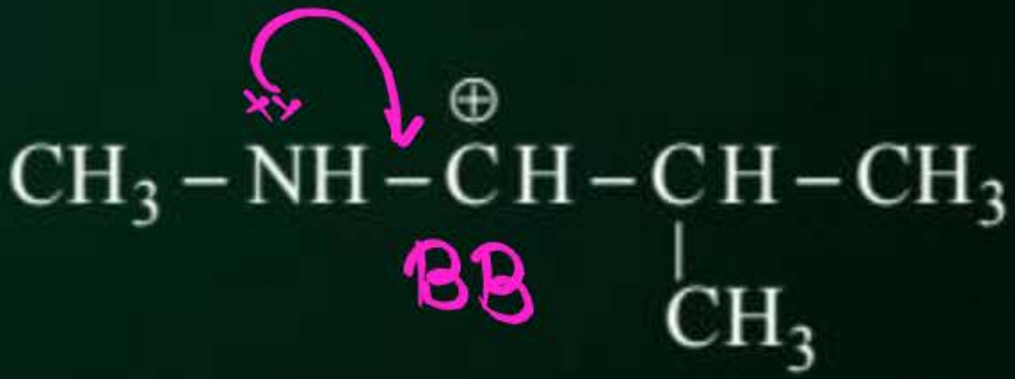
(C)



$CH_3-\underset{\displaystyle CH_3}{\underset{|}{C}}H-\overset{\oplus}{C}=O$

BB

(D)



$CH_3-\ddot{N}H-\overset{\oplus}{C}H-\underset{\displaystyle CH_3}{\underset{|}{C}}H-CH_3$

BB

QUESTION

Which of the following is Lucas reagent?

A ammonical silver nitrate

B Br/CCl_4

[✓ C] dry $ZnCl_2$/conc. HCl

D alk. $KMnO_4$

QUESTION

Which reaction is termed as Darzen's reaction?

A $ROH + HCl$

B $ROH + PCl_5$

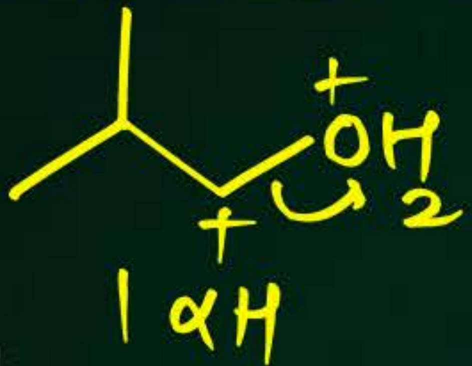
[✓ C] $ROH + SOCl_2$

D $ROH + PCl_3$

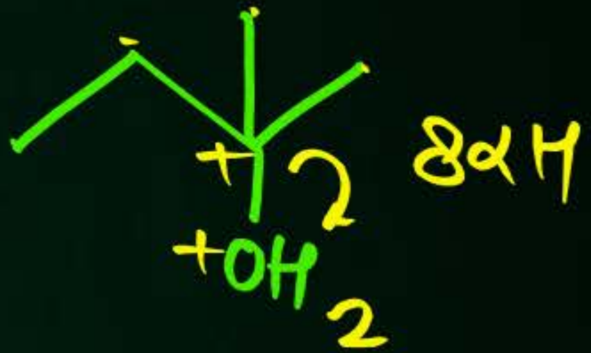
QUESTION

Which of the following alcohols give immediate turbidity with Lucas reagent?

(A) 2-Methyl propanol

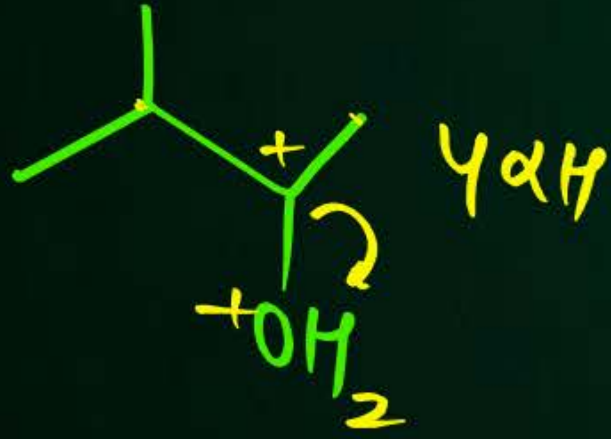

+
$\overset{+}{O}H_2$
+
1αH

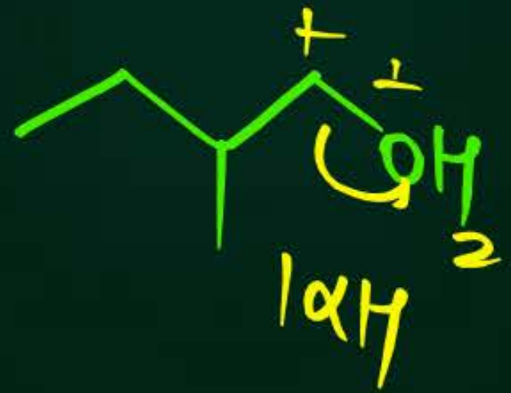
[✓ (B)] 2-Methyl-2-butanol



(C) 3-Methyl-2-butanol

(D) 2-Methyl-1-butanol





QUESTION

Given below are two statements:

Statement I: In Lucas test, primary, secondary and tertiary alcohols are distinguished on the basis of their reactivity with conc. $HCl + ZnCl_2$, known as Lucas Reagent.

Statement II: Primary alcohols are most reactive and immediately produce turbidity at room temperature on reaction with Lucas Reagent.

In the light of the above statements, choose the most appropriate answer from the options given below:

Ⓐ Both Statement I and Statement II are incorrect.

Ⓑ [✓ Statement I is correct but Statement II is incorrect.]

Ⓒ Statement I is incorrect but Statement II correct.

Ⓓ Both Statement I and Statement II are correct

QUESTION

BET ↑ $\boxed{C-O}$

$$R\boxed{-OH} \xrightarrow[\text{Bad L.G}]{Cl^{\ominus}} R-Cl + \bar{O}H$$

Which reagent cannot be used to prepare an alkyl chloride from an alcohol?

- (A) HCl + anhyd. $ZnCl_2$
- (B) ✗ $NaCl$
- (C) PCl_5
- (D) $SOCl_2$

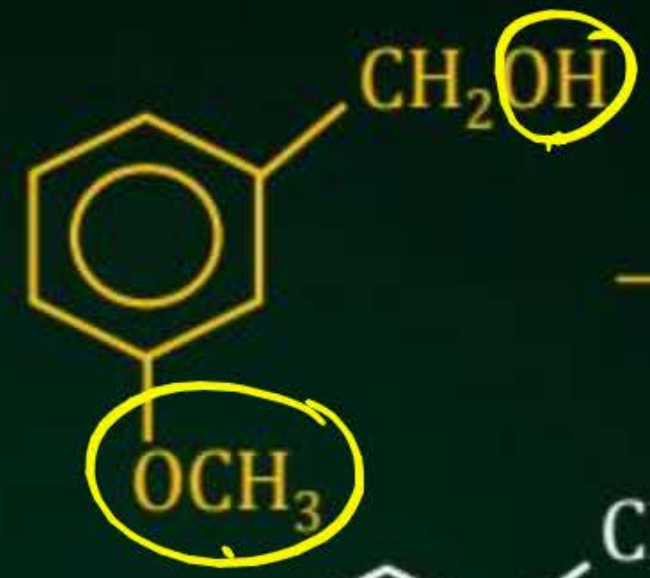
QUESTION

The reaction : Alcohol + HCl $\rightleftharpoons$ Alkyl halide + H_2O is reversible for the completion of the reaction we use

- A [✓ Anhydrous $ZnCl_2$]
- B Conc. H_2SO_4
- C $CaCl_2$
- D Excess of water

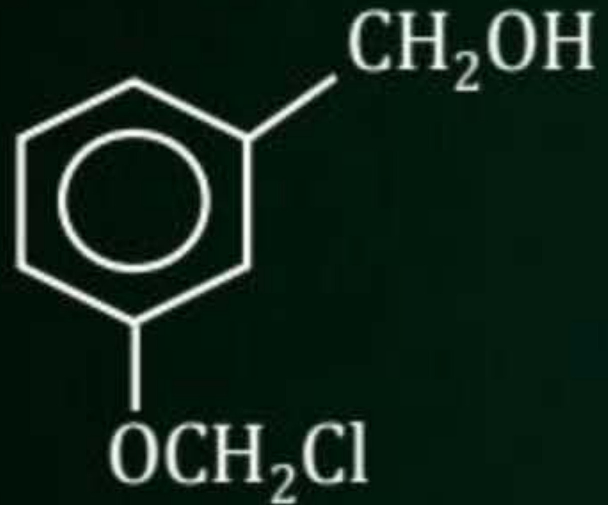
QUESTION

The product A in the above reaction is:

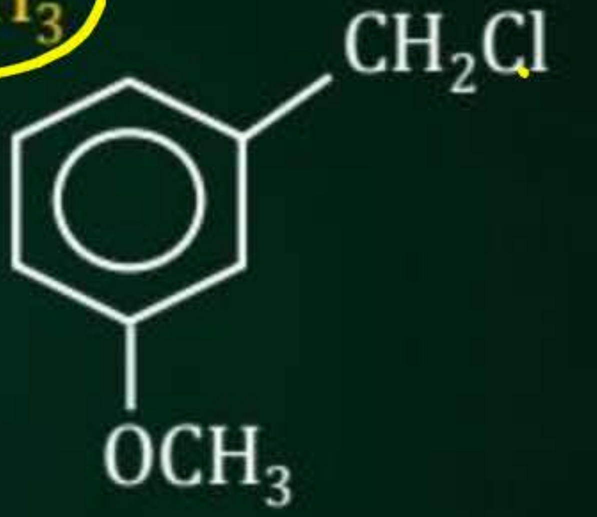


$\xrightarrow[\text{Pyridine}]{SOCl_2}$ A + SO_2 + HCl

A


CH$_2$OH
OCH$_2$Cl

B



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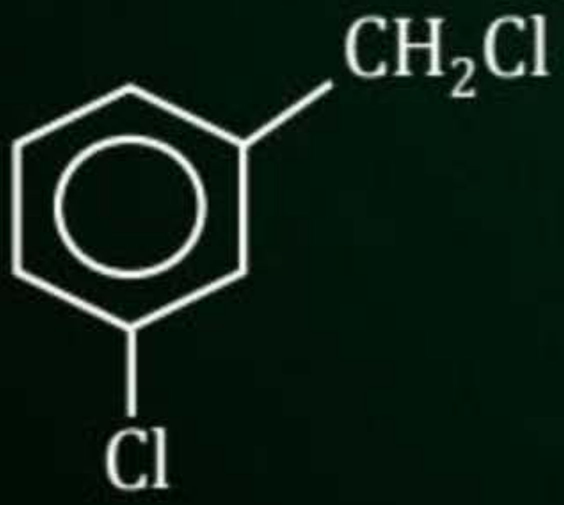

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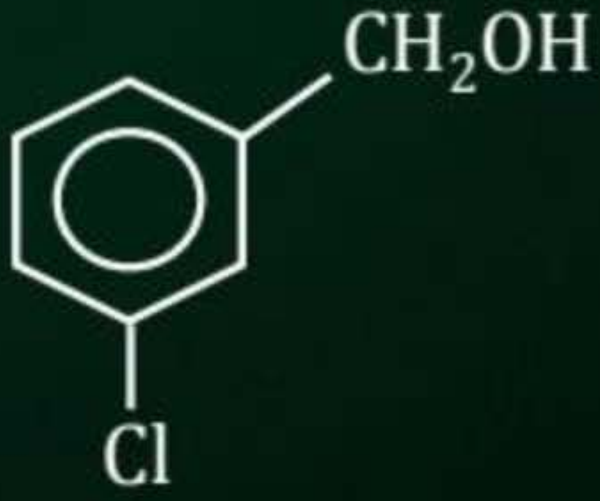


QUESTION

The reaction of $SOCl_2$ on alkanols to form alkyl chlorides give good yields because:

A Alkyl chloride are immiscible with $SOCl_2$

$SO_2 \uparrow$ $HCl \uparrow$

[✓ B] The other products of the reactions are gaseous and escape out.

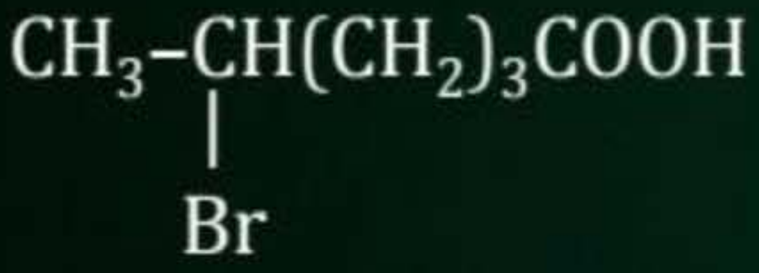
C Alcohol and $SOCl_2$ are soluble in water.

D The reaction does not occur via intermediate formation of an alkyl chloro sulphite.

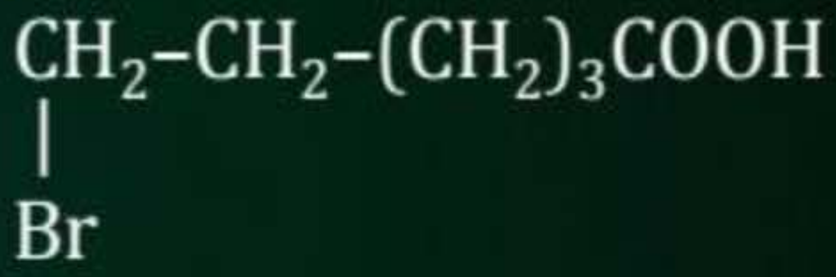
QUESTION

The principal organic compound formed in the reaction is:

$$CH_2=CH(CH_2)_3COOH + \overset{+}{H}\overset{-}{Br} \xrightarrow{\text{organic peroxide}} \text{Major product}$$

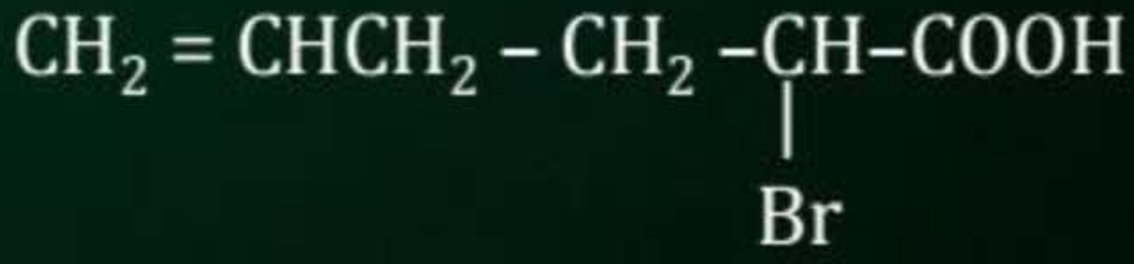
(A) 

$CH_3-\underset{\displaystyle Br}{\underset{|}{C}}H(CH_2)_3COOH$

(B) ✓ 

$\underset{\displaystyle Br}{\underset{|}{C}}H_2-CH_2-(CH_2)_3COOH$

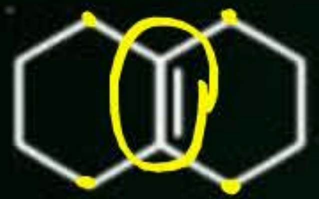
(C) $CH_2=CH(CH_2)_3COBr$

(D) 

$CH_2=CHCH_2-CH_2-\underset{\displaystyle Br}{\underset{|}{C}}H-COOH$

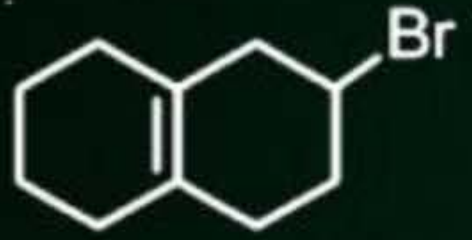
QUESTION

$Br^{\bullet}$

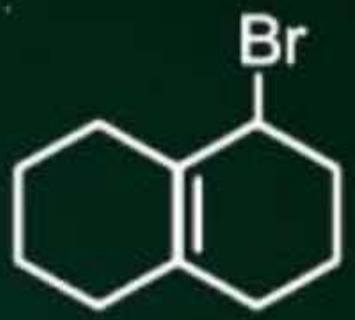


$\xrightarrow{Br_2/heat}$ P. P is:

A



[✓ B]



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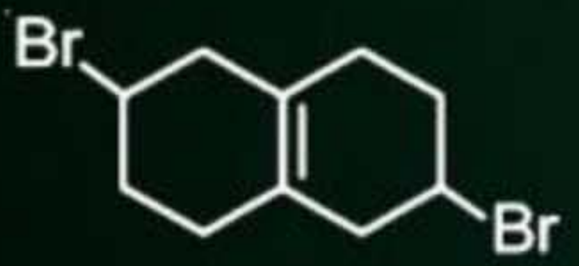

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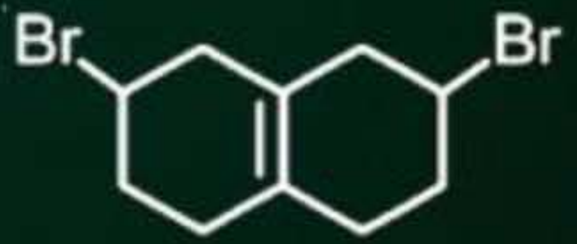
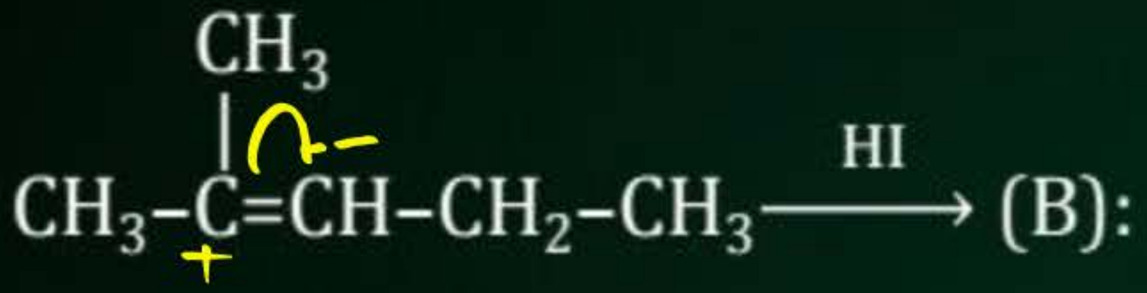


QUESTION

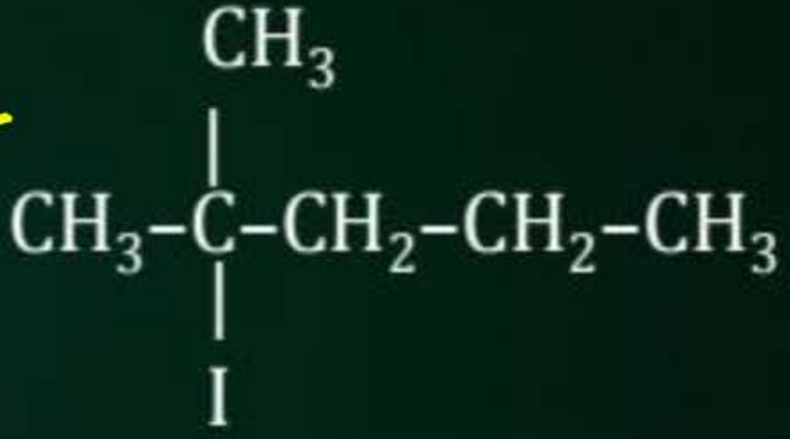
What will be the major product?



$CH_3-\overset{CH_3}{\underset{+}{C}}=CH-CH_2-CH_3 \xrightarrow{HI} (B):$

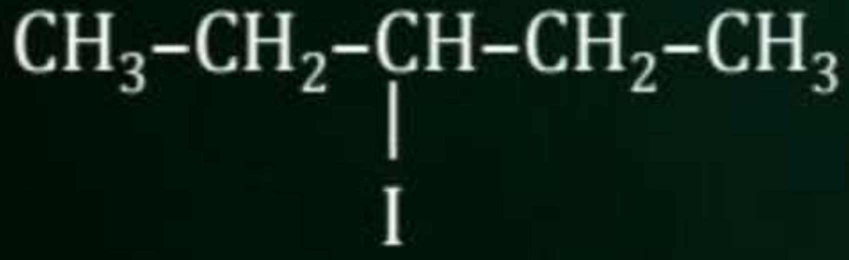
Ⓐ $CH_3-CH_2-CH_2-CH_2-CH_2I$

[✓ Ⓑ]



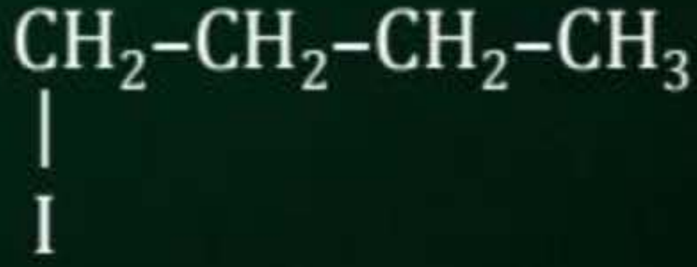
$CH_3-\overset{CH_3}{\underset{I}{C}}-CH_2-CH_2-CH_3$

Ⓒ



$CH_3-CH_2-\underset{I}{CH}-CH_2-CH_3$

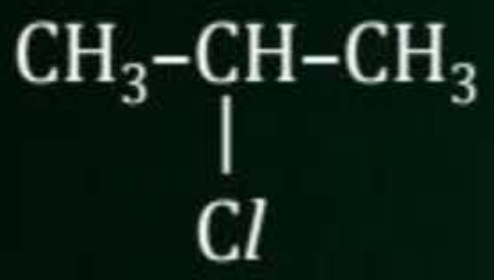
Ⓓ



$\underset{I}{CH_2}-CH_2-CH_2-CH_3$

QUESTION

$CH_3-\overset{+}{C}H=\overset{-}{C}H_2 \xrightarrow[R_2O_2]{\overset{+\;-}{HCl}} \times$ (A). A is in the given reaction will be

[✓ A] 

$CH_3-\underset{Cl}{\underset{|}{C}}H-CH_3$

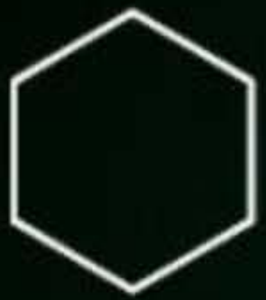
B $CH_3-CH_2-CH_2-Cl$

C $Cl-CH_2-CH=CH_2$

D $CH_2=CH_2$

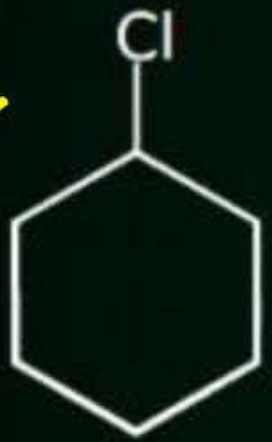
QUESTION

ċ



$\xrightarrow[h\nu]{Cl_2}$ (A). Product (A) will be:

[✓ A]



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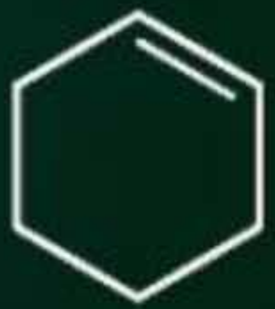

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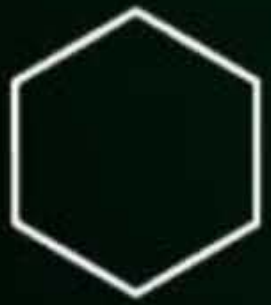
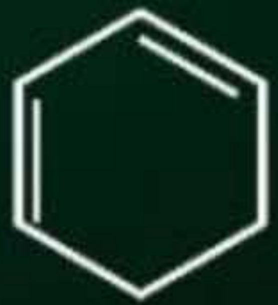
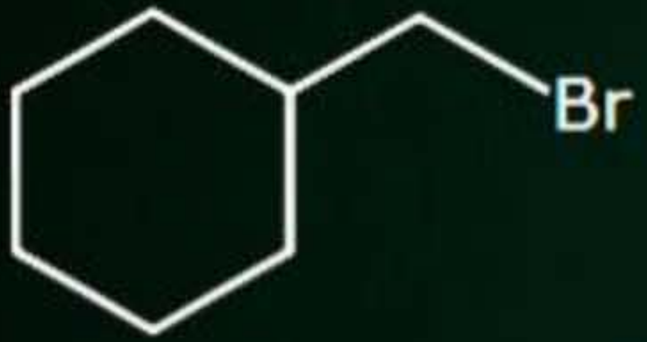


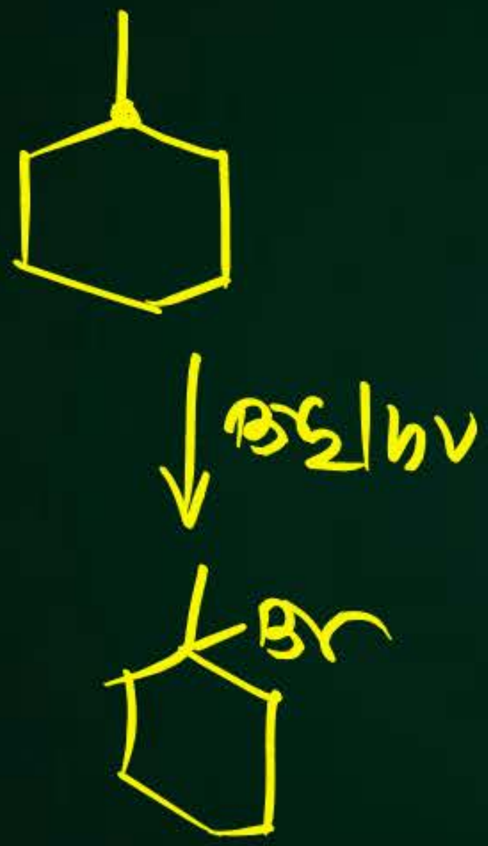
D



QUESTION

Methyl cyclohexane react with Br_2 in presence of U.V. light major product will be:

A




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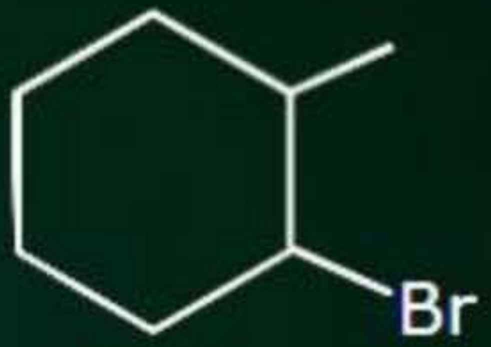
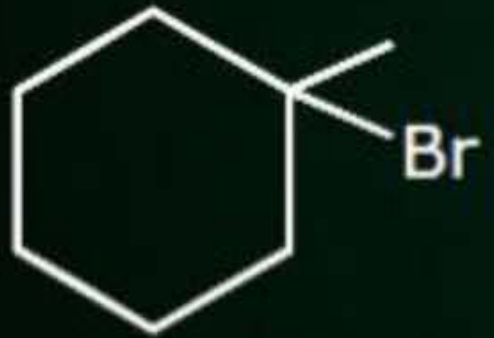


[✓ C]


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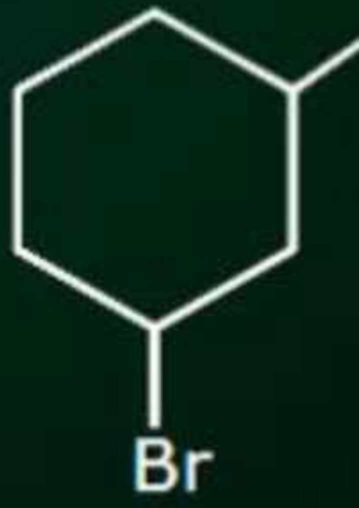
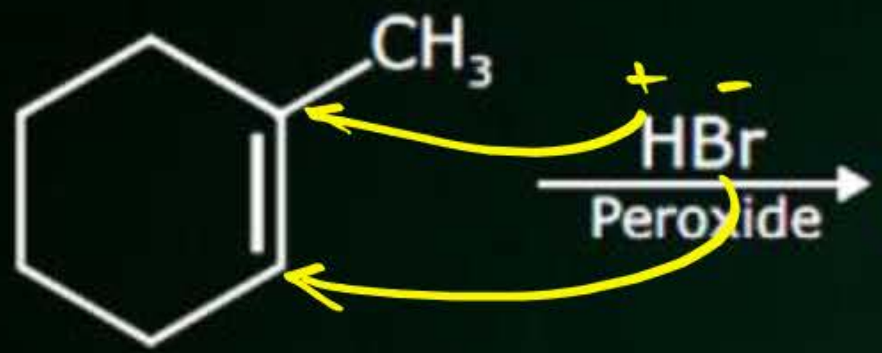
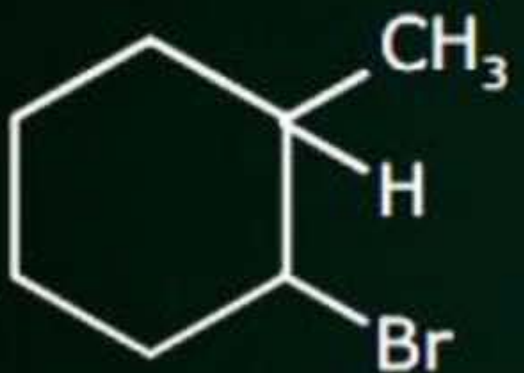


QUESTION


CH3
+
-
HBr
Peroxide

Major product will be:

[✓ A]



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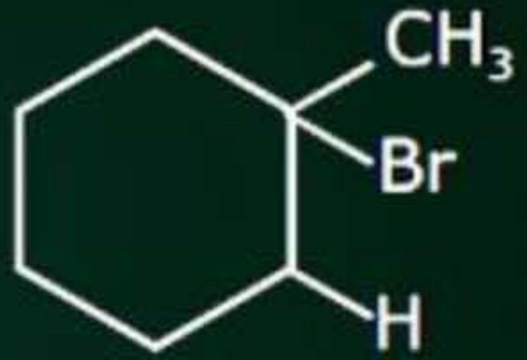

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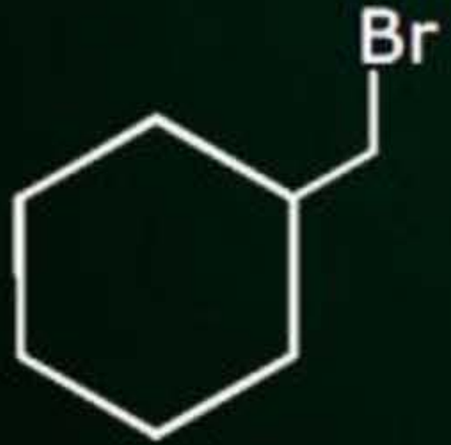

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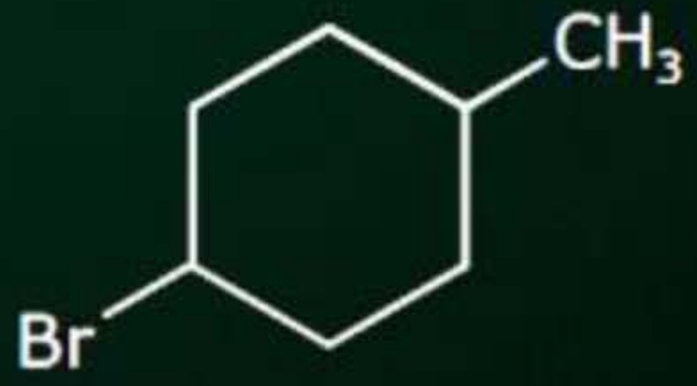
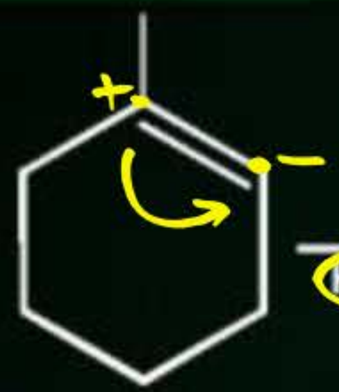
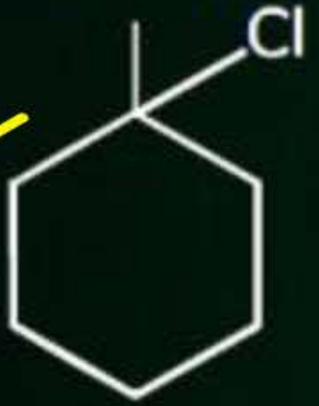


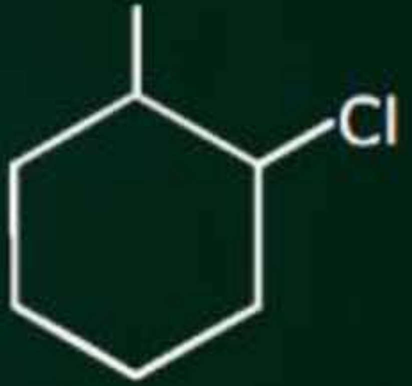
QUESTION



$\xrightarrow[\text{Peroxide}]{\text{HCl}}$ (X) (Major product)

Structure of (X) will be:

Ⓐ


Ⓑ


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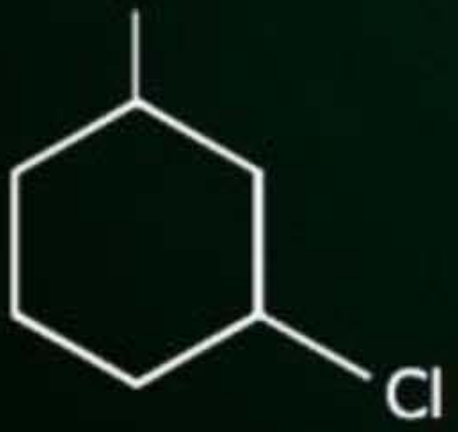
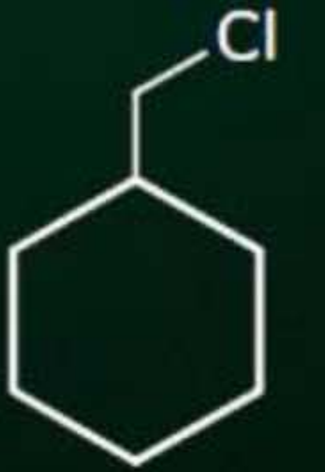
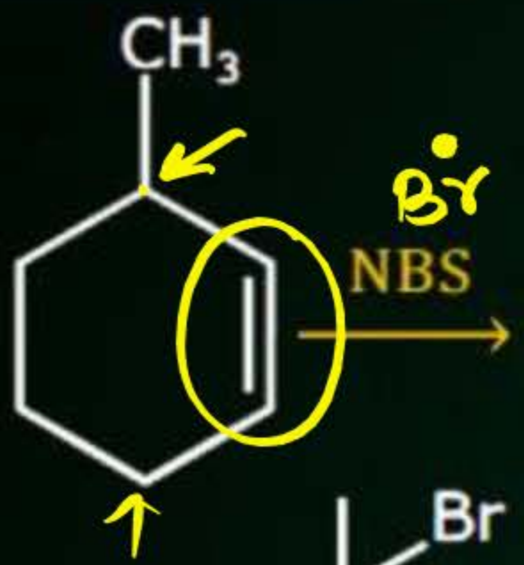
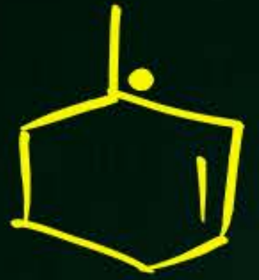


Ⓓ


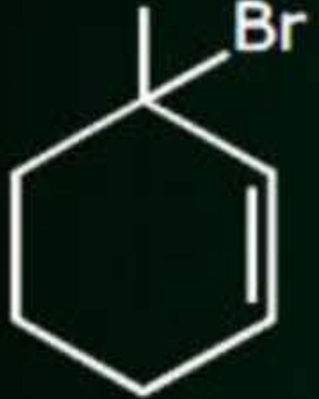
QUESTION



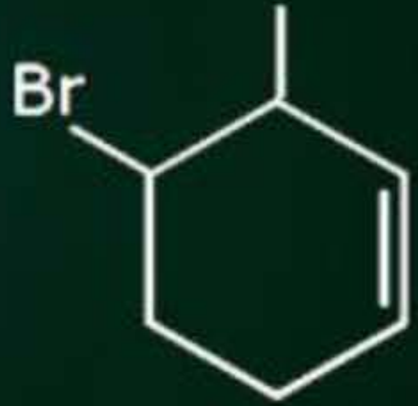


Major Product will be:

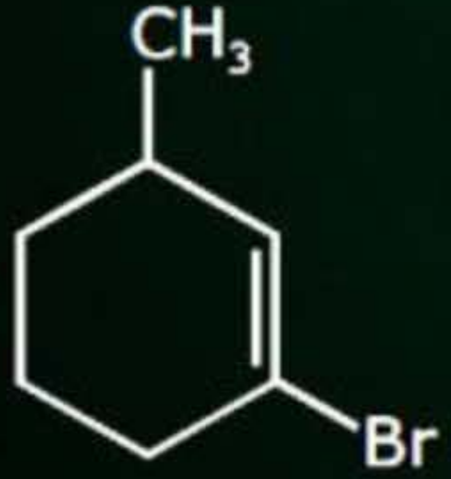
[✓ A]



B



C



D All of these

QUESTION

$(CH_3)_2CHCl + NaI \longrightarrow (CH_3)_2CHI + NaCl$

The above reaction is known as:

[✓ Ⓐ Finkelstein reaction]

Ⓑ Stephen's reaction

Ⓒ Kolbe's reaction

Ⓓ Wurtz reaction

QUESTION

In the reaction $ROH \xrightarrow[PI_3]{\text{Red } P+I_2} RI + A$. A is:

$$3ROH \xrightarrow{PI_3} 3RI + \underline{\underline{H_3PO_3}}$$

(A) H_3PO_2

[✓ B] H_3PO_3

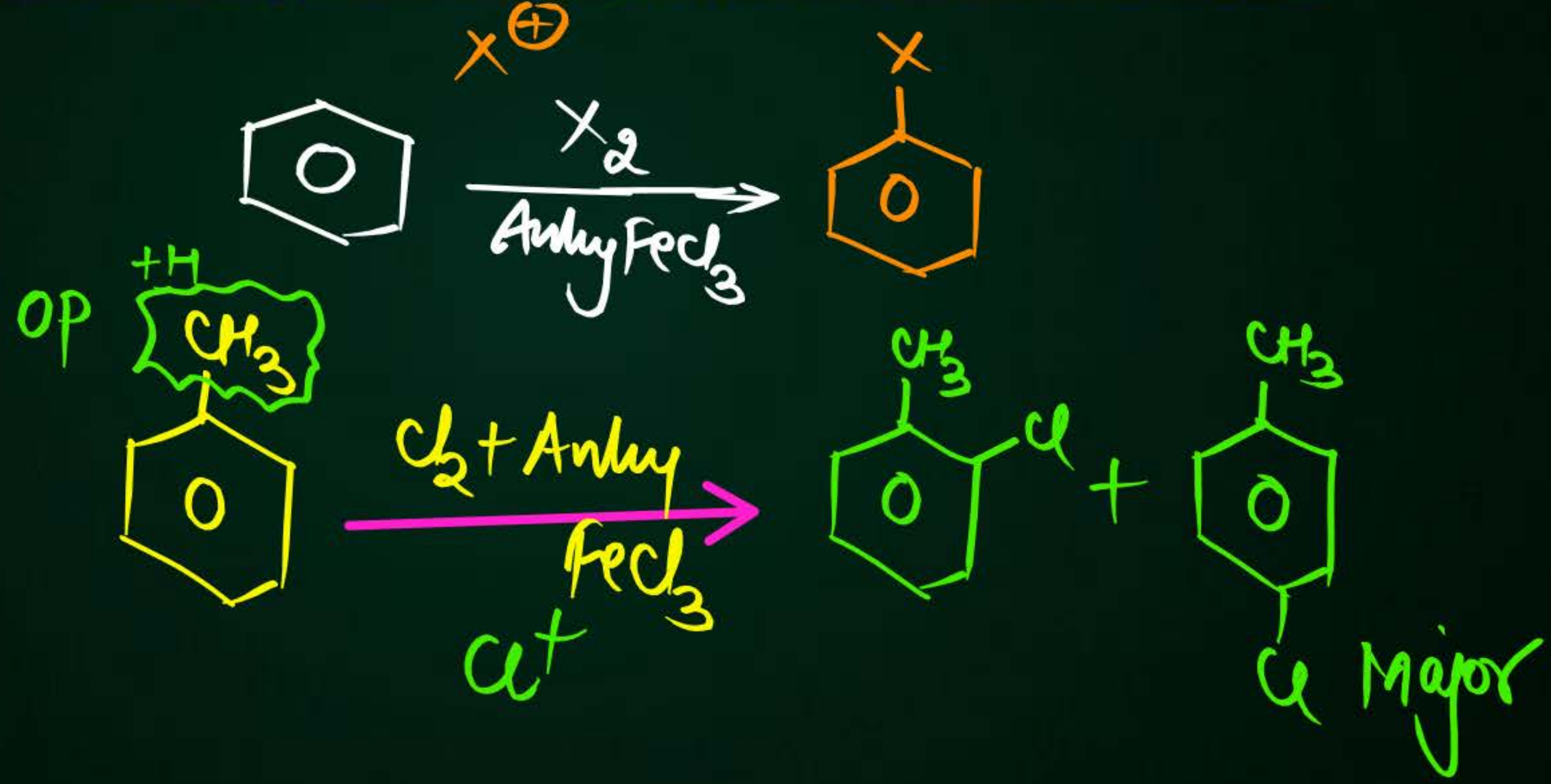
(C) H_3PO_4

(D) HPO_3

Methods of Preparation of Haloarenes

1. From hydrocarbons by electrophilic substitution:

Pad chuka hain



$X^{\oplus}$
X_2
Anhy FeCl$_3$
X
OP
+H
CH$_3$
Cl$_2$ + Anhy FeCl$_3$
Cl$^+$
CH$_3$
Cl
+
CH$_3$
Cl
Major

② from Benzene diazonium salt

a) Sandmeyer rxn

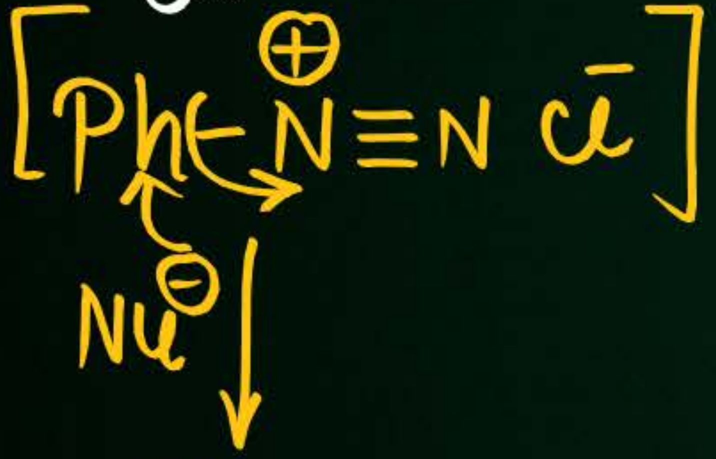
$$Ph-N_2^+Cl^- \xrightarrow{\overset{+1}{Cu_2}Cl_2/HCl^-} Ph-Cl$$ ✓

$$Ph-N_2^+Cl^- \xrightarrow{\overset{+1}{Cu_2}Br_2/HBr^-} Ph-Br$$ ✓

$$Ph-N_2^+Cl^- \xrightarrow[K\bar{C}N]{CuCN} Ph-CN$$

$PhN_2^+Cl^-$

Benzene diazonium chloride



$$\left[Ph-\overset{\oplus}{N}\equiv N\ Cl^-\right]$$

$$\xrightarrow{Nu^\ominus}$$

$$Ph-Nu + N_2 + Cl^-$$

$BF_4^{\ominus} \rightarrow BF_3 + F^{\ominus}$

b) Gattermann Rxn

$$\begin{tikzcd}
Ph-N_2^+Cl^- \arrow[r, "\overset{\circ}{Cu}|HCl^-"] \arrow[dr, "\overset{\circ}{Cu}|HBr^-"'] & Ph-Cl \\
& Ph-Br
\end{tikzcd}$$

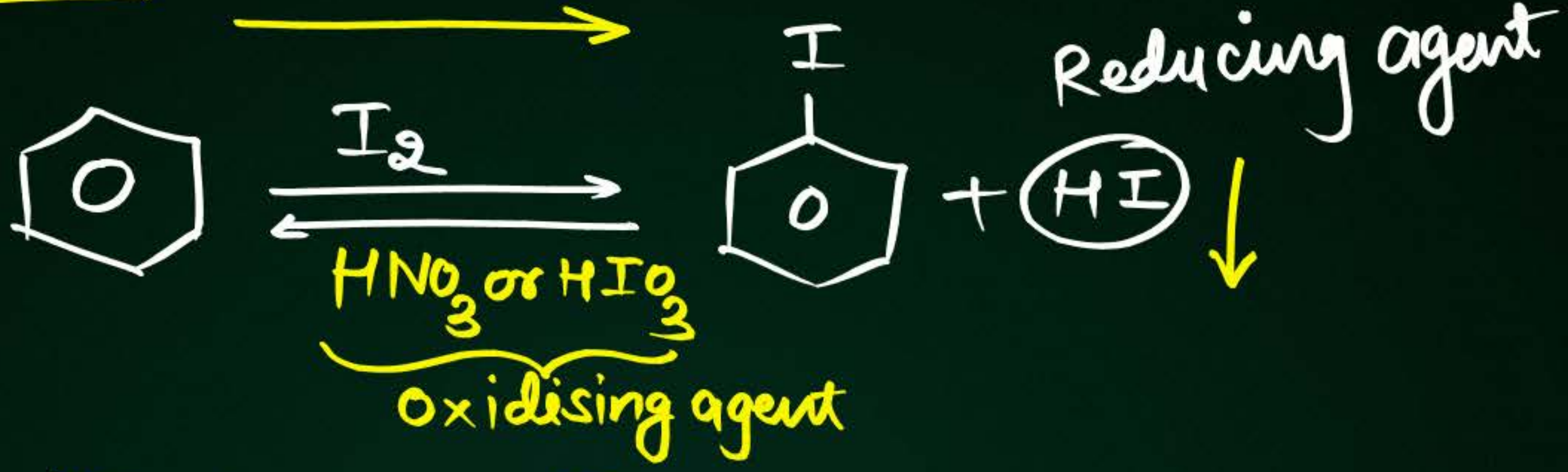
c) Sizzi's Rxn

$$Ph-N_2^+Cl^- \xrightarrow{KI^{\ominus}} Ph-I$$

d) Balz-schiemann Rxn :

$$Ph-N_2^+Cl^- \xrightarrow{\overset{+}{H}\overset{-}{BF_4}} \underset{+\,HCl}{Ph-N_2^+BF_4^-} \xrightarrow{\Delta} Ph-F$$

For iodobenzene formation


I
I_2
HNO_3 or HIO_3
Oxidising agent
+ HI
Reducing agent

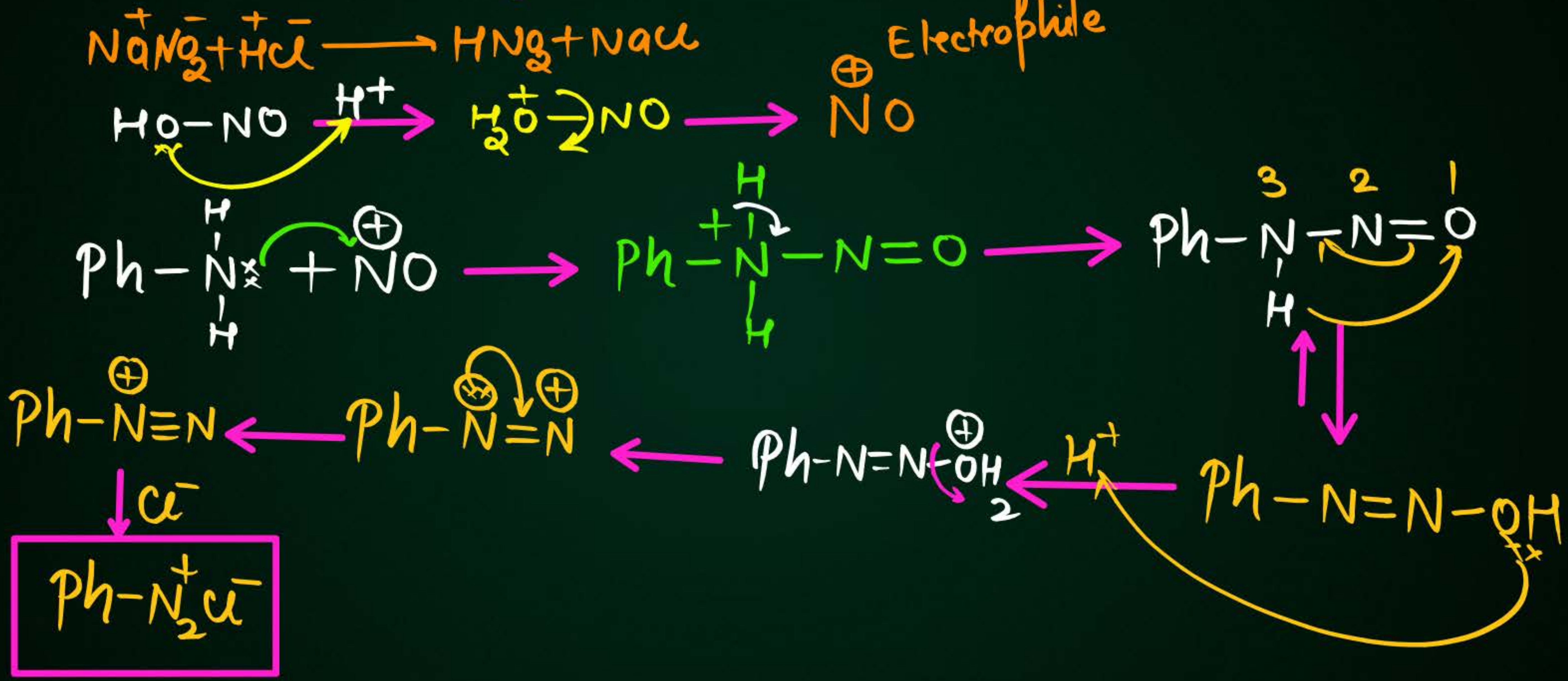
$$HI + HNO_3 \longrightarrow I_2 + NO_2 + H_2O$$

$$HI + HIO_3 \longrightarrow I_2 + H_2O$$

Formation of benzene diazonium chloride (B.D.C)

$$Ph-\ddot{N}H_2 \xrightarrow[0-5^\circ C]{NaNO_2+HCl} PhN_2^+Cl^-$$

Mech



$$Na^+NO_2^- + H^+Cl^- \longrightarrow HNO_2 + NaCl$$

Electrophile

$$HO-NO \xrightarrow{H^+} H_2\overset{+}{O}-NO \longrightarrow \overset{\oplus}{N}O$$

$$Ph-\ddot{N}H_2 + \overset{\oplus}{N}O \longrightarrow Ph-\overset{+}{N}H_2-N=O \longrightarrow Ph-\overset{3}{N}H-\overset{2}{N}=\overset{1}{O}$$

$$\rightleftharpoons Ph-N=N-OH \xrightarrow{H^+} Ph-N=N-\overset{\oplus}{O}H_2 \longrightarrow Ph-\ddot{N}=\overset{\oplus}{N} \longrightarrow Ph-\overset{\oplus}{N}\equiv N$$

$$\downarrow Cl^-$$

$$\boxed{Ph-N_2^+Cl^-}$$

formation of aniline

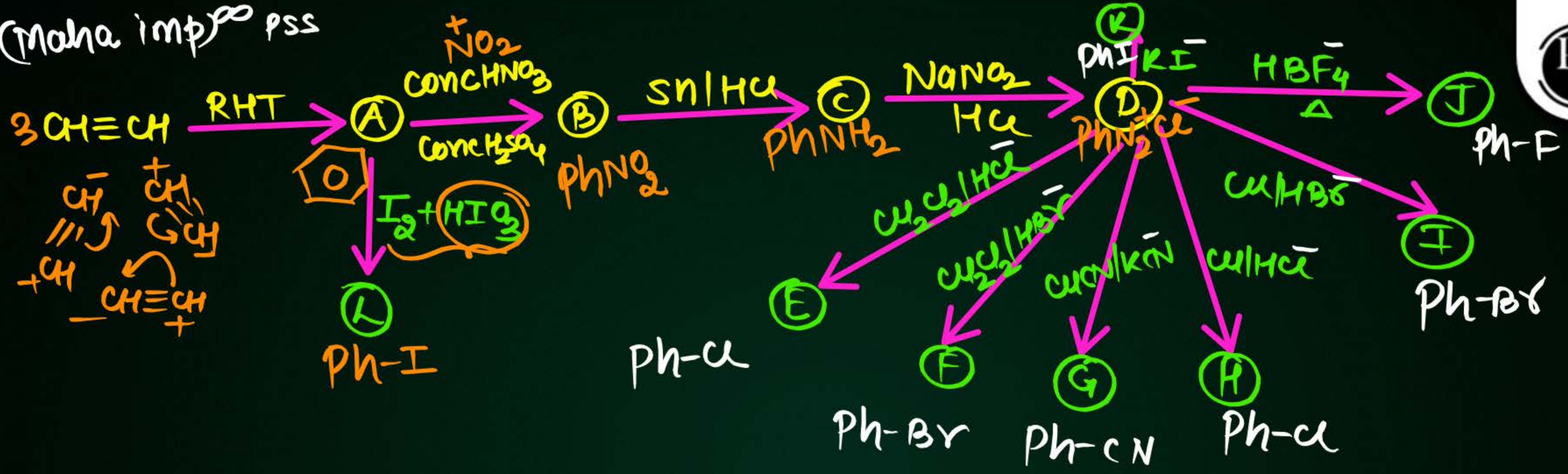
$$Ph-NO_2 \xrightarrow[\substack{\text{or} \\ Sn|HCl \\ \text{or} \\ Fe|HCl\ (\text{Best})}]{H_2 + cat} Ph-NH_2$$

$Sn|HCl \rightarrow SnCl_4 + H_2$

$Fe|HCl \rightarrow FeCl_2 + H_2$

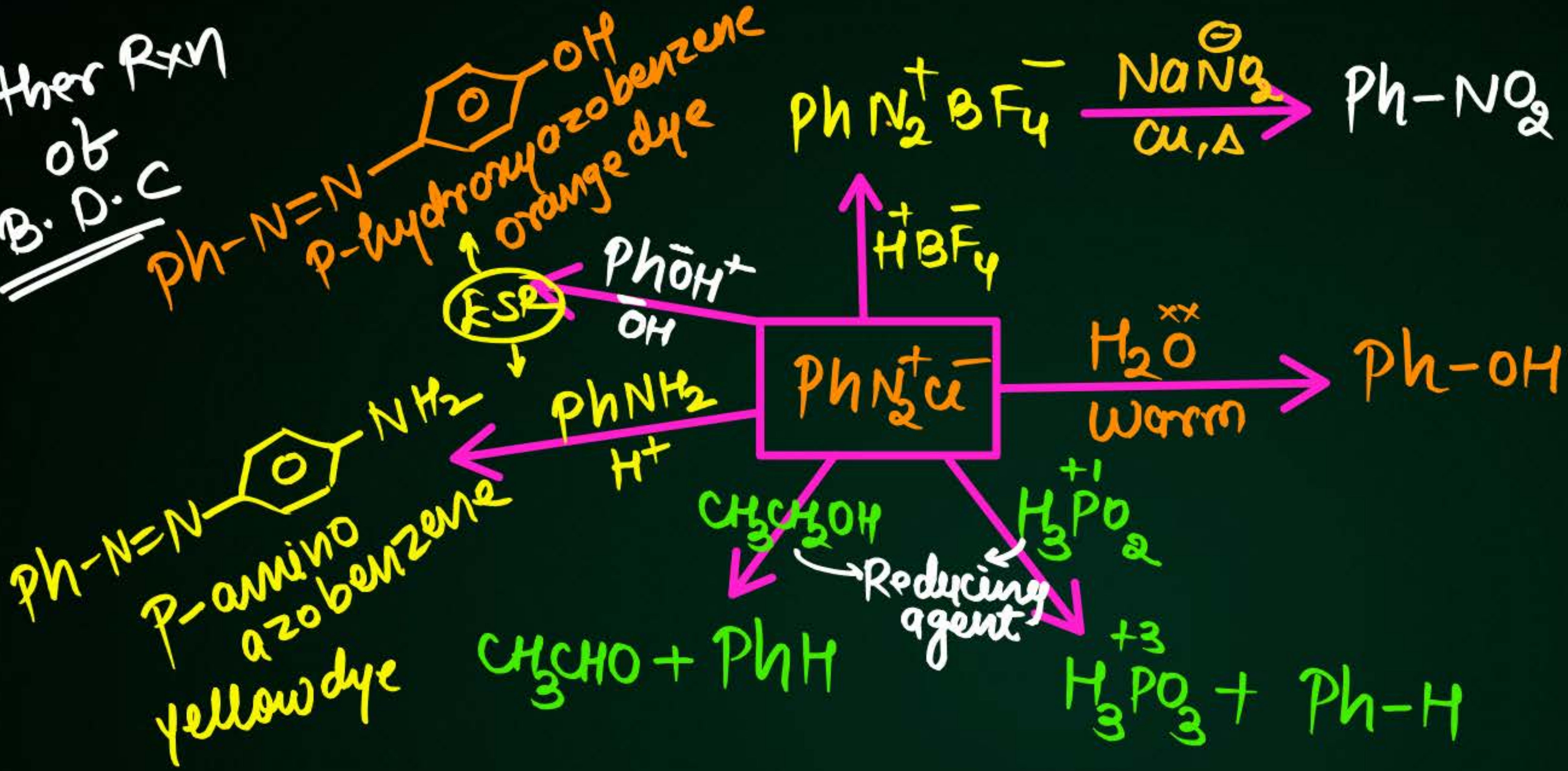
$$FeCl_2 + H_2 \xrightarrow{H_2O} Fe(OH)_2 + \boxed{HCl}$$

(Maha imp)∞ pss



3CH≡CH
RHT
A
CH−
+CH
CH
CH
+CH
CH≡CH
conc HNO3
conc H2SO4
+NO2
B
PhNO2
Sn|HCl
C
PhNH2
NaNO2
HCl
D
PhN2+Cl−
KI−
K
PhI
HBF4−
Δ
J
Ph-F
I2+HIO3
L
Ph-I
Cu2Cl2/HCl−
E
Ph-Cl
Cu2Cl2/HBr−
F
Ph-Br
CuCN/KCN−
G
Ph-CN
Cu/HCl−
H
Ph-Cl
Cu/HBr−
I
Ph-Br

Other Rxn
of
B.D.C


Ph-N=N-⟨O⟩-OH
p-hydroxyazobenzene
orange dye
PhOH
$\bar{O}H$
ESR
$PhN_2^+BF_4^-$
$\xrightarrow[Cu,\Delta]{NaNO_2^-}$
$Ph-NO_2$
$\overset{+}{H}\overset{-}{B}F_4$
$PhN_2^+Cl^-$
$H_2\ddot{O}$
warm
Ph-OH
$PhNH_2$
H^+
Ph-N=N-⟨O⟩-NH₂
P-amino azobenzene
yellow dye
CH_3CH_2OH
Reducing agent
$\overset{+1}{H_3PO_2}$
$CH_3CHO + PhH$
$\overset{+3}{H_3PO_3} + Ph-H$

PhN_2^+

$Ph-\overset{+}{N}\equiv N$

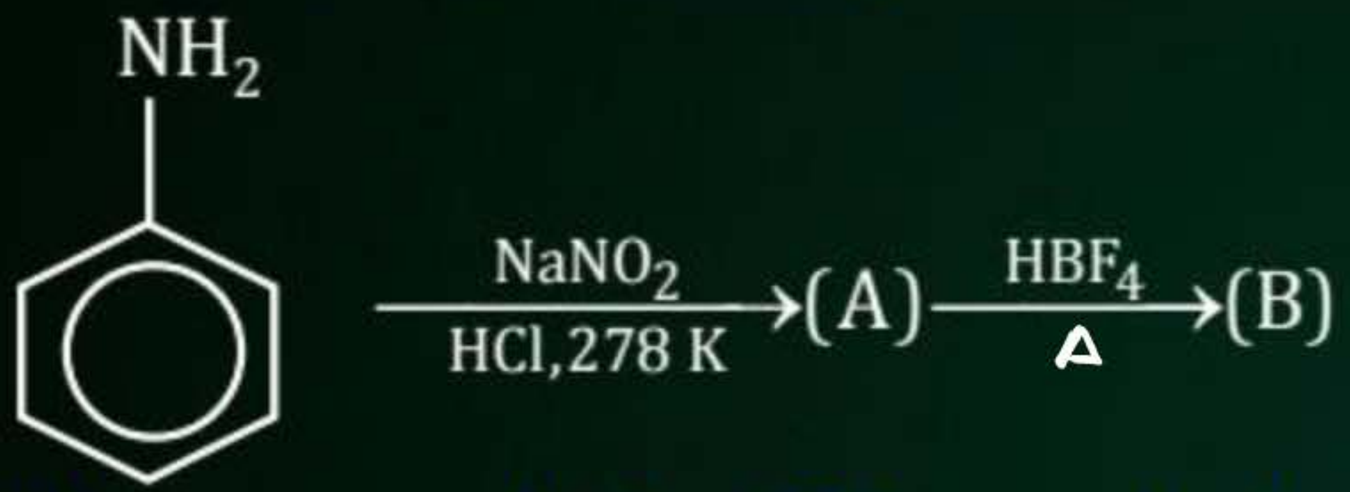
$Ph-N=\overset{\oplus}{N}$

$E^{\oplus}$

Home Work

QUESTION 01

In the chemical reaction,


NH_2
$NaNO_2$
HCl, 278 K
(A)
HBF_4
Δ
(B)

The compounds A and B respectively are:

- (A) Nitrobenzene and chlorobenzene
- (B) Nitrobenzene and fluorobenzene
- (C) Benzene diazonium chloride and fluorobenzene
- (D) Phenol and benzene

QUESTION 02

The following is an example of Sandmeyer reaction

Ⓐ $C_6H_5N_2^+Cl^- \xrightarrow{CuCl/HCl} C_6H_5Cl$

Ⓑ $C_6H_5N_2^+Cl^- \xrightarrow{H_2O/\Delta} C_6H_5OH$

Ⓒ $C_6H_5N_2^+Cl^- \xrightarrow{HBF_4} C_6H_5F$

Ⓓ $C_6H_5N_2^+Cl^- \xrightarrow{KI/warm} C_6H_5I$

QUESTION 03

A direct iodination of benzene is not possible because

(A) Iodine is oxidizing agent.

(B) The product C_6H_5I is reduced to C_6H_6 by HI

(C) HI is unstable.

(D) Ring is deactivated.

QUESTION 04

Preparation of aryl halide by Benzene diazonium chloride and HBF_4 is called

- (A) Sandmeyer reaction
- (B) Gattermann reaction
- (C) Schiemann reaction
- (D) Friedal Craft reaction

QUESTION 05

Chlorobenzene can be prepared by reacting benzene diazonium chloride with

(A) HCl

(B) Cu_2Cl_2/HCl

(C) $Cl_2/AlCl_3$

(D) HNO_2

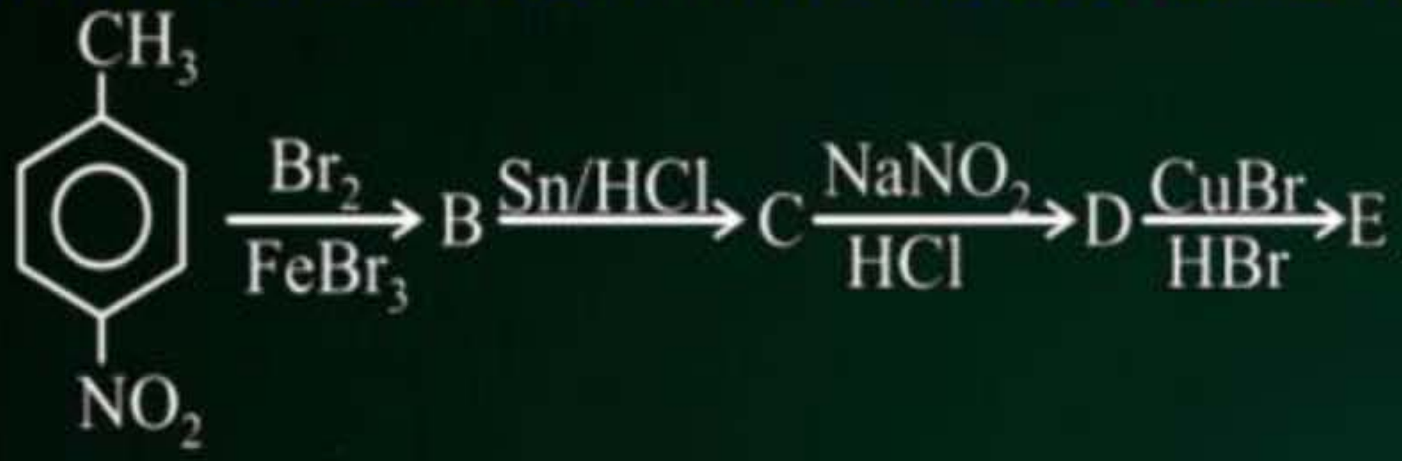
QUESTION 06

Chlorobenzene can be prepared by reacting aniline with:

- (A) HCl and Cu_2Cl_2
- (B) chlorine in presence of U.V. light
- (C) chlorine in presence of anhydrous $AlCl_3$
- (D) nitrous acid followed by heating with Cu_2Cl_2/HCl

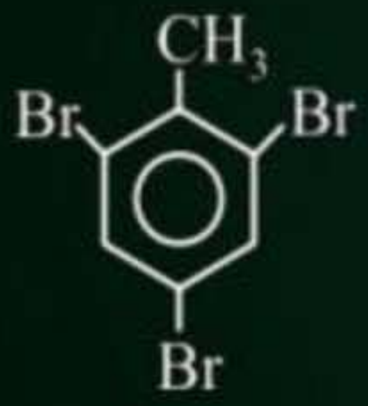
QUESTION 07

In a set of reactions p-nitrotoluene yielded a product E. The product E would be:

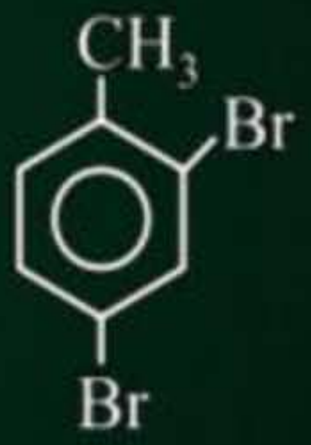


CH3
NO2
Br2
FeBr3
B
Sn/HCl
C
NaNO2
HCl
D
CuBr
HBr
E

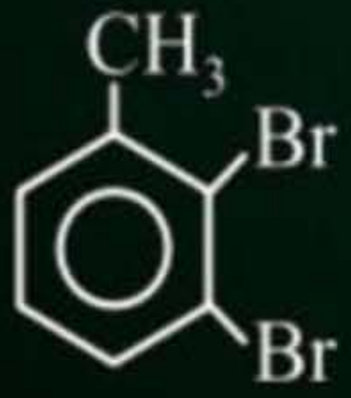
(A)



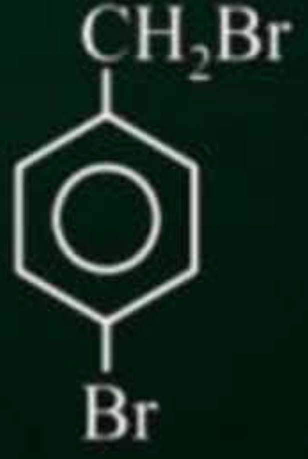
(B)



(C)



(D)



QUESTION 08

Which of the following halogens can be introduced into the benzene ring via diazonium salts?

(A) F

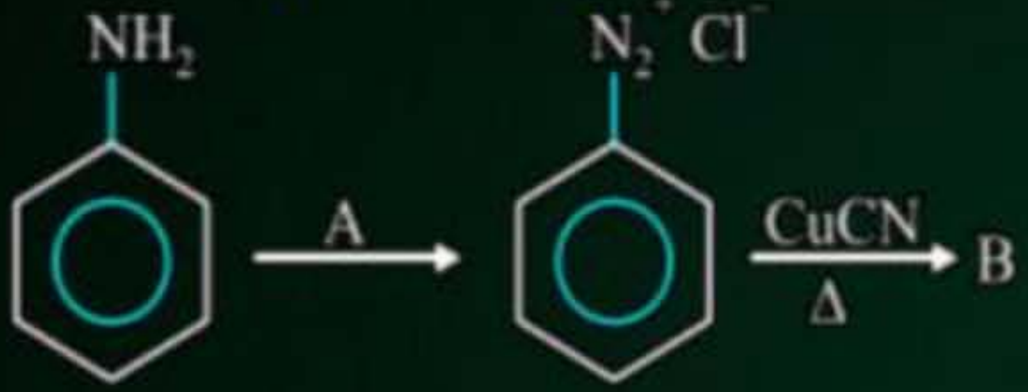
(B) Cl

(C) Br

(D) All of these

QUESTION 09

A and B are respectively:


NH2
A
N2+ Cl-
CuCN
Δ
B

A Phenol and methyl nitrile

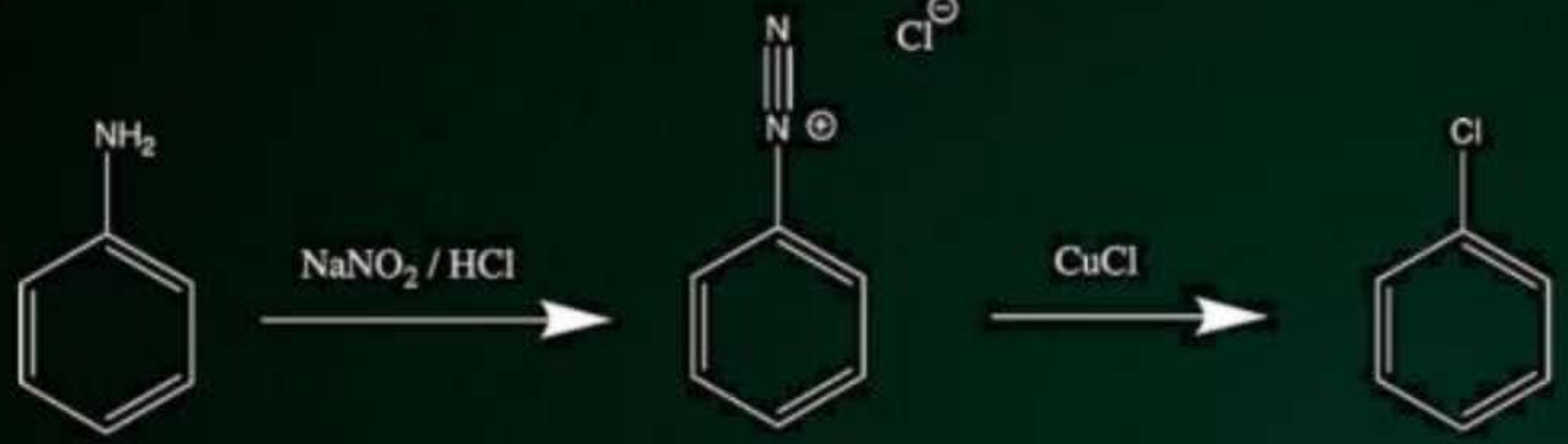
B HNO_3 and benzonitrile

C $NaNO_2/HCl$ and benzonitrile

D HNO_2 and methyl cyanide

QUESTION 10

Name of the following reaction is:



NH_2
$NaNO_2$ / HCl
N
N ⊕
Cl⊖
CuCl
Cl

A Wurtz reaction

B Sandmeyer reaction

C Gattermann reaction

D Friedel Crafts reaction

ANSWER KEY

1. C
2. A
3. B
4. C
5. B
6. D
7. B
8. D
9. C
10. B

Home Work From PW Module (Yakeen NEET)

Prarambh: Q 12, 13, 15

Prabal: Q 02, 12

Parikshit: Q 01, 15, 20

MARK THE DATE 4th May, 2025

Only 04 Months left for the NEET

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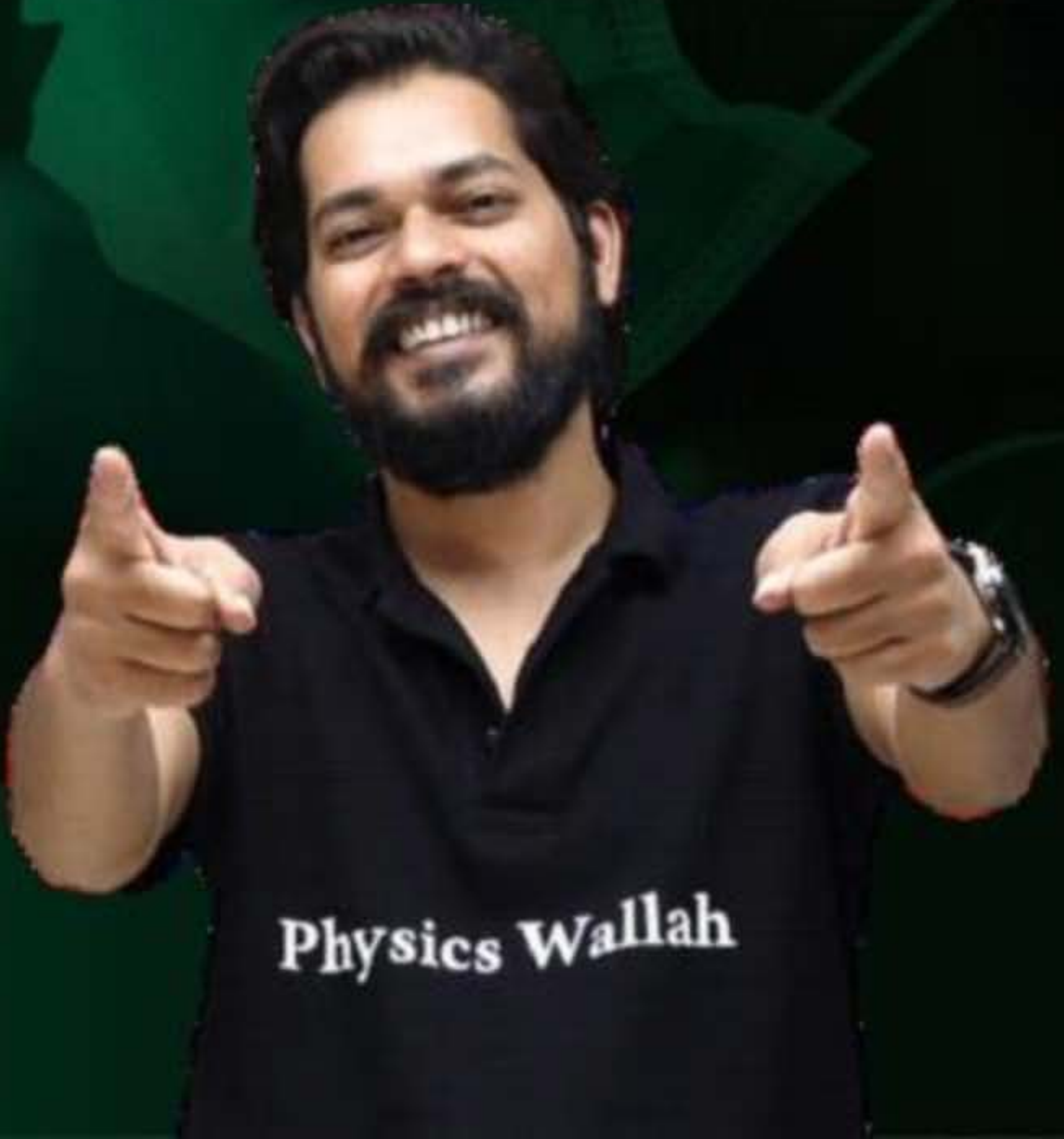
YAKEEN 2.0

FOR NEET 2025

Lecture- 03 | Organic Chemistry

Haloalkanes and Haloarenes

By- Pankaj Sir(POPU MAMA)


Physics Wallah

Topics *to be covered*

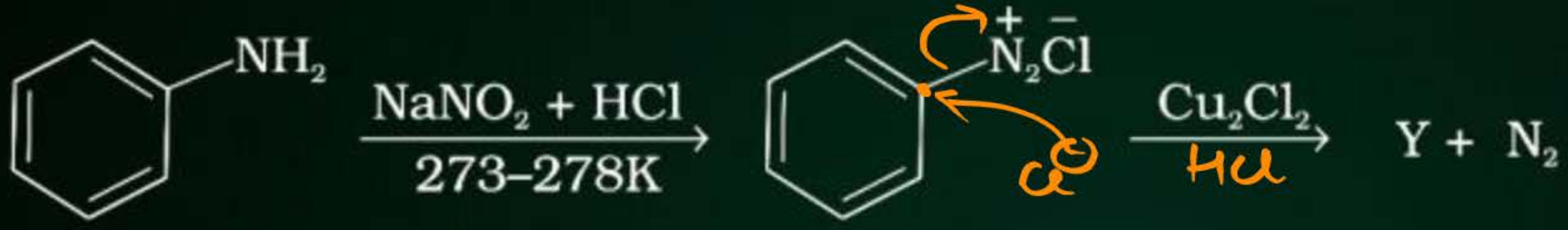
1. Last Class Practice Session ✓
2. Chemical Properties of Haloalkanes ✓ (Elimination)
3. Practice

LAST CLASS

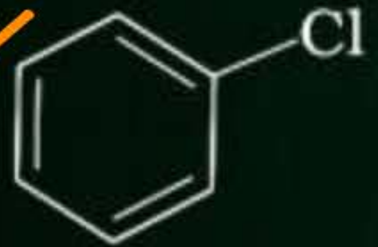
PRACTICE SESSION

QUESTION (NCERT Exemplar)

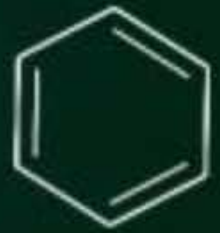
Identify the compound Y in the following reaction.


NH$_2$
NaNO$_2$ + HCl
273–278K
$\overset{+}{N}_2\overset{-}{Cl}$
Cl$^{\ominus}$
Cu$_2$Cl$_2$
HCl
Y + N$_2$

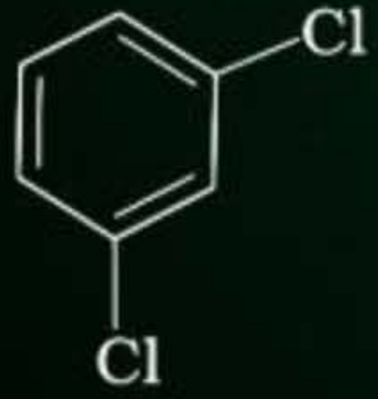
[✓ A]



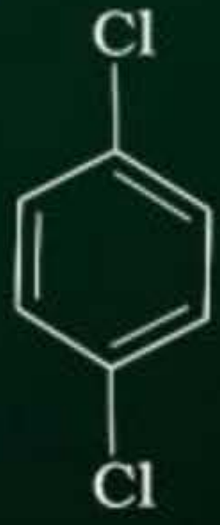
B



C

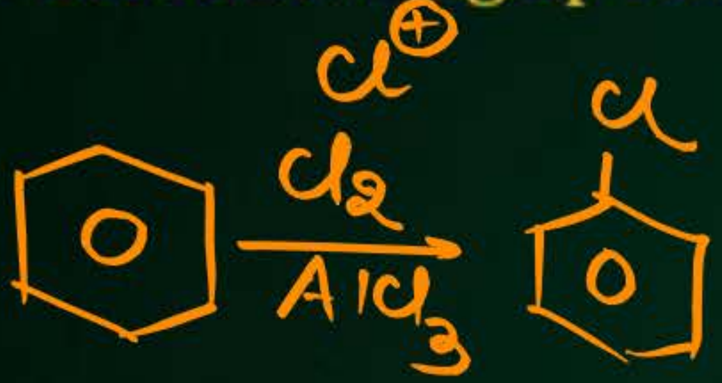


D



QUESTION (NCERT Exemplar)

Chlorobenzene is formed by reaction of chlorine with benzene in the presence of $AlCl_3$. Which of the following species attacks the benzene ring in this reaction?



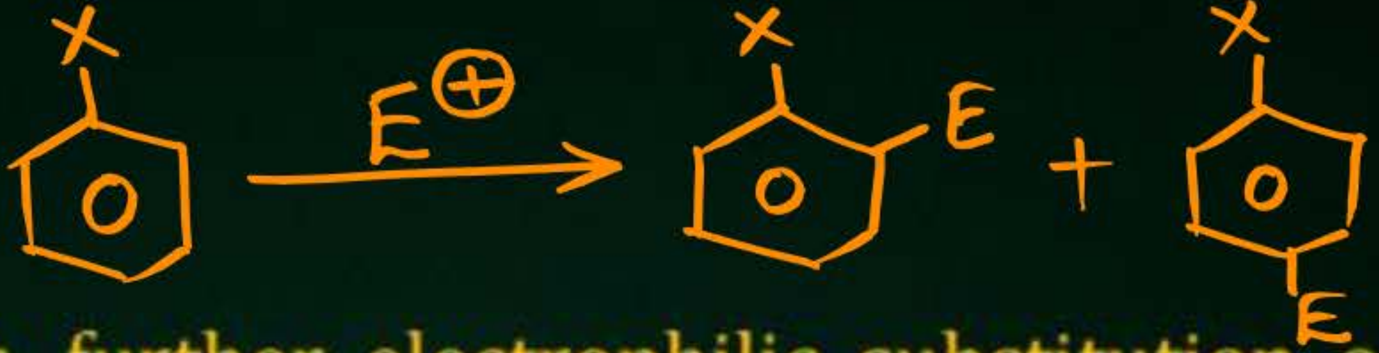
A Cl^-

[✓ **B**] Cl^+

C $AlCl_3$

D $[AlCl_4]^-$

QUESTION (NCERT Exemplar)



Assertion: In monohaloarenes, further electrophilic substitution occurs at ortho and para positions.

Reason: Halogen atom is a ring deactivator.

$-I > +M$

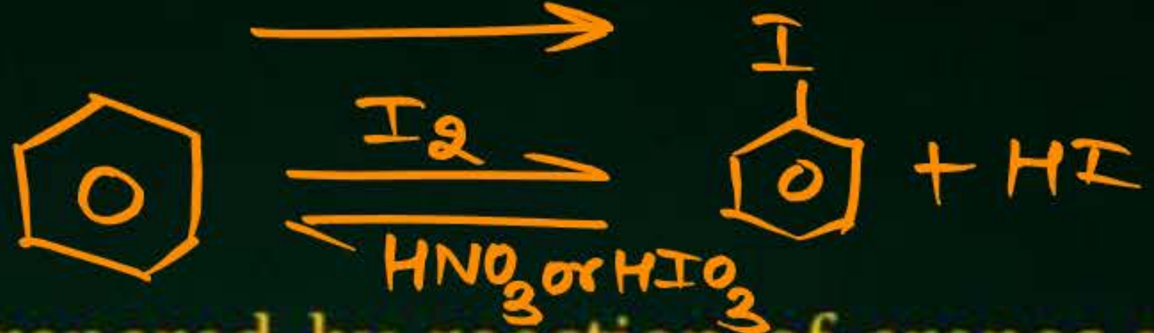
A Assertion and reason both are correct and reason is correct explanation of assertion.

B Assertion and reason both are correct statements but reason is not correct explanation of assertion.

C Assertion is correct but reason is wrong statement.

D Assertion is wrong but reason is correct statement.

QUESTION (NCERT Exemplar)



Assertion: Aryl iodides can be prepared by reaction of arenes with iodine in the presence of an Oxidising agent.

$H\overset{-1}{I} \xrightarrow[\text{Oxi}]{} \overset{0}{I_2}$

Reason: Oxidising agent oxidizes $\underbrace{\overset{0}{I_2} \xrightarrow{\text{Red}} \text{into } \overset{-1}{HI}}$. X

A Assertion and reason both are correct and reason is correct explanation of assertion.

B Assertion and reason both are correct statements but reason is not correct explanation of assertion.

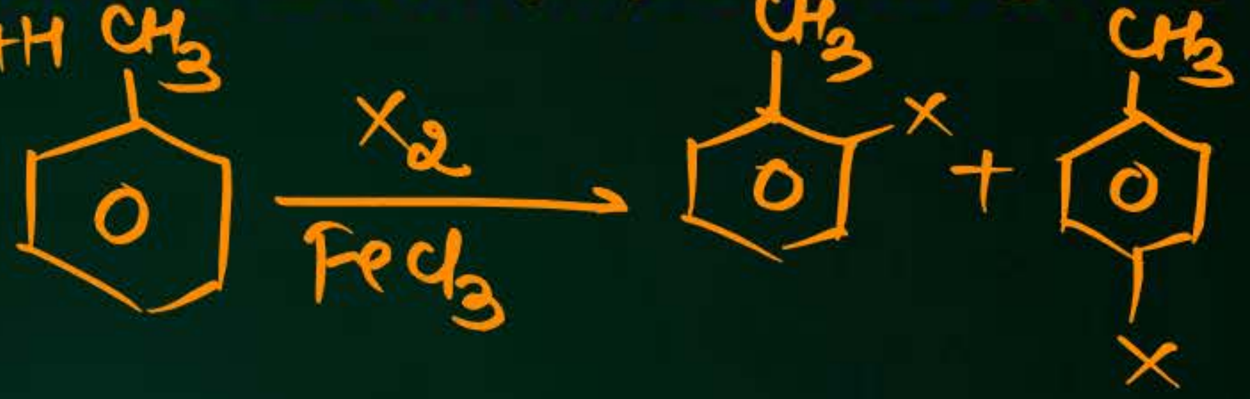
[✓ C] Assertion is correct but reason is wrong statement.

D Assertion is wrong but reason is correct statement.

QUESTION (NCERT Exemplar)

o/p dir

Toluene reacts with a halogen in the presence of iron (III) chloride giving ortho and para halo compounds. The reactions is:



A Electrophilic elimination reaction

[✓ B] Electrophilic substitution reaction

C Free radical addition reaction

D Nucleophilic substitution reaction

QUESTION

On treatment of Toluene with Cl_2 in presence of Fe, dark the product formed is:

Cl^+ ESR

- **A** [✓ o-and p-chloro Toluene]
- **B** Benzyl chloride
- **C** m-chloro Toluene
- **D** only p-chloro Toluene

QUESTION

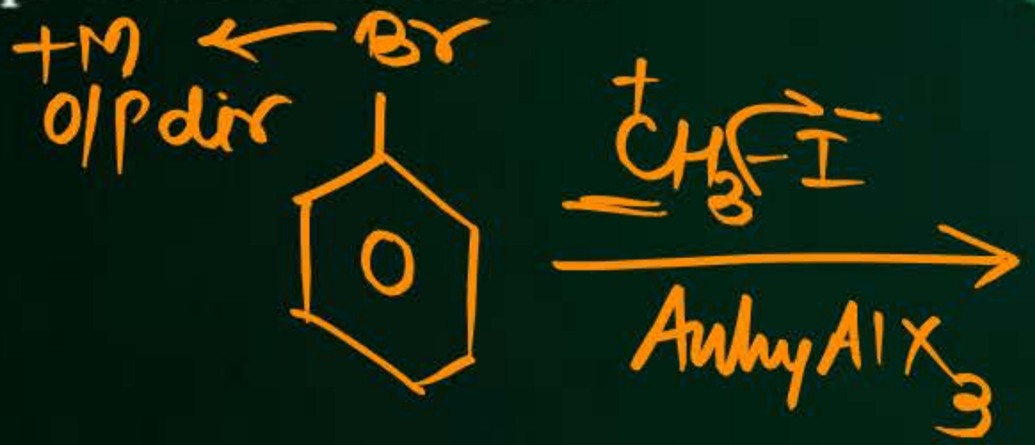
Friedel-Craft's reaction of bromobenzene with methyl iodide gives

A o-bromo toluene

B p-bromo toluene

[✓ C] o-and p-bromo toluene

D m-bromo toluene


+M
o/p dir
Br
$\overset{+}{C}H_3-\overset{-}{I}$
Anhy AlX$_3$

QUESTION

In the halogenation of aromatic nucleus, the halogen carrier is used to generate the species:

ESR

(A) $Cl\bullet$

[✓ (B)] Cl^+

(C) Cl^-

(D) Cl

QUESTION

$$Ph-NH_2 \xrightarrow[0-5^\circ C]{NaNO_2+HCl} PhN_2^+Cl^-$$

Aniline on treatment with nitrous acid ($NaNO_2$ + HCl) at 0°C, forms:

- A phenol
- B nitobenzene
- C nitrosobenzene
- [✓ D] benzene diazonium chloride

QUESTION

Aryl fluoride may be prepared from arene diazonium chloride using:

$$PhN_2^+Cl^- \xrightarrow{\overset{+}{H}\overset{-}{BF_4}} PhN_2^+BF_4^- \xrightarrow{\Delta} Ph\text{-}F$$

$$BF_4^{\ominus} \longrightarrow F^{\ominus} + BF_3$$

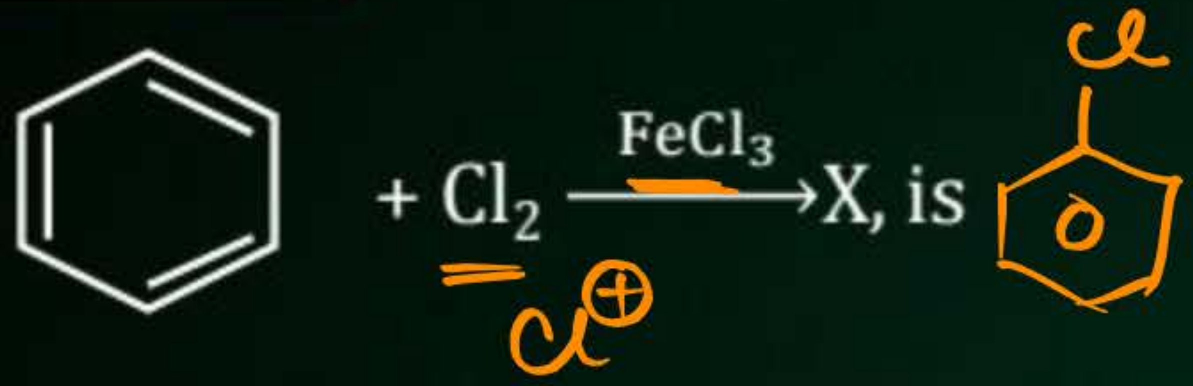
[✓ A] $\underbrace{HBF_4/\Delta}$

B $HBF_4/NaNO_2$, Cu, Δ

C CuF/HF

D Cu/HF

QUESTION



$+ \underset{= Cl^{\oplus}}{Cl_2} \xrightarrow{FeCl_3} X$, is

[✓ **A**] Chlorobenzene

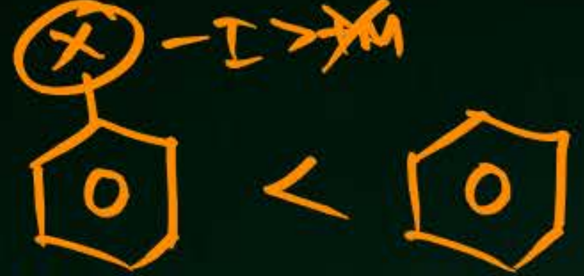
B m-dichloro benzene

C Benzene hexachloride

D p-dichlorobenzene

QUESTION

R.O.R



Assertion: Aryl halides undergo electrophilic substitution less readily than benzene.

Reason: Aryl halide gives only meta product w.r.to electrophilic substitution.

A Both Assertion and Reason are correct and Reason is the correct explanation of the Assertion.

B Both Assertion and Reason are correct but Reason is not the correct explanation of the Assertion.

[✓ **C**] The Assertion is correct but Reason is incorrect.

D The Assertion is incorrect but the Reason is correct.

QUESTION

$$\begin{tikzcd} Ph{-}NH_2 \arrow[r, "NaNO_2"', "HCl"'] & PhN_2^+Cl^- \arrow[r, "HBF_4"] & PhN_2^+BF_4^- \arrow[d, "\Delta"] \\ & & Ph{-}F \end{tikzcd}$$

Fluorobenzene (C_6H_5F) can be synthesized in the laboratory:

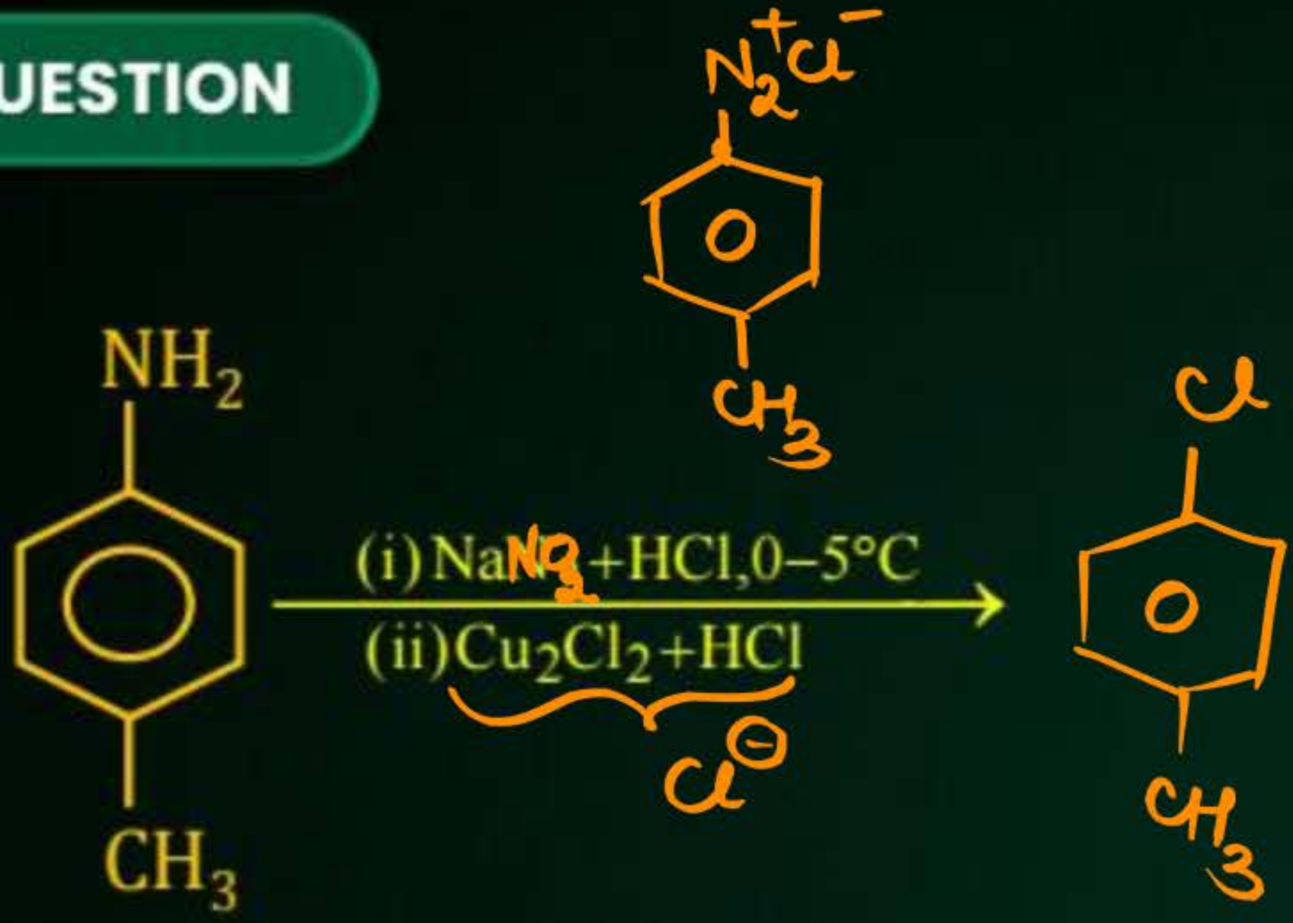
A By heating phenol with HF and KF

[✓ **B**] From aniline by diazotization followed by heating the diazonium salt with HBF_4

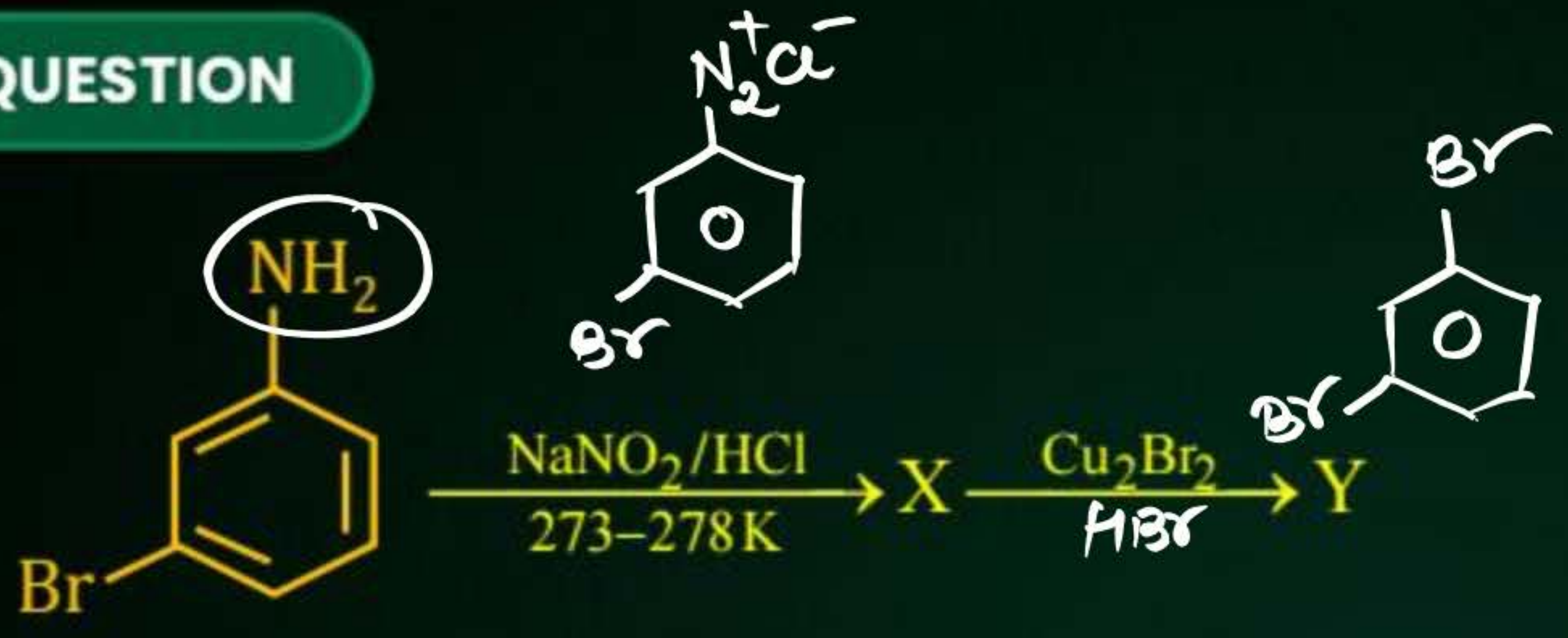
C By direct fluorination of benzene with F_2 gas

D By reacting bromobenzene with NaF solution

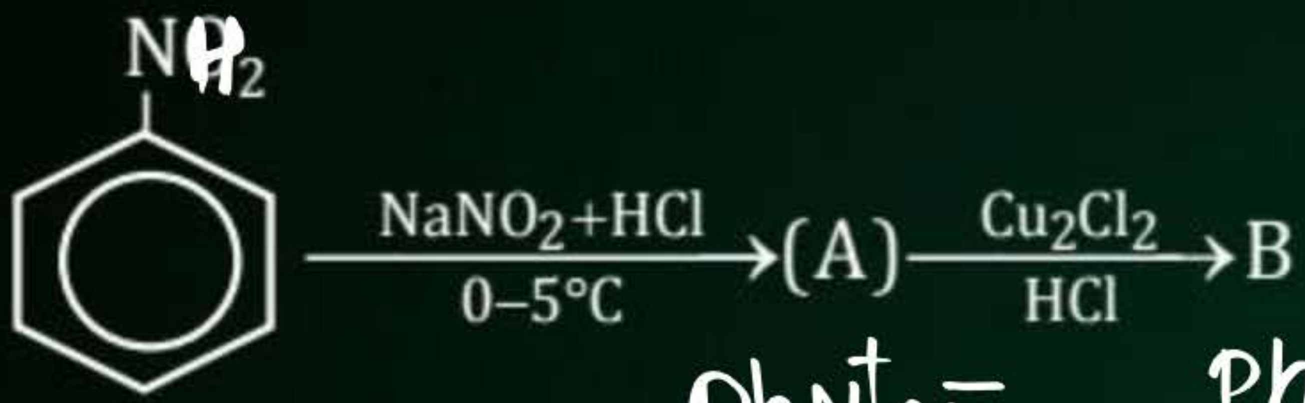
QUESTION


$N_2^+Cl^-$
CH_3
NH_2
(i) NaNO$_2$+HCl, 0–5°C
(ii) Cu$_2$Cl$_2$+HCl
$Cl^\ominus$
CH_3
Cl
CH_3

QUESTION

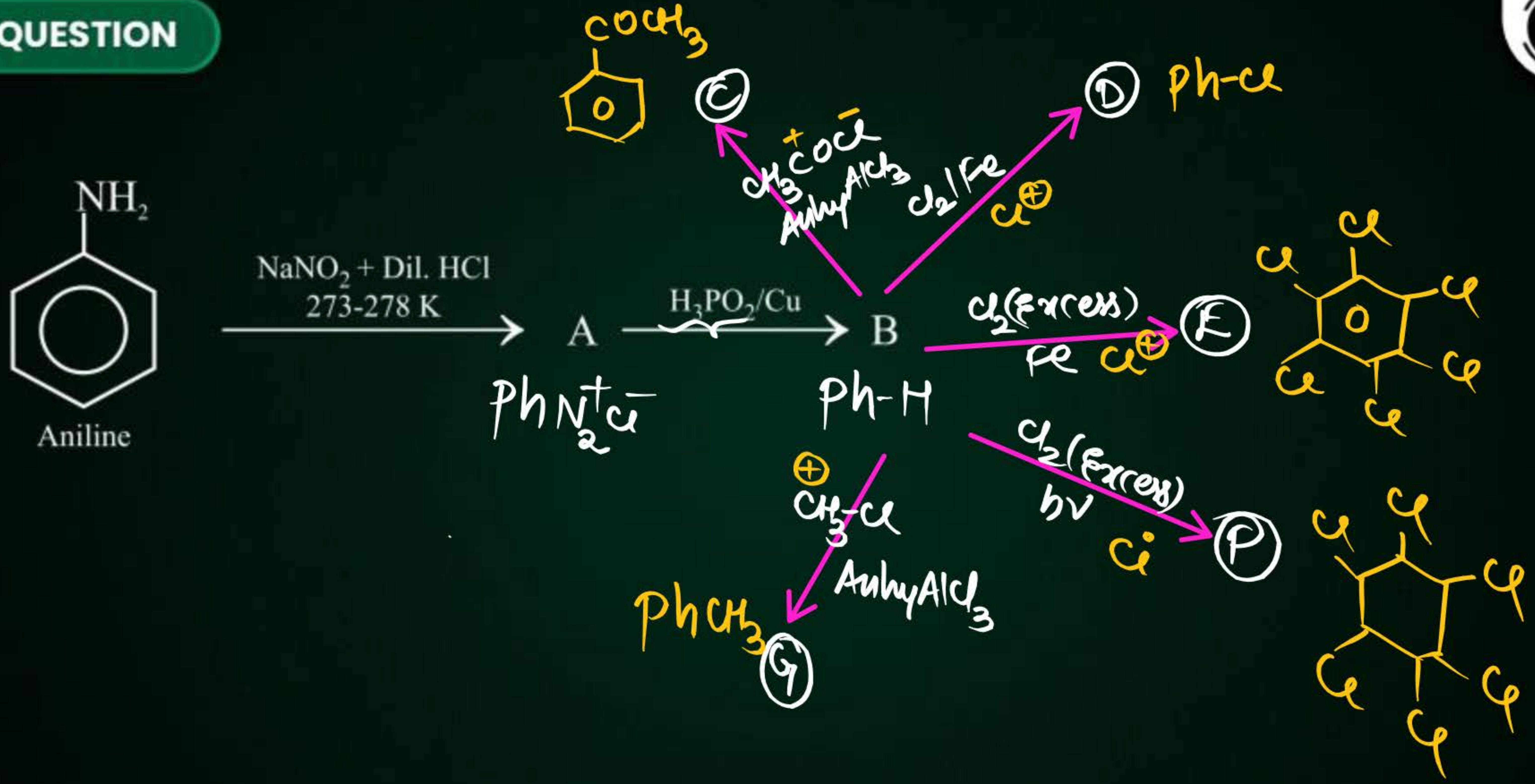

NH_2
Br
$NaNO_2/HCl$
273–278K
X
Cu_2Br_2
HBr
Y
$N_2^+Cl^-$
Br
Br
Br

QUESTION

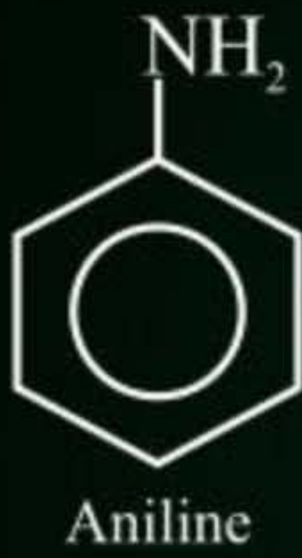

NH2
NaNO2+HCl
0–5°C
(A)
Cu2Cl2
HCl
B

$PhN_2^+Cl^-$ $Ph-Cl$

QUESTION


NH2
Aniline
NaNO2 + Dil. HCl
273-278 K
A
H3PO2/Cu
B
PhN2+Cl−
Ph-H
CH3C+OCl−
Anhy AlCl3
C
COCH3
Cl2/Fe
Cl⊕
D
Ph-Cl
Cl2(Excess)
Fe
Cl⊕
E
Cl
Cl2(Excess)
hν
Cl•
F
⊕
CH3-Cl
Anhy AlCl3
PhCH3
G

QUESTION


Aniline

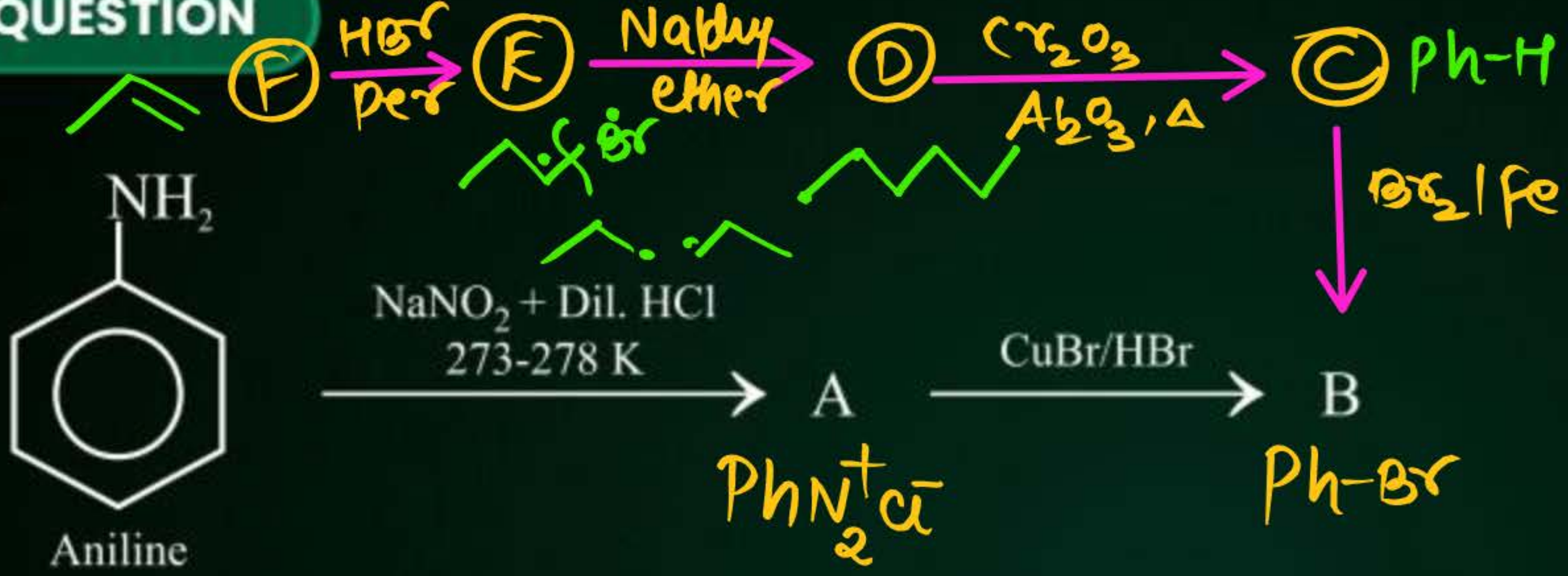
$$\xrightarrow[273\text{-}278\ K]{NaNO_2 + Dil.\ HCl} PhN_2^+Cl^- \xrightarrow{Boiling\ H_2O/H^+} Ph\underset{(Zn)}{OH} \xrightarrow{Zn/dust} \text{Ⓐ}\ PhH$$

$$ZnX_2 + CH_2{=}CH_2 \xleftarrow{Zn} \underset{X\qquad X}{CH_2-CH_2}\ \text{Ⓒ} \xrightarrow[NaNH_2\ E^2]{E^2\ Alc\ KOH} \text{Ⓑ}\ CH\equiv CH \xrightarrow{RHT} \text{Ⓐ}$$

Vic dihalide

$$\text{Ⓒ} \xrightarrow[H_2]{Zn/H^+} CH_3-CH_3$$

QUESTION

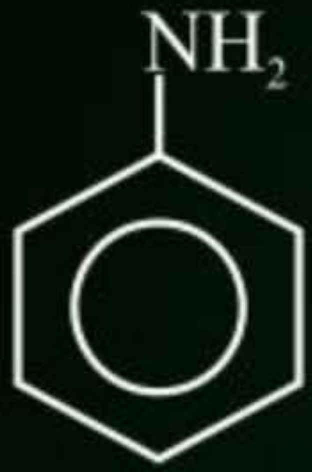


$$\underset{\text{Aniline}}{C_6H_5NH_2} \xrightarrow[273\text{-}278\ K]{NaNO_2 + \text{Dil. } HCl} \underset{PhN_2^+Cl^-}{A} \xrightarrow{CuBr/HBr} \underset{Ph\text{-}Br}{B}$$

$$F \xrightarrow[Per]{HBr} E \xrightarrow[ether]{Na/dry} D \xrightarrow[Al_2O_3,\ \Delta]{Cr_2O_3} C \ \ Ph\text{-}H$$

$$C \xrightarrow{Br_2/Fe} B$$

QUESTION

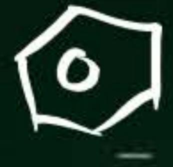


Aniline

$\xrightarrow[273\text{-}278\text{ K}]{NaNO_2 + \text{Dil. HCl}}$ A $\xrightarrow[\text{Heat}]{KI^{\ominus}}$ B

A = $PhN_2^+Cl^-$

B = Ph-I

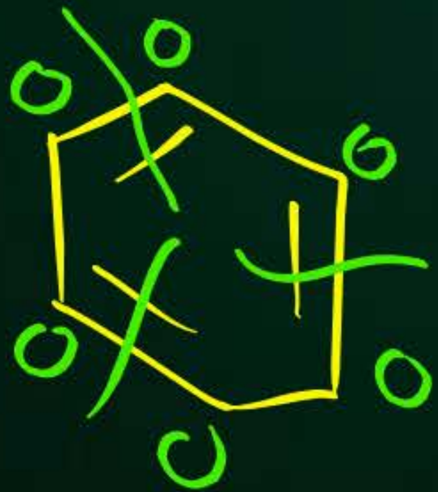


Ⓒ $\xrightarrow[Zn/H_2O]{O_3 + CCl_4}$ Ⓓ $\begin{matrix} CH\ddot{O} \\ | \\ CH\ddot{O} \end{matrix}$

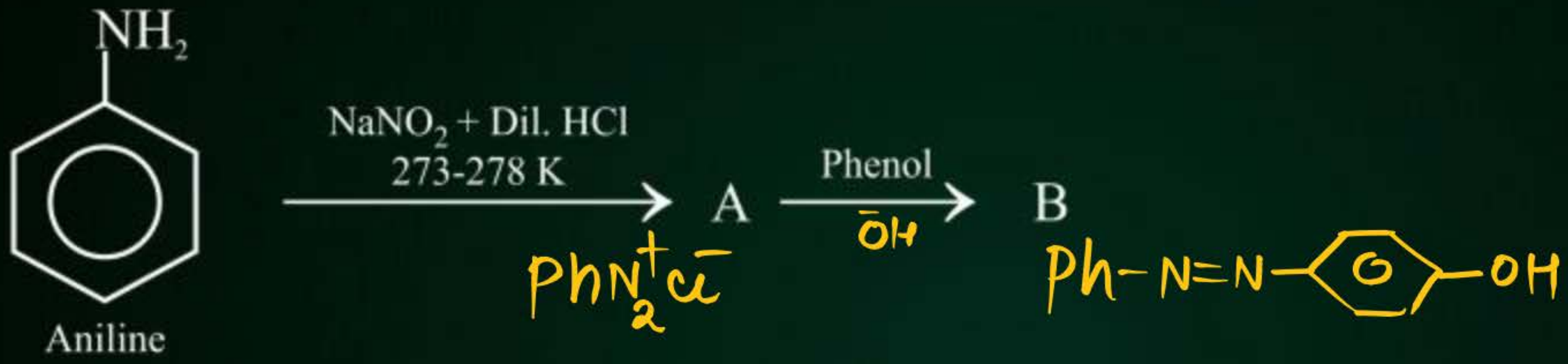
Ⓒ $\Big\downarrow$ $I_2 + \underbrace{HNO_3}_{OA}$ B

Dicarbonyl comp.

No. of L.P in one molecule = 4



QUESTION


NH2
Aniline
Ph−N=N−
−OH

$$\text{Aniline} \xrightarrow[273\text{-}278\ K]{NaNO_2 + \text{Dil. HCl}} A \xrightarrow[\bar{O}H]{\text{Phenol}} B$$

A: $PhN_2^+\bar{Cl}$

Chemical Properties of Haloalkanes

~~Ei~~ (Intramolecular elimination)
(Not in syllabus)

1. Elimination Reactions:

④ E_{1cb} elimination (elimination via conjugate anion formation)
✓ (< 1%)

③ E_{2a} elimination (Bugati)
✓

(Nana mausi !

② E_2 elimination ★ ★ ★ ★ ✓

NEET-2025
(>99%)

① E^1 Elimination

Alkyl Halide
(< 1%)

Dehydration of Alcohol ✓
(>99%)

① E^1 elimination of Alkyl Halide ÷

$$R-X \xrightarrow[\boxed{\Delta}]{PPS} \text{Alkene}$$

(PPS) Polar protic solvent
'O' se H Juda ho.

$$\underbrace{H_2O\ ,ROH,\ RCOOH}_{\text{Dipole moment} \neq 0}\ \text{etc}$$

(Polar)

Mech

$$\overset{\delta+}{R}-\overset{\delta-}{X} \underset{\text{slow}}{\overset{PPS}{\rightleftharpoons}} R^{\oplus} + X^{\ominus}$$

(Rearr is pos)

$$R^{\oplus} \xrightarrow[\text{fast}]{\Delta} \text{Alkene} + H^{+}$$

Op point ÷ ① Carbocation formation is the R.D.S

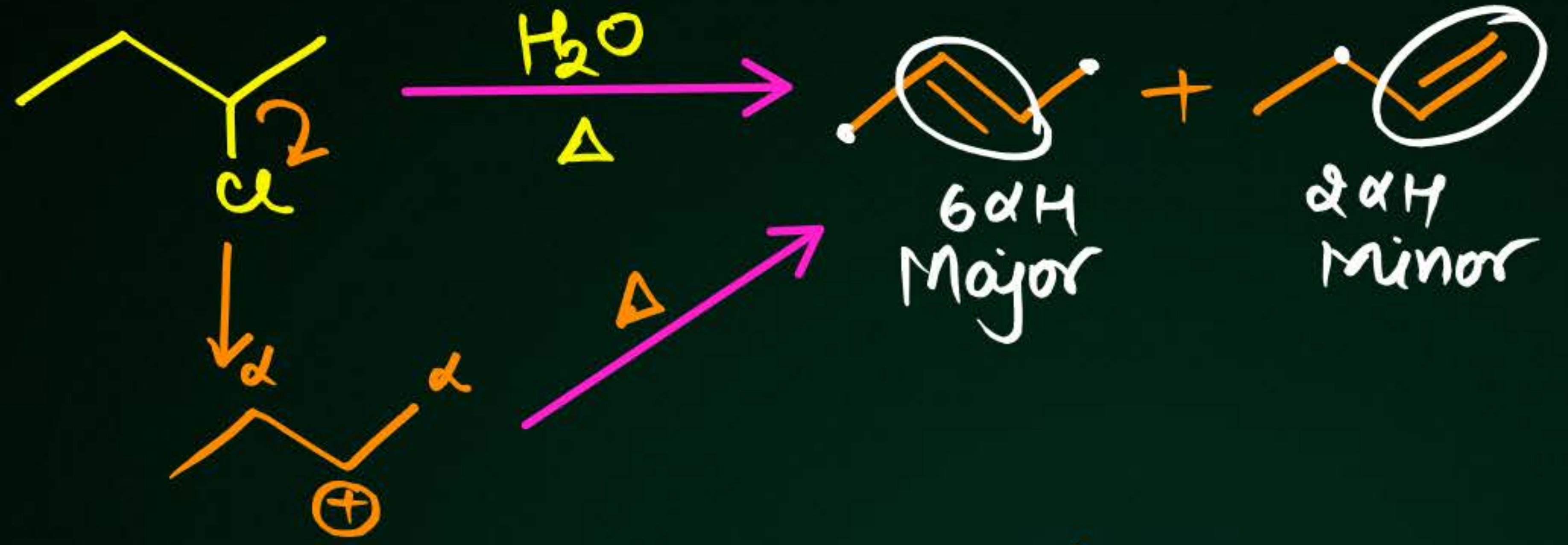
② R.O.R ∝ stability of 1^{st} $C^{\oplus}$

③ rate $r = K[R-X]^1$

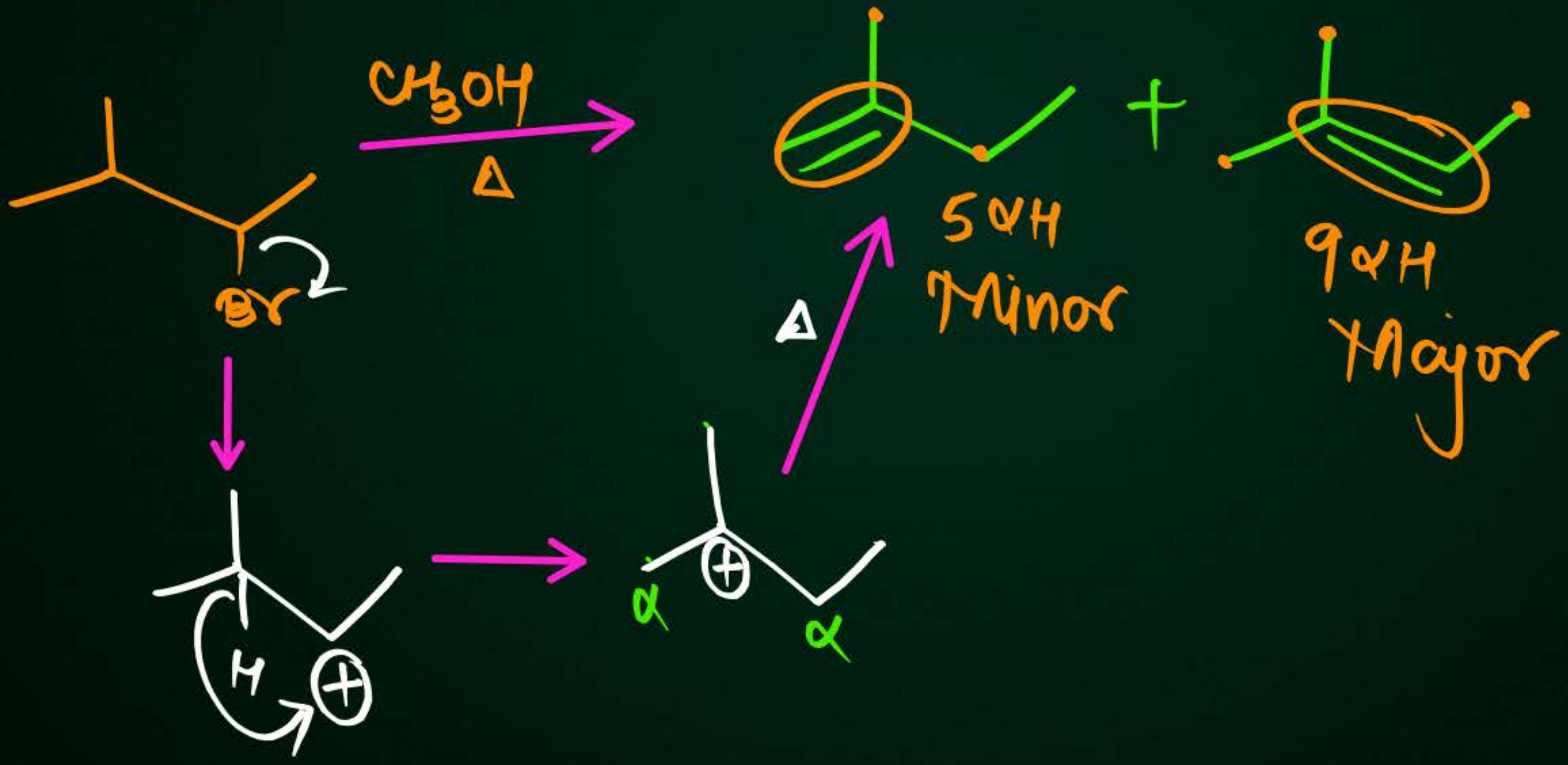
④ order = 1, Molecularity = 1

⑤ More stable alkene is the major product

Q.1


H_2O
Δ
Cl
α
α
Δ
6αH
Major
2αH
Minor

Q.2


CH_3OH
Δ
Br
H
α
α
Δ
5αH
Minor
9αH
Major

② E^1 elimination of Alcohol

Mech

$$R-OH \xrightarrow[\text{conc}\,H_2SO_4\ \text{or conc}\ H_3PO_4]{H^+/\Delta} \text{Alkene}$$

$$R-\ddot{O}H \xrightarrow{H^+} R-\overset{\oplus}{O}H_2 \underset{\text{slow}}{\rightleftharpoons} R^{\oplus} + H_2O$$

(Rearr if pos)

$$R^{\oplus} \xrightarrow[\text{fast}]{\Delta} \text{Alkene} + H^+$$

Imp point ÷ ① Carbocation formation is the R.D.S

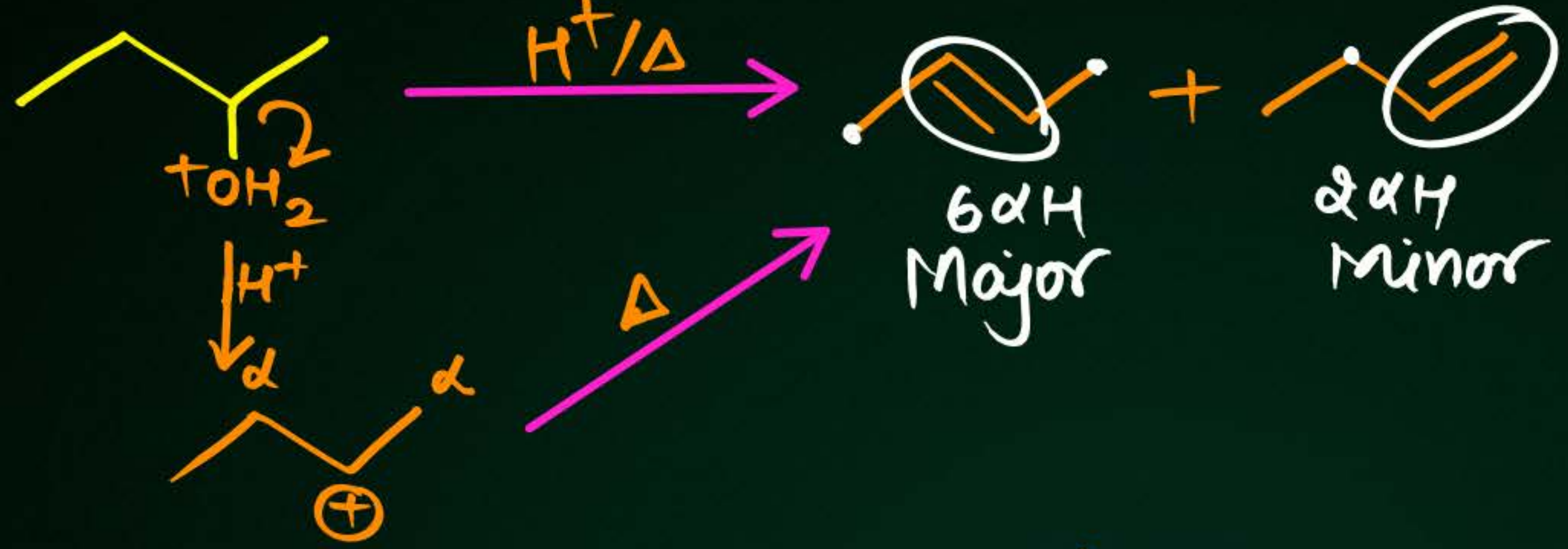
② R.O.R ∝ stability of 1^{st} $C^{\oplus}$

③ rate $r = K[R-\overset{+}{O}H_2]^1$

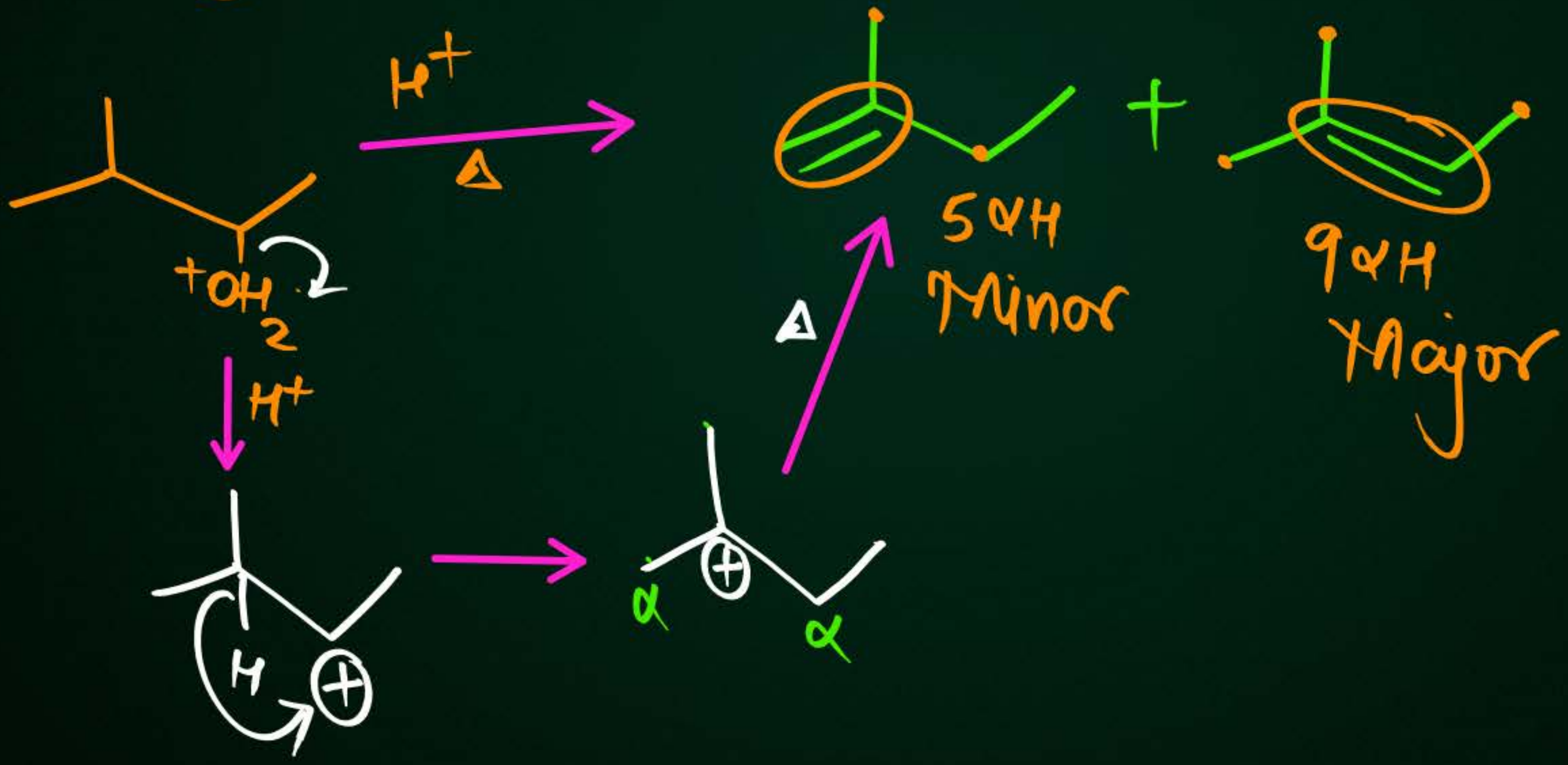
④ Order = 1, Molecularity = 1

⑤ More stable alkene is the major product

Q.1


H+/Δ
+OH2
H+
α
α
Δ
+
6αH
Major
2αH
Minor

Q.2

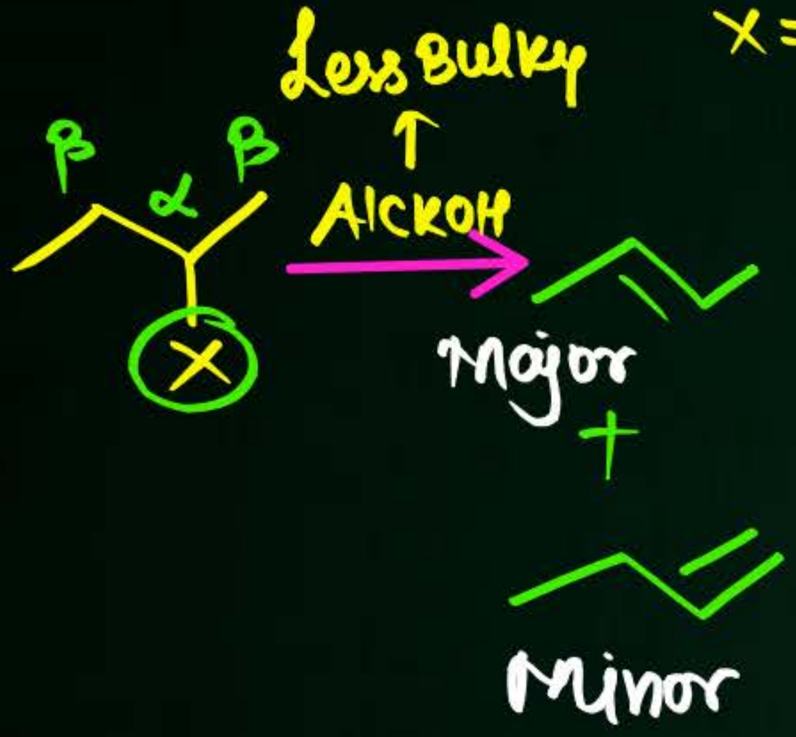

H+
Δ
+OH2
H+
H
Δ
α
α
+
5αH
Minor
9αH
Major

Elimination Reaction E 2: (AlcKOH)

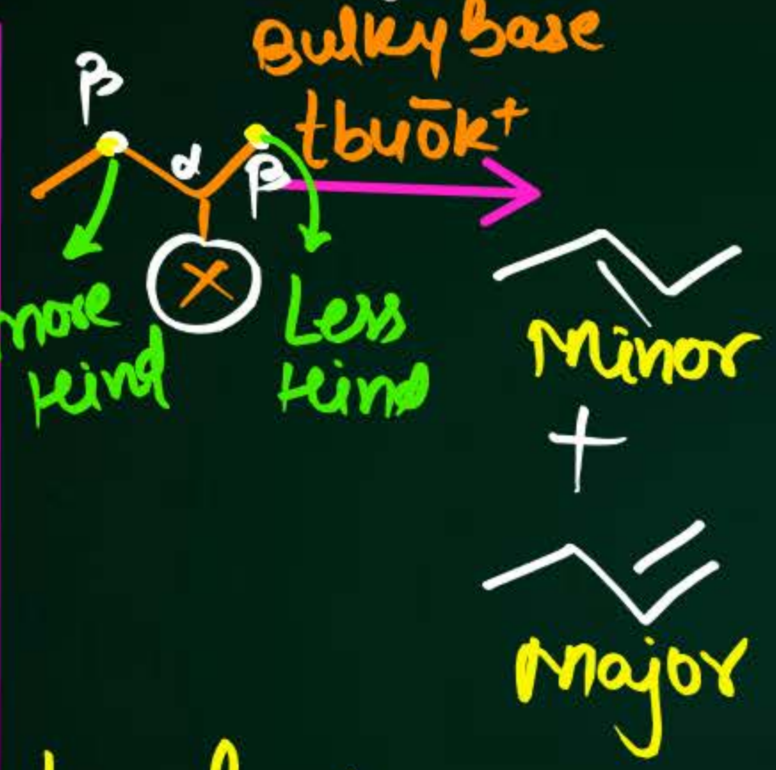
③

Mama mausi (E2)

x = Cl, Br, I (good L.G)


Less Bulky
↑
AlcKOH
β
α
β
X
Major
+
Minor

More stable alkene is the Major product

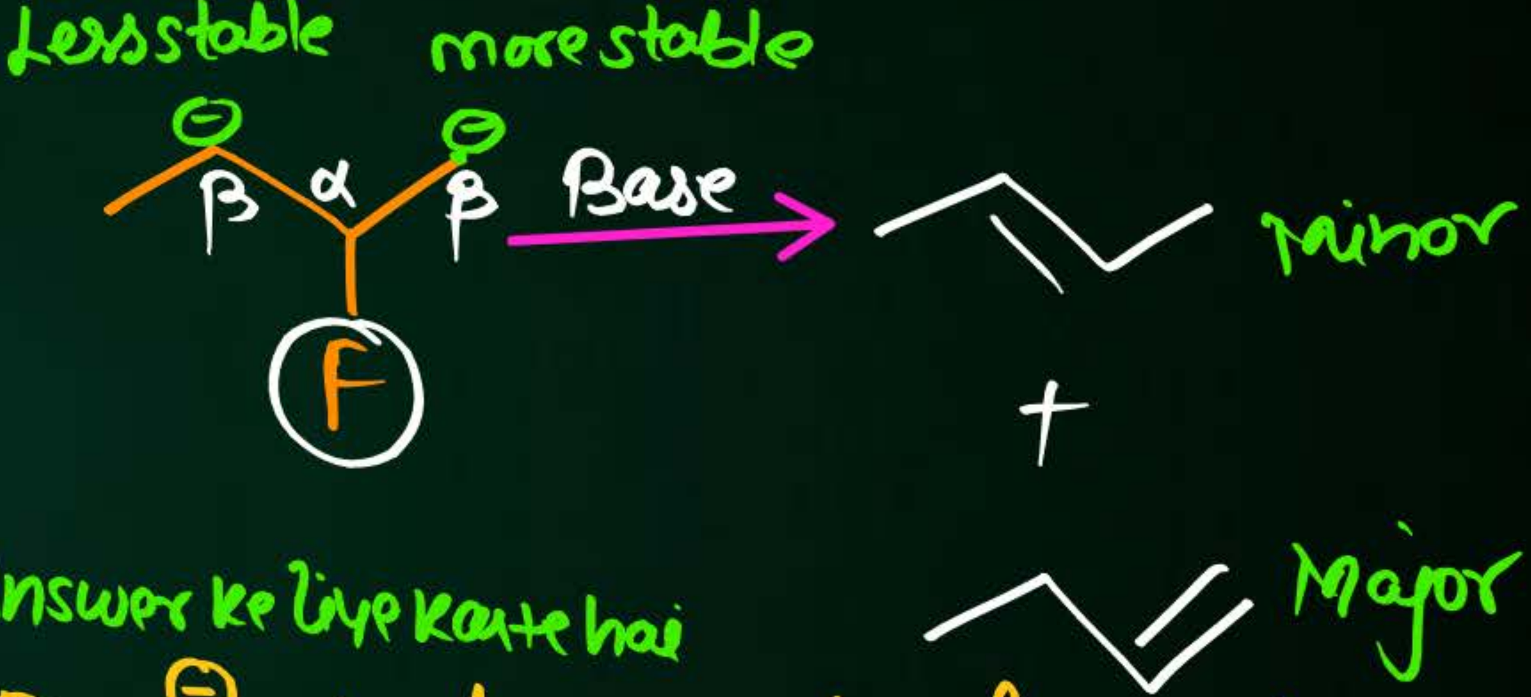

β
α
β
Bulky Base
tBuŌK⁺
more hind
Less hind
Minor
+
Major

Less hindered β-H will decide Major product

Buaji (E2a) anion like charac

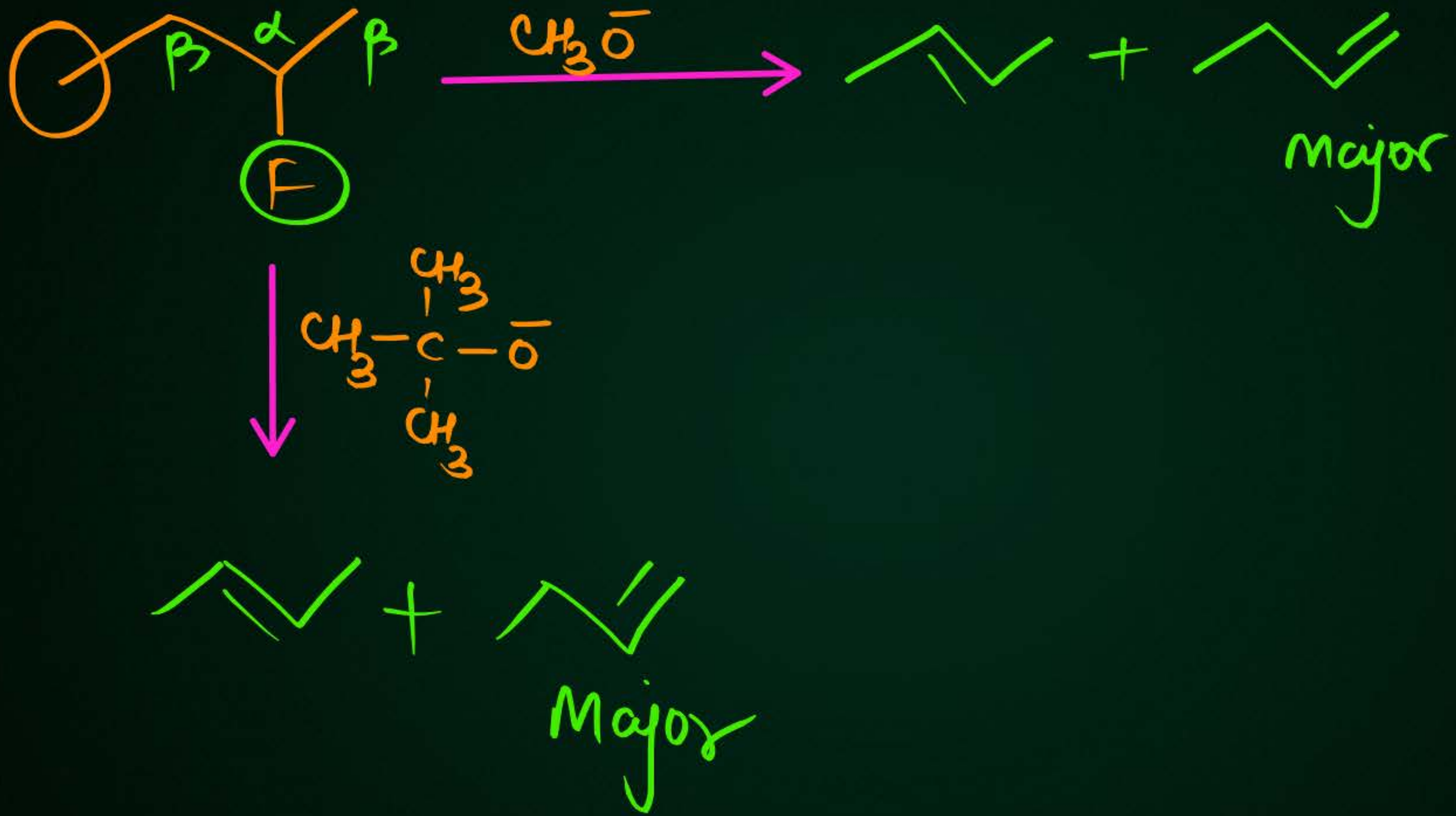
X = F (bad L.G)

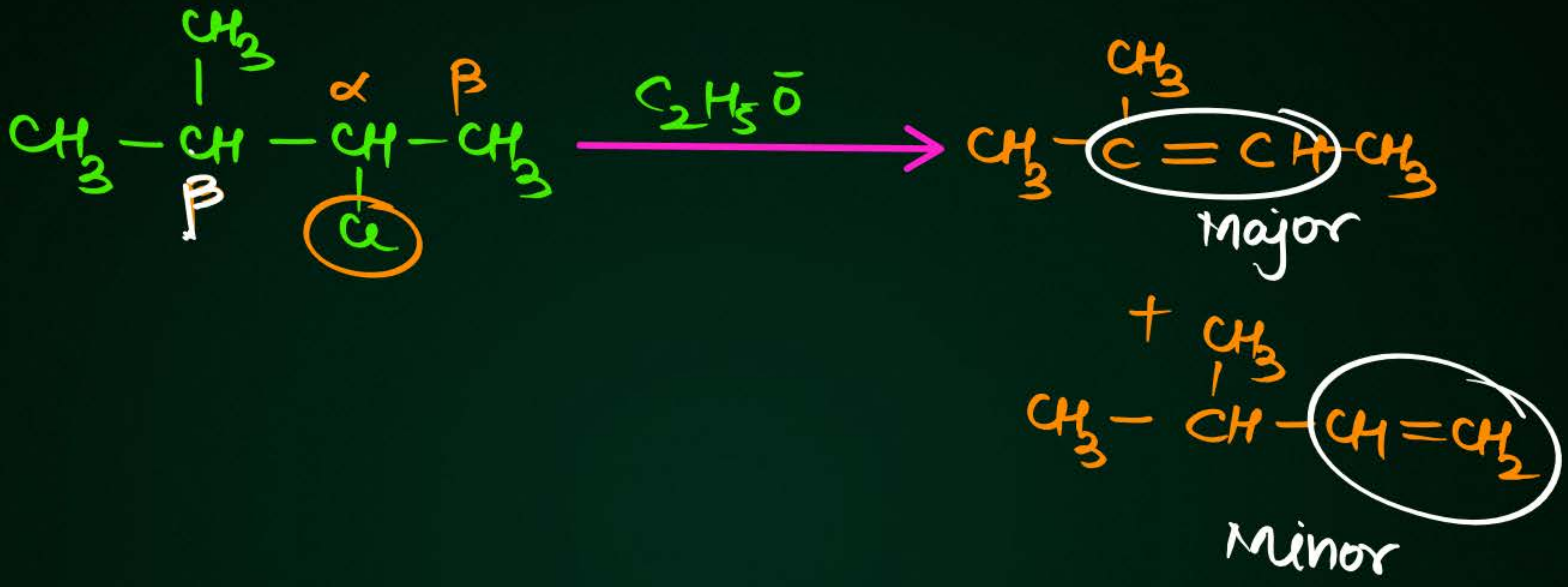
chahe kaisa bhi base ho


Less stable
more stable
⊖
⊖
β
α
β
Base
F
Minor
+
Major

Answer ke liye karte hai

β-$\overset{\ominus}{C}$ will decide major product (More Stable)

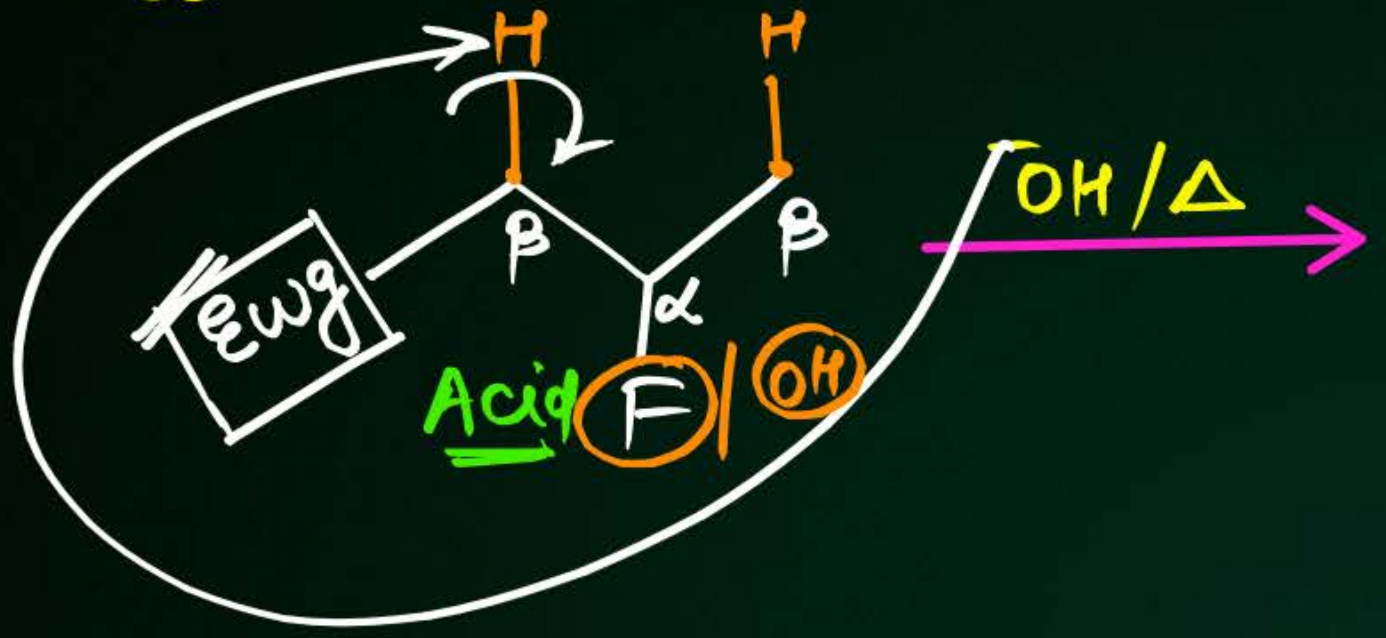

β
α
β
F
CH₃O⁻
Major
CH₃–C(CH₃)₂–O⁻
Major

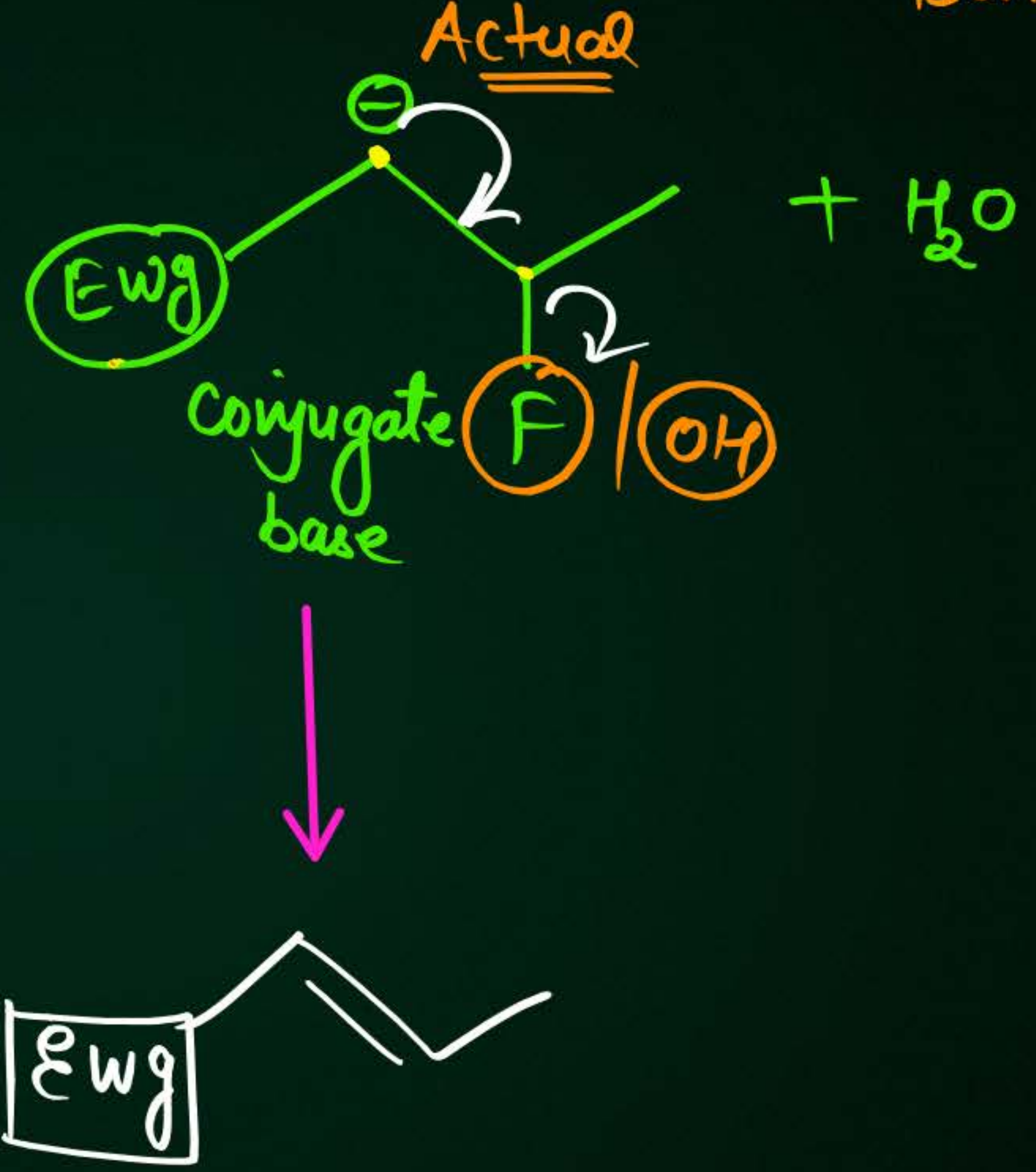


④ E_1cb elimination

F, OH Bad L-G

$\left.\begin{matrix} C=O \\ C-F \end{matrix}\right\}$ strong Bond


H
H
β
β
α
EWG
Acid
F
OH
OH/Δ


Actual
⊖
EWG
conjugate base
F
OH
+ H_2O
EWG

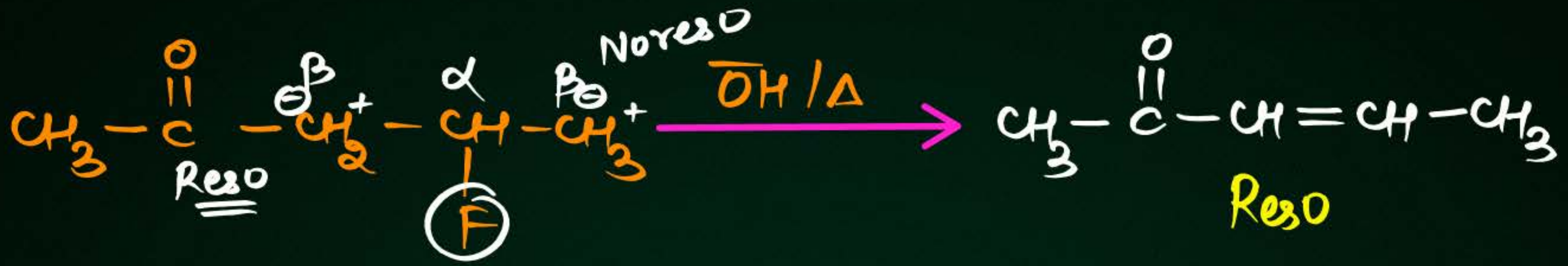
E_{2a} vs E_1cb

Aankh dikhane se kaam ho jaye

Kaksh

ewg support $\overset{\ominus}{C}$

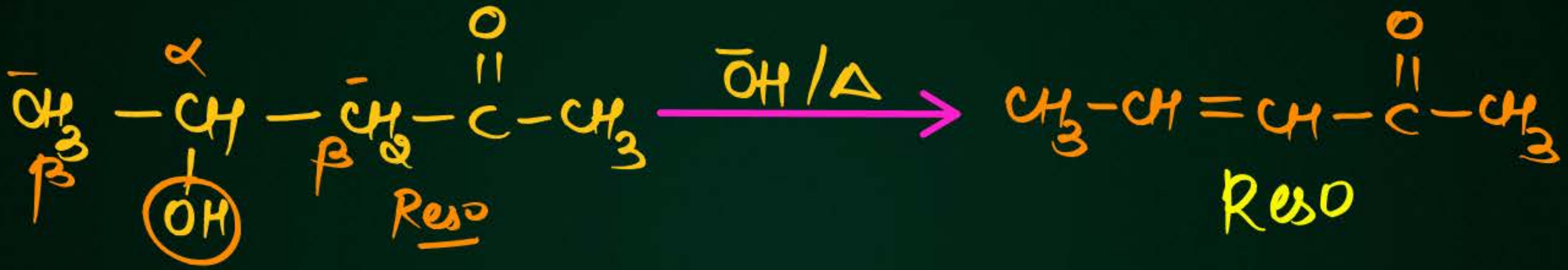
Q.1



$$CH_3-\overset{O}{\overset{\|}{C}}-\overset{\beta}{\overset{\delta}{C}H_2^{+}}-\overset{\alpha}{\underset{F}{CH}}-\overset{\beta\ominus}{CH_3^{+}}\xrightarrow{\bar{O}H/\Delta}CH_3-\overset{O}{\overset{\|}{C}}-CH=CH-CH_3$$

Q-2

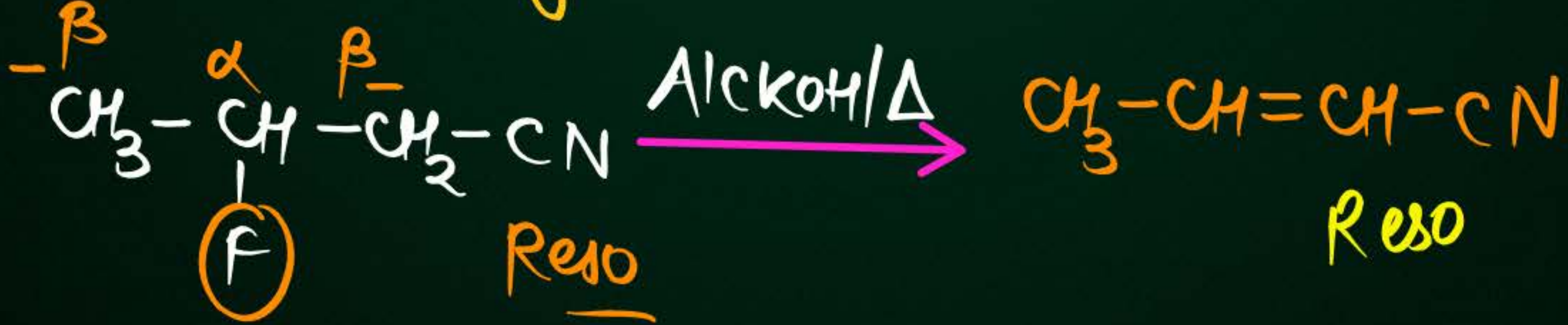
Aldol



$$\overset{-}{\underset{\beta}{CH_3}}-\overset{\alpha}{\underset{OH}{CH}}-\overset{-}{\underset{\beta}{CH_2}}-\overset{O}{\overset{\|}{C}}-CH_3\xrightarrow{\bar{O}H/\Delta}CH_3-CH=CH-\overset{O}{\overset{\|}{C}}-CH_3$$

β-hydroxyketone

Q.3

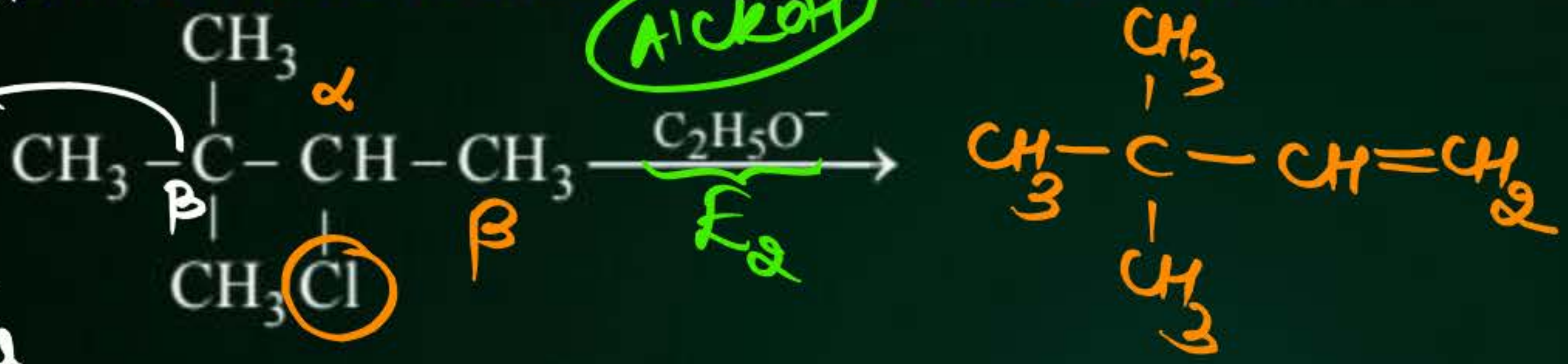


$$\overset{\beta}{\overset{-}{CH_3}}-\overset{\alpha}{\underset{F}{CH}}-\overset{\beta}{\overset{-}{CH_2}}-CN\xrightarrow{Alc\,KOH/\Delta}CH_3-CH=CH-CN$$

QUESTION (AIIMS 2018)

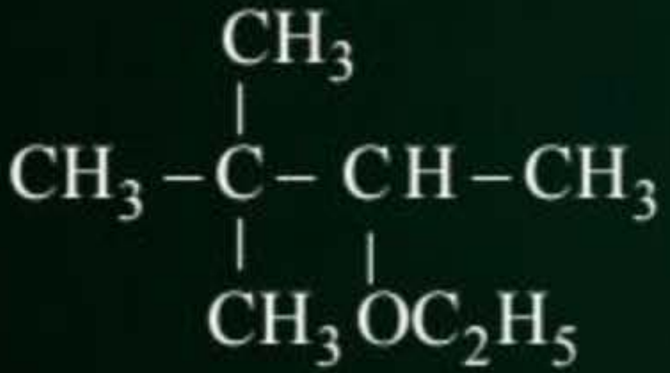
The major product of the following reaction is:

β-c toh hai
but
β-par
'H' nahi
hai



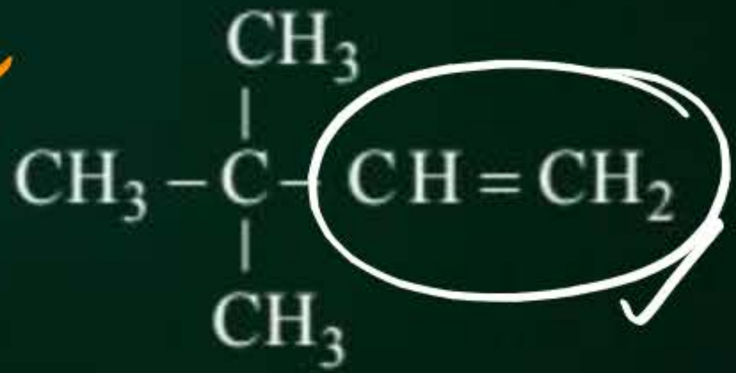
$$CH_3-\underset{\beta\ CH_3}{\overset{CH_3}{C}}-\underset{Cl}{\overset{\alpha}{C}H}-\underset{\beta}{CH_3} \xrightarrow[E_2]{\text{Alc KOH}\quad C_2H_5O^-} CH_3-\underset{CH_3}{\overset{CH_3}{C}}-CH=CH_2$$

A



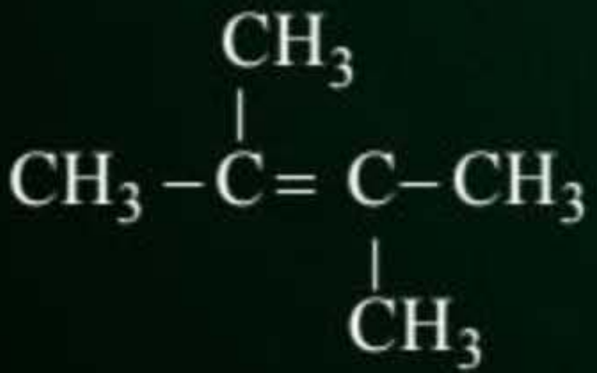
$$CH_3-\underset{CH_3}{\overset{CH_3}{C}}-\underset{OC_2H_5}{CH}-CH_3$$

B ✓



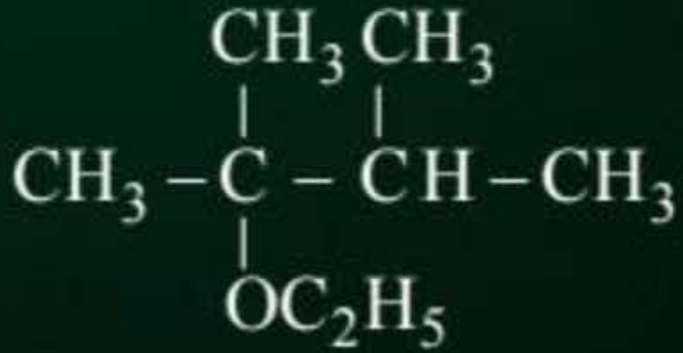
$$CH_3-\underset{CH_3}{\overset{CH_3}{C}}-CH=CH_2$$

C



$$CH_3-\overset{CH_3}{C}=\underset{CH_3}{C}-CH_3$$

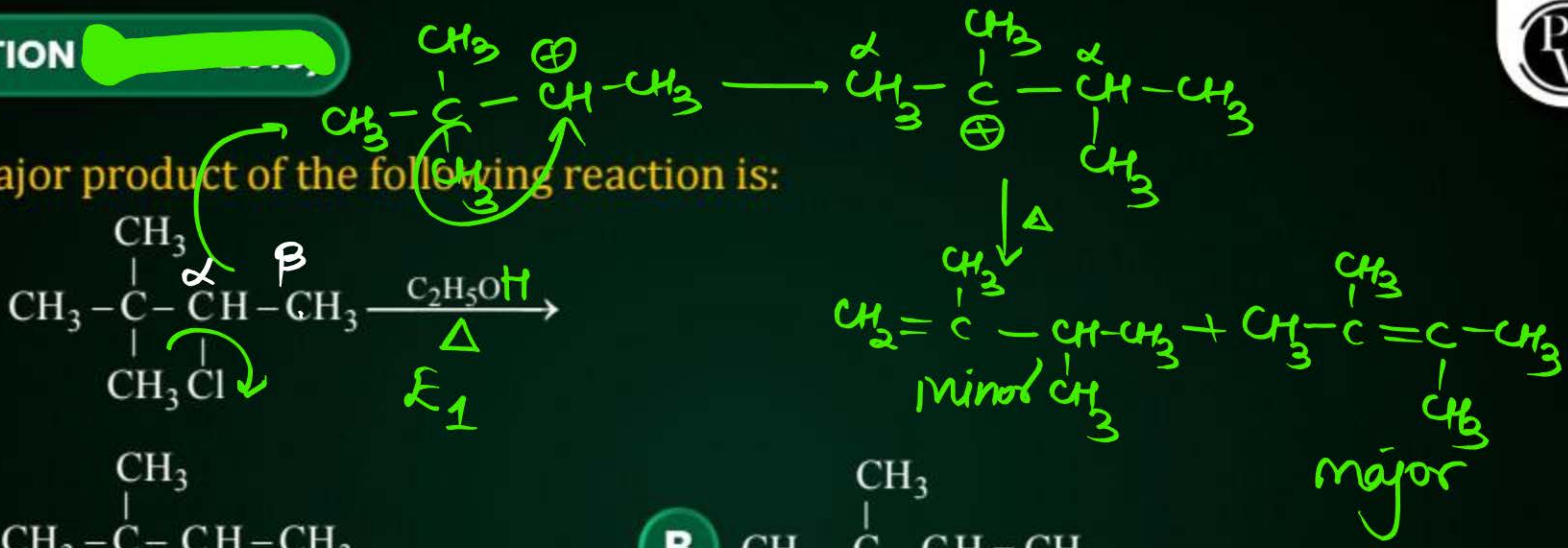
D



$$CH_3-\underset{OC_2H_5}{\overset{CH_3}{C}}-\overset{CH_3}{CH}-CH_3$$

QUESTION [redacted]

The major product of the following reaction is:

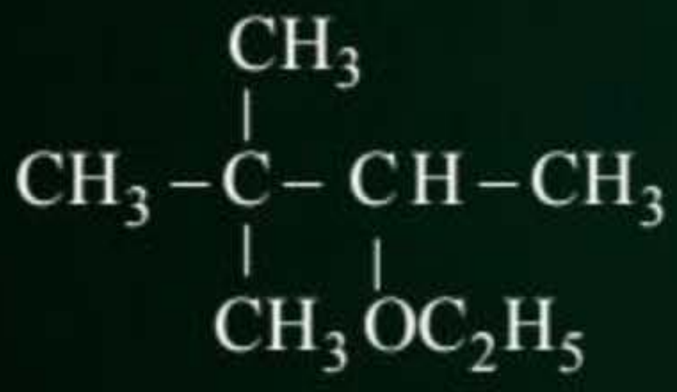


$$CH_3-\overset{\displaystyle CH_3}{\underset{\displaystyle CH_3}{C}}-\overset{\alpha}{\underset{\displaystyle Cl}{C}H}-\overset{\beta}{C}H_3 \xrightarrow[\Delta]{C_2H_5OH}$$

E_1

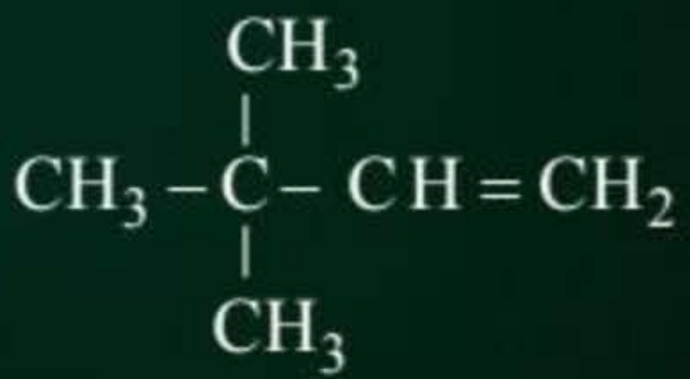
$$CH_3-\overset{\displaystyle CH_3}{\underset{\displaystyle CH_3}{C}}-\overset{\oplus}{C}H-CH_3 \longrightarrow \overset{\alpha}{C}H_3-\overset{\displaystyle CH_3}{\underset{\oplus}{C}}-\overset{\alpha}{\underset{\displaystyle CH_3}{C}H}-CH_3 \xrightarrow{\Delta} \underset{\text{minor}}{CH_2=\overset{\displaystyle CH_3}{C}-\underset{\displaystyle CH_3}{C}H-CH_3} + \underset{\text{major}}{CH_3-\overset{\displaystyle CH_3}{C}=\underset{\displaystyle CH_3}{C}-CH_3}$$

A



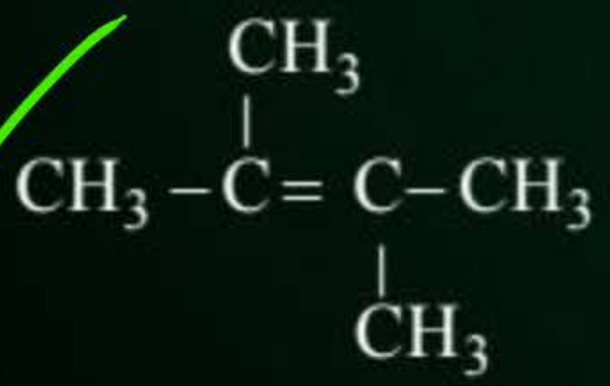
$$CH_3-\overset{\displaystyle CH_3}{\underset{\displaystyle CH_3}{C}}-\underset{\displaystyle OC_2H_5}{C}H-CH_3$$

B



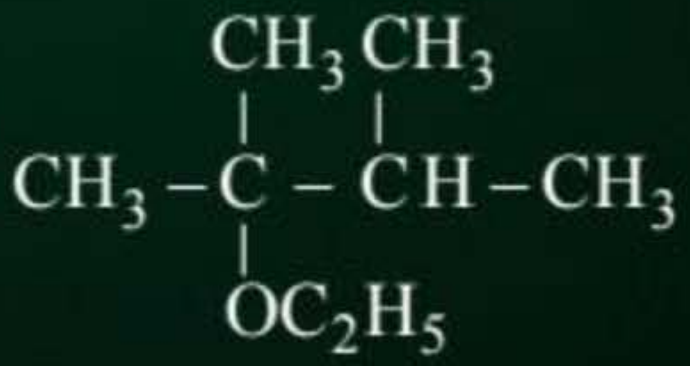
$$CH_3-\overset{\displaystyle CH_3}{\underset{\displaystyle CH_3}{C}}-CH=CH_2$$

C ✓



$$CH_3-\overset{\displaystyle CH_3}{C}=\underset{\displaystyle CH_3}{C}-CH_3$$

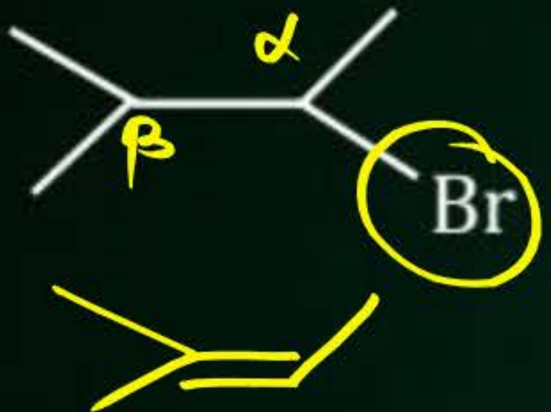
D

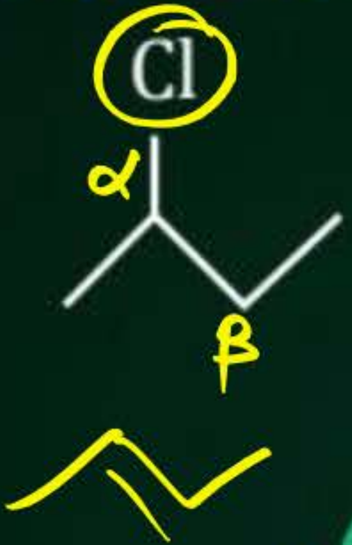


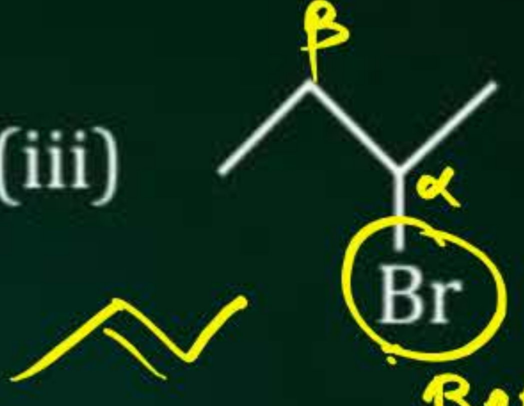
$$CH_3-\overset{\displaystyle CH_3}{\underset{\displaystyle OC_2H_5}{C}}-\overset{\displaystyle CH_3}{C}H-CH_3$$

QUESTION (AIIMS 2019)

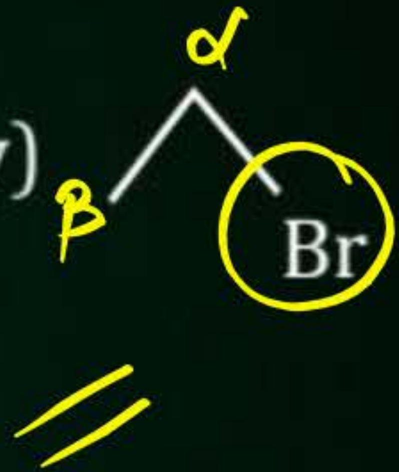
The correct order for reaction with alcoholic KOH of the following compounds is:

(i)


(ii)


(iii)


Better L.G

(iv)


A i > ii > iii > iv

[✓ B] i > iii > ii > iv

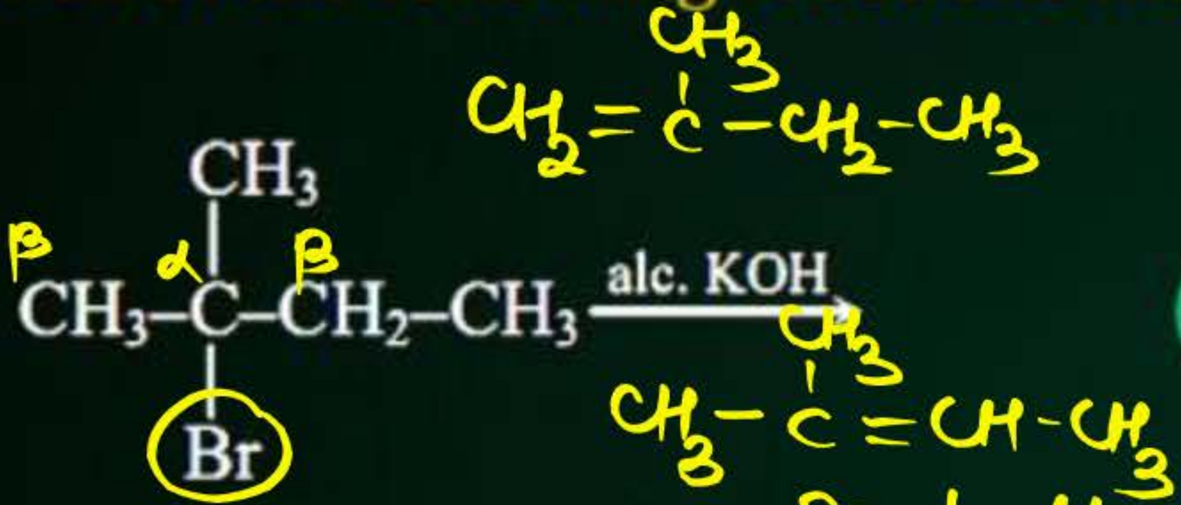
C iv > ii > iii > i

D i > iv > ii > iii

QUESTION

In which of the following reactions major product is formed by Saytzeff's rule:

A

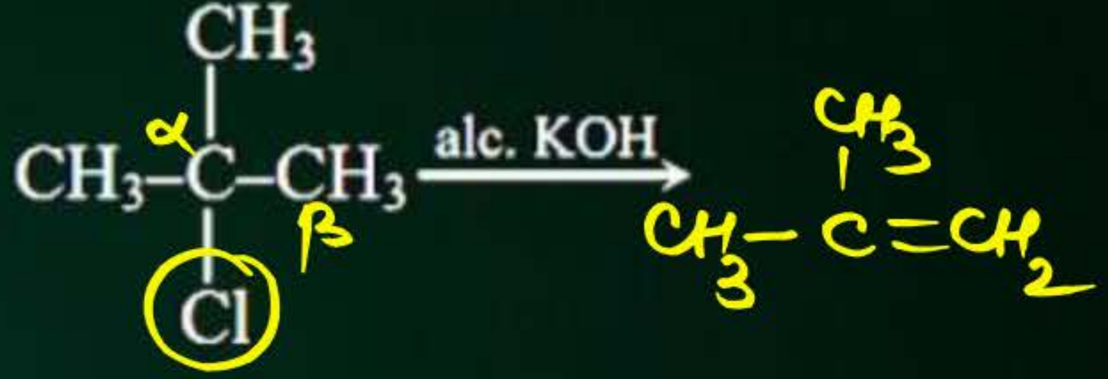


$$CH_2=\overset{CH_3}{C}-CH_2-CH_3$$

$$\overset{\beta}{CH_3}-\underset{Br}{\overset{CH_3}{\overset{\alpha}{C}}}-\overset{\beta}{CH_2}-CH_3 \xrightarrow{alc.\ KOH} CH_3-\overset{CH_3}{C}=CH-CH_3$$

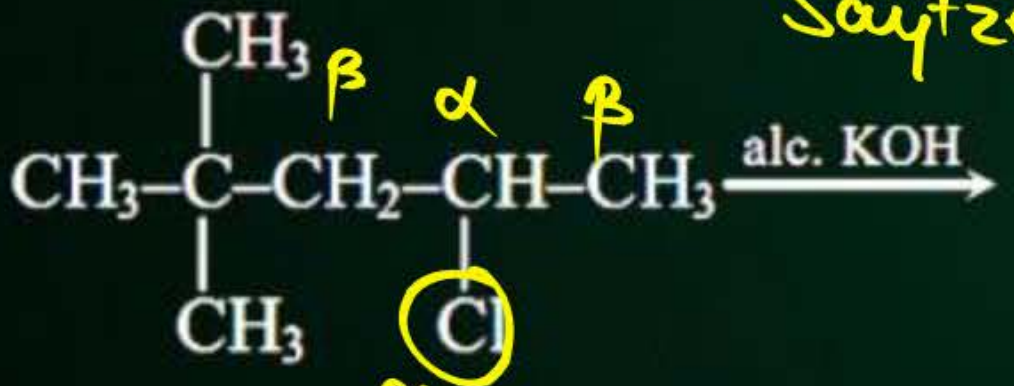
Saytzeff

B

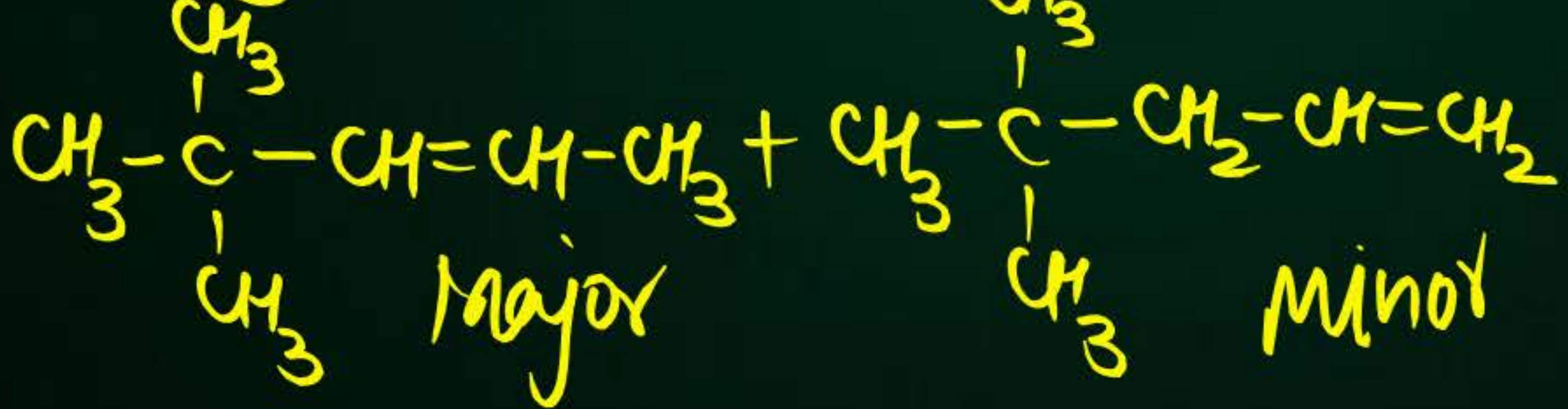


$$CH_3-\underset{Cl}{\overset{CH_3}{\overset{\alpha}{C}}}-\overset{\beta}{CH_3} \xrightarrow{alc.\ KOH} CH_3-\overset{CH_3}{C}=CH_2$$

C



$$CH_3-\underset{CH_3}{\overset{CH_3}{C}}-\overset{\beta}{CH_2}-\underset{Cl}{\overset{\alpha}{CH}}-\overset{\beta}{CH_3} \xrightarrow{alc.\ KOH}$$

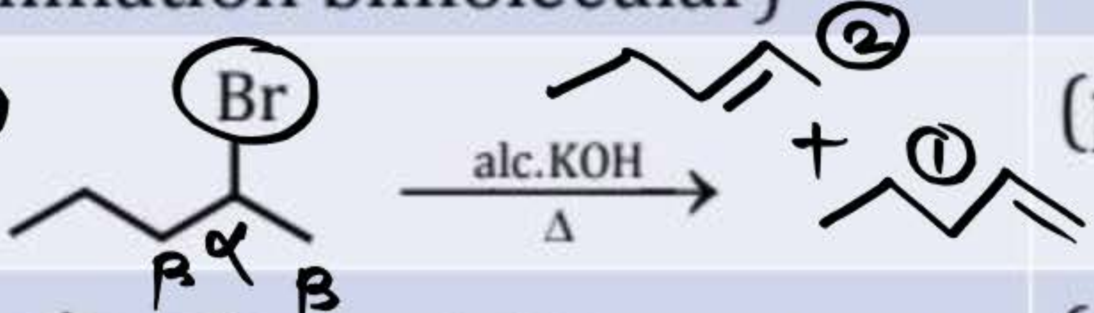
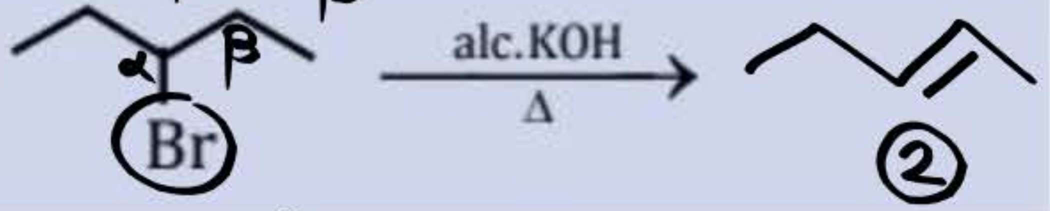
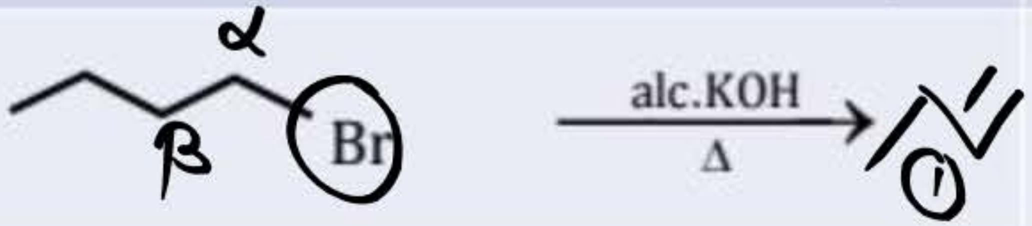
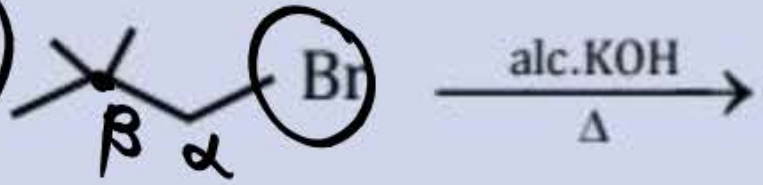


$$\underset{\text{Major}}{CH_3-\underset{CH_3}{\overset{CH_3}{C}}-CH=CH-CH_3} + \underset{\text{Minor}}{CH_3-\underset{CH_3}{\overset{CH_3}{C}}-CH_2-CH=CH_2}$$

D ✓ All the above

QUESTION

Match the Column.

	Column (I)		Column (II)
	E_2 reaction (elimination bimolecular)		No. of possible products. (including stereoisomerism)
(a)	ⓢ  Br alc.KOH Δ ② + ① β α β	(p)	0
(b)	ⓡ  α β Br alc.KOH Δ ②	(q)	1
(c)	ⓠ  α β Br alc.KOH Δ ①	(r)	2
(d)	ⓟ  β α Br alc.KOH Δ NO Rxn	(s)	3

QUESTION

$$CH_3CH_2CH_2OH \xrightarrow[\Delta]{\text{conc. } H_2SO_4} CH_3CH = CH_2 + H_2O$$

(A) [✓ E^1 pathway]

(B) E^2 pathway

(C) E^1cb pathway

(D) Unpredictable

Revision kam kar rahe ho

Previous Lecture revise
Karte raho

Home Work From PW Module (Yakeen NEET)

Prarambh: Q 16, 32

Parikshit: Q 02

MARK THE DATE 4th May, 2025

Only 04 Months left for the NEET

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Thank you!

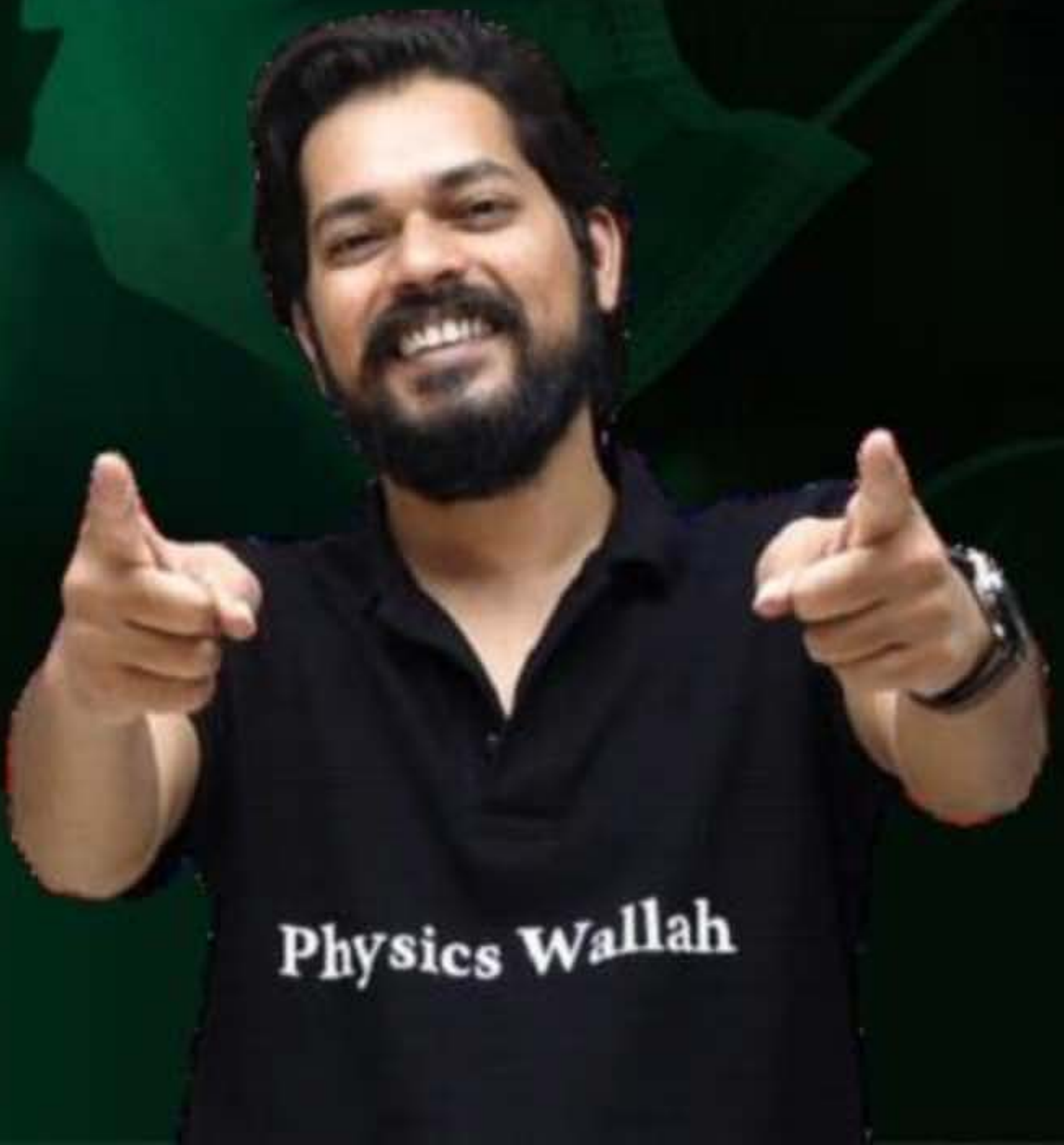
YAKEEN 2.0

FOR NEET 2025

Lecture- 04 | **Organic Chemistry**

Haloalkanes and Haloarenes

By- Pankaj Sir(POPU MAMA)


Physics Wallah

Topics *to be covered*

1. Chemical Properties of Haloalkanes Part 02
2. Nucleophilic Substitution Reactions S_N1 & S_N2
3. Practice

Chemical Properties of Haloalkanes

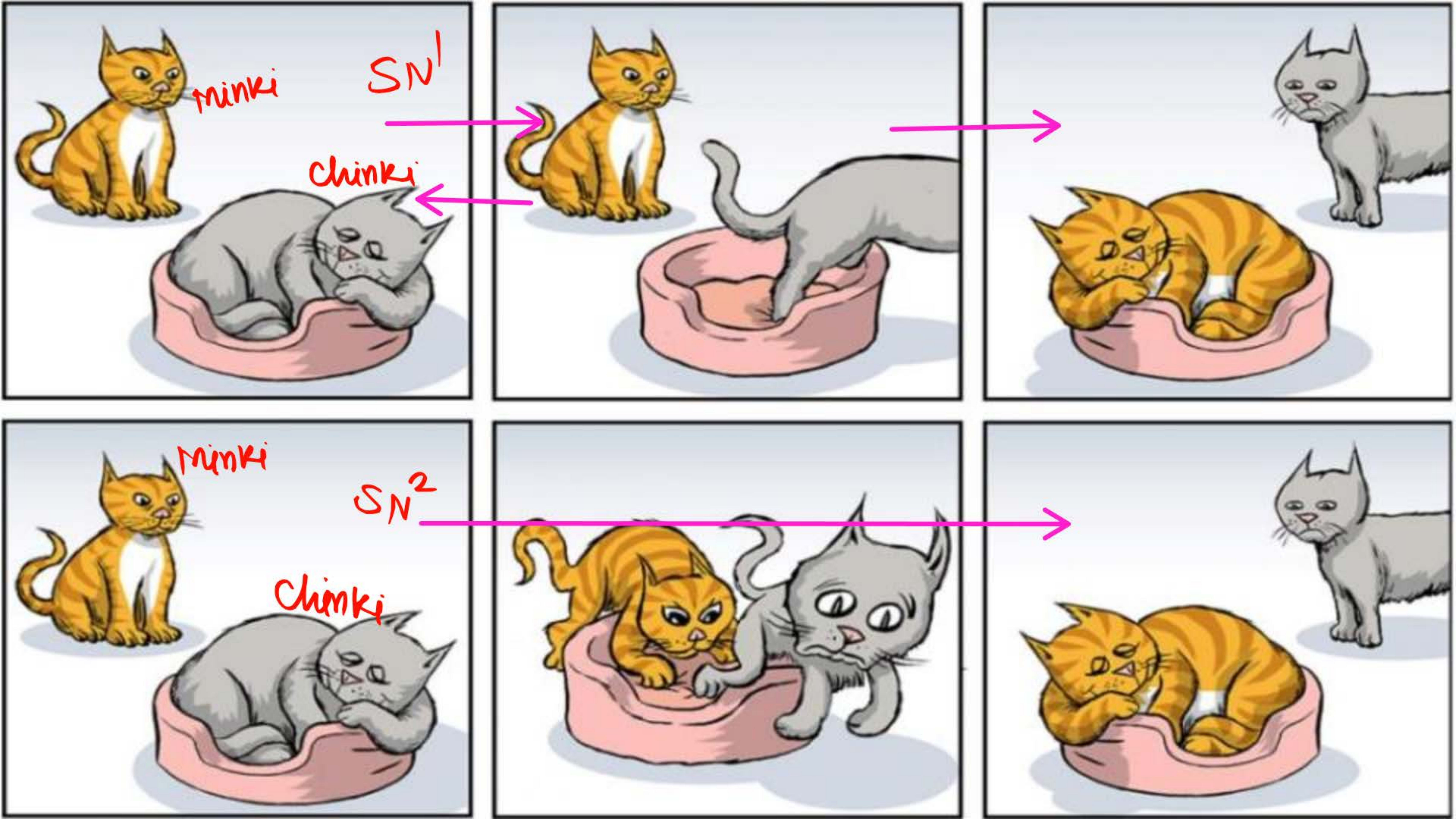
Nucleophile (L.P wale)

2. Nucleophilic Substitution Reactions:

General NSR

$$R-\boxed{X} \xrightarrow{Nu^{\ominus}} R-\boxed{Nu} + X^{\ominus}$$

Leaving group


minki
SN^1
chinki
minki
SN^2
chinki

A. Unimolecular Nucleophilic Substitution Reaction S_N1:

Step ① $\overset{\delta+}{R}-\overset{\delta-}{X} \xrightleftharpoons{\overset{\text{slow}}{\text{RDS}}} R^{\oplus} + X^{\ominus}$

(Rearrange if pos)

Step ② $R^{+} \xrightarrow[\text{fast}]{Nu^{\ominus}} R-Nu$

OP Points of S_N1:

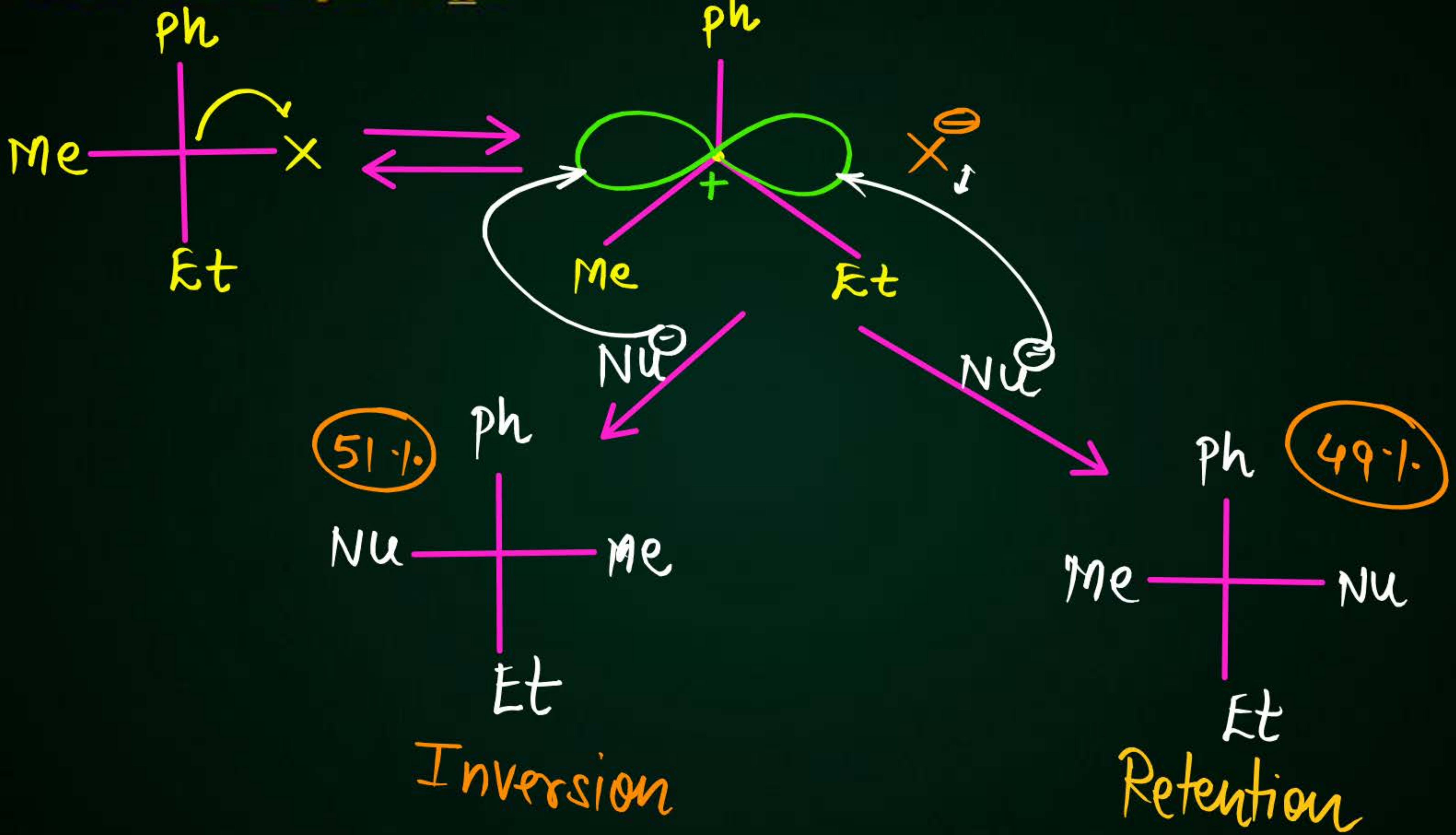
1. Carbocation intermediate formation ✓
2. 1^{st} step is the R.D.S (slow step) ✓
3. R.O.R w.r.t. Halogen $R-F < R-Cl < R-Br < R-I$

   BE ↓ leaving ability ↑

   R.O.R w.r.t. Alkyl   ROR α Stability of 1st carbocation
4. Rate $r = k[R-X]^1$
5. Order = 1 & Molecularity = 1
6. Weak nucleophile

   Neutral Nu fav.

Stereochemistry of S_N1:


Ph
Me
X
Et
Ph
+
X⊖
Me
Et
Nu⊖
Nu⊖
51%
Ph
Nu
Me
Et
Inversion
Ph
49%
Me
Nu
Et
Retention

Stereochemistry of S_N1:

# Racemisation occurs (Ret + Inv.)

# Enantiomer pair

# 100 % Racemisation

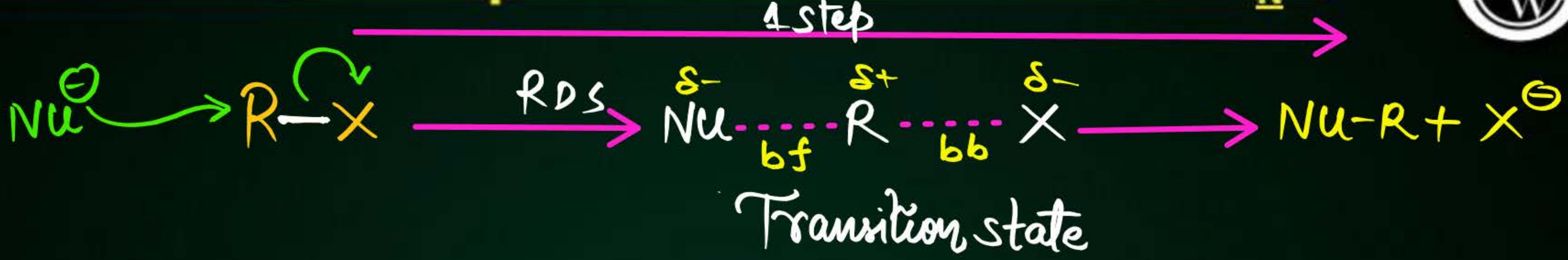
(50 % Ret + 50 % Inv)

Racemization occurs (Retention & inversion)

Retention < Inversion

49% 51%

B. Bimolecular Nucleophilic Substitution Reaction S_N2:



1 step

$$Nu^{\ominus} + R-X \xrightarrow{RDS} \overset{\delta-}{Nu}\underset{bf}{\cdots\cdots}\overset{\delta+}{R}\underset{bb}{\cdots\cdots}\overset{\delta-}{X} \longrightarrow Nu-R + X^{\ominus}$$

Transition state

OP Points of S_N2:

1. Transition state formation ✓ (No Carbocation formation)
2. 1^{st} step is the R.D.S (slow step) ✓ (onestep)

BE↓ d.A↑

3. R.O.R w.r.t. Halogen $R-F < R-Cl < R-Br < R-I$

   R.O.R w.r.t. Alkyl $ROR \propto \frac{1}{S.H}$ (S.H = Steric Hindrance) $\underbrace{(1^o > 2^o > 3^o)}_{}$ ROR

   (S.H) → $(3^o > 2^o > P)$

4. Rate $r = k[R\text{–}X]^{①}[Nu^-]^{①}$
5. Order = 2 & Molecularity = 2
6. Strong nucleophile ✓

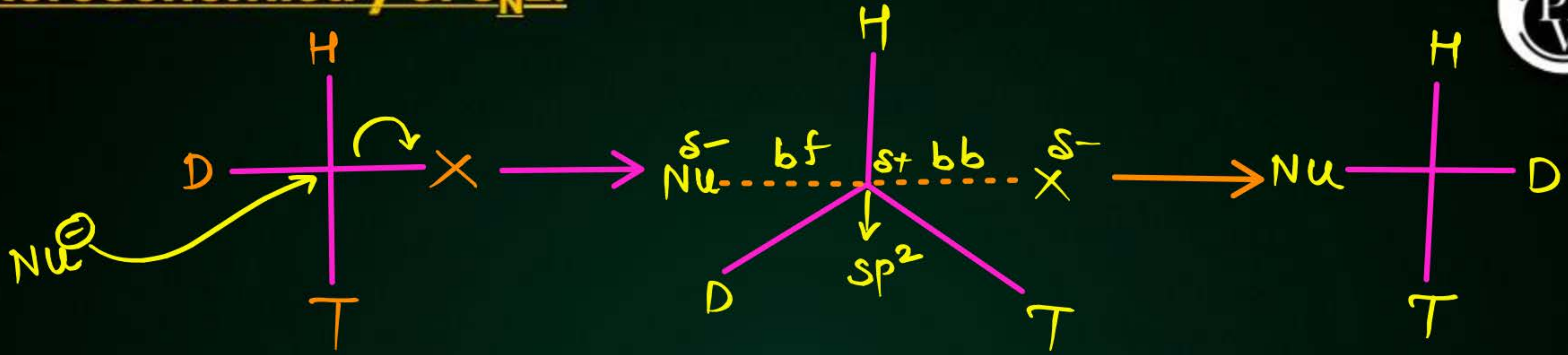
strong $Nu^{\ominus}$ fav

(−ve) charge

Agar degree same ho & R diff

$\boxed{ROR \propto ewg}$

Stereochemistry of S_N2:

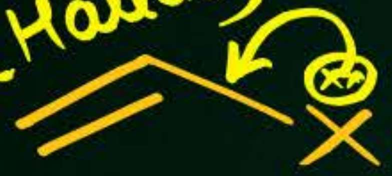
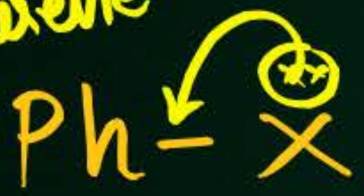
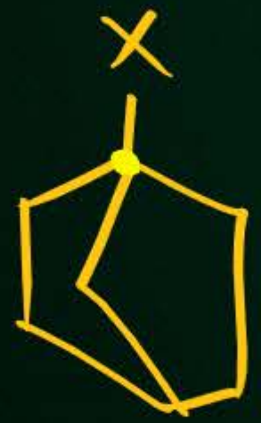


H
D
X
T
Nu⊖
H
δ−
Nu
bf
δ+
bb
δ−
X
D
T
sp²
H
Nu
D
T

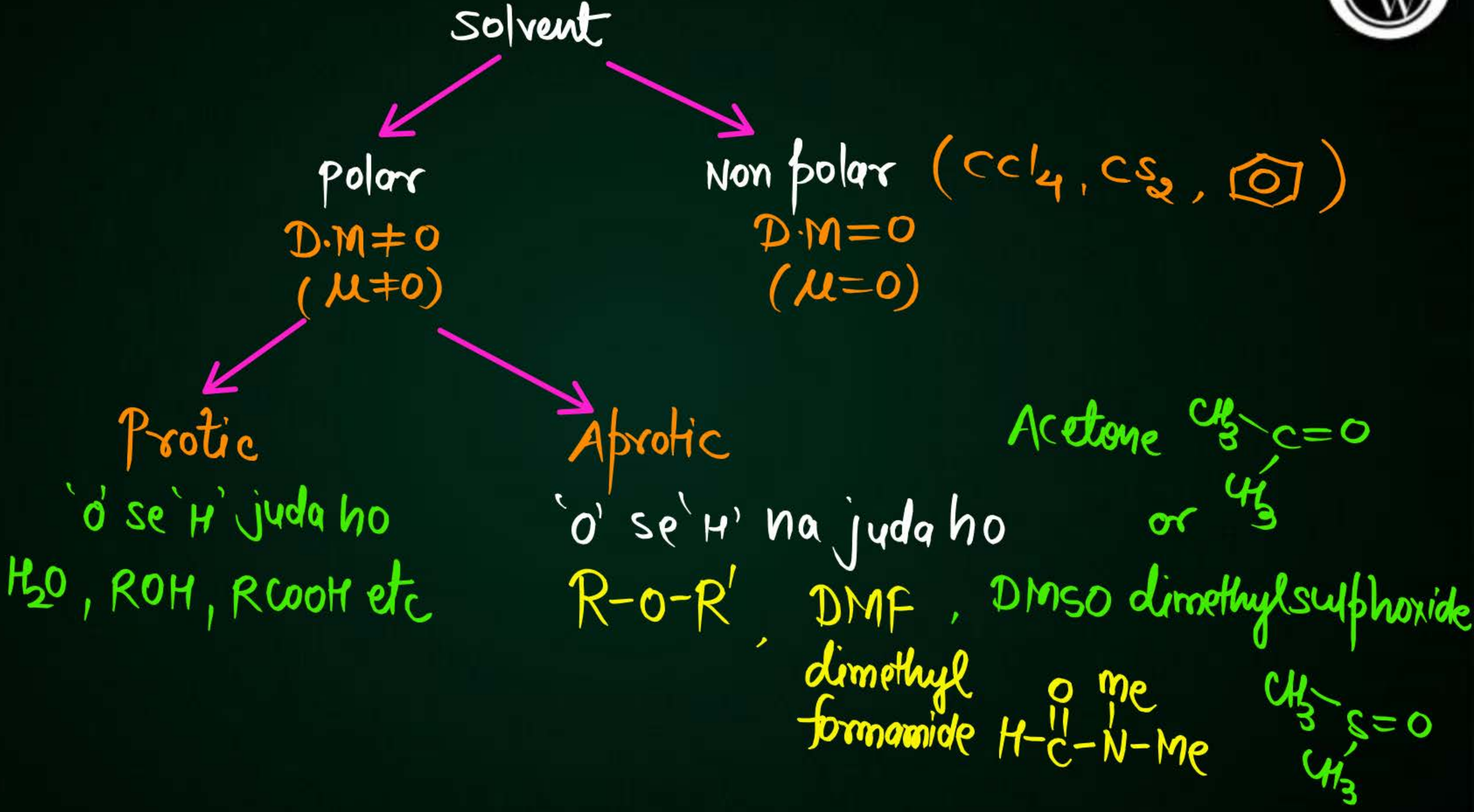
(100 % Inversion)

Inversion (Walden Inversion)

Compounds which can not give SN^1 & SN^2

	comp	reason
①	R–F	poor L.G ($F^\ominus$)
②	(vinyl Halide) 	due to partial double bond charac
③	Haloarene 	" " " "
④		Bredt's rule

Effect of Solvent:



Solvent

Polar

$D \cdot M \neq 0$

$(\mu \neq 0)$

Non polar (CCl_4, CS_2,)

$D \cdot M = 0$

$(\mu = 0)$

Protic

'O' se 'H' juda ho

H_2O, ROH, RCOOH etc

Aprotic

'O' se 'H' na juda ho

R-O-R', DMF, DMSO dimethylsulphoxide

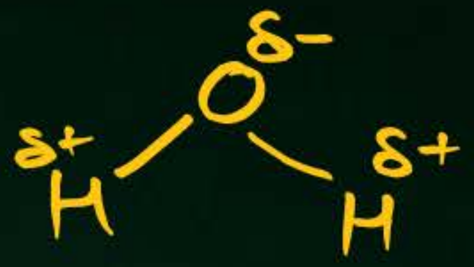
Acetone $CH_3-C(=O)-CH_3$

or

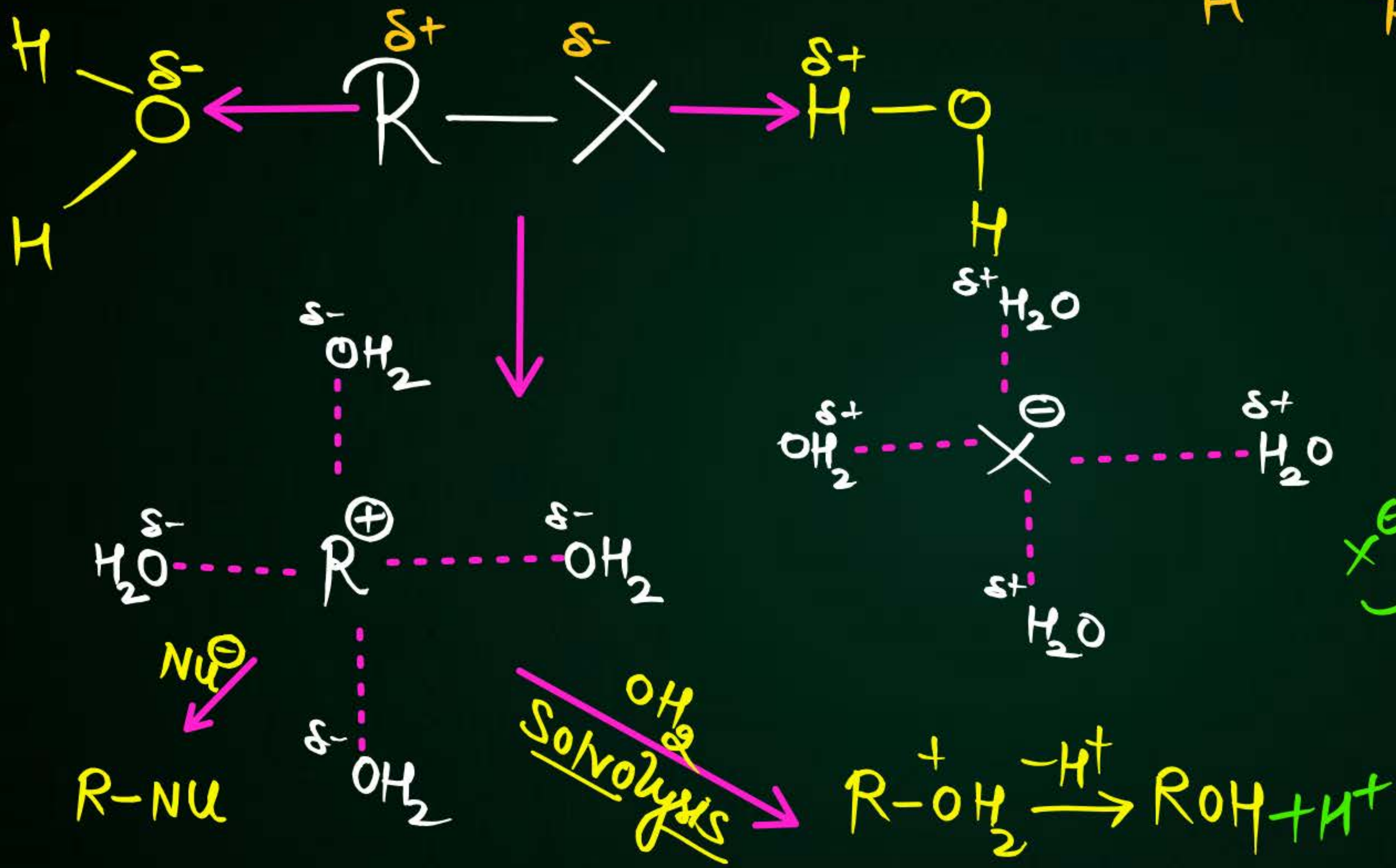
dimethyl formamide $H-\overset{O}{\overset{\|}{C}}-\overset{Me}{\overset{|}{N}}-Me$

$CH_3-S(=O)-CH_3$

PPS favours S_N1 Reactions:



$\delta-$ O
$\delta+$ H
$\delta+$ H



H_2O ... $\delta+$ R — X $\delta-$ ... H—O—H
$\delta-$ OH_2
H_2O $\delta-$
$R^{\oplus}$
$\delta-$ OH_2
$\delta-$ OH_2
$Nu^{\ominus}$
R-Nu
$\delta+$ H_2O
$\delta+$ OH_2
$X^{\ominus}$
$\delta+$ H_2O
$\delta+$ H_2O
OH_2
Solvolysis
$R-\overset{+}{O}H_2 \xrightarrow{-H^+} ROH + H^+$

Solvolysis → S_N1

when solvent itself act as Nu.

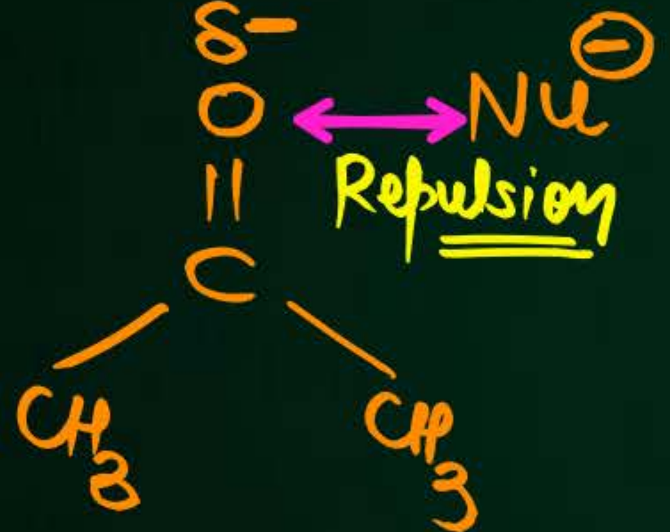
$\underbrace{X^{\ominus} + H^+ \rightarrow HX}$

PPS solvate R^+

PPS solvate $X^{\ominus}$

PAS favours S_N2 Reactions:

$$\underset{\text{(Strong)}}{Nu^{\ominus}} \rightarrow R-X \longrightarrow Nu-R+X^-$$


δ-
O
C
CH3
CH3
Nu⊖
Repulsion

1) PAS repel Nu ✓

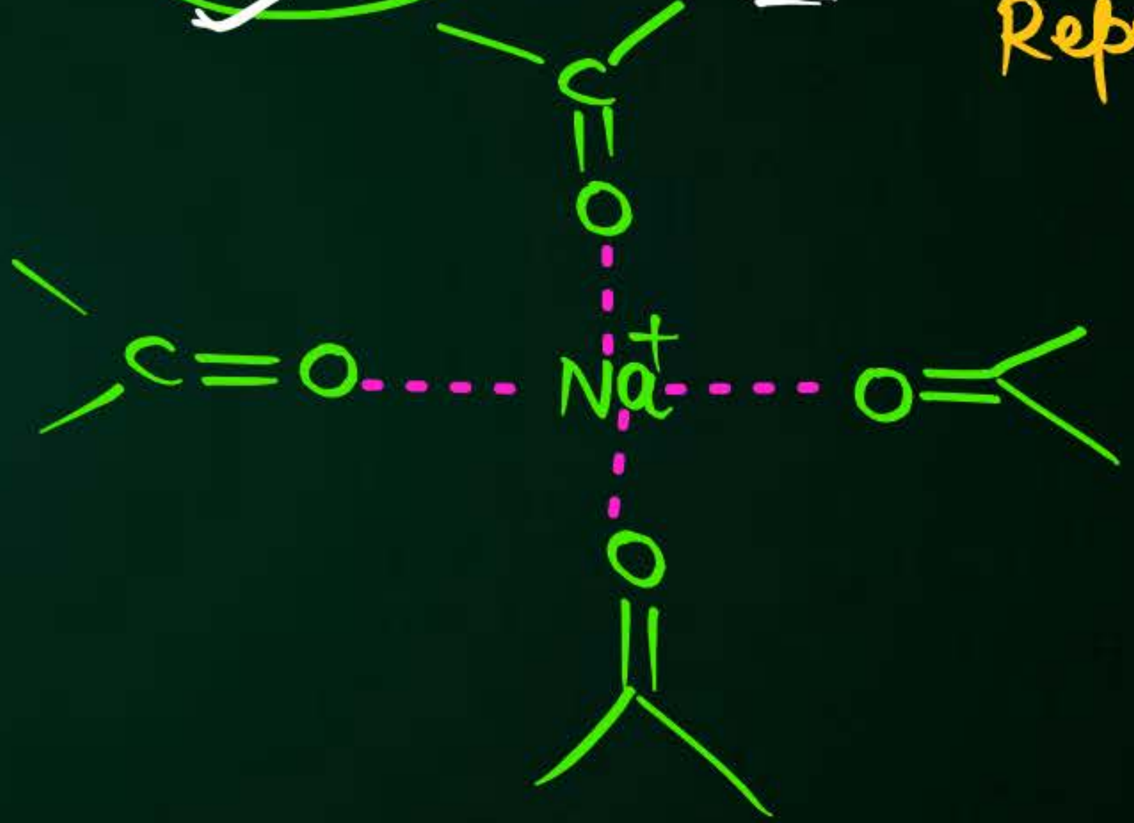
2) PAS attack cation ✓

Neutral

$$\boxed{NaOH}\ ✓ \longrightarrow \underline{Na}^{+} + \overset{\ominus}{O\underline{H}}$$

⊖ → Jao attack karo

Repel by solvent PAS



$$R - X + Nu^- \rightarrow R - Nu + X^-$$

Reagent	Nucleophile (Nu^-)	Substitution product R–Nu	Class of main product
NaOH (KOH)	HO^-	ROH	Alcohol
H_2O	H_2O	ROH	Alcohol
NaOR′	$R'O^-$	ROR′	Ether
NaI	I^-	R—I	Alkyl iodide
NH_3	NH_3	RNH_2	Primary amine
$R'NH_2$	$R'NH_2$	RNHR′	Sec. amine
R′R″NH	R′R″NH	RNR′R″	Tert. amine
KCN *	$\bar{C}\equiv N:$	RCN	Nitrile (cyanide)
AgCN *	Ag-CN:	RNC (isocyanide)	Isonitrile
KNO_2 *	O=N—O	R—O—N=O	Alkyl nitrite
$AgNO_2$ *	$Ag-\ddot{O}-N=O$	$R-NO_2$	Nitroalkane
R′COOAg	$R'COO^-$	R′COOR	Ester
$LiAlH_4$	H	RH	Hydrocarbon
$R'^- M^+$	R'^-	RR′	Alkane

most imp.

OP Points:

1. $AgNO_3$, $AlCl_3$, $SbCl_5$ etc. can form carbocation so will give S_N1.

Lewis acid

$$R-Cl \xrightarrow[\text{or } AlCl_3 \,/\, SbCl_5]{Ag^+} \{R^{\oplus}\} \quad AgCl,\ \overset{\ominus}{AlCl_4},\ \overset{\ominus}{SbCl_6}$$

2. Solvolysis usually follow S_N1 Path.

$$R-X \xrightarrow{H_2O} R-OH + HX$$

$$R^{\oplus} \quad R'OH \quad R-OR' + HX$$

$$R'COOH \quad R-O-COR' + HX$$

QUESTION (NCERT Exercise)

Which compound in each of the following pairs will react faster in S_N2 reaction with ^-OH?

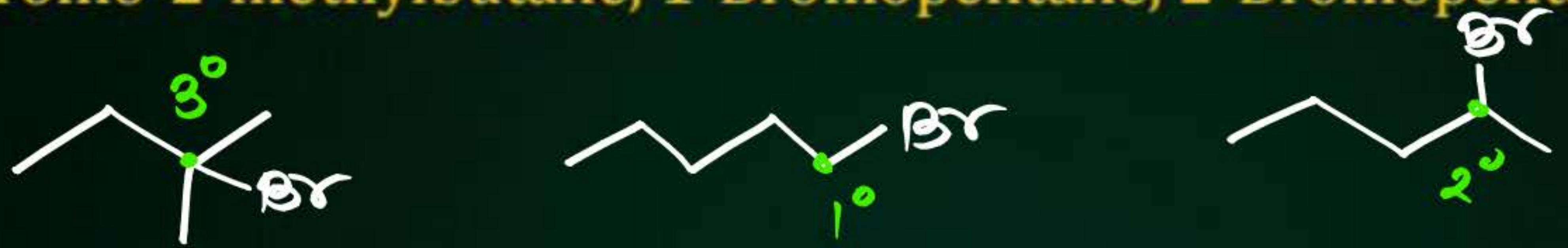
(i) $CH_3\underline{Br} \overset{<}{\text{or}} CH_3\underline{I}$

(ii) $\underbrace{(CH_3)_3CCl}_{3^\circ} \overset{<}{\text{or}} \underbrace{CH_3Cl}_{\text{super } 1^\circ}$

QUESTION (NCERT Exercise)

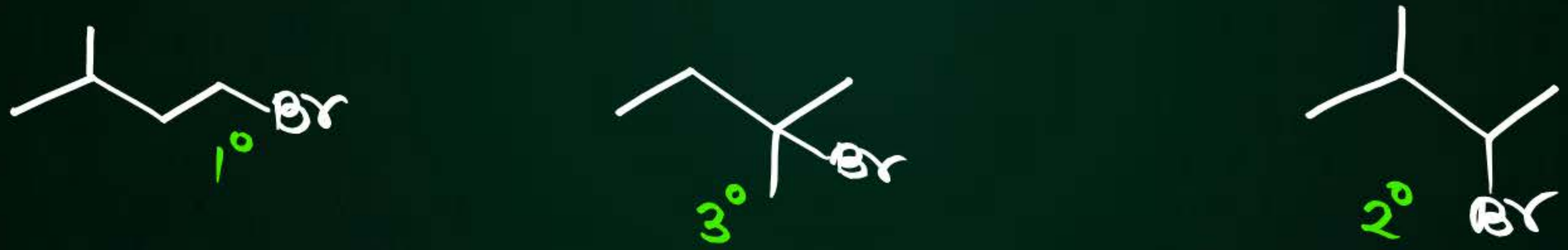
Arrange the compounds of each set in order of reactivity towards S_N2 displacement:

(i) 2-Bromo-2-methylbutane, 1-Bromopentane, 2-Bromopentane



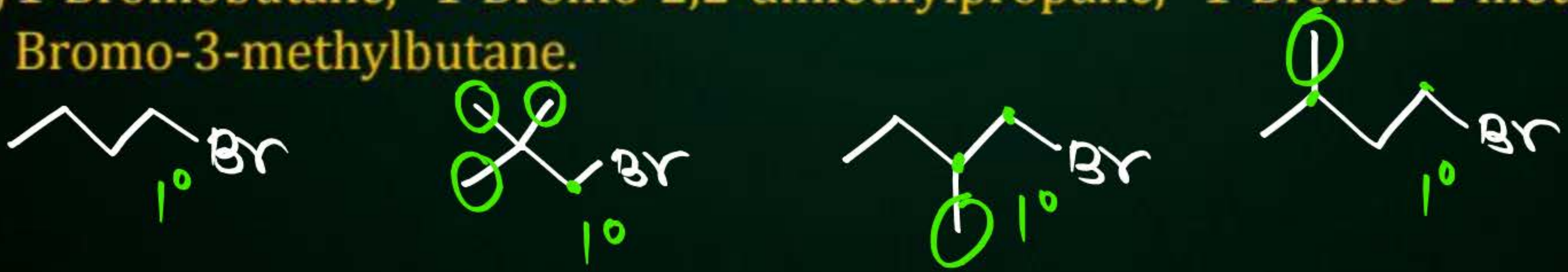
(B > C > A)

(ii) 1-Bromo-3-methylbutane, 2-Bromo-2-methylbutane, 2-Bromo-3-methylbutane



(A > C > B)

(iii) 1-Bromobutane, 1-Bromo-2,2-dimethylpropane, 1-Bromo-2-methylbutane, 1-Bromo-3-methylbutane.



A > D > C > B

QUESTION (NCERT Exemplar)

Which of the following alkyl halides will undergo S_N1 reaction most readily?

BE↓ L.A ↑

A $(CH_3)_3C-F$

B $(CH_3)_3C-Cl$

C $(CH_3)_3C-Br$

[✓ **D**] $(CH_3)_3C-I$

QUESTION (AIIMS 2006)

The correct increasing order of the reactivity of halides for S_N1 reaction is:

✓ (A) $CH_3-\underset{3\alpha H}{\overset{\oplus}{C}H_2}-\overline{X} < (CH_3)_2\underset{6\alpha H}{\overset{\oplus}{C}H}-\overline{X} < CH_2=CH-\underset{1\,\text{conju}}{\overset{\oplus}{C}H_2}-\overline{X} < \underset{\text{Ring Reso}}{Ph\overset{\oplus}{C}H_2}-\overline{X}$

(B) $(CH_3)_2\underset{6\alpha H}{\overset{+}{C}H}-$[illegible]$-\overline{X} < \underset{3\alpha H}{CH_3}-CH_2-X < CH_2=CH-CH_2X < PhCH_2-X$

(C) $PhCH_2-X < (CH_3)_2CH-X < CH_3-CH_2-X < CH_2=CH-CH_2-X$

(D) $CH_2=CH-CH_2-X < PhCH_2-X < (CH_3)_2CH-X < CH_3-CH_2-X$

QUESTION

S_N1 reaction occurs through the intermediate formation of

(A) [✓ carbocation]

(B) carbanion

(C) Free radical

(D) transition

QUESTION

S_N2 mechanism proceeds through the formation of a

Ⓐ carbocation

Ⓑ [✓ transition state]

Ⓒ free radical

Ⓓ carbanion

QUESTION

S_N1

$$(CH_3)_3C{-}Br \rightleftharpoons (CH_3)_3\overset{+}{C} \xrightarrow[-H^+]{CH_3OH} (CH_3)_3C{-}OCH_3$$

$$r = K[(CH_3)_3C{-}Br]$$

What effect do you expect due to following changes in S_N1 reaction of $(CH_3)_3CBr$ with $CH_3\ddot{O}H$?

(a) The concentration of $\underbrace{(CH_3)_3CBr}$ is doubled and that of $\underbrace{CH_3OH \text{ is halved}}$.

rate double

(b) The concentration of both $(CH_3)_3CBr$ and CH_3OH are tripled.

rate triple

QUESTION

Increasing the concentration of a nucleophile in a typical S_{N^2} reaction by a factor 10 will cause the reaction rate to:

[✓ A] increase by a factor of 10

B increase by a factor of 10^2

C decrese by a factor of 10

D remain about the same

$$r = k[Rx]\underline{\underline{[Nu^-]}}$$

10times

QUESTION

3αH

Arrange the following halides in the decreasing order of S_N1 reactivity:

(I) $CH_3\overset{+}{C}H_2\overset{-}{Cl}$

(II) $CH_3 = CH\overset{+}{C}H(\overset{-}{Cl})CH_3$ (Reso)

(III) $CH_3CH_2\overset{+}{C}H(\overset{-}{Cl})CH_3$

5αH

(A) I > II > III

(B) II > I > III

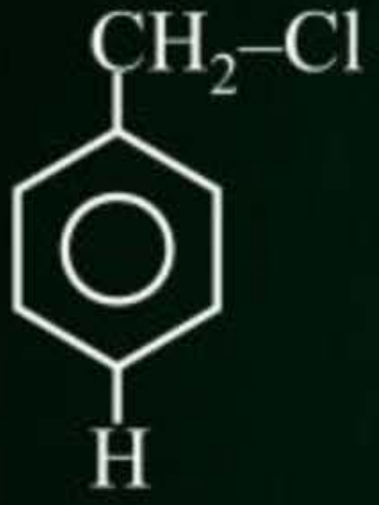
[✓ (C) II > III > I]

(D) III > II > I

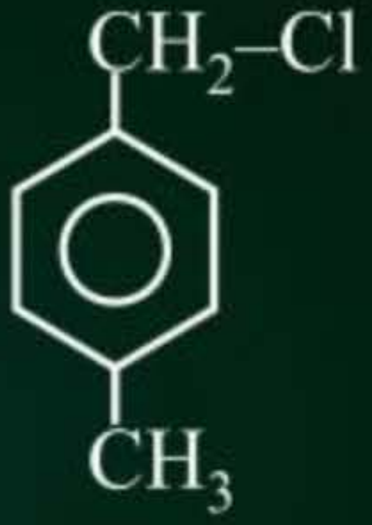
QUESTION

Which of the following is most reactive toward S_N2.

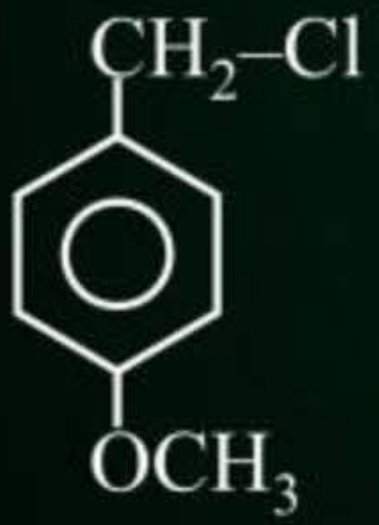
A



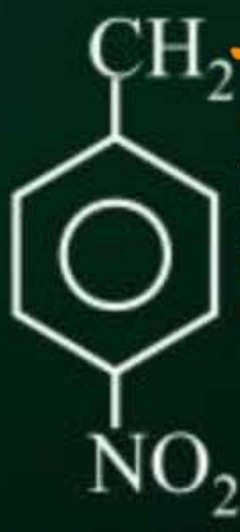
B



C



✓ D

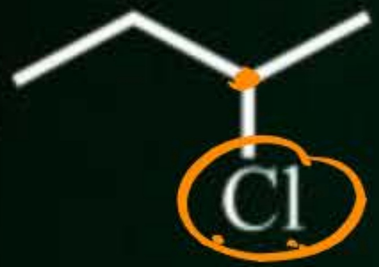


more Polar

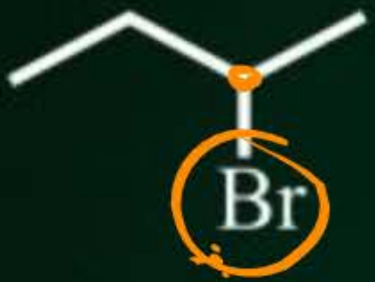
QUESTION

Arrange these following compounds in order of increasing S_N2 reaction rate:

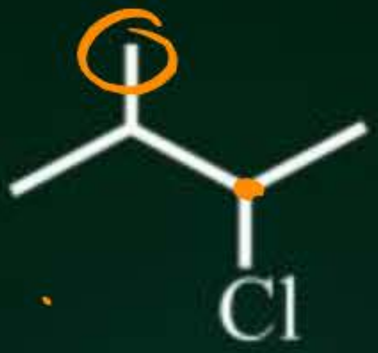
(I)



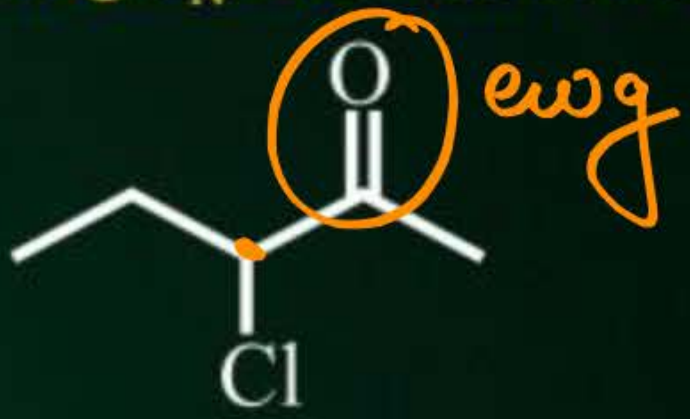
(II)



(III)



(IV)



[✓ A] III < I < II < IV

B III < II < I < IV

C IV < III < I < II

D III < IV < I < II

QUESTION

Which Statement is correct about aliphatic nucleophilic substitution reactions?

A In S_N2 racemization takes place.

B In S_N1 complete racemization occurs.

51% Inv

[✓ C] In S_N1 partial racemization occurs and isomer with inverted configuration forms more.

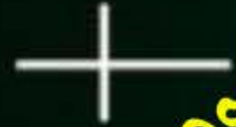
49% Ret

D In S_N1 partial racemization occurs and isomer having configuration similar to that of substrate forms more.

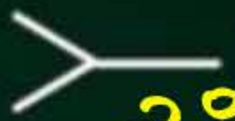
QUESTION

1° > 2° > 3°

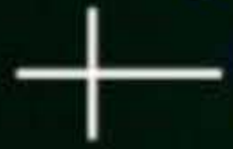
In which case chances of S_N2 are maximum:

(A) ✗  Br + $C_2H_5O^{(-)}$ (in H_2O) $\longrightarrow$

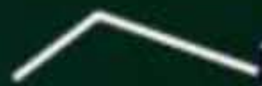
3°

(B) ✗  Br + $C_2H_5O^{(-)}$ (in C_6H_6) $\longrightarrow$

2°

(C) ✗  Br + $C_2H_5O^{(-)}$ in DMF $\longrightarrow$

3°

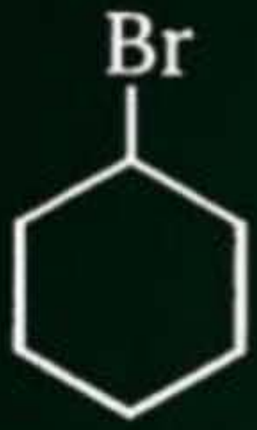
(D) ✓  Br + $C_2H_5O^{(-)}$ in DMSO $\longrightarrow$

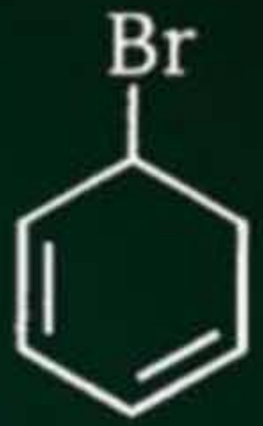
1°

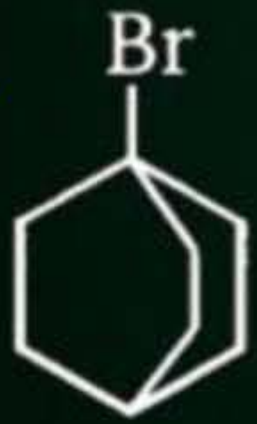
PAS

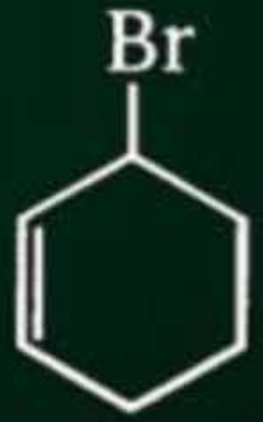
QUESTION

Rate of S_N2 will be negligible in:

A


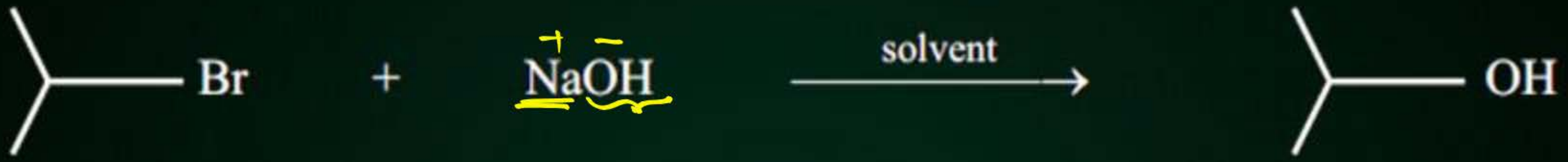
B


[✓ C]


D


QUESTION

For which solvent rate of $\underline{\overset{\text{PAS}}{S_N}}2$ will be maximum


Br
+
$\overset{+}{Na}\overset{-}{O}H$
solvent
OH

A 100% H_2O

B 75% H_2O + 25% acetone

[✓ C] 100% acetone

D 25% H_2O +75% acetone

Home Work

QUESTION 01

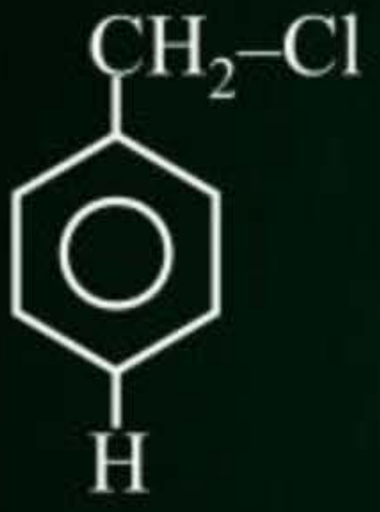
Assertion: S_N1 reaction is carried out in the presence of a polar protic solvent.
Reason: A polar protic solvent increases the stability of carbocation due to solvation.

- (A) Both Assertion and Reason are correct and Reason is the correct explanation for Assertion.
- (B) Both Assertion and Reason are correct but Reason is not the correct explanation for Assertion.
- (C) Assertion is correct but Reason is incorrect.
- (D) Assertion is incorrect but Reason are correct.

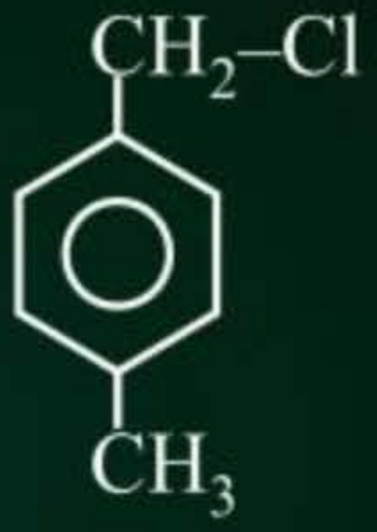
QUESTION 02

Which of the following is most reactive toward S_N1 reaction?

A



B



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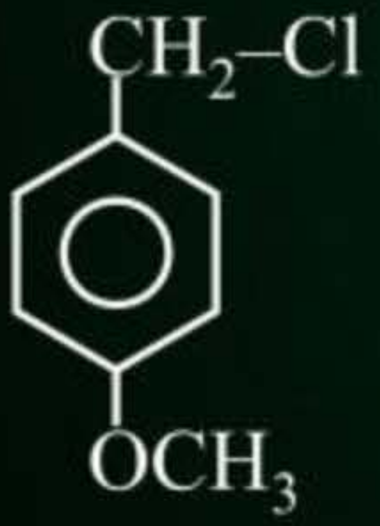

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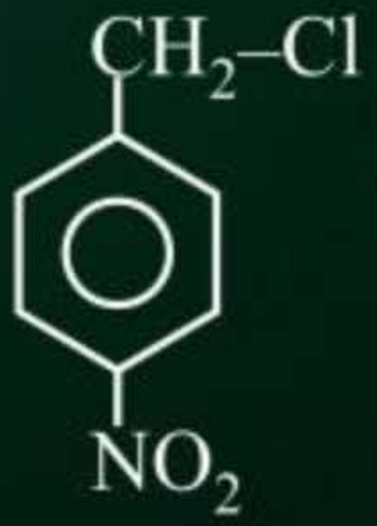


QUESTION 03

The rate of S_N2 reaction is maximum when the solvent is:

A methyl alcohol

B water

C dimethyl sulphoxide

D benzene

QUESTION 04

For reaction $CH_3Br + OH^- \longrightarrow CH_3OH + Br^-$
the rate of reaction is given by the expression:

Ⓐ Rate = $k[CH_3Br]$

Ⓑ Rate = $k[OH^-]$

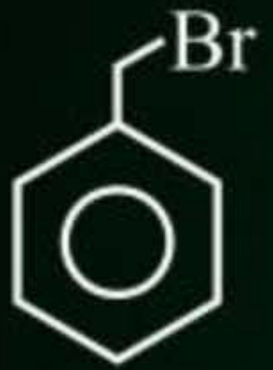
Ⓒ Rate = $k[CH_3Br][OH^-]$

Ⓓ Rate = $k[CH_3Br][H_2O]$

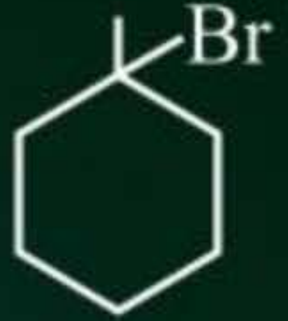
QUESTION 05

Which of the following cannot give S_N1 reaction easily?

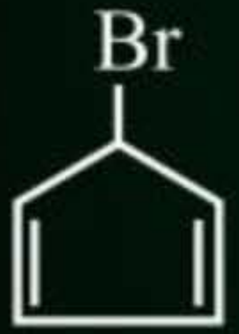
A



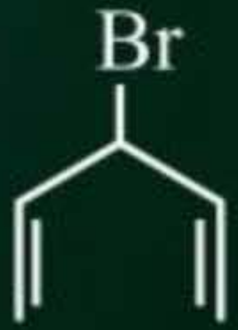
B



C



D



QUESTION 06

In S_N2 reaction the order of reactivity of the halides. CH_3X, C_2H_5X, n-C_3H_7X, n-C_4H_9X is:

A $CH_3X > C_2H_5X > n\text{-}C_3H_7X > n\text{-}C_4H_9X$

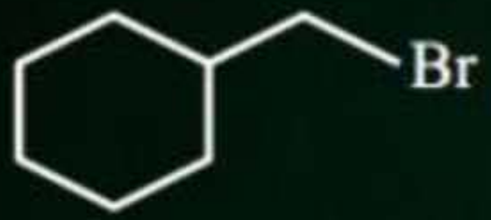
B $C_2H_5X > n\text{-}C_3H_7X > n\text{-}C_4H_9X > CH_3X$

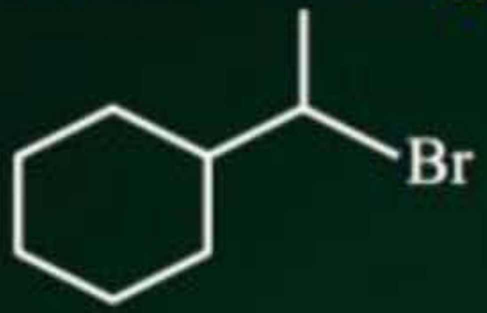
C $C_2H_5X > n\text{-}C_3H_7X > n\text{-}C_4H_9X < CH_3X$

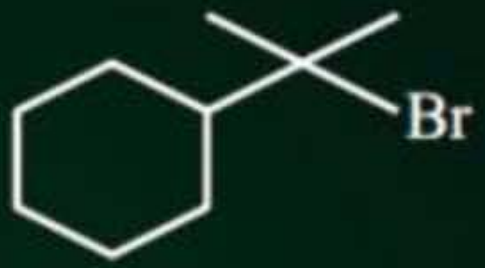
D $n\text{-}C_4H_9X > n\text{-}C_3H_7X > C_2H_5X > CH_3X$

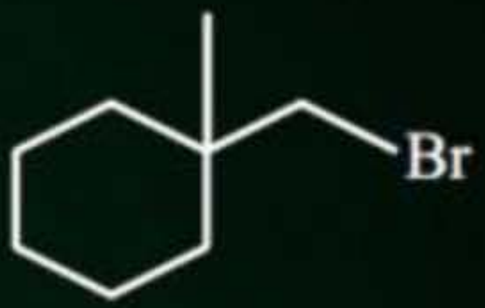
QUESTION 07

Arrange the following in decreasing order of S_N2:


(1)


(2)


(3)


(4)

(A) $1 > 4 > 2 > 3$

(B) $1 > 4 > 3 > 2$

(C) $1 > 2 > 4 > 3$

(D) $1 > 3 > 4 > 2$

QUESTION 08

Which of the following undergoes nucleophilic substitution exclusively by S_N1 mechanism?

- (A) Ethyl chloride
- (B) Isopropyl chloride
- (C) Benzyl chloride
- (D) Chlorobenzene

QUESTION 09

The order of reactivities of the following alkyl halides for a S_N2 reaction is:

- Ⓐ RF > RCl > RBr > RI
- Ⓑ RCl > RBr > RF > RI
- Ⓒ RF > RBr > RCl > RI
- Ⓓ RI > RBr > RCl > RF

QUESTION 10

The correct order of reactivity towards nucleophilic substitution reaction is:

A $CH_3F > CH_3Cl > CH_3Br > CH_3I$

B $CH_3I > CH_3Br > CH_3Cl > CH_3F$

C $CH_3I > CH_3Cl > CH_3Br > CH_3F$

D $CH_3I > CH_3Br > CH_3F > CH_3Cl$

ANSWER KEY

1. A
2. C
3. C
4. C
5. C
6. A
7. A
8. C
9. D
10. B

Home Work From PW Module (Yakeen NEET)

Prarambh: Q 26, 27, 28, 31, 33, 34, 37

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14
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RANKERS TEST SERIES
SOLUTION

Thank you!!

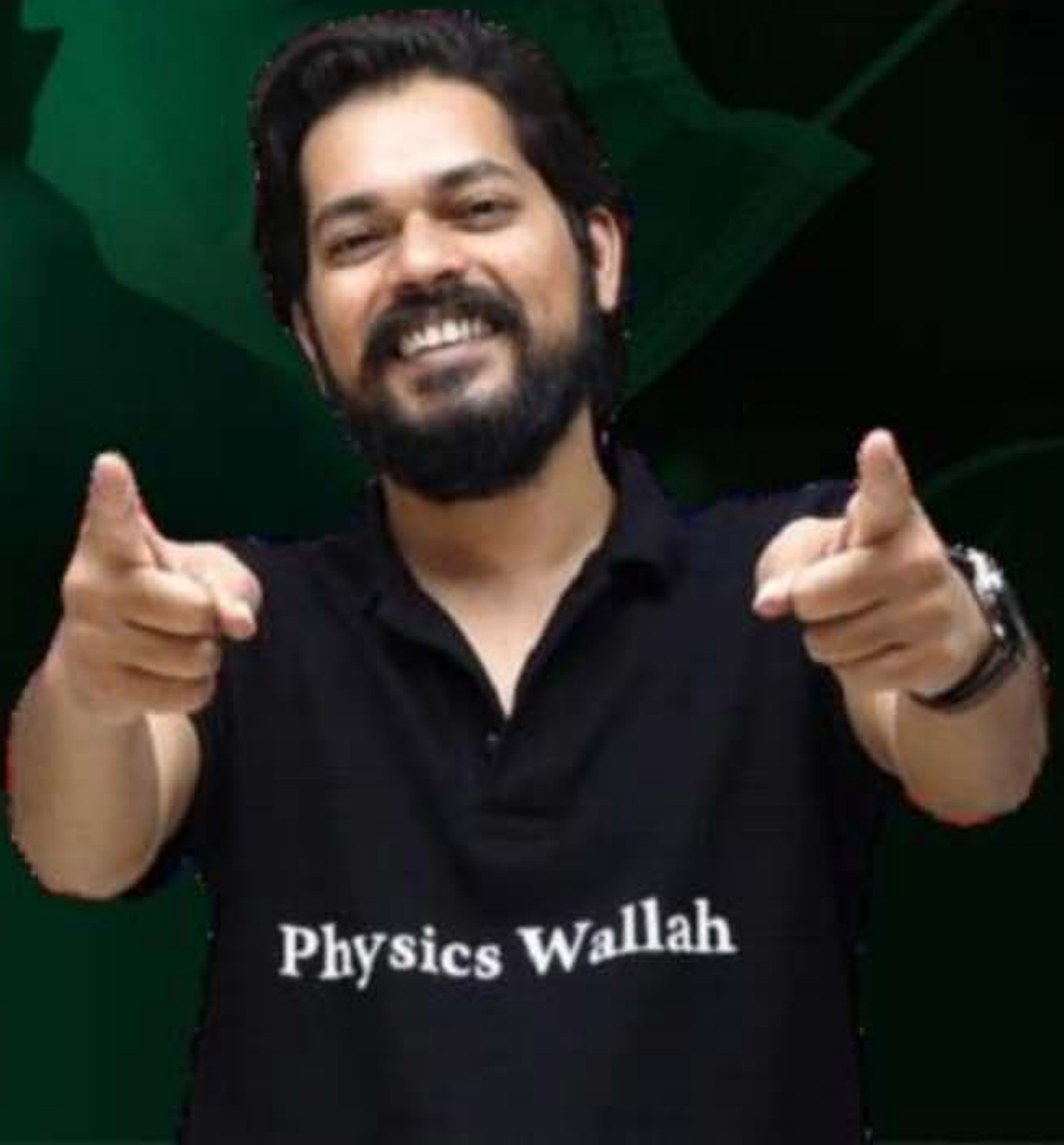
YAKEEN 2.0

FOR NEET 2025

Lecture- 05 | **Organic Chemistry**

Haloalkanes and Haloarenes

By- Pankaj Sir(POPU MAMA)


Physics Wallah

Topics *to be covered*

1. Nucleophilic Substitution Reactions S_N1 & S_N2 Practice
2. Reaction with metals
3. Practice

$$R - X + Nu^- \rightarrow R - Nu + X^-$$

Reagent	Nucleophile (Nu^-)	Substitution product R–Nu	Class of main product
NaOH (KOH) {aqNaOH KOH}	HO^-	ROH	Alcohol
H_2O	H_2O	ROH	Alcohol
NaOR′	$R'O^-$	ROR′	Ether
NaI finkelstein	I^-	R—I	Alkyl iodide
NH_3	NH_3	RNH_2	Primary amine
$R'NH_2$	$R'NH_2$	RNHR′	Sec. amine
R′R″NH	R′R″NH	RNR′R″	Tert. amine
KCN	$\bar{C}\equiv N:$	RCN	Nitrile (cyanide)
AgCN	Ag-CN:	RNC (isocyanide)	Isonitrile
KNO_2	O=N—O	R—O—N=O	Alkyl nitrite
$AgNO_2$	Ag—Ö—N=O	$R—NO_2$	Nitroalkane
R′COOAg $\delta-$ $\delta+$	$R'COO^-$	R′COOR	Ester
$LiAlH_4$ $H^\ominus$	H	RH	Hydrocarbon
R'^-M^+	R'^-	RR′	Alkane

Q KCN forms alkyl cyanide, while AgCN isocyanide why?
NaCN

$\overset{+}{K}\overset{-}{C}N \longrightarrow K^{+} + \boxed{{}^{\times}_{\times}\overset{\ominus}{C}\equiv N{}^{\times}_{\times}}$

(Ionic comp) (C>N)

(Ambident Nu$^{\ominus}$)

(two donor site
but only one
can donate
at a time)

$$R-X \xrightarrow[SN^{2}]{\overset{\ominus}{C}N} R-\boxed{CN}$$

AgCN $Ag-C\equiv N{}^{\times}_{\times}$

(Covalent)

$$R-X \xrightarrow[SN^{2}]{Ag-CN{}^{\times}_{\times}} R-\boxed{NC}$$

Q KNO_2 or $NaNO_2$ forms alkyl nitrite, while $AgNO_2$ nitroalkane why?

(Ambident $Nu^{\ominus}$)

(two donor site but only one can donate at a time)

$$\overset{+}{K}\overset{-}{NO_2} \longrightarrow K^+ + \bar{O}-\ddot{N}=O$$

(Ionic comp) ($O^{\ominus} > N$)

$$R-X \xrightarrow[SN^2]{NO_2^{\ominus}} R-\boxed{ONO}$$

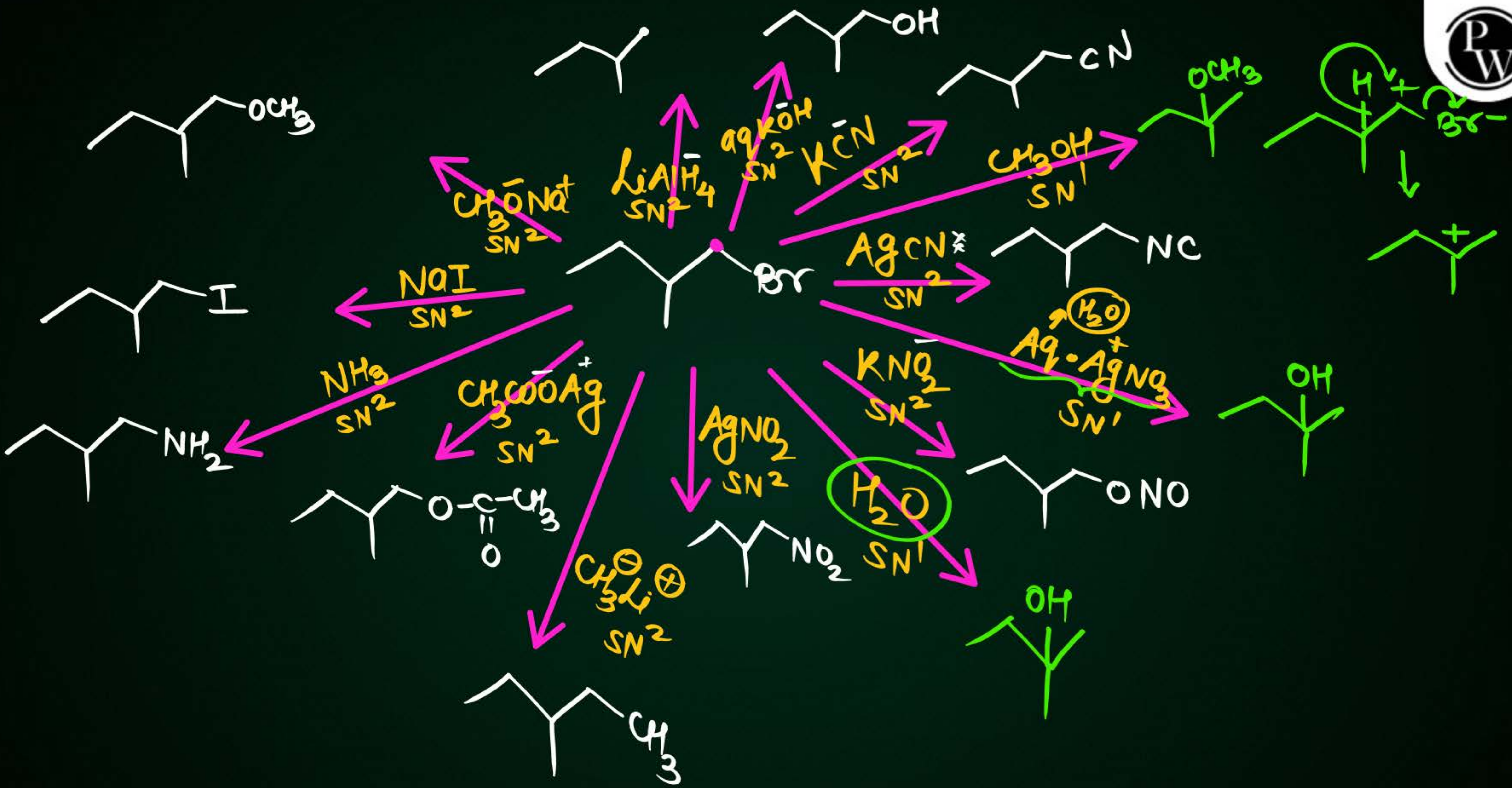
$AgNO_2$

(Covalent)

$$Ag-\ddot{O}-\ddot{N}=O$$

($O < N$)

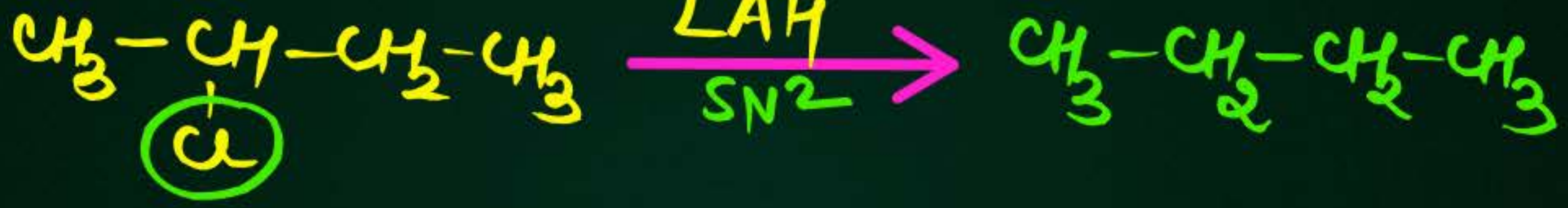
$$R-X \xrightarrow[SN^2]{Ag-\ddot{N}O_2} R-\boxed{NO_2}$$


OCH3
OH
CN
OCH3
H
Br⁻
CH3O⁻Na⁺
SN2
LiAlH4
SN2
aq KOH
SN2
KCN
SN2
CH3OH
SN1
Br
NaI
SN2
I
AgCN
SN2
NC
H2O
Aq. AgNO3
SN1
OH
NH3
SN2
NH2
CH3COO⁻Ag⁺
SN2
AgNO2
SN2
H2O
SN1
KNO2
SN2
ONO
O–C–CH3
O
NO2
CH3⁻Li⁺
SN2
OH
CH3

Rxn with LAH

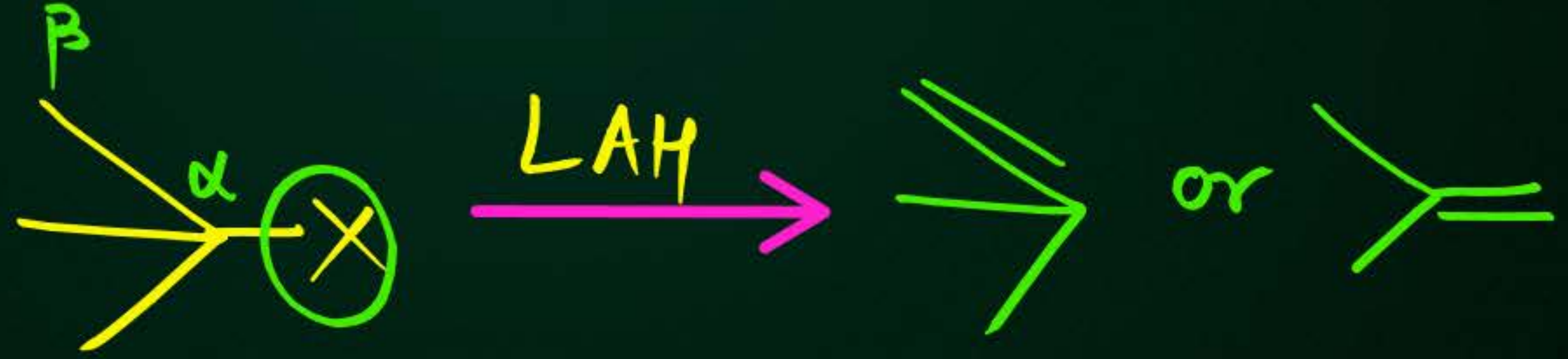
1° R–X & 2° R–X Redⁿ S_N2

$$CH_3-CH_2-Br \xrightarrow[S_N2]{LAH} CH_3CH_3$$



$$CH_3-\underset{Cl}{CH}-CH_2-CH_3 \xrightarrow[S_N2]{LAH} CH_3-CH_2-CH_2-CH_3$$

3° R–X E^2



Aq KOH Vs Alc KOH

$\bar{O}H$ good Nu

$R\bar{O}$ good base

E → Elimination

S → substitution

$$\boxed{R-X \xrightarrow[SN^2]{aq\,KOH} R-OH}$$

$S>E$

$$\underset{1^\circ}{R-X} \xrightarrow[Nu^{\ominus}]{RO^{\ominus}} R-OR$$ williamson's ether synthesis.

$+ E$

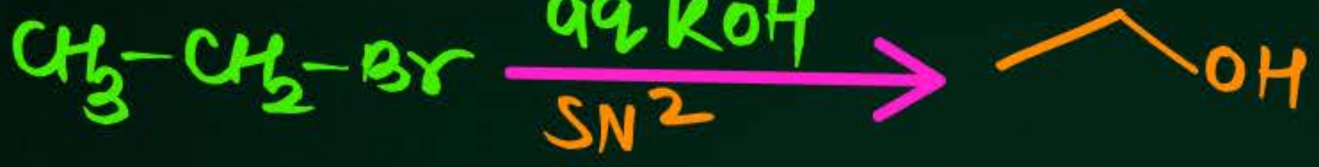
$$\underset{2^\circ \,\&\, 3^\circ}{R-X} \xrightarrow[Base]{RO^{\ominus}} E_2(\text{Alkene}) + S$$

$E>S$

Q/

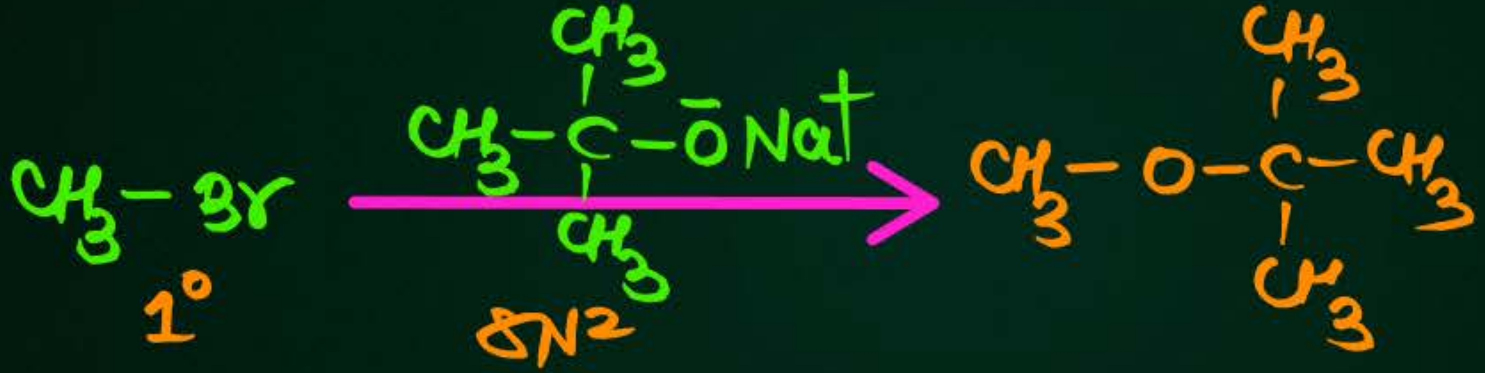
① $CH_3-Cl \xrightarrow[SN^2]{CH_3-\overset{\ominus}{O}Na^+} CH_3-O-CH_3$

②



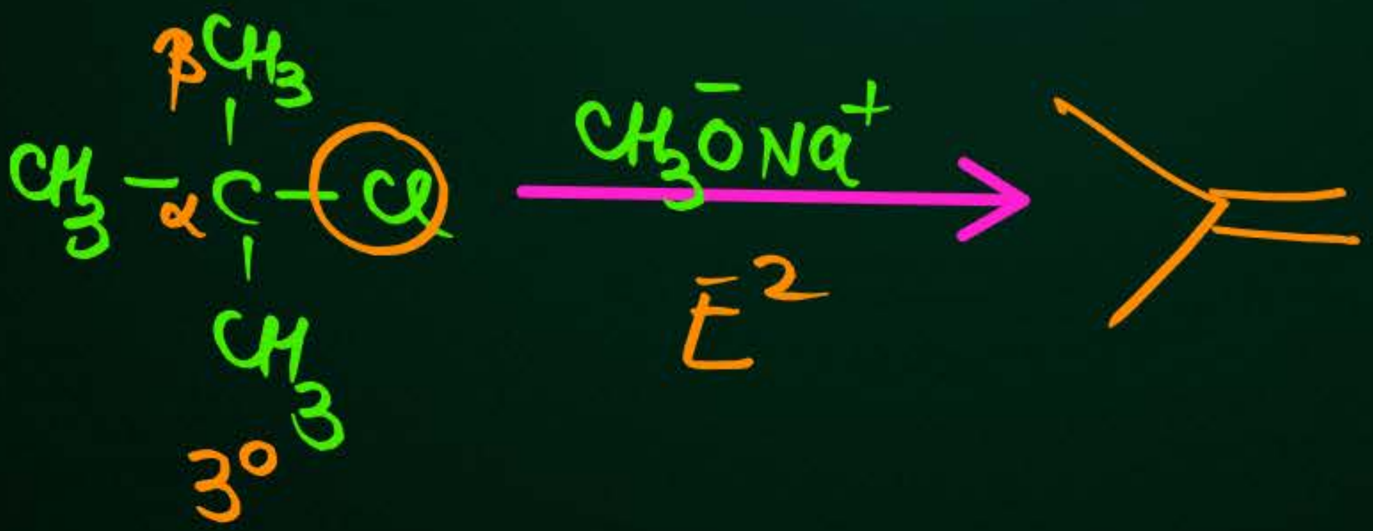
CH3–CH2–Br
aq KOH
SN2
OH

③



$$\underset{1^\circ}{CH_3-Br} \xrightarrow[SN^2]{CH_3-\overset{CH_3}{\underset{CH_3}{C}}-\bar{O}Na^+} CH_3-O-\overset{CH_3}{\underset{CH_3}{C}}-CH_3$$

④



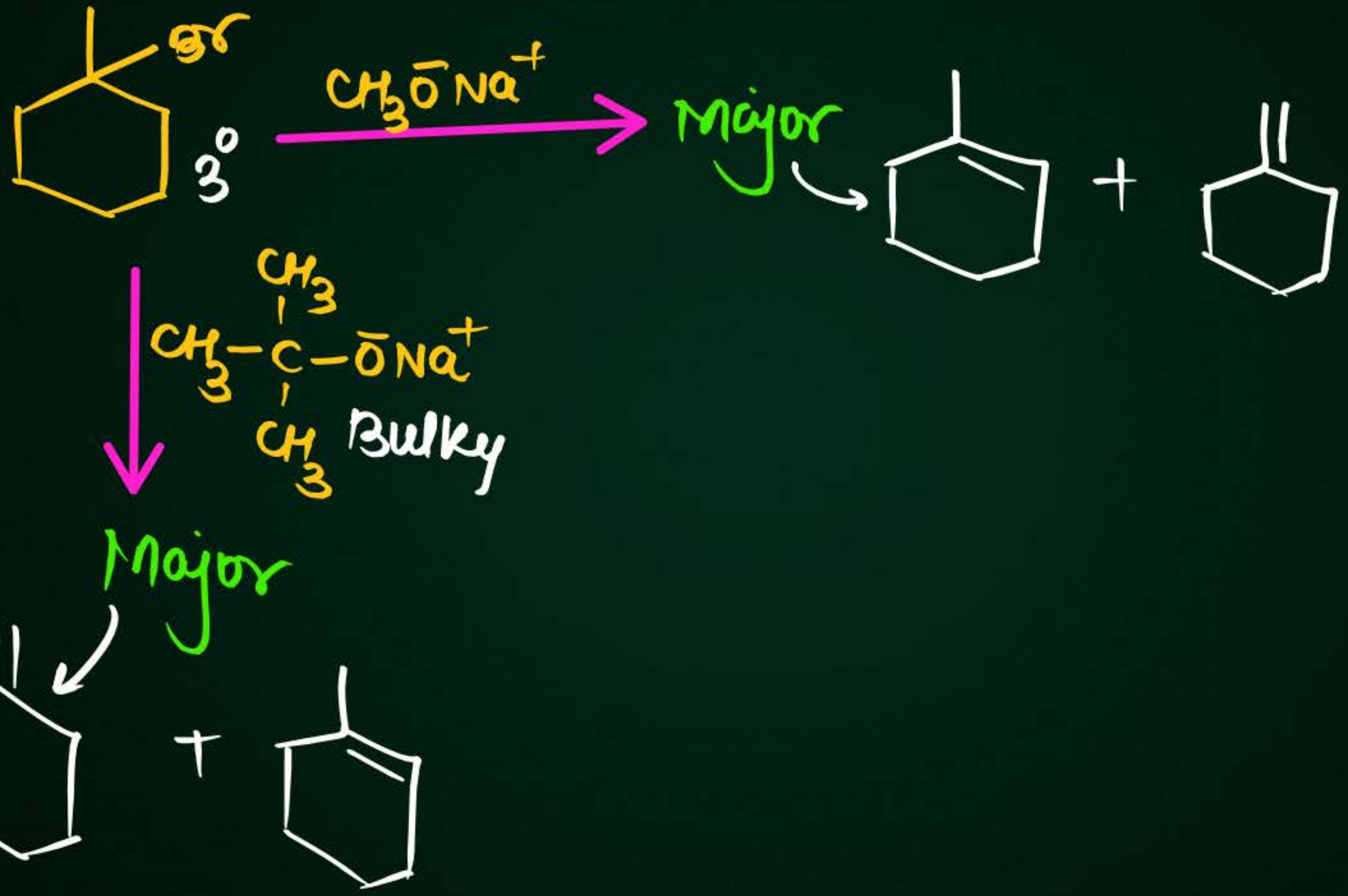
β CH3
CH3
α C
Cl
CH3
3°
CH3ŌNa+
E2

Q

① $PhOH \xrightarrow{Na|\Delta} \text{Ⓐ} \xrightarrow{CH_3-Br} \text{Ⓑ}$ $PhO-CH_3$

$Ph\bar{O}Na^+$ Anisole

②


Br
3°
$CH_3\bar{O}Na^+$
Major
+
$CH_3-\underset{CH_3}{\overset{CH_3}{C}}-\bar{O}Na^+$
Bulky
Major
+

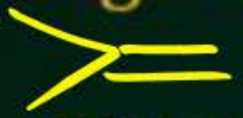
Practice of S_N1 & S_N2 Reactions

QUESTION (NCERT Exercise)

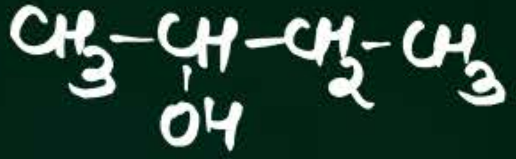
Alc KOH

Write the structure of the major organic product in each of the following reactions:

(i) $(CH_3)_3CBr + KOH \xrightarrow[\text{heat}]{\text{ethanol}}$

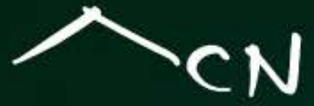


(ii) $CH_3CH(Br)CH_2CH_3 + NaOH \xrightarrow{Water}$



$\underset{OH}{CH_3-CH-CH_2-CH_3}$

(iii) $CH_3CH_2Br + KCN \xrightarrow{aq.ethanol}$



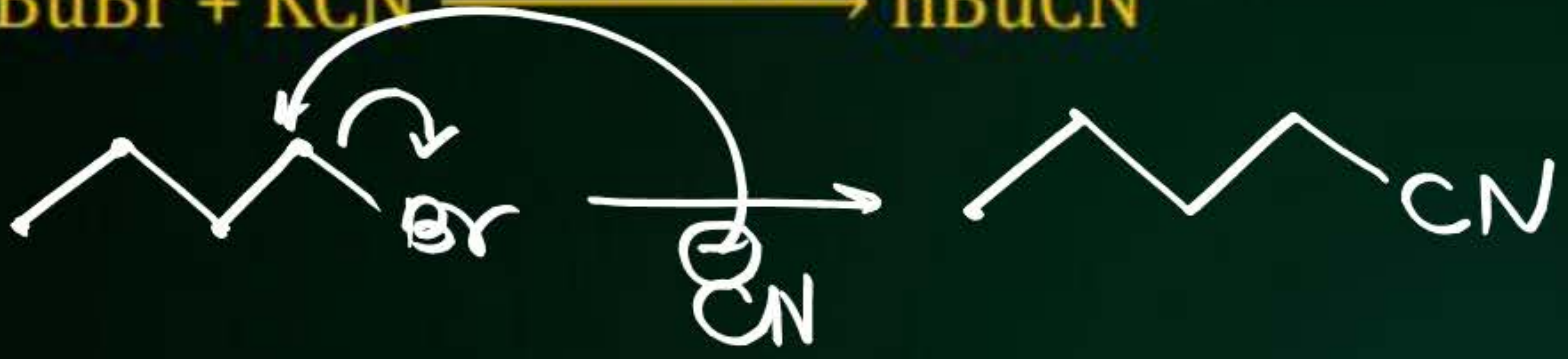
(iv) $C_6H_5\bar{O}Na + C_2H_5Cl \longrightarrow$ $C_6H_5OC_2H_5$

1°

QUESTION (NCERT Exercise)

Write the mechanism of the following reaction:

$$\text{nBuBr} + \text{KCN} \xrightarrow{EtOH-H_2O} \text{nBuCN}$$



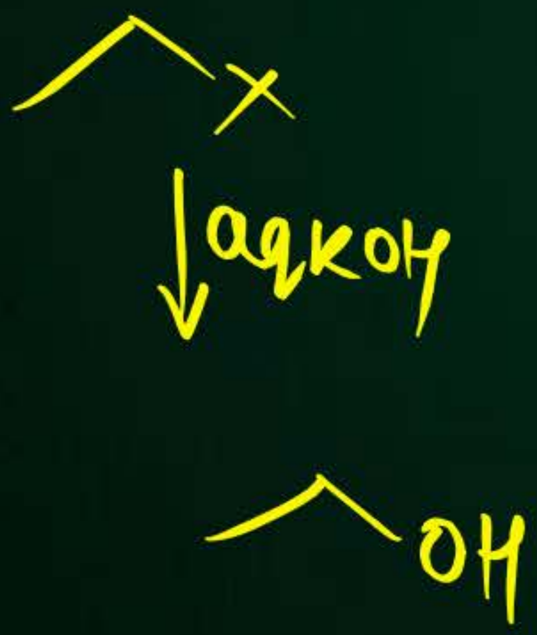
SN^2

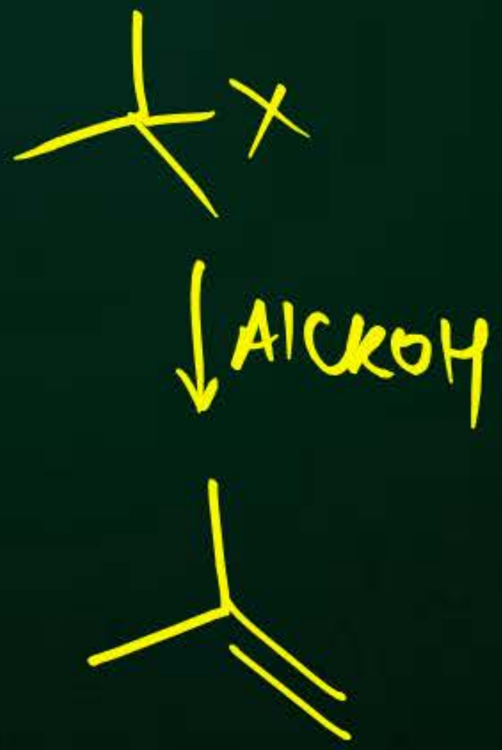
QUESTION (NCERT Exercise)

The treatment of alkyl chlorides with aqueous KOH leads to the formation of alcohols but in the presence of alcoholic KOH, alkenes are major products. Explain.

$\overset{\ominus}{O}H$ } $RO^{\ominus}$

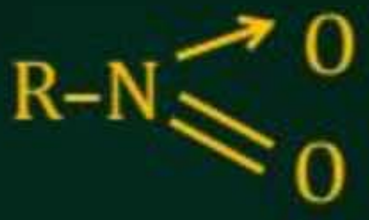
NSR } Elimi





QUESTION (AIIMS 2015)

Which of the following pairs is/are correctly matched ?

	Reaction	Product
I.	$RX + AgCN$ ✓	RNC
II.	$RX + KCN$ ✓	RCN
III.	$RX + KNO_2$ ✗	 $R-N\begin{matrix}\nearrow O \\ = O\end{matrix}$
IV.	$RX + AgNO_2$ ✗	$R-O-N=O$

(A) Only I

[✓ (B)] I and II

(C) III and IV

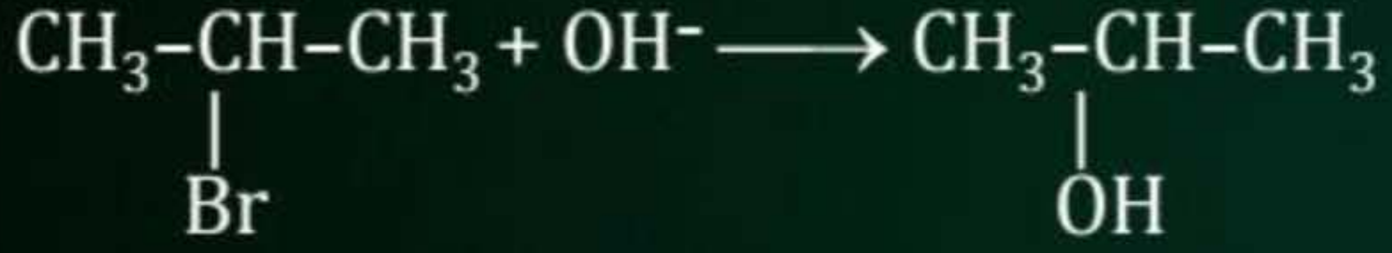
(D) I, II, III and IV

QUESTION (AIIMS 2013)

$\underbrace{1^\circ > 2^\circ > 3^\circ}$

Which of the following is an example of S_N2 reaction?

[✓ A] $CH_3Br + OH^- \longrightarrow CH_3OH + Br^-$

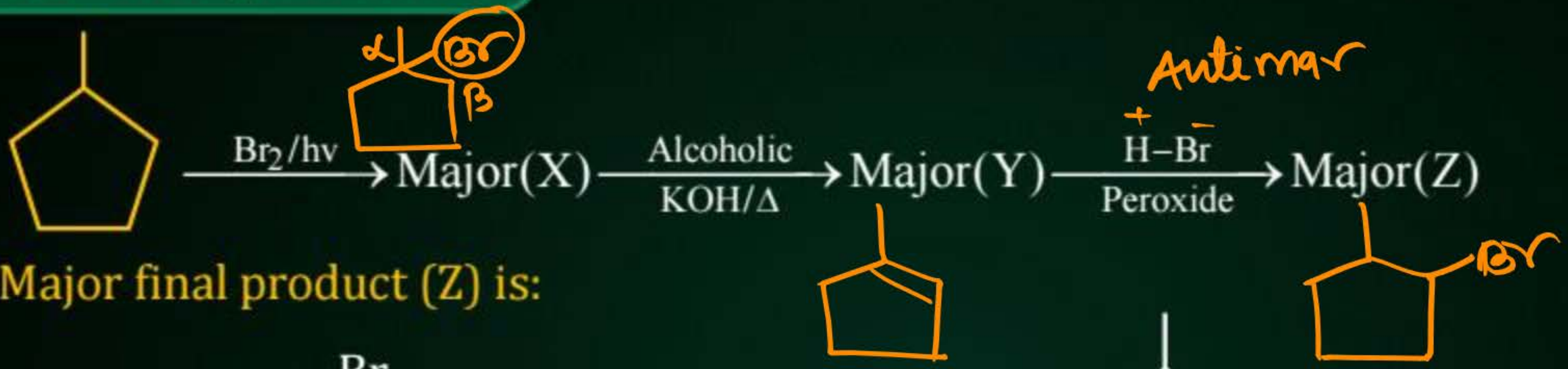
B 

$CH_3-\underset{Br}{\underset{|}{CH}}-CH_3 + OH^- \longrightarrow CH_3-\underset{OH}{\underset{|}{CH}}-CH_3$

C $CH_3CH_2OH \xrightarrow{-H_2O} CH_2{=}CH_2$

D $(CH_3)_3C-Br + OH^- \longrightarrow (CH_3)_3COH + Br^-$

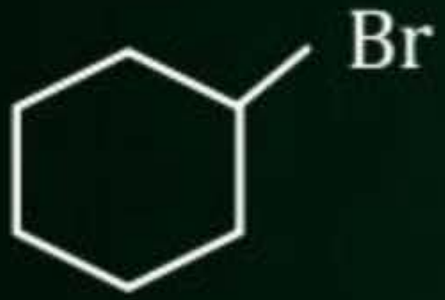
QUESTION (AIIMS 2009)



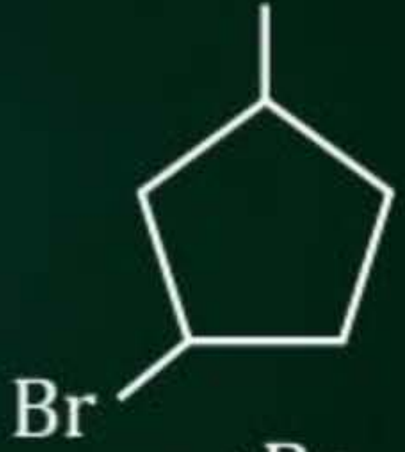
Br
α
β
Br$_2$/hν
Major(X)
Alcoholic
KOH/Δ
Major(Y)
Antimar
+ −
H–Br
Peroxide
Major(Z)
Br

Major final product (Z) is:

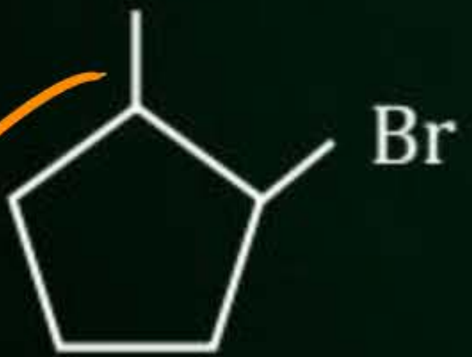
A



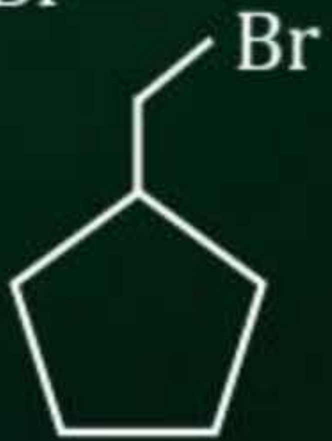
B



C



D



QUESTION

Draw the product of the following chemical reactions.

$H_2C{=}CH{-}CH_2Cl \xrightarrow[SN^2]{Aq.KOH} ?$ $CH_2{=}CH{-}CH_2{-}OH$

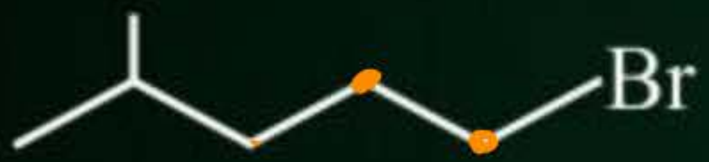
$H_2C{=}CHCl \xrightarrow{Aq.KOH} ?$ $\underline{\text{NO Rxn}}$

QUESTION

Arrange the following isomeric bromides in order of decreasing reactivity in S_N2 displacement:

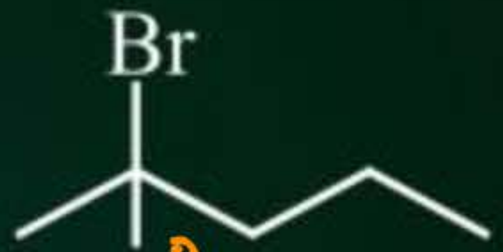
A>D>C>B

A



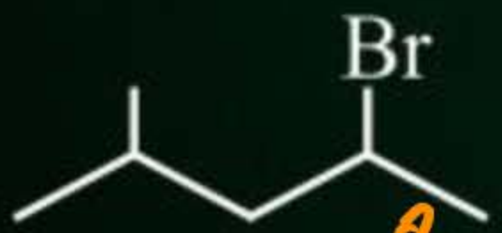
1°

B



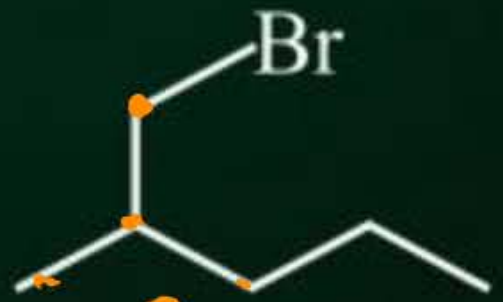
3°

C



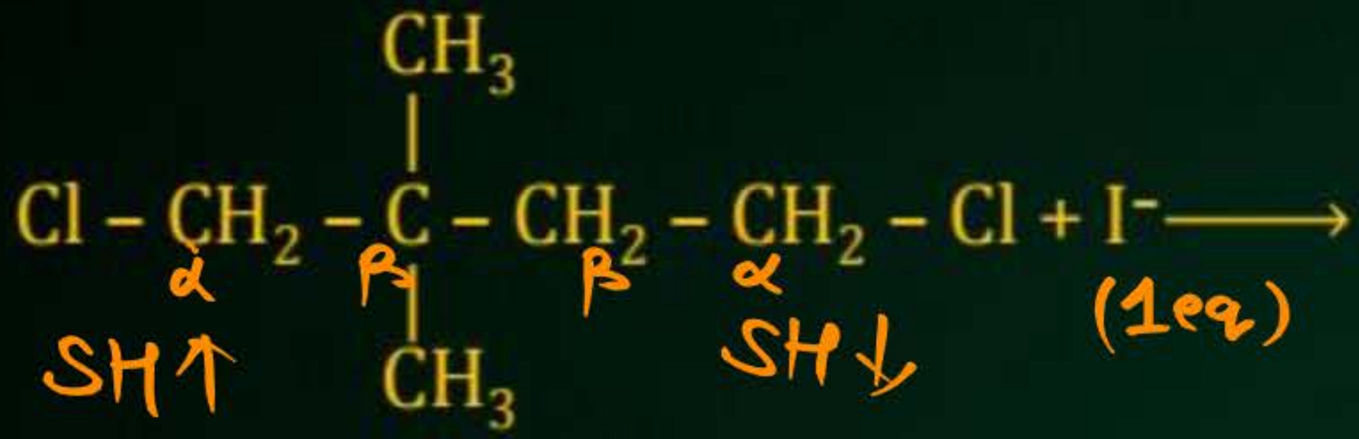
2°

D



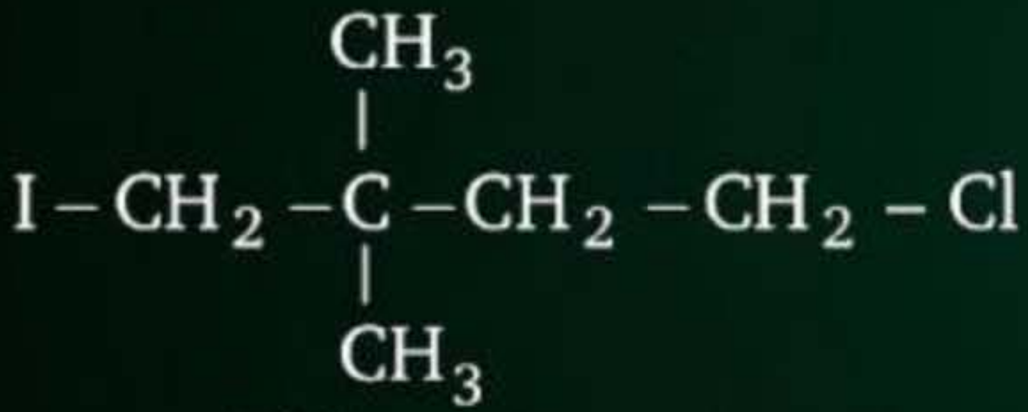
1°

QUESTION



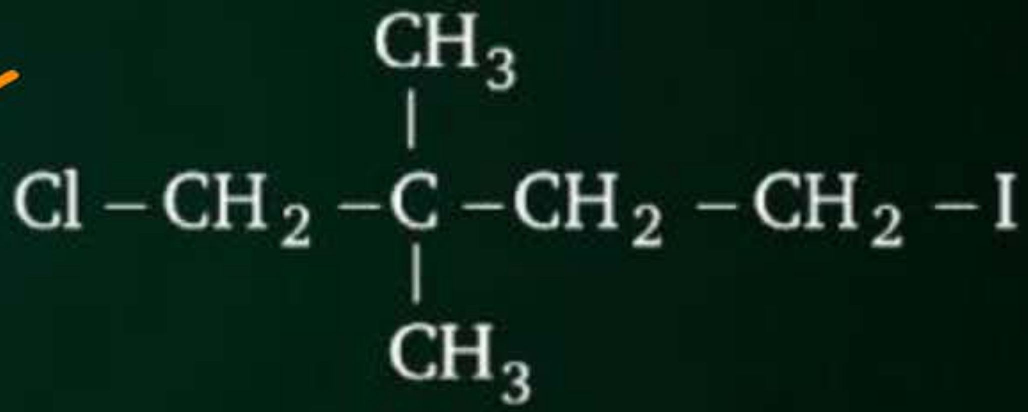
$$\mathrm{Cl-CH_2-\overset{CH_3}{\underset{CH_3}{C}}-CH_2-CH_2-Cl} + \mathrm{I^-} \xrightarrow[\text{(1eq)}]{}$$ Product; Major product of this reaction is:

(A)



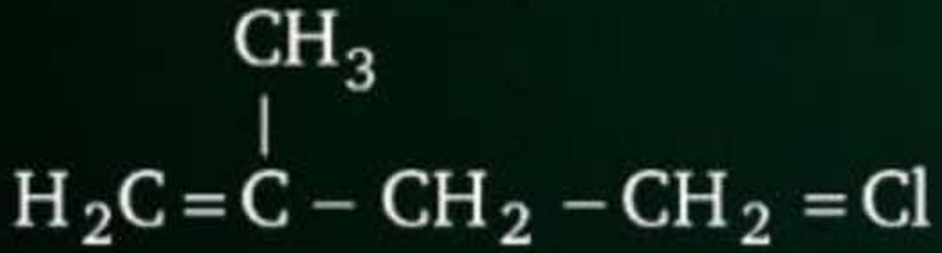
$$\mathrm{I-CH_2-\overset{CH_3}{\underset{CH_3}{C}}-CH_2-CH_2-Cl}$$

(B) ✓



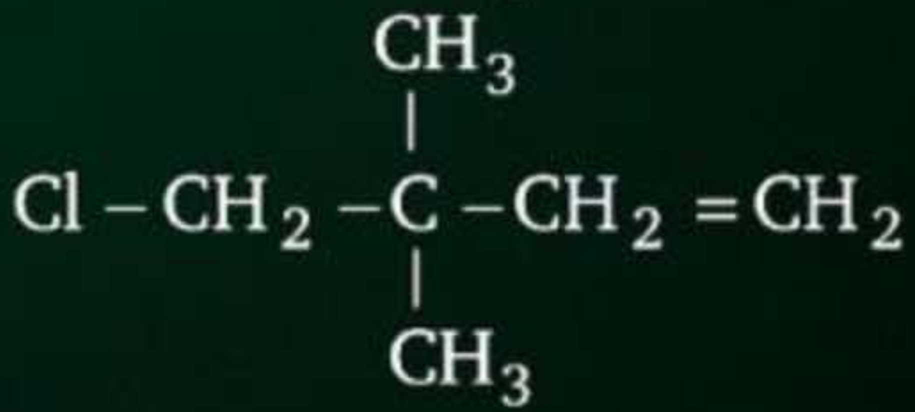
$$\mathrm{Cl-CH_2-\overset{CH_3}{\underset{CH_3}{C}}-CH_2-CH_2-I}$$

(C)



$$\mathrm{H_2C=\overset{CH_3}{C}-CH_2-CH_2=Cl}$$

(D)

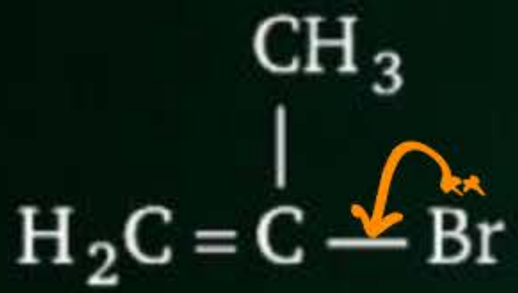


$$\mathrm{Cl-CH_2-\overset{CH_3}{\underset{CH_3}{C}}-CH_2=CH_2}$$

QUESTION

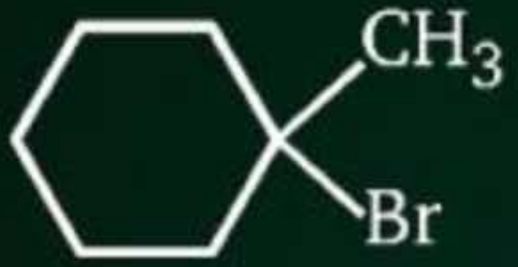
S_N1

Rank the following in order of decreasing rate of solvolysis with aqueous ethanol (fastest → slowest)

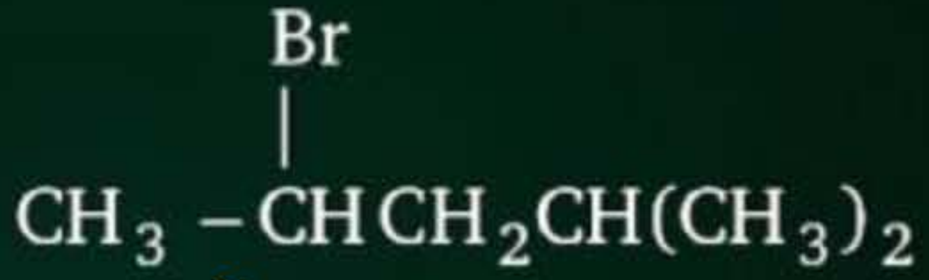


$H_2C=C(CH_3)-Br$

(1)



(2) 3°



$CH_3-CH(Br)CH_2CH(CH_3)_2$

2° (3)

(A) 2 > 1 > 3

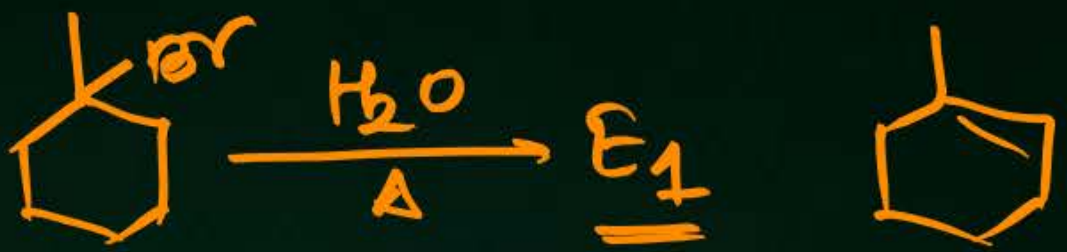
(B) 1 > 2 > 3

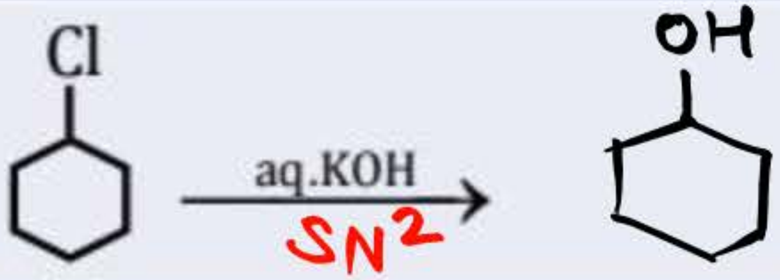
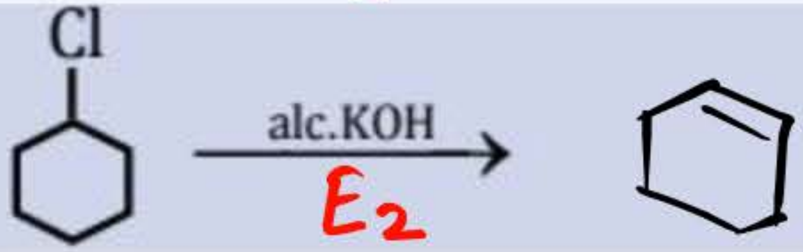
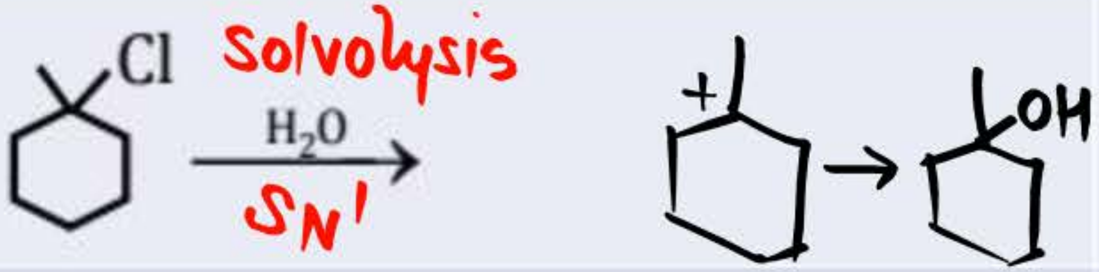
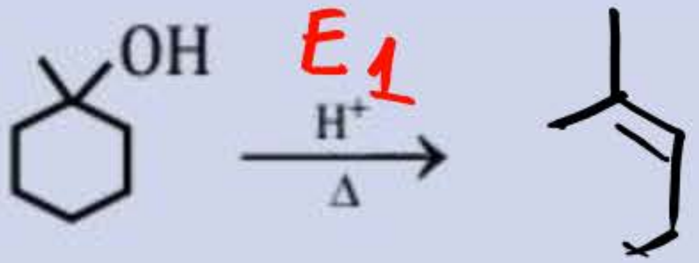
[✓ (C)] 2 > 3 > 1

(D) 1 > 3 > 2

QUESTION

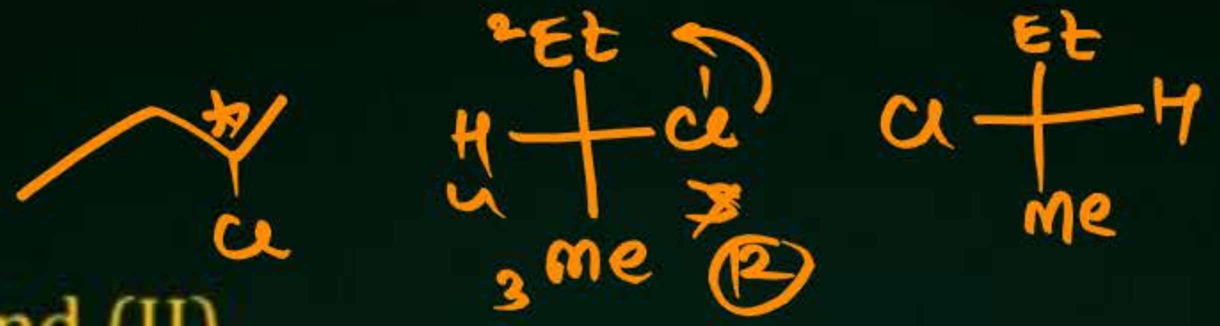
Match the column (I) and (II).



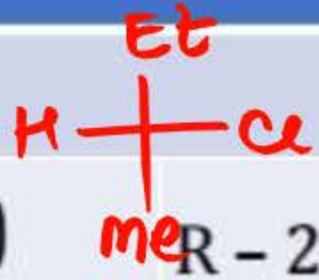
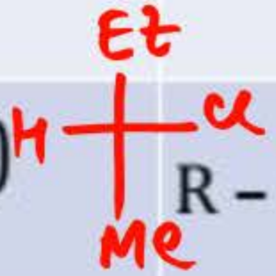
Column (I)		**Column (II)**	
Reaction		Type of Reaction	
(a) ⓠ	 Cl aq.KOH SN2 OH	(p)	S_{N^1}
(b) ⓢ	 Cl alc.KOH E2	(q)	S_{N^2}
(c) ⓟ	 Cl Solvolysis H₂O SN1 + OH	(r)	E_1
(d) ⓡ		(s)	E_2

QUESTION

$SN^1 | E_1$ $SN^2 \} E^2$



Match the column (I) and (II).

Column (I)		Column (II)	
	Reaction SN^2		Type of Reaction
(a) 	R – 2- chlorobutane $\xrightarrow[\text{acetone}]{\overset{+\ -}{\text{KSH}}}$ ⓠ 2°	(p)	S_{N^1}
(b) 	R – 2- chlorobutane $\xrightarrow[\text{acetone}]{\text{EtO}^- \overset{\oplus}{\text{Na}}}$ ⓢ Alc KOH 2°	(q)	S_{N^2}
(c)	2-Bromo-2-methyl propane ⓟ $\xrightarrow{H_2O}$ 3°	(r)	E_1
(d)	2-butanol $\xrightarrow[\Delta]{H_2SO_4}$ E_1 ⓡ	(s)	E_2

Chemical Properties of Haloalkanes

3. Reaction with metals:

A. Wurtz Reaction:

$$R-X \xrightarrow{Na/dry\ ether} R-R$$

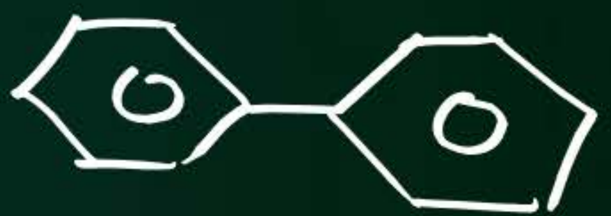
$$2\ \dot{R} \wr \dot{X}$$

$$\dot{R} + \dot{R} \rightarrow R-R$$

B. Wurtz-Fittig Reaction

$$R-\underbrace{X + X}_{2Na}-Ph \xrightarrow[\text{ether}]{\text{Na/dry}} R-Ph$$

C. Fittig Reaction



$$Ph-\underbrace{X+X}_{2Na}-Ph \xrightarrow{\text{Na/dry ether}} Ph-Ph$$

Ulman

$$Ph-\underbrace{I + I}_{2Cu}-Ph$$

$$\Big\downarrow \text{Cu}/\Delta$$

$$Ph-Ph$$

Grignard Reagent

organometallic comp.

The comp in which metal is directly bonded with the carbon.

$$\begin{tikzcd}
 & \overset{\ominus}{R}\,{}^{+}Mg^{+}X^{-} \quad (R^{\ominus} \text{ Base}) \\
RMgX \arrow[ur] \arrow[dr] & \\
 & \overset{\delta-}{R}-\overset{\delta+}{Mg}^{+}X^{-} \quad (\overset{\delta-}{R} \text{ Nu})
\end{tikzcd}$$

MOP of Grignard Reagent:

$$R-X \xrightarrow[\text{ether}]{\text{Mg/dry}} RMgX$$

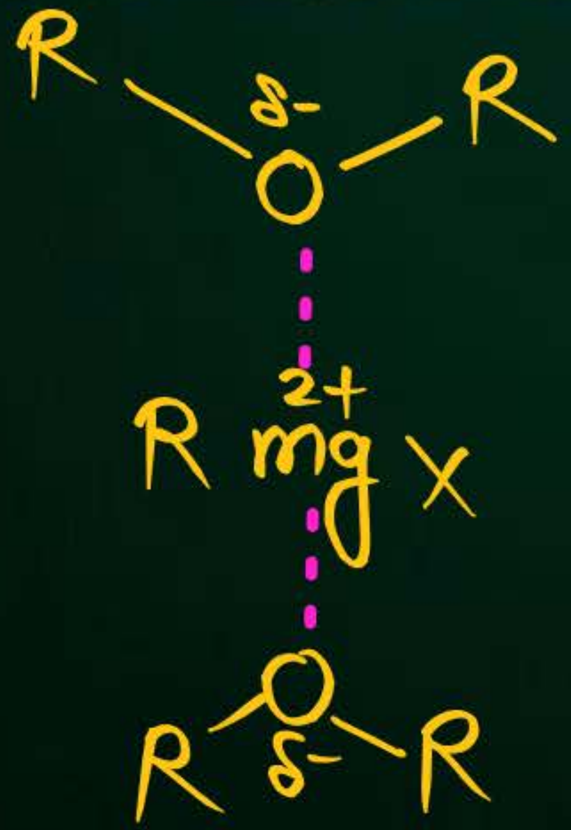
OP Points:

BE↓ L.A↑

1. ROR -----> R – F < R – Cl < R – Br < R – I ✓
2. In moist condition, alkane will be formed.

$$R^{\ominus}\overset{2+}{Mg}X^{-} \xrightarrow{\overset{\oplus}{H}-\overset{-}{O}H} \underset{\text{(Alkane)}}{R-H} + Mg(OH)X$$

3. Grignard Reagent is an Organometallic compound.
4. Dry ether stabilizes G.R & decreases the reactivity of G.R.



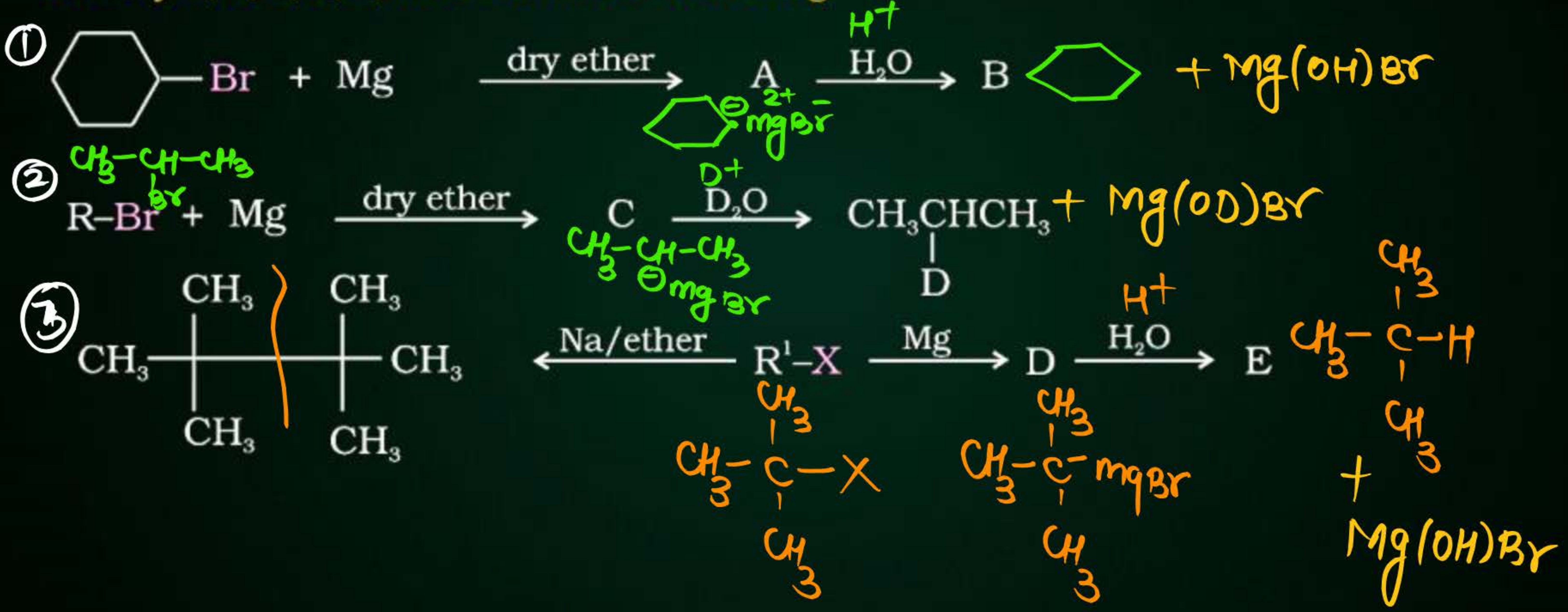
Chemical Reaction

Acid base reactions or Zerewitinoff's reactions:

$$\underset{(\text{Base})}{\overset{\ominus}{R}}\overset{2+}{Mg}\overset{-}{X} \xrightarrow[H^{\oplus}]{\text{Acid}} R-H$$

QUESTION (NCERT Example)

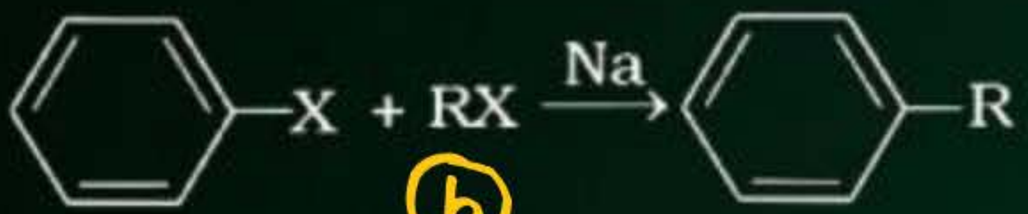
Identify A, B, C, D, E, R and R^1 in the following:


①
Br
+ Mg
dry ether
A
H⁺
H2O
B
+ Mg(OH)Br
2+
MgBr⁻
②
CH3–CH–CH3
Br
R–Br + Mg
dry ether
C
CH3–CH–CH3
MgBr
D⁺
D2O
CH3CHCH3
D
+ Mg(OD)Br
③
CH3
CH3
CH3
CH3
CH3
CH3
Na/ether
R¹–X
Mg
D
H⁺
H2O
E
CH3
CH3–C–X
CH3
CH3
CH3–C–MgBr
CH3
CH3
CH3–C–H
CH3
+
Mg(OH)Br

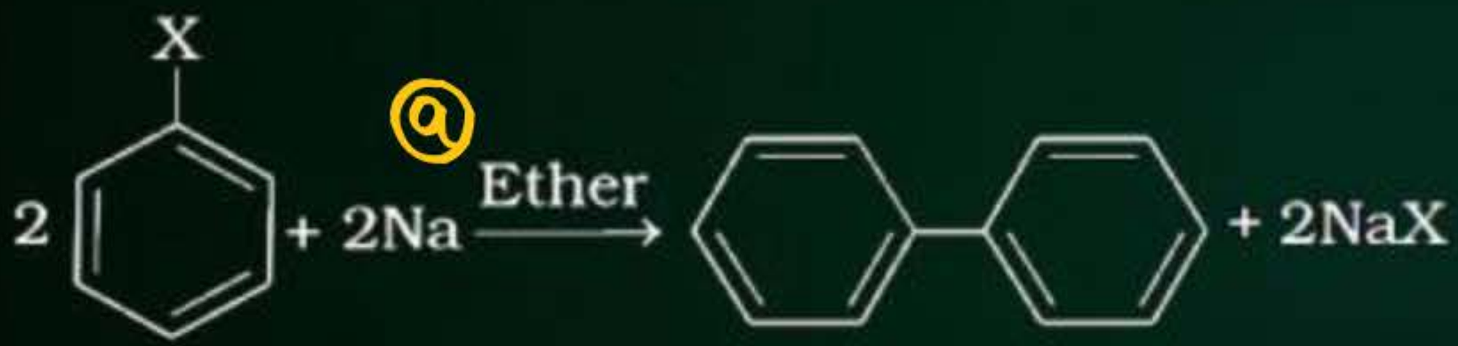
QUESTION (NCERT Exemplar)

Match the reactions given in Column I with the names given in Column II.

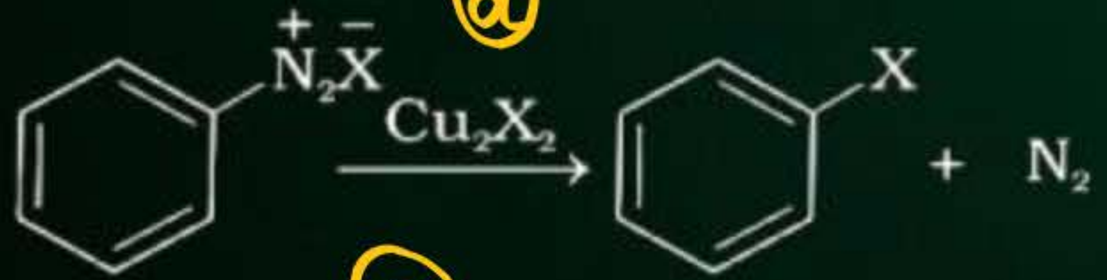
Column I

(i) 

ⓑ

(ii) 

ⓐ

(iii) 

ⓓ

ⓒ

(iv) $C_2H_5Cl + NaI \xrightarrow{\text{dry acetone}} C_2H_5I + NaCl$

Column II

(a) Fittig reaction

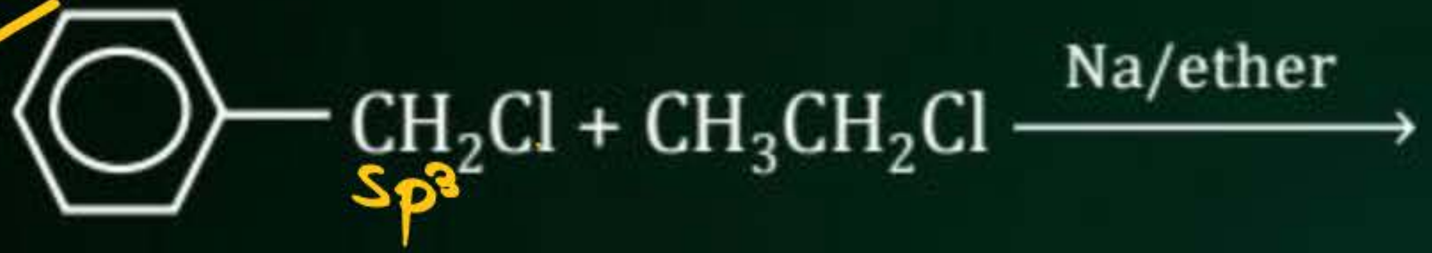
(b) Wurtz Fittig reaction

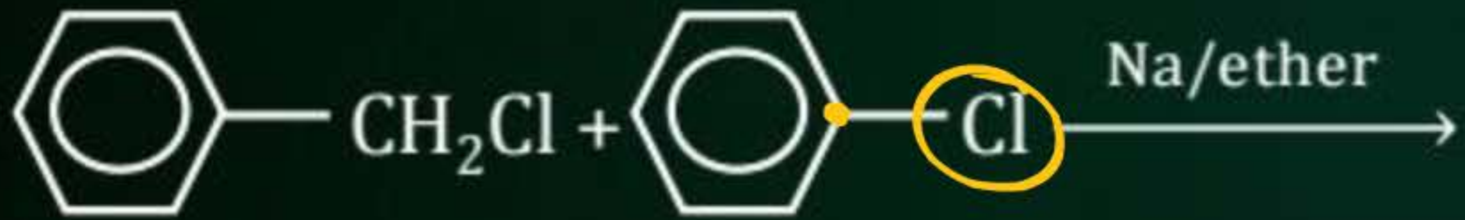
(c) Finkelstein reaction

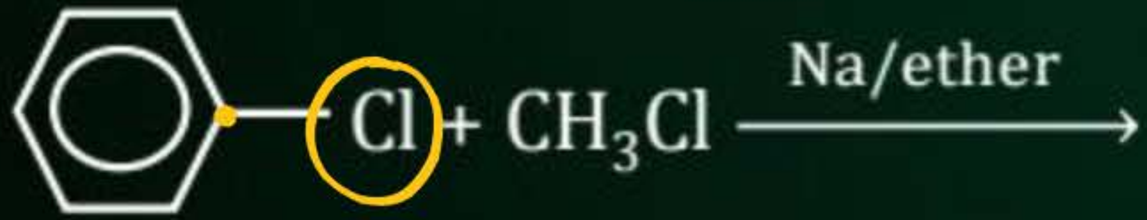
(d) Sandmeyer reaction

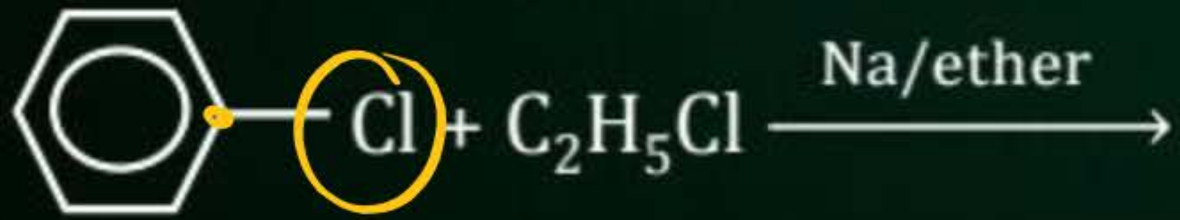
QUESTION

Which of the following reactions is not the correct representation of Wurtz-Fitting reaction?

A

CH₂Cl + CH₃CH₂Cl
Na/ether
sp³

B

CH₂Cl +
Cl
Na/ether

C

Cl + CH₃Cl
Na/ether

D

Cl + C₂H₅Cl
Na/ether

QUESTION

Grignard reagent is formed when alkyl halide react with which one of the following

- A Mg in alcohol
- B Mg in acid
- C [✓ Mg in dry ether]
- D MgO

QUESTION

$\overset{\ominus}{R}mgx$

Grignard reagents does not give alkane, on reaction with:

(A) phenol $PhO-H^{+}$

[✓ (B)] ether $R-O-R$

(C) alcohol $RO-H^{+}$

(D) water $H-O-H^{+}$

QUESTION

An ethereal solution of alkyl halide is heated with sodium metal. The reaction is known as:

Ⓐ Frankland's reaction

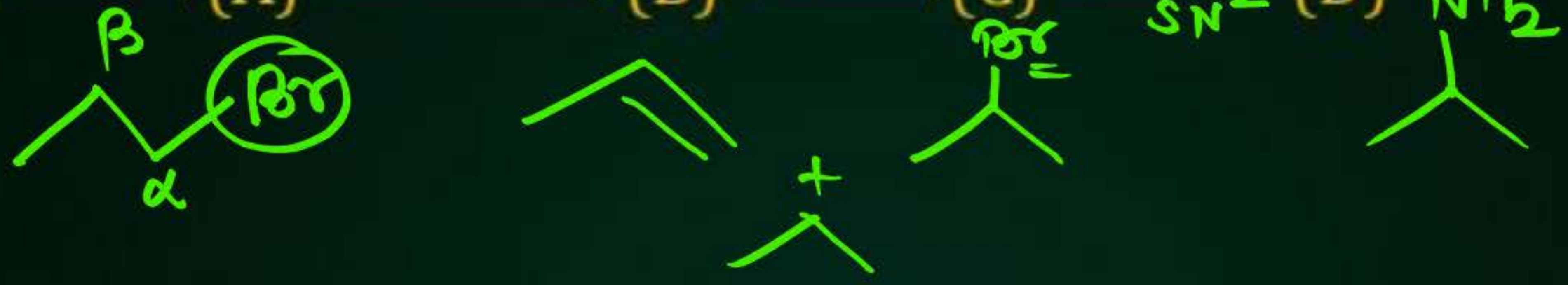
Ⓑ Sandmeyer's reaction

Ⓒ Wurtz-Fitting reaction

Ⓓ [✓ Wurtz reaction]

QUESTION

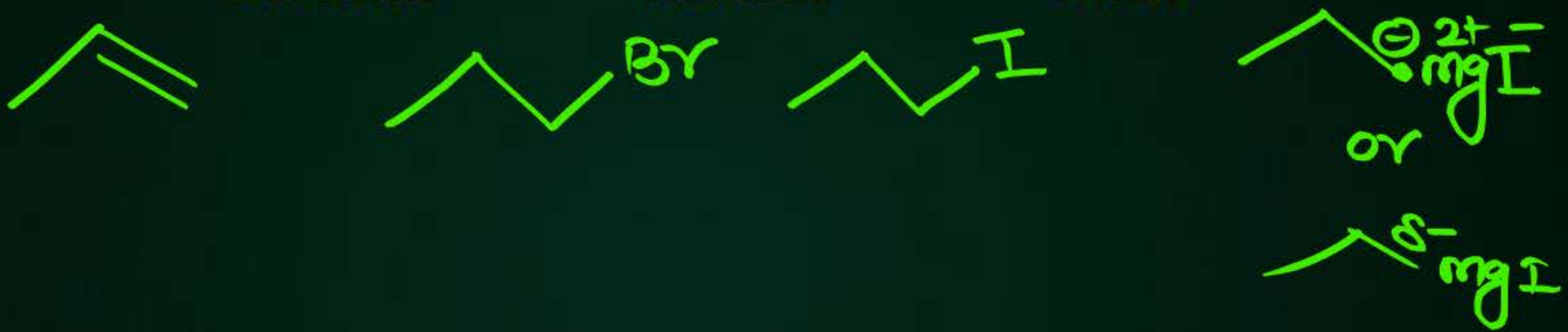
$$CH_3CH_2CH_2OH \xrightarrow{PBr_3} (A) \xrightarrow{\text{Alc. KOH}} (B) \xrightarrow{HBr} (C) \xrightarrow[S_N2]{NH_3} (D)$$



QUESTION

(Antimar)

$$CH_3\overset{\alpha}{C}HBr\overset{\beta}{C}H_3 \xrightarrow{\text{Alc. KOH}} (A) \xrightarrow[\text{Peroxide}]{\overset{+}{H}\overset{-}{Br}} (B) \xrightarrow[\text{Acetone}]{\text{NaI}} (C) \xrightarrow[\text{Ether}]{\text{Mg}} (D)$$



QUESTION

A Grignard reagent is prepared by the action of magnesium in dry ether on:

A C_2H_5OH

B C_2H_6

[✓ C] C_2H_5Cl

D C_2H_5CN

QUESTION

The Wurtz-Fitting reaction involves

A two molecules of aryl halides

B two molecules of alkyl halides

[✓ C one molecule of each of aryl halide and alkyl halide]

D one molecule of each of aryl halide and phenol

$$\left.\begin{array}{c}\text{Solvolysis}\\ \&\\ \text{Lewist Acid}\end{array}\right\} SN^1$$

Rest all
are SN^2

Home Work

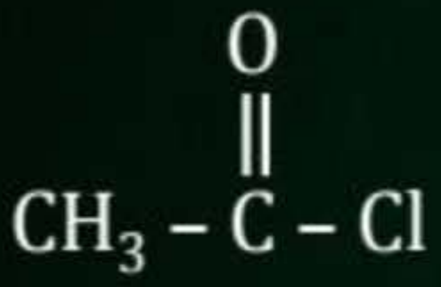
QUESTION 01

Alkyl halides can be converted into Grignard reagents by ____.

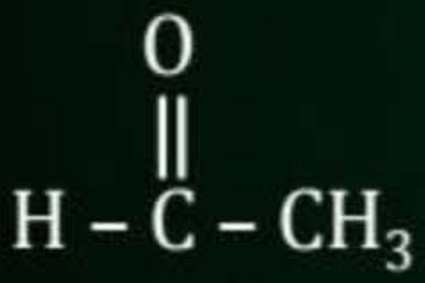
- (A) Boiling them with Mg ribbon in alcoholic solution
- (B) Warming them with magnesium powder in dry ether
- (C) Refluxing them with $MgCl_2$ solution
- (D) Warming them with $MgCl_2$

QUESTION 02

Which of the following compounds will give acid base reaction with RMgX?

(A) 
$CH_3-\overset{O}{\overset{\|}{C}}-Cl$

(B) H_2S

(C) 
$H-\overset{O}{\overset{\|}{C}}-CH_3$

(D) None of these

QUESTION 03

For preparation of Grignard reagent from haloalkanes which metal is used:

Ⓐ Na

Ⓑ Mg

Ⓒ Ca

Ⓓ Ag

QUESTION 04

Which of the following compounds will form hydrocarbon on reaction with Grignard reagent?

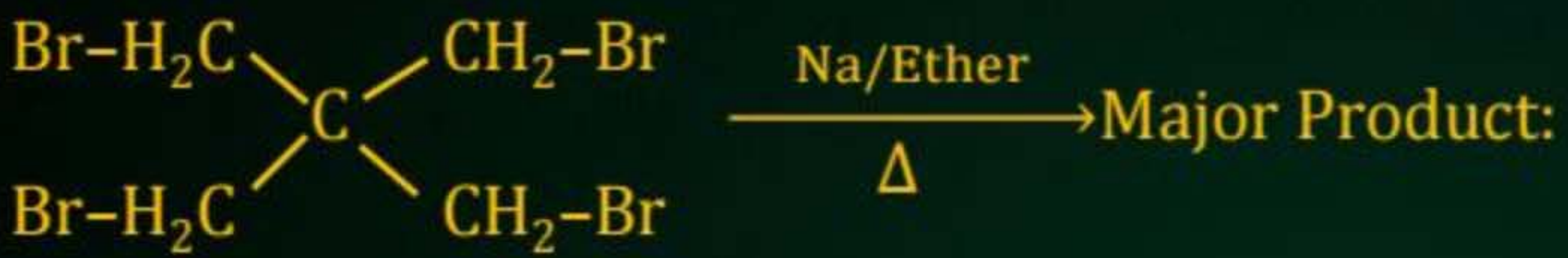
(A) CH_3CH_2OH

(B) CH_3CHO

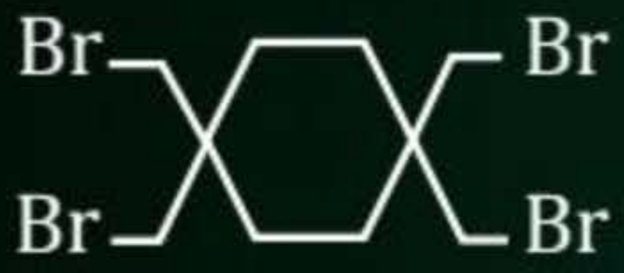
(C) CH_3COCH_3

(D) $CH_3CO_2CH_3$

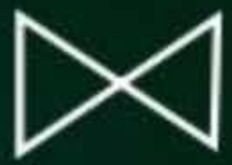
QUESTION 05


Br–H$_2$C
CH$_2$–Br
C
Br–H$_2$C
CH$_2$–Br
Na/Ether
Δ
Major Product:

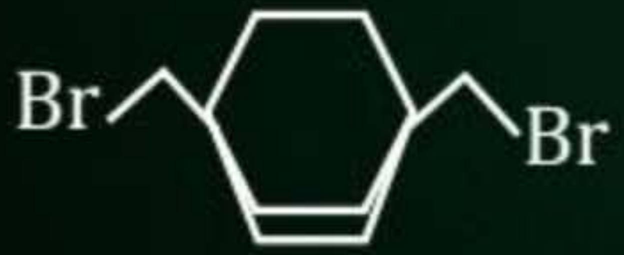
A



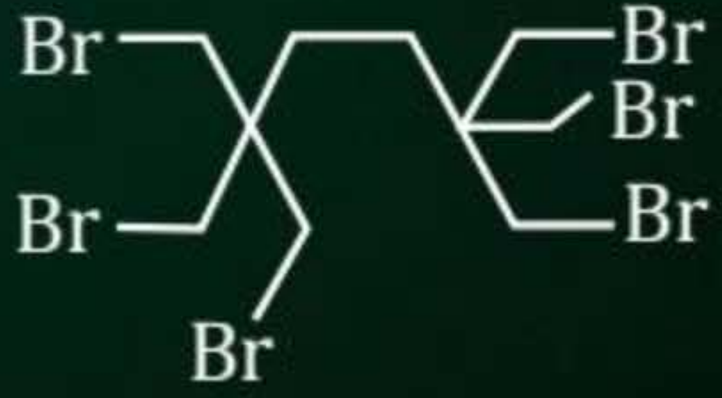
B



C



D


Br
Br
Br
Br
Br
Br

QUESTION 06

Which of the following reactions is an example of nucleophilic substitution reaction?

- Ⓐ $RX + Mg \longrightarrow RMgX$
- Ⓑ $RX + KOH \longrightarrow ROH + KX$
- Ⓒ $2RX + 2Na \longrightarrow R{-}R + 2NaX$
- Ⓓ $RX + H_2 \longrightarrow RH + HX$

QUESTION 07

Which one is an organometallic compound?

Ⓐ C_2H_5ONa

Ⓑ C_2H_5SNa

Ⓒ C_2H_5MgI

Ⓓ All of these

QUESTION 08

$(CH_3)_3CMgCl$ on reaction with D_2O produces

A $(CH_3)_3CD$

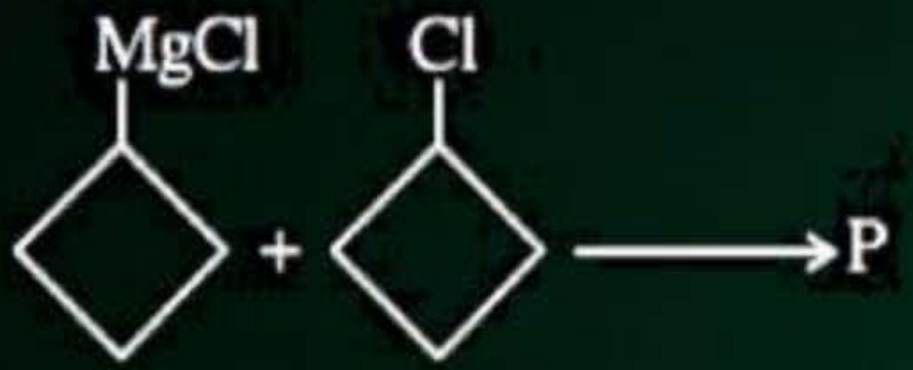
B $(CH_3)_3COD$

C $(CD)_3CD$

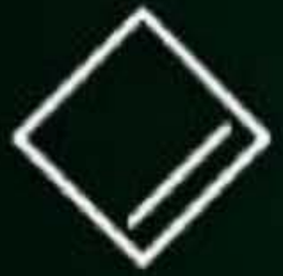
D $(CD)_3COD$

QUESTION 09

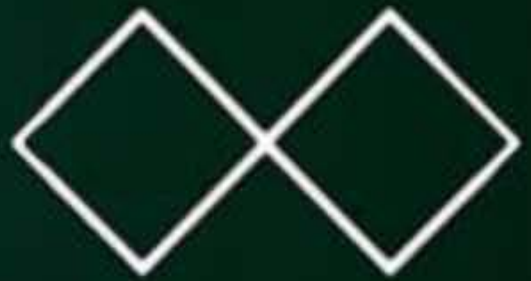
Product 'P' is:



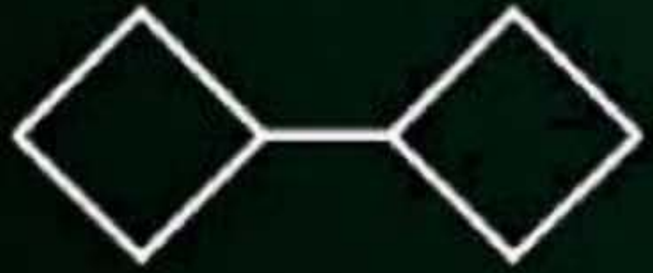
A



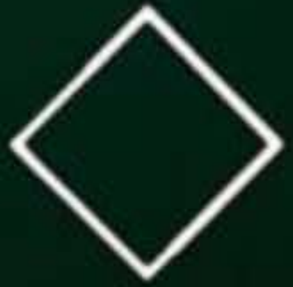
B



C



D



QUESTION 10

In the reaction

$$CH_3CH_2I \xrightarrow{Alc.KOH} X \xrightarrow{Br_2} Y \xrightarrow{KCN\ (Excess)} Z, \text{ Z is:}$$

Ⓐ CH_3CH_2CN

Ⓑ $CNCH_2CH_2CN$

Ⓒ $BrCH_2CH_2CN$

Ⓓ $BrCH = CHCN$

ANSWER KEY

1. B
2. B
3. B
4. A
5. B
6. B
7. C
8. A
9. C
10. B

Home Work From PW Module (Yakeen NEET)

Prarambh: Q 18, 24, 38, 45, 46

Prabal: Q 15, 20

Parikshit: Q 03, 04, 05, 06, 09, 10, 11, 12, 14, 16, 26, 27, 36

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14 TEST BOOKLET
14 OMR SHEETS
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Thankyou!!

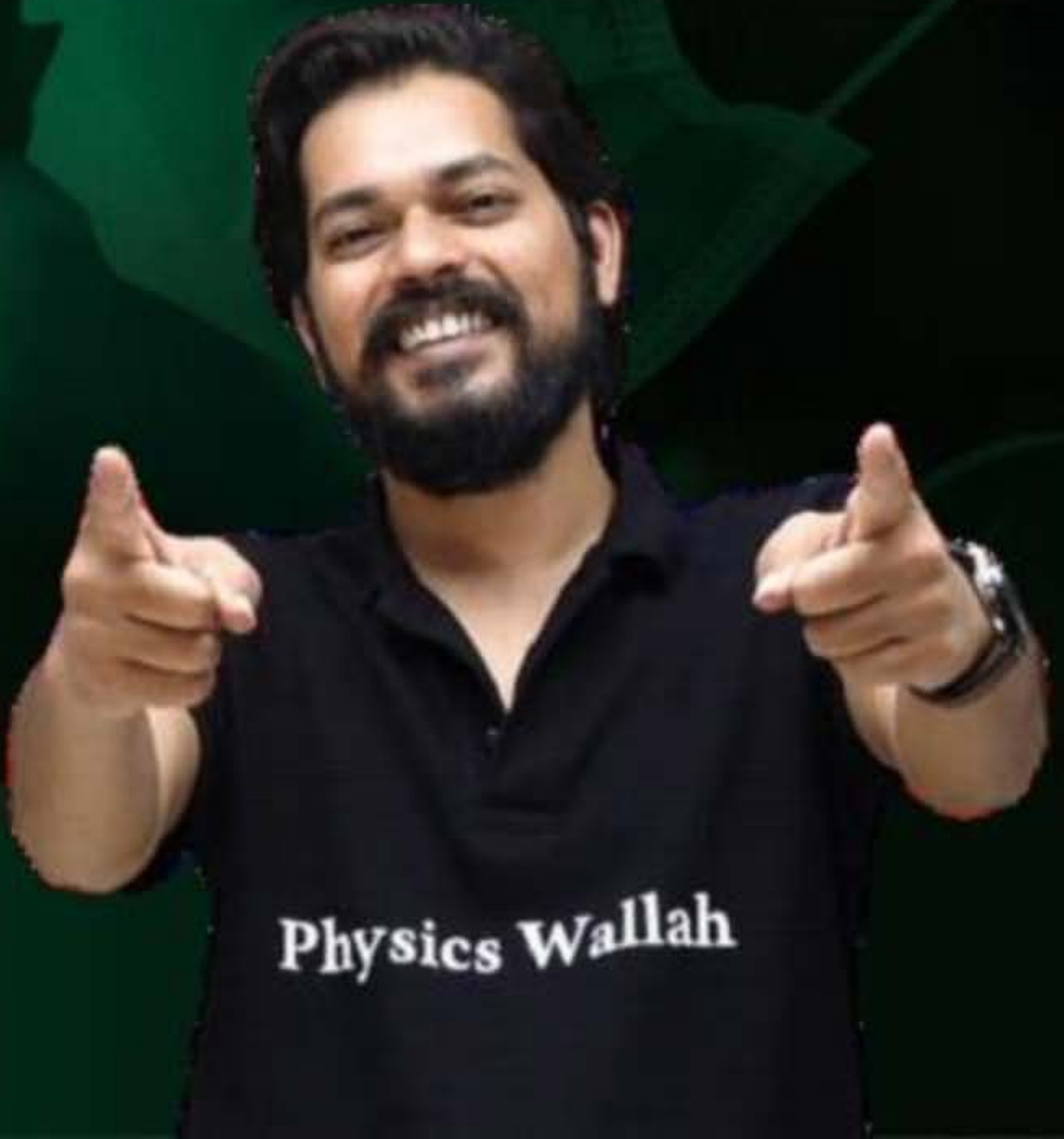
YAKEEN 2.0

FOR NEET 2025

Lecture- 06 Organic Chemistry

Haloalkanes and Haloarenes

By- Pankaj Sir(POPU MAMA)


Physics Wallah

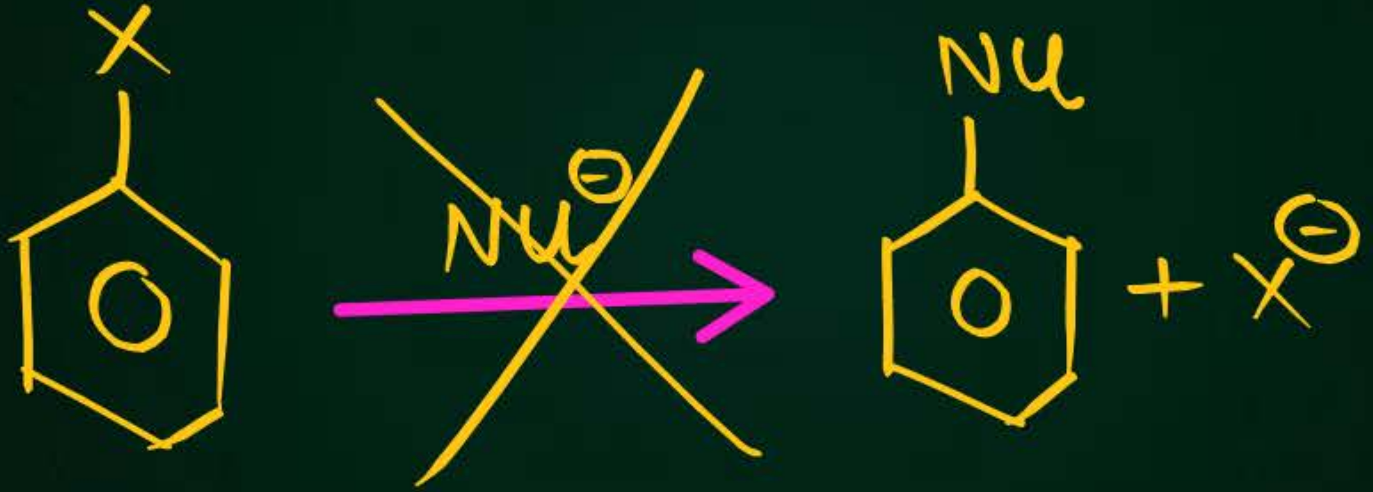
Topics *to be covered*

1. Chemical Properties of Haloarenes
2. Practice

Chemical Properties of Haloarenes

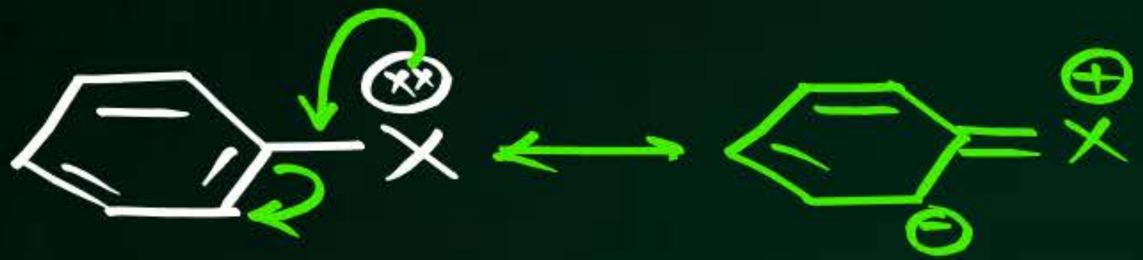
1. Nucleophilic Substitution Reactions:

Generally Aromatic N.S.R do not occurs why?

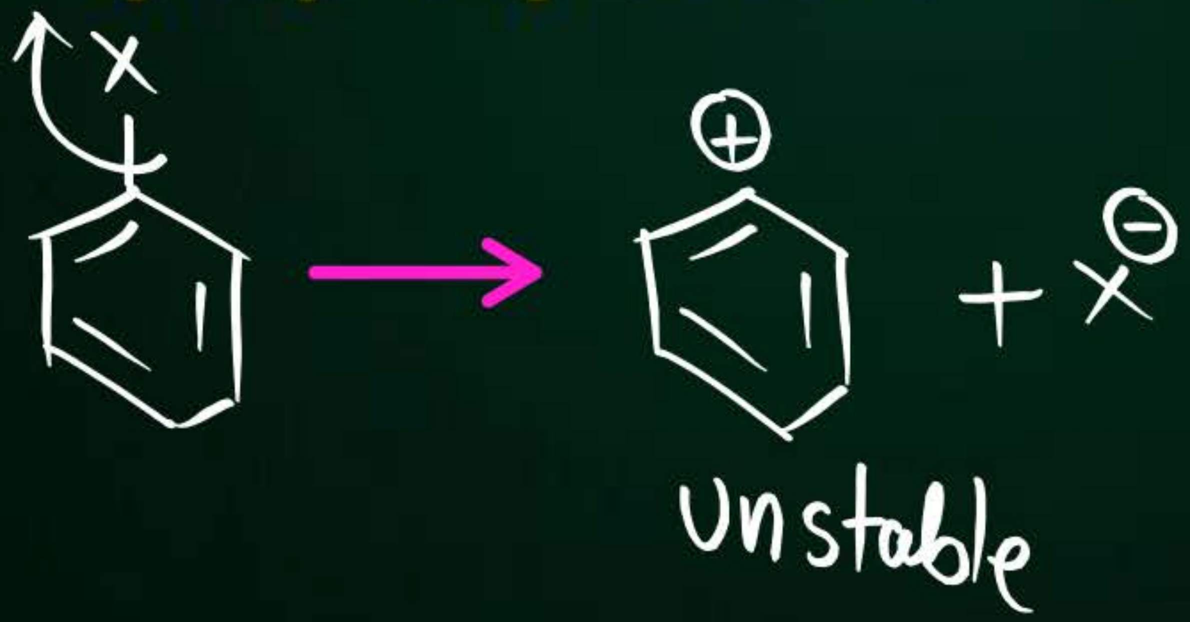


Reasons

1. Due to partial bond character b/w C and X



2. Due to instability of phenyl cations



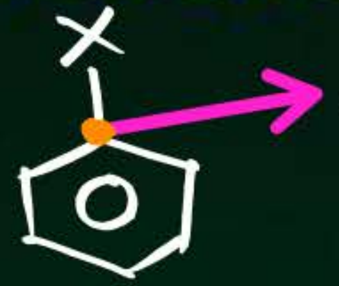
3. Due to difference in hybridization of carbon of C-X bond

CH_3-X

$\downarrow$

sp^3

$\% s = 25\%$

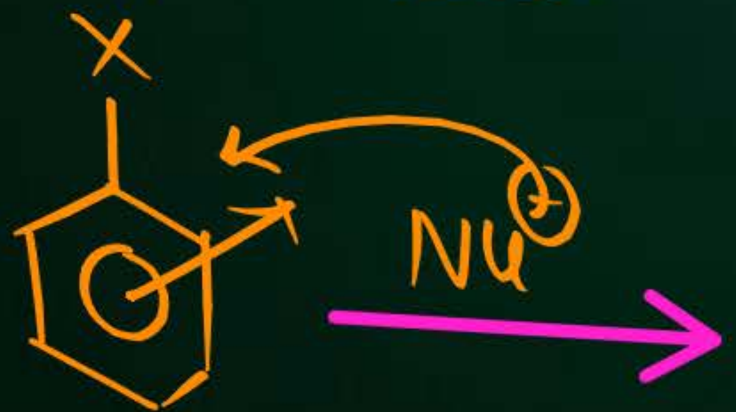


sp^2

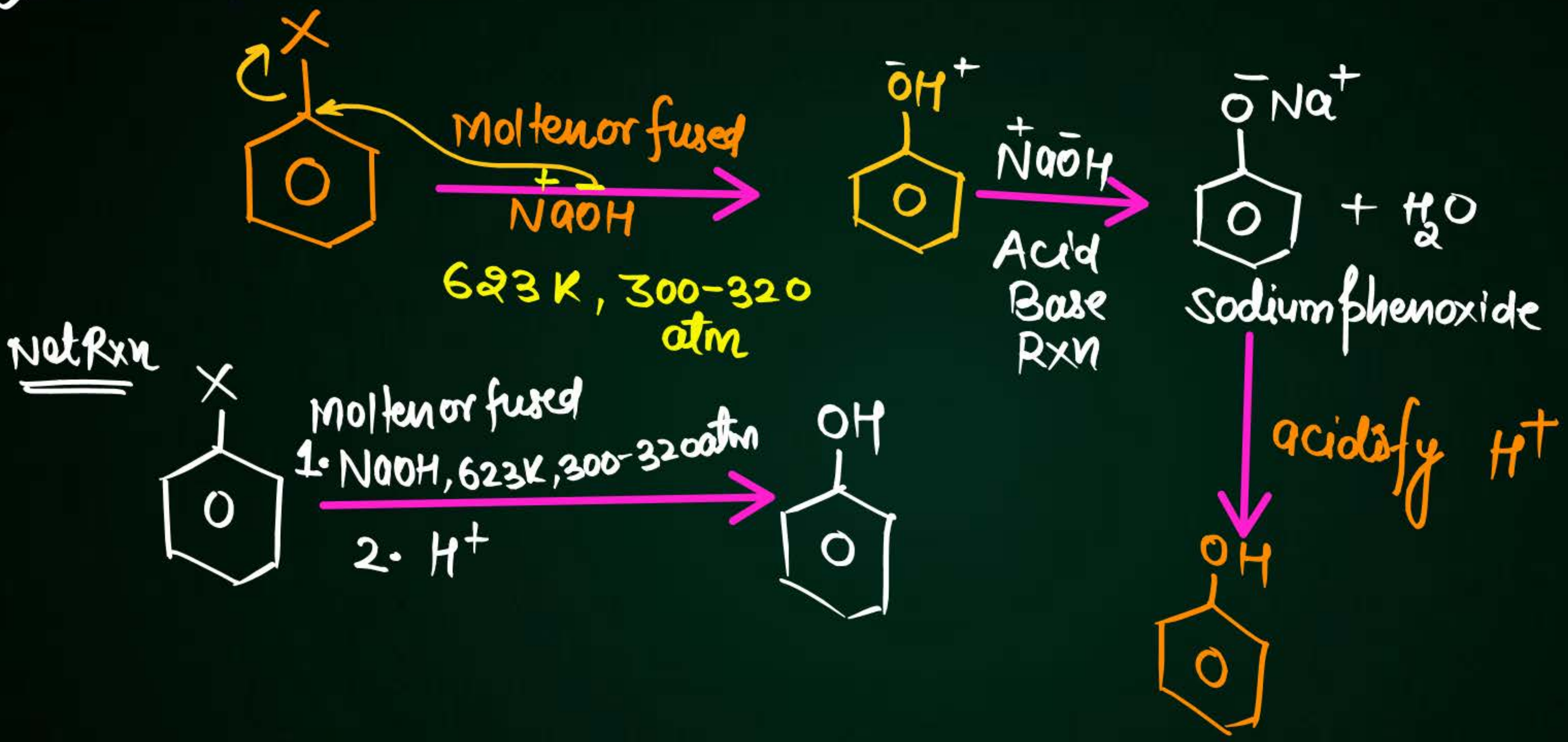
$\% s = 33.33\%$

E.N $C_{sp^2} > C_{sp^3}$

4. Due to repulsion b/w Nucleophile and electron rich haloarenes



1. Dows process (ArSN²)

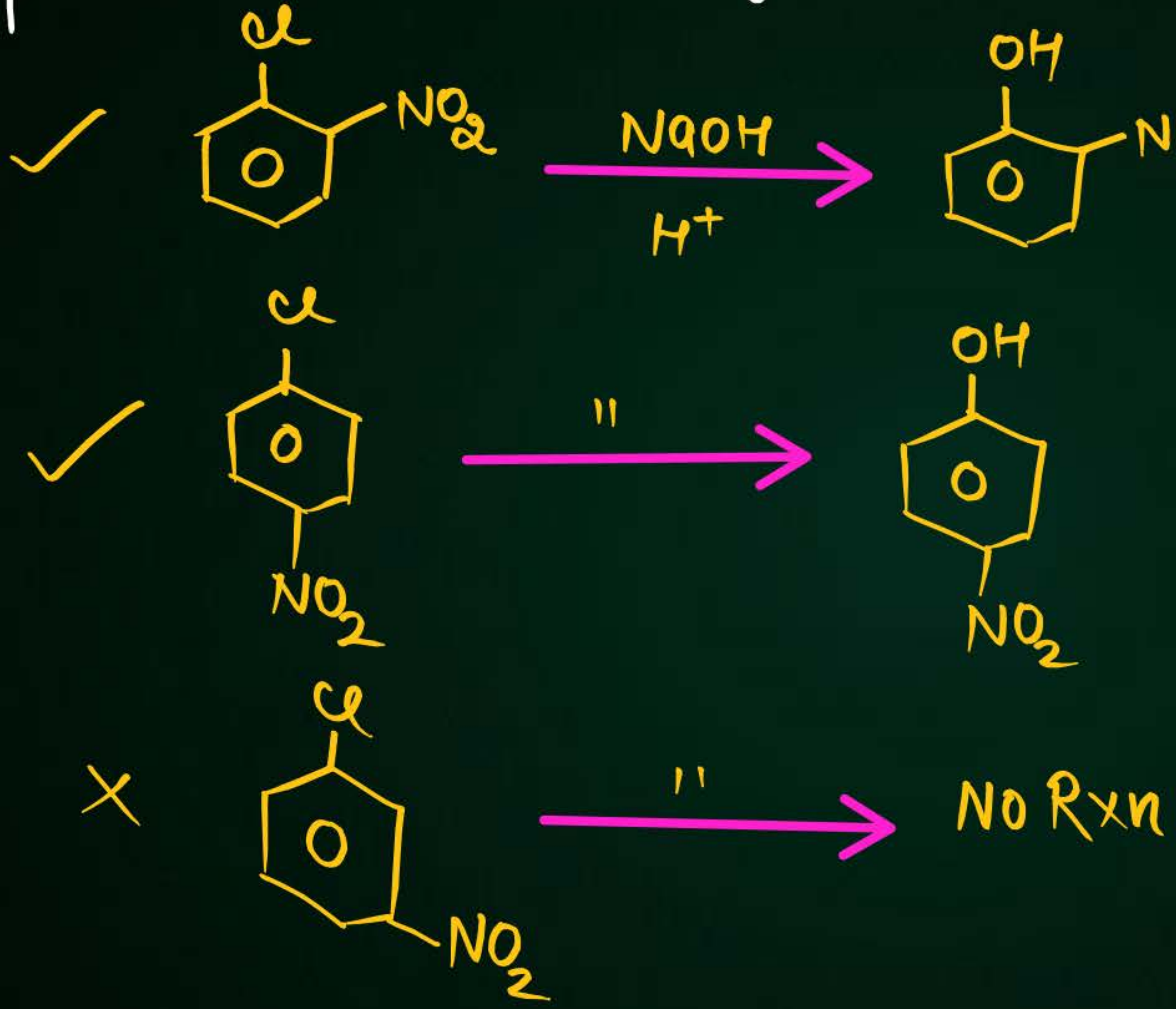


X
Molten or fused
$\overset{+}{N}a\overset{-}{O}H$
NaOH
623 K, 300-320 atm
$\overset{-}{O}H^+$
$\overset{+}{N}a\overset{-}{O}H$
Acid Base Rxn
$\overset{-}{O}Na^+$
+ H_2O
Sodium phenoxide
acidify H^+
OH
Net Rxn
X
Molten or fused
1. NaOH, 623K, 300-320 atm
2. H^+
OH

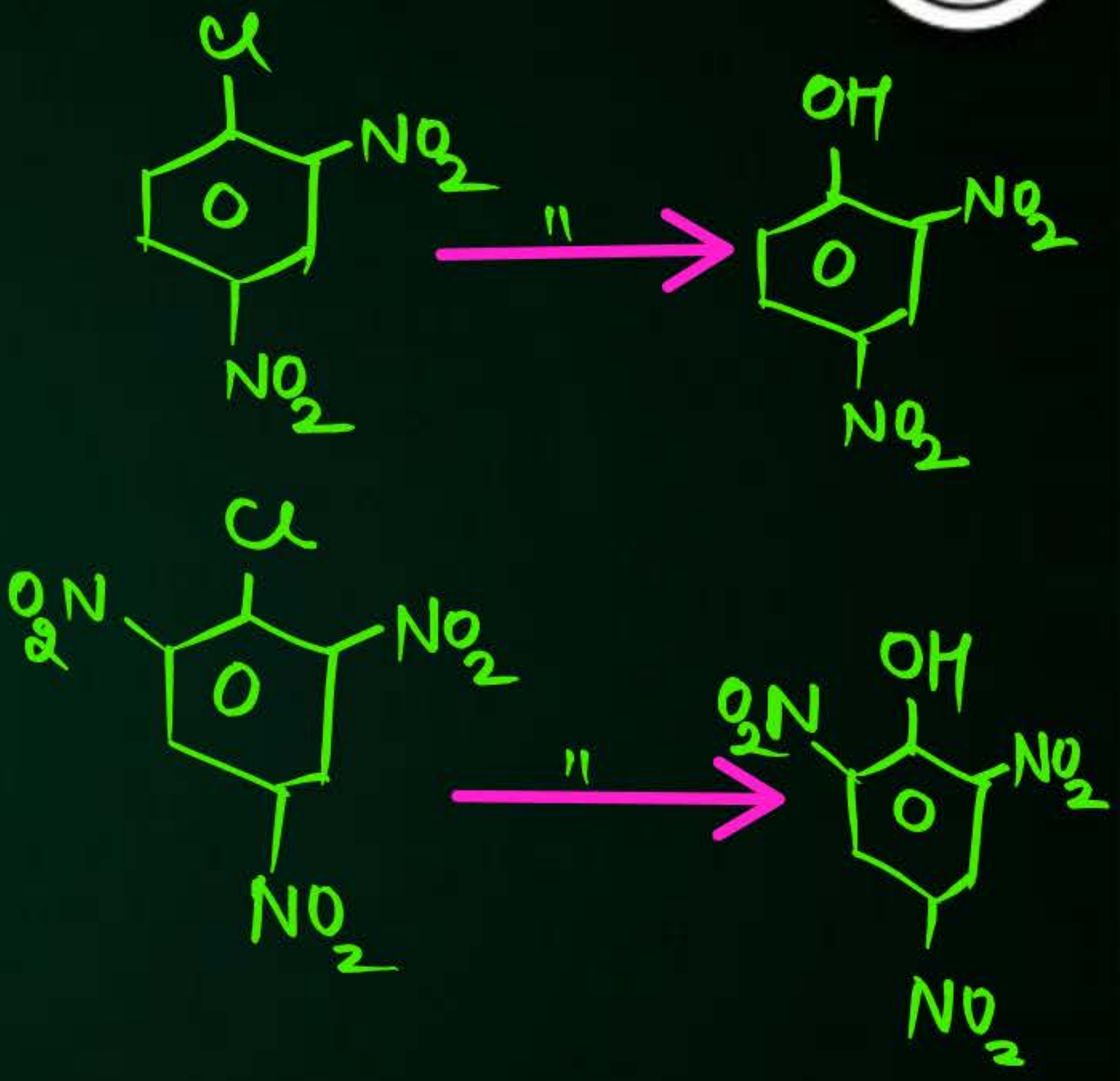
2. Nitro Halobenzene

Can give ArSN^2

O&P



✓
Cl
NO2
NaOH
H+
OH
NO2
✓
Cl
NO2
"
OH
NO2
×
Cl
NO2
"
No Rxn

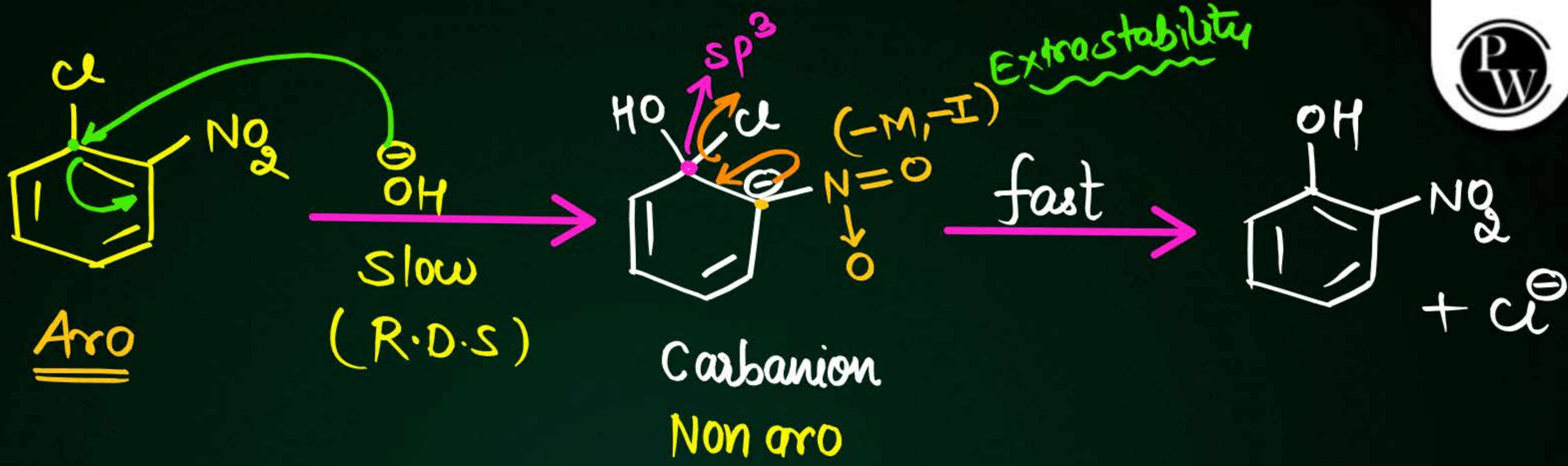


Cl
NO2
NO2
"
OH
NO2
NO2
Cl
O2N
NO2
NO2
"
OH
O2N
NO2
NO2

Mechanism

$ArSN^2$

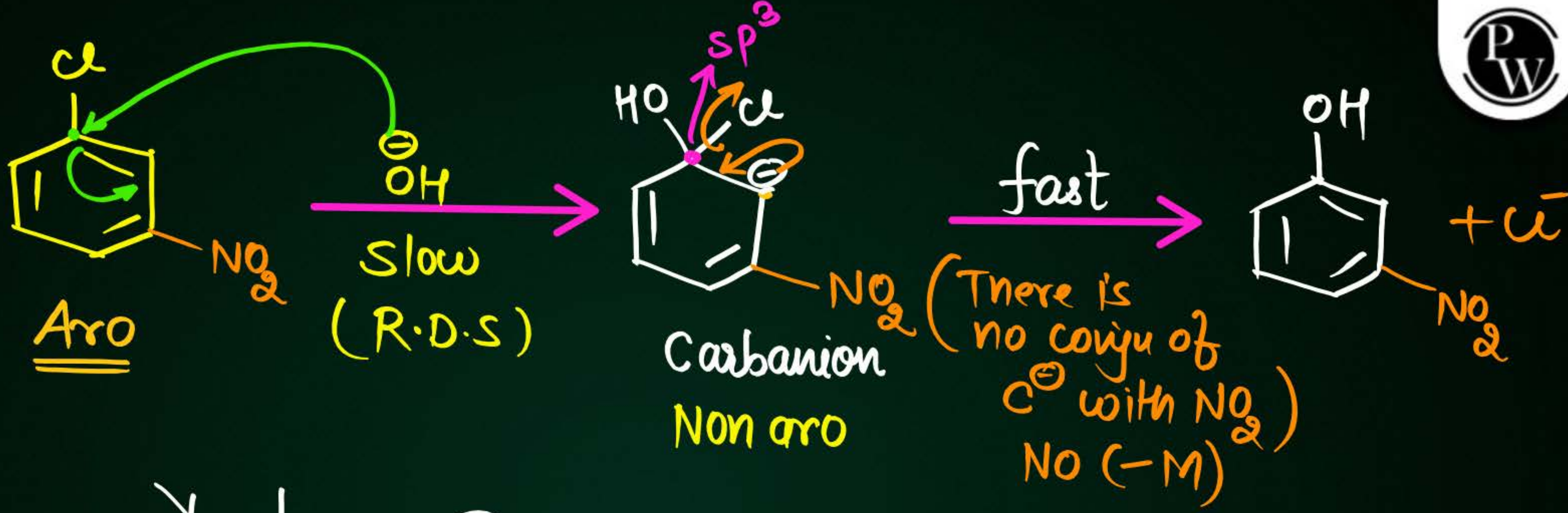
ortho


Cl
NO₂
⊖OH
Aro
Slow
(R.D.S)
sp³
HO
Cl
⊖
N=O
O
(−M, −I)
Extrastability
Carbanion
Non aro
fast
OH
NO₂
+ Cl⊖

Mechanism

ArSN^2

meta


Cl
$\overset{\ominus}{OH}$
Slow
(R.D.S)
Aro
NO_2
sp^3
HO
Cl
Carbanion
Non aro
NO_2
fast
OH
NO_2
+ Cl^-

(There is no conju of $C^{\ominus}$ with NO_2)
No (−M)

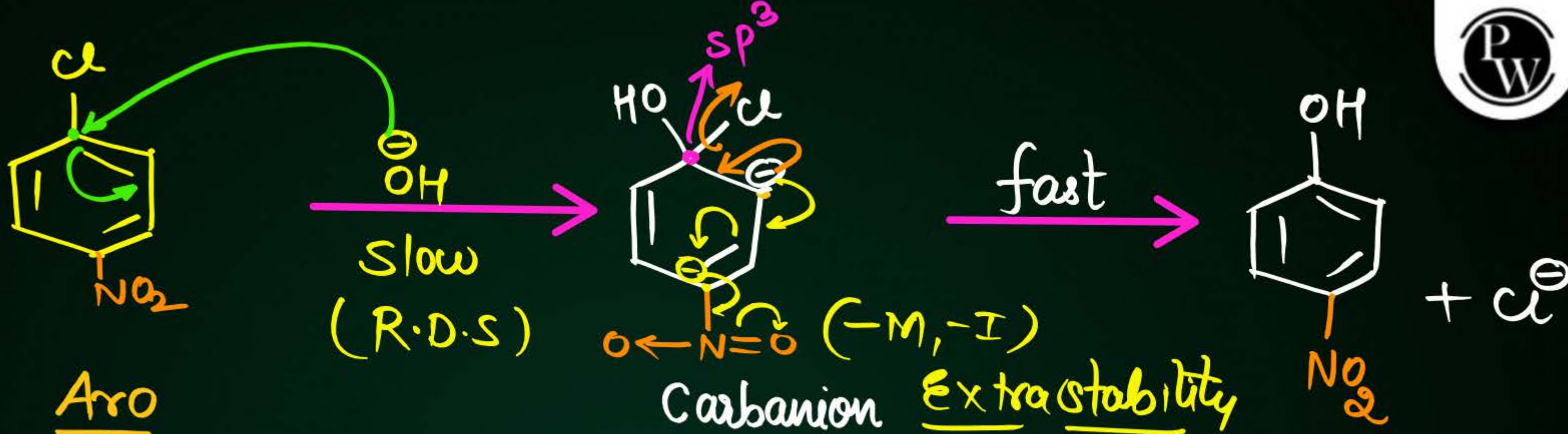
No RXN

(ooper wali Rxn nahi karni)

Mechanism

$ArSN^2$

Para


Cl
NO2
$\overset{\ominus}{OH}$
slow
(R.D.S)
sp^3
HO
Cl
$O \leftarrow N = O$
(−M, −I)
fast
OH
NO2
$+ Cl^{\ominus}$

Aro

Carbanion

Non aro

Extra stability

op points

① Carbanion intermediate formation

② Example of Aromatic bimolecular N.S.R ($ArSN^2$)

③ 2 step Rxn

④ 1^{st} step R.D.S

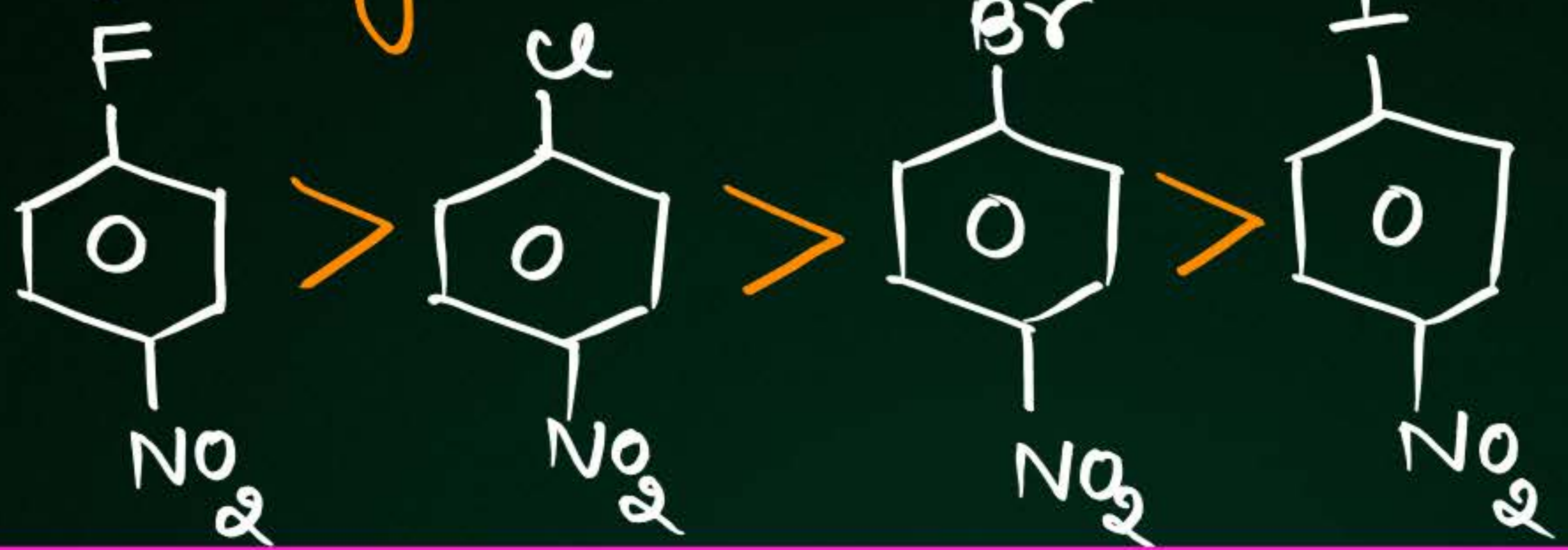
⑤ r.o.r $r = K[\text{nitrohalobenzene}]^1[\bar{O}H]^1$

⑥ order = 2 , Molecularity = 2

⑦ r.o.r w.r.t to NO_2 groups

$\boxed{\text{3 nitro} > \text{2 nitro} > \text{1 nitro}}$

⑧ R.O.R w.r.t Halogen



F
Cl
Br
I
NO2
NO2
NO2
NO2
>
>
>

R.O.R ∝ stability of $C^{\ominus}$ ∝ −I power of X

There is no relation with leaving ability

SN^2

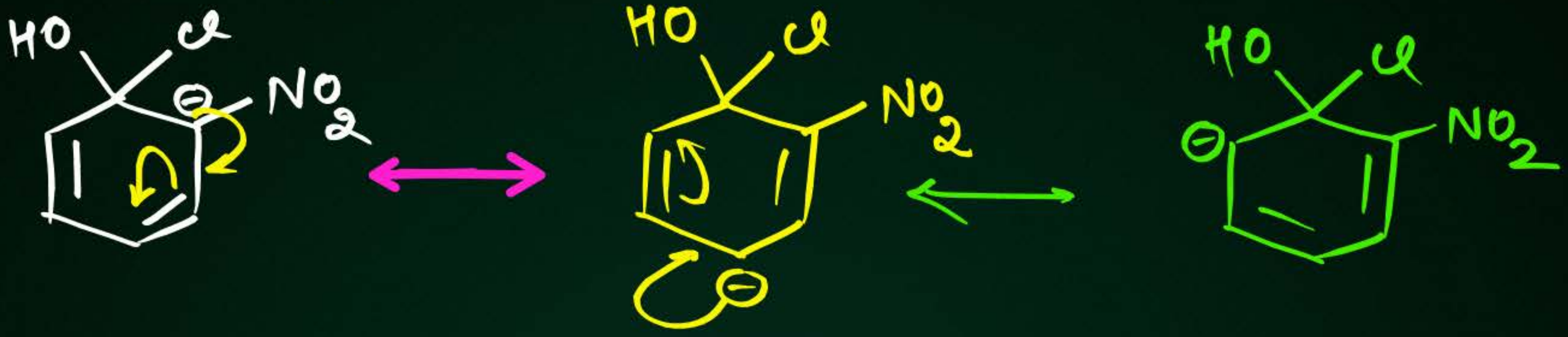
(R–F < R–Cl < R–Br < R–I)

BE ↓ ROR ↑

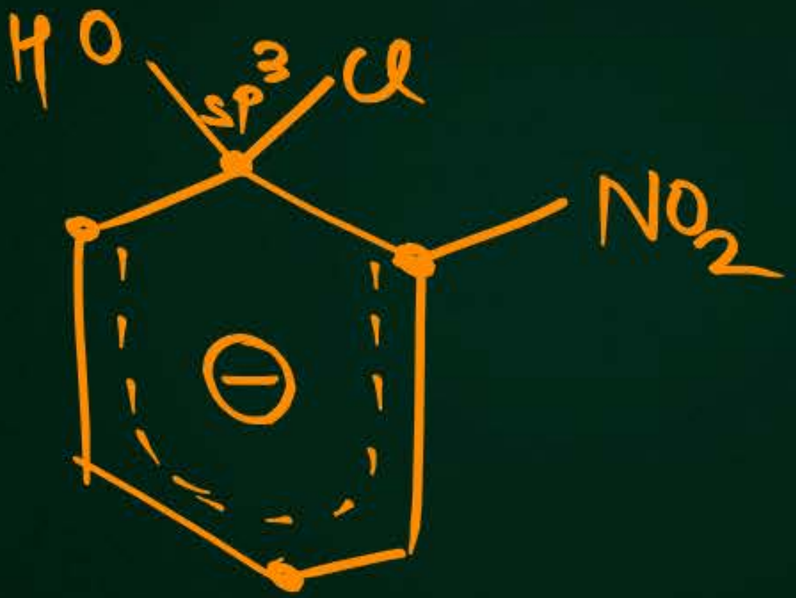
1 step

RDS

⑨ Meisenheimer complex


HO
Cl
NO2
HO
Cl
NO2
HO
Cl
NO2

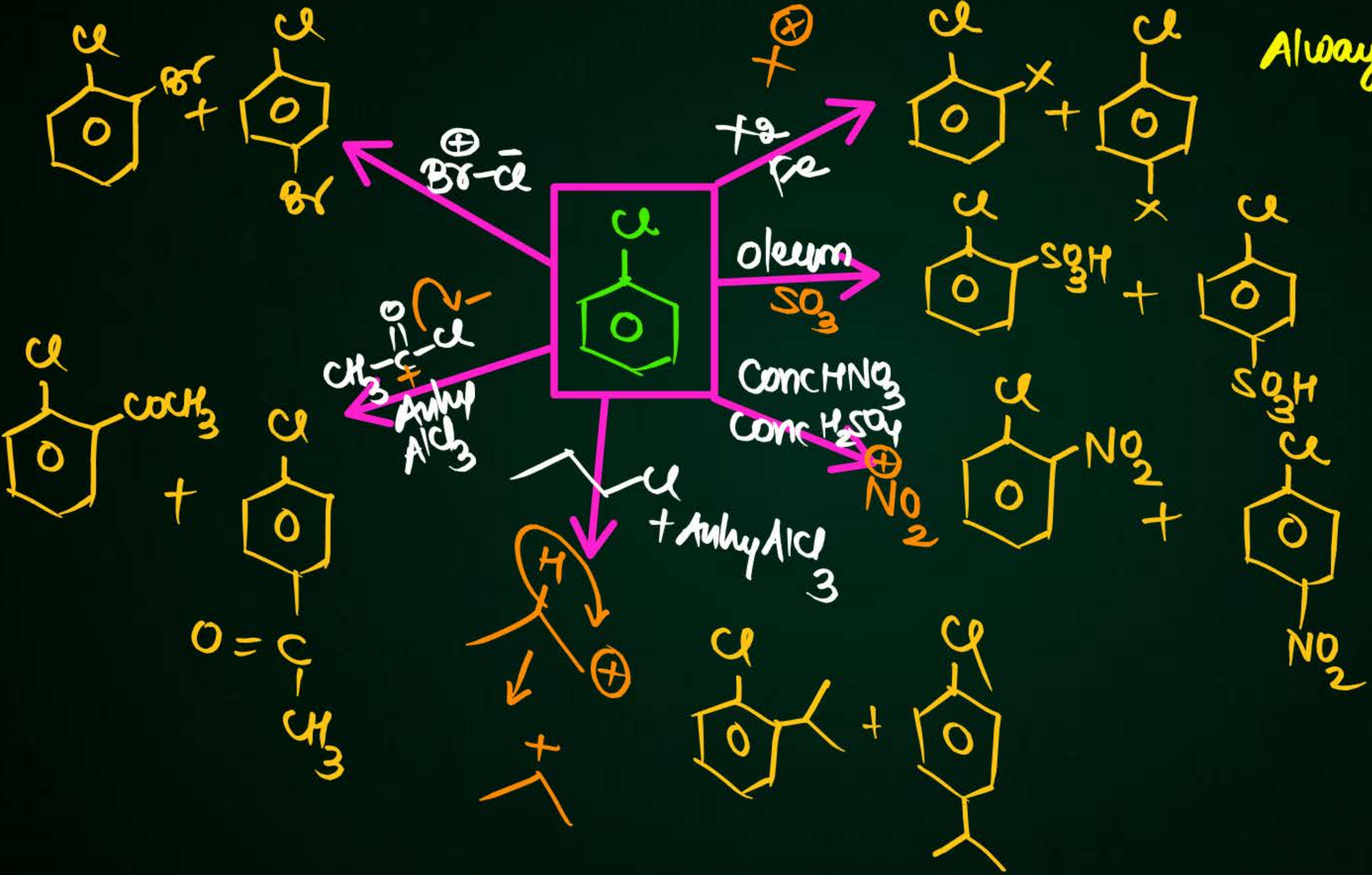
Meisenheimer complex


HO
sp3
Cl
NO2

2. Electrophilic Substitution reactions:

Halobenzene ⊗ o/p dir

Always P Major

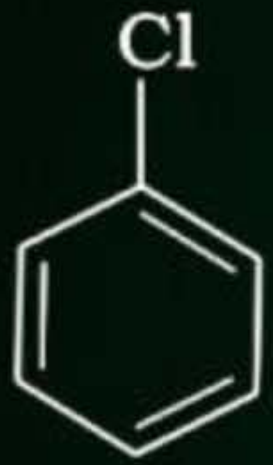


Cl
Br
+
$\overset{\oplus}{Br}-\overset{-}{Cl}$
X_2
Fe
$\overset{\oplus}{X}$
X
oleum
SO_3
SO_3H
Conc HNO_3
Conc H_2SO_4
$\overset{\oplus}{NO_2}$
NO_2
$CH_3-\overset{O}{\overset{\|}{C}}-Cl$
Anhy $AlCl_3$
$COCH_3$
O=C
CH_3
+ Anhy $AlCl_3$
H
⊕

QUESTION (NCERT Exemplar)

In the given question arrange the compounds in increasing order of rate of reaction towards nucleophilic substitution.

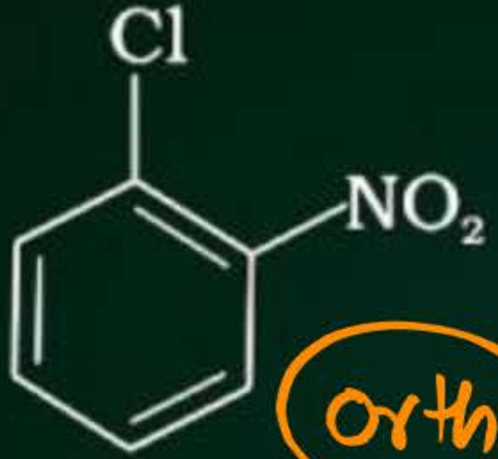
(a)



sp. case

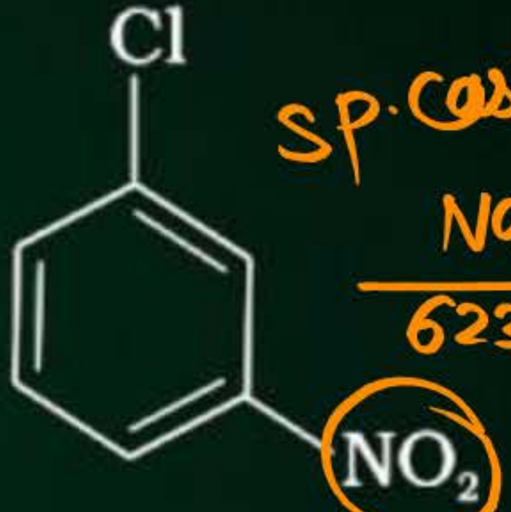
$\xrightarrow[623K, 300atm]{NaOH}$ less rate

(b)



ortho

(c)



-I

sp. case

$\xrightarrow[623K, 300atm]{NaOH}$ more rate

A (a) < (b) < (c)

B (c) < (b) < (a)

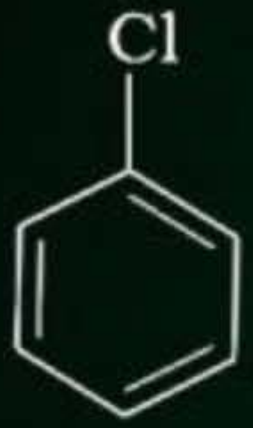
C [✓ (a) < (c) < (b)]

D (c) < (a) < (b)

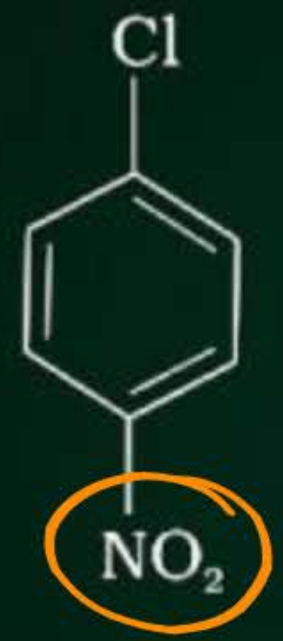
QUESTION (NCERT Exemplar)

In the given question arrange the compounds in increasing order of rate of reaction towards nucleophilic substitution.

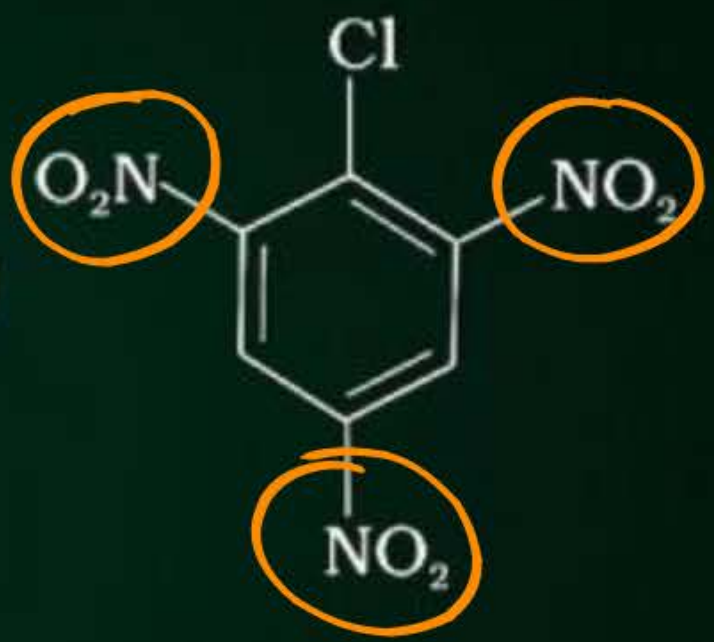
(a)



(b)



(c)


Cl
O₂N
NO₂
NO₂

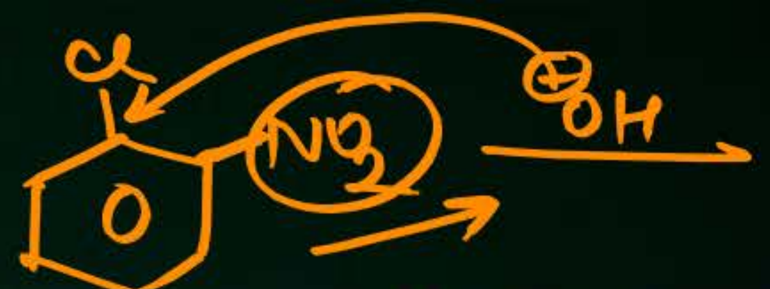
A (c) < (b) < (a)

B (b) < (c) < (a)

C (a) < (c) < (b)

[✓ D] (a) < (b) < (c)

QUESTION (NCERT Exemplar)



Assertion: Presence of a nitro group at ortho or para position increases the reactivity of haloarenes towards nucleophilic substitution.

Reason: Nitro group being an electron withdrawing group decreases the electron density over the benzene ring.

[✓ A] Assertion and reason both are correct and reason is correct explanation of assertion.

B Assertion and reason both are wrong statements.

C Assertion is correct but reason is wrong statement.

D Assertion is wrong but reason is correct statement.

QUESTION (NCERT Exemplar)

Assertion: It is difficult to replace chlorine by –OH in chlorobenzene in comparison to that in chloroethane.

Reason: Chlorine-carbon (C–Cl) bond in chlorobenzene has a partial double bond character due to resonance.

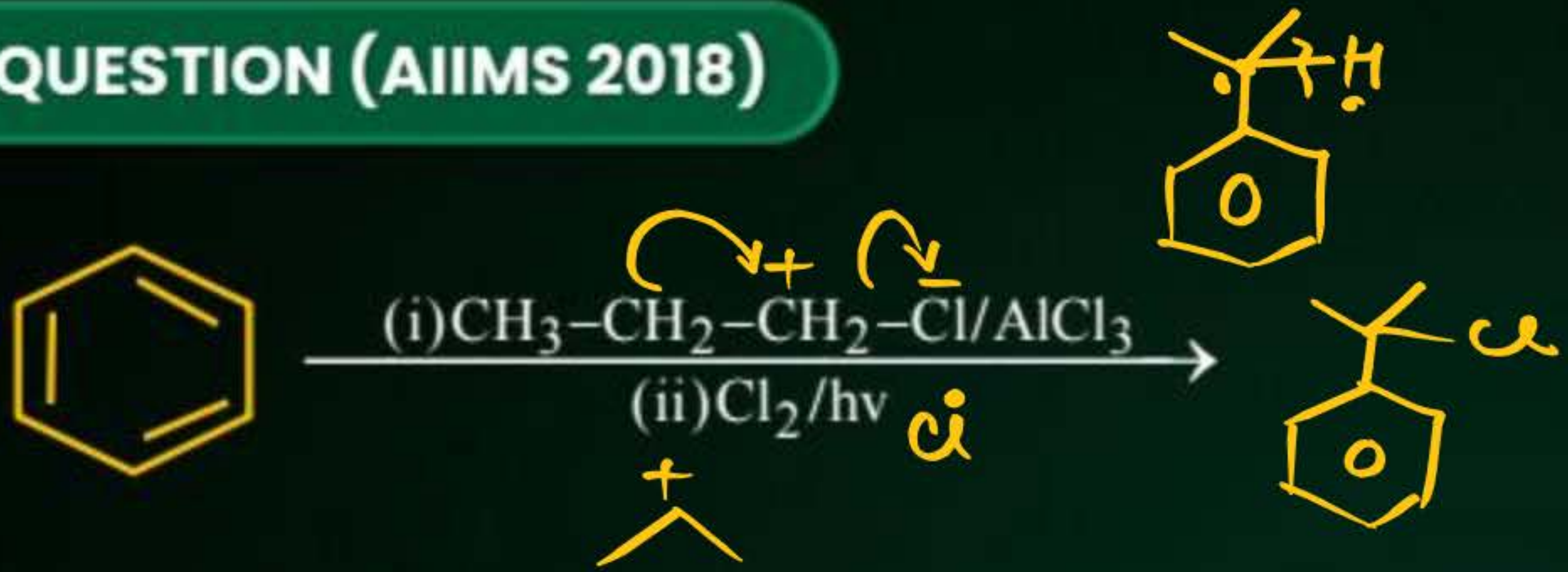
[✓ A] Assertion and reason both are correct and reason is correct explanation of assertion.

B Assertion and reason both are wrong statements.

C Assertion is correct but reason is wrong statement.

D Assertion is wrong but reason is correct statement.

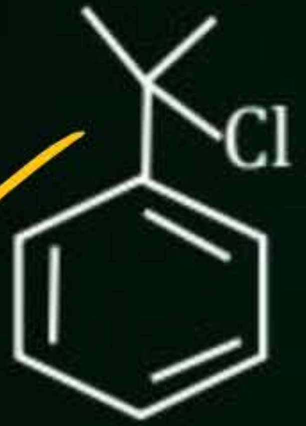
QUESTION (AIIMS 2018)



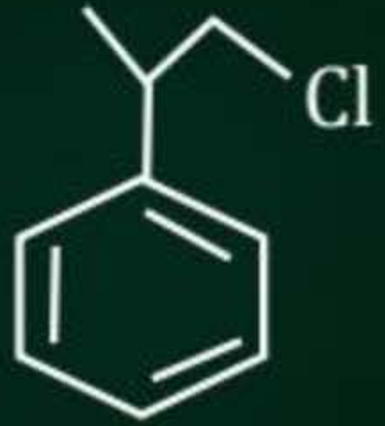
$$\xrightarrow[\text{(ii)}Cl_2/h\nu]{\text{(i)}CH_3-CH_2-CH_2-Cl/AlCl_3}$$

(i)CH3–CH2–CH2–Cl/AlCl3
(ii)Cl2/hv
+
−
Cl
H

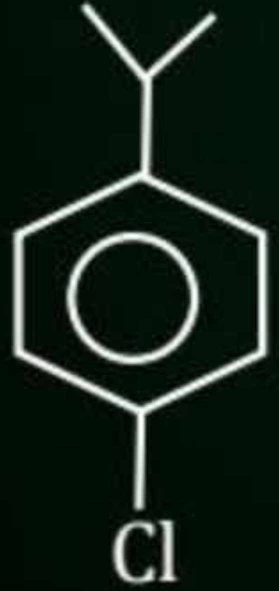
A



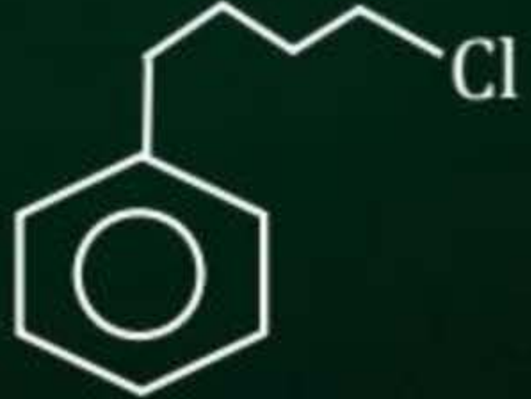
B



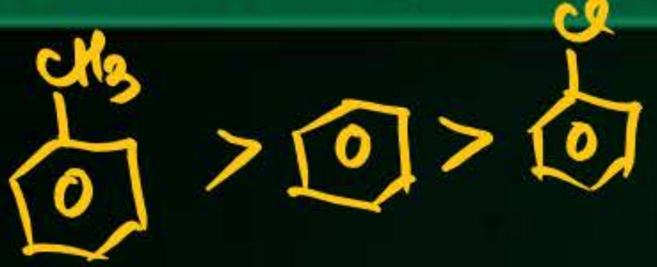
C

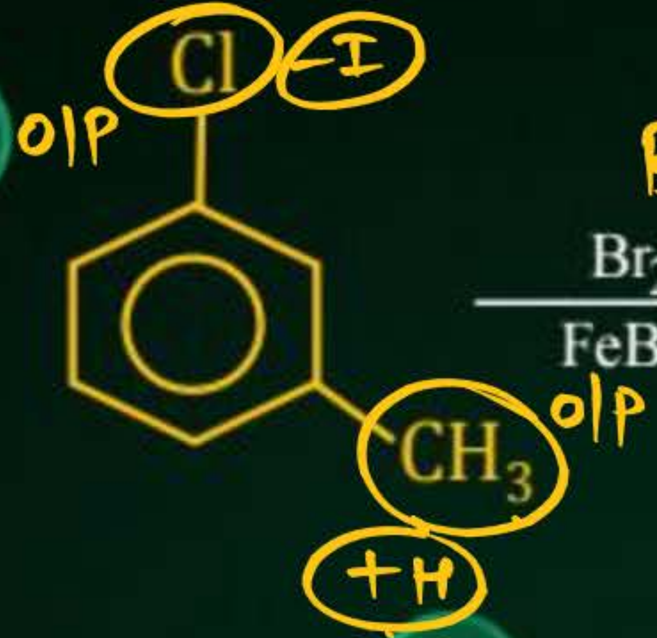


D



QUESTION (AIIMS 2018)

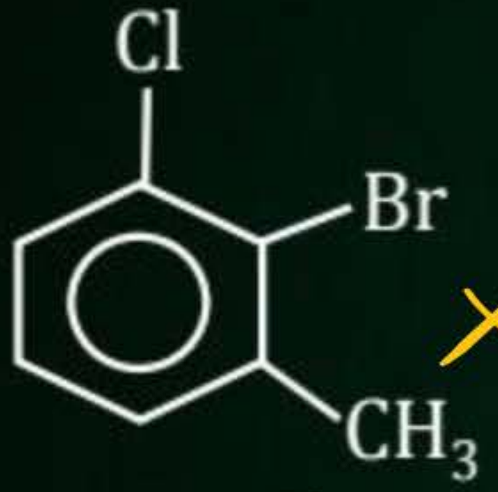



o/p
Cl
-I
CH3
o/p
+H

$Br^{\oplus}$

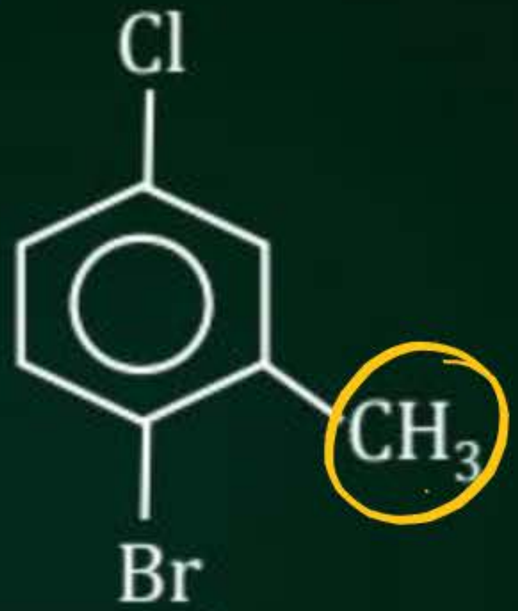
$\xrightarrow[FeBr_3]{Br_2}$ Major product

A



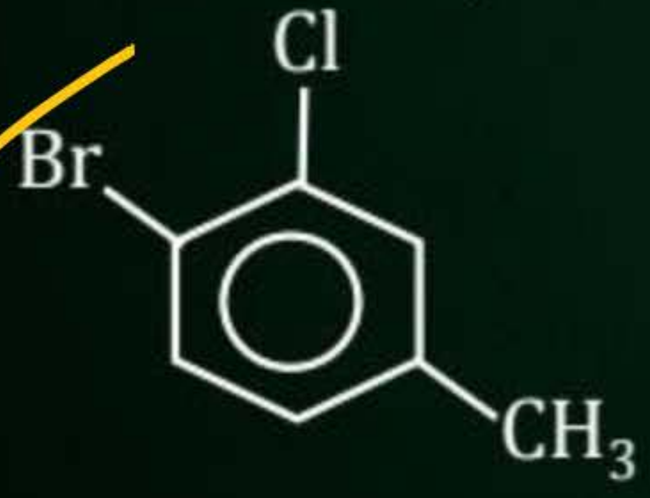
✗

B

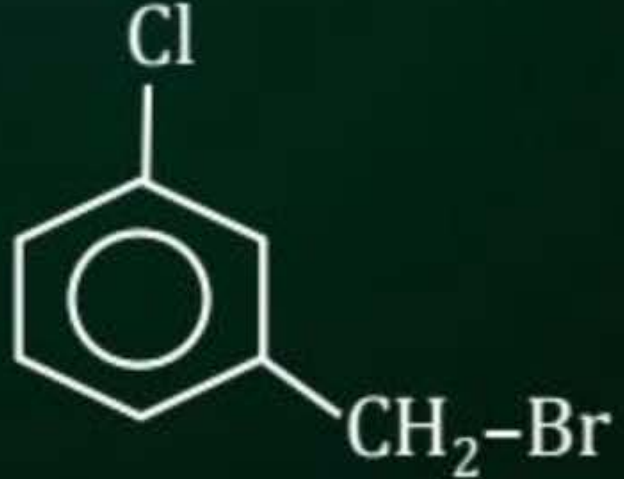


o/p ✓

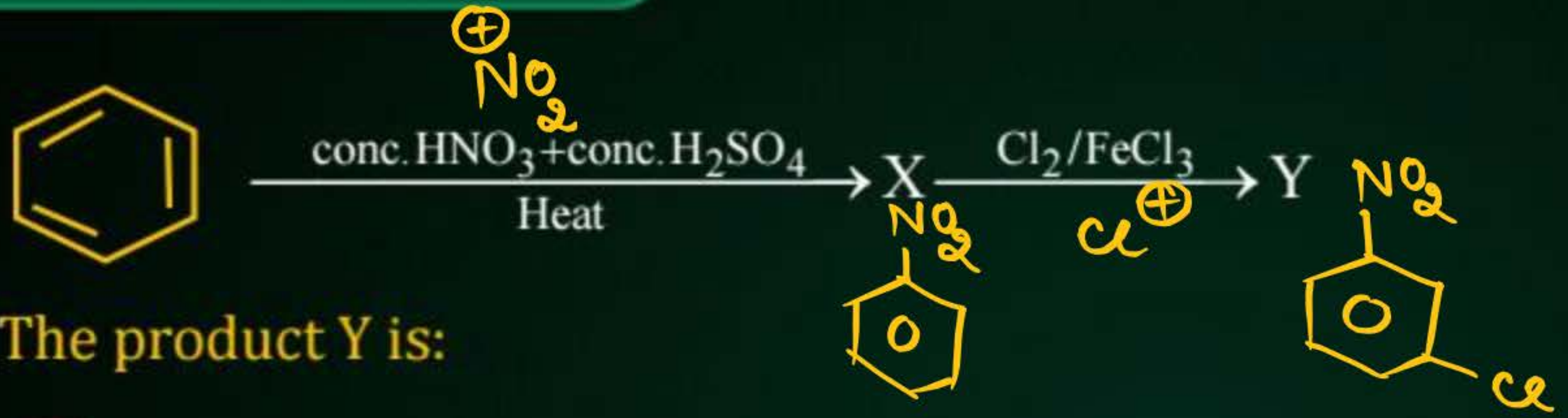
C ✓



D



QUESTION (AIIMS 2000)


$\overset{\oplus}{NO_2}$
conc. HNO_3+conc. H_2SO_4
Heat
X
NO_2
$Cl_2/FeCl_3$
$Cl^{\oplus}$
Y
NO_2
Cl

The product Y is:

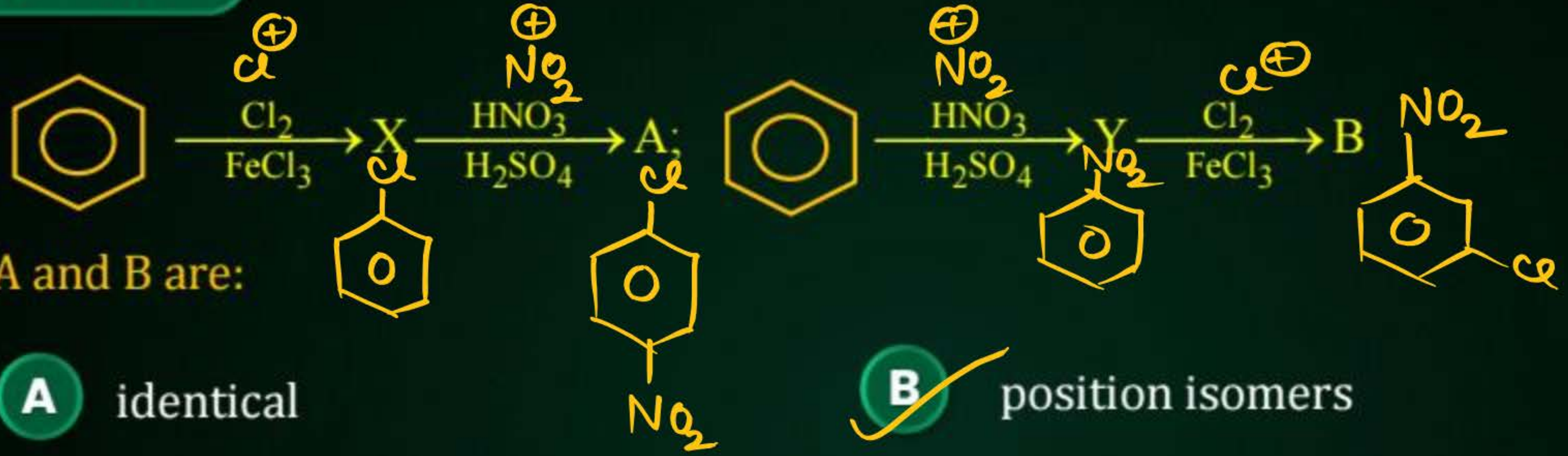
Ⓐ *p*-chloronitrobenzene

[✓ Ⓑ *m*-chloronitrobenzene]

Ⓒ *o*-chloronitrobenzene

Ⓓ *o*-*p*-dichloronitrobenzene

QUESTION



Cl⊕
Cl_2
$FeCl_3$
X
Cl
NO₂⊕
HNO_3
H_2SO_4
A;
Cl
NO₂
NO₂⊕
HNO_3
H_2SO_4
Y
NO₂
Cl⊕
Cl_2
$FeCl_3$
B
NO₂
Cl

A and B are:

(A) identical

[✓ (B)] position isomers

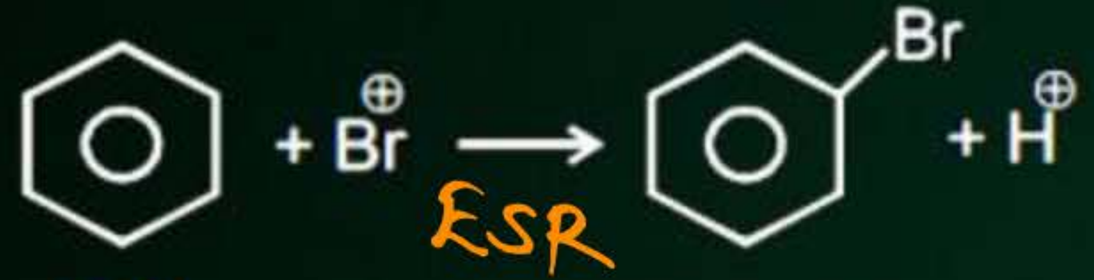
(C) geometrical isomers

(D) none of these

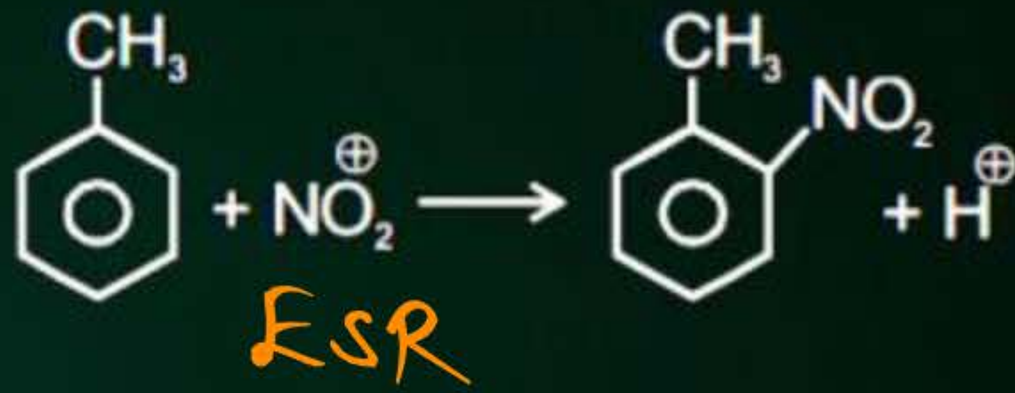
QUESTION

Which of the following reaction is S_N2Ar reaction?

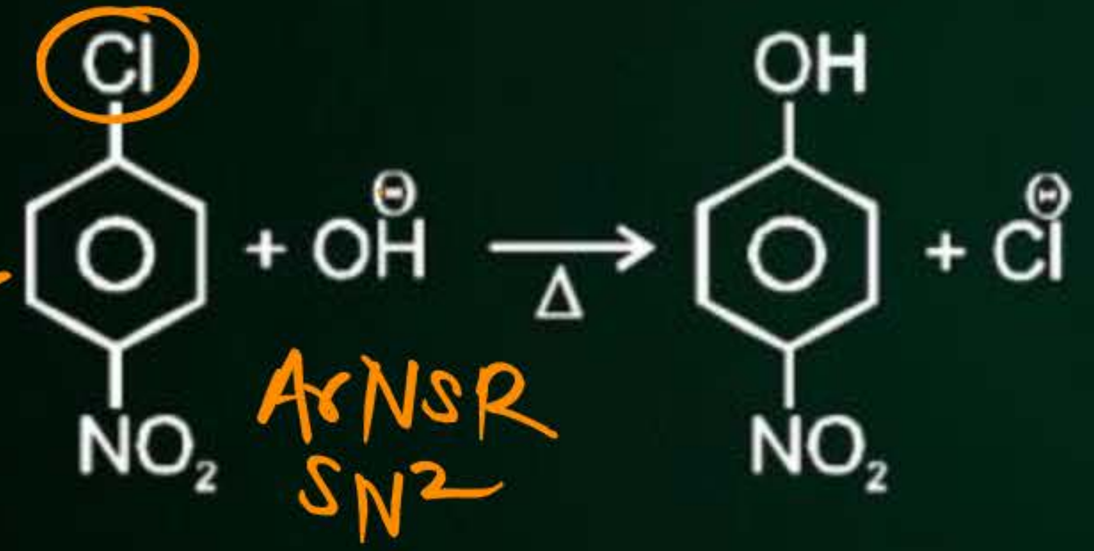
A


+ $Br^{\oplus}$
Br
+ $H^{\oplus}$
ESR

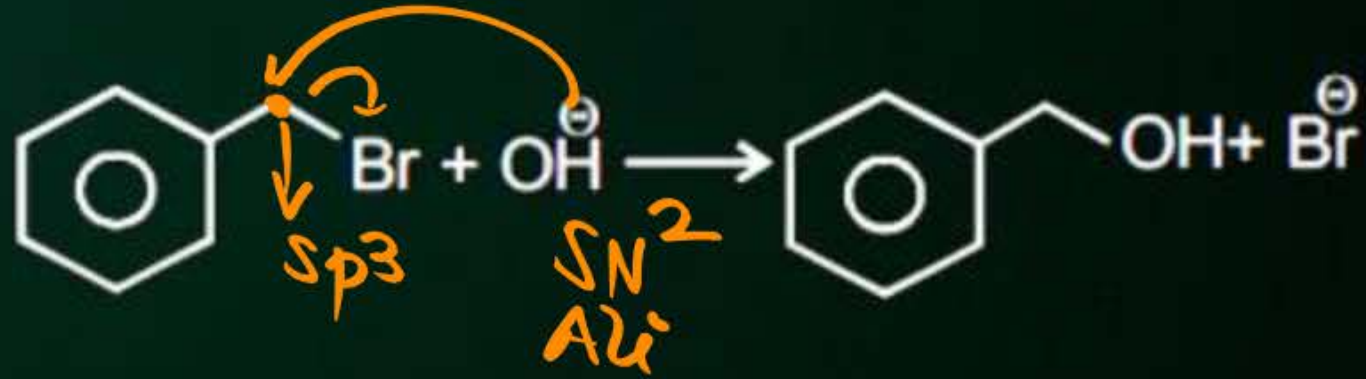
B


CH_3
+ $NO_2^{\oplus}$
CH_3
NO_2
+ $H^{\oplus}$
ESR

[✓ **C**]


Cl
NO_2
+ $OH^{\ominus}$
Δ
ArNSR
SN2
OH
NO_2
+ $Cl^{\ominus}$

D


Br + $OH^{\ominus}$
sp3
SN2
Ali
OH+ $Br^{\ominus}$

QUESTION

(major)

The sulphonation of chlorobenzene gives exclusively:

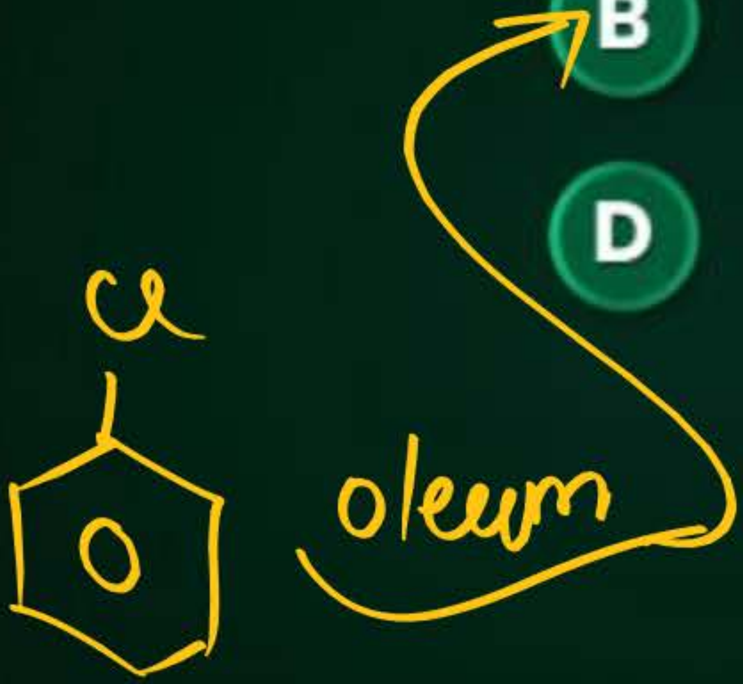
Exclu
predomi
major

A An o-product

B An p-product

C An m-product

D An o-, p-disubstituted product



QUESTION

$-I > \underline{\underline{+M}}$

Chlorobenzene is --Less--- reactive than benzene towards electrophilic substitution and directs incoming electrophilic to the -o/p-- position.

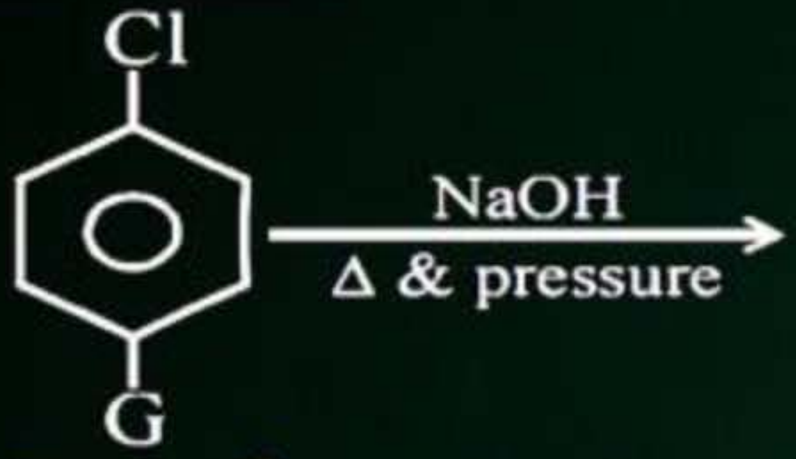
(A) More, ortho & para

[✓ (B)] Less, ortho & para

(C) More, meta

(D) Less, meta

QUESTION


Cl
NaOH
Δ & pressure
G

Rate of reaction is maximum if G is:

A $-OCH_3$

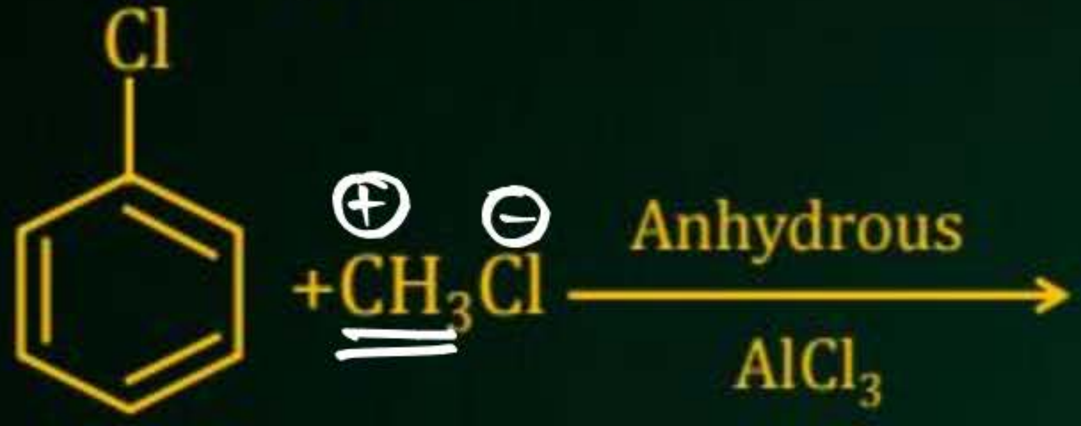
B $-CH_3$

[✓ C] $-NO_2$ ewg

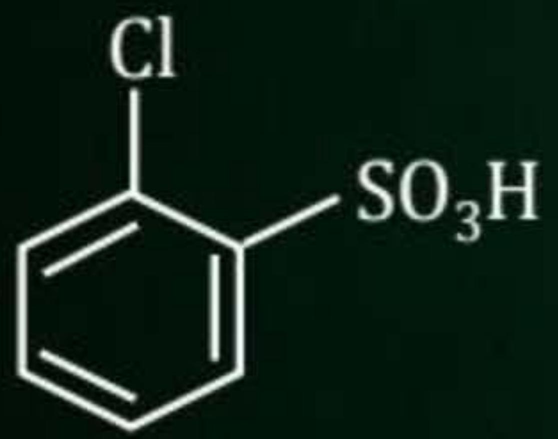
D $-H$

QUESTION

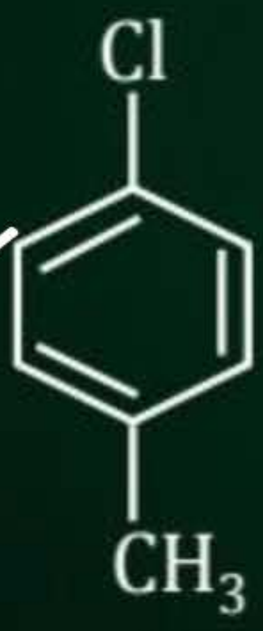
The major product obtained in the reaction given below is:


Cl
⊕ ⊖
+CH3Cl
Anhydrous
AlCl3

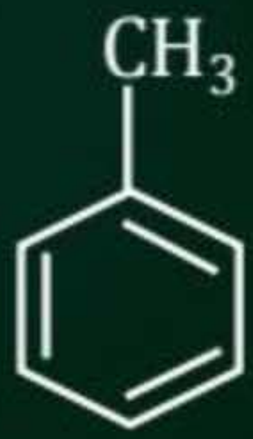
A



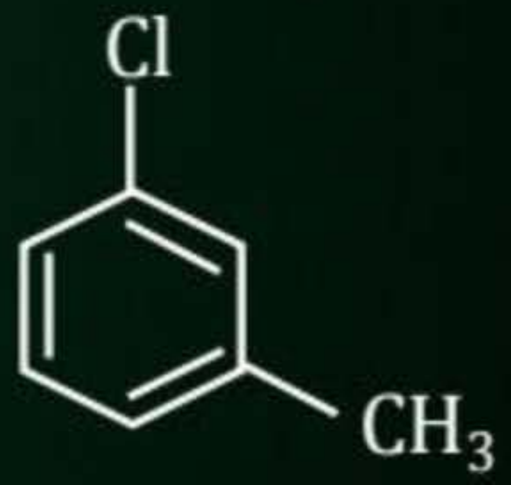
B ✓



C



D



QUESTION

The function of anhydrous $AlCl_3$ in Friedel-Crafts reaction is to:

$$R-Cl \xrightarrow[AlCl_3]{Anhy} \underline{R^+} + \overset{\ominus}{AlCl_4}$$

- **A** absorb water
- **B** produce a nucleophile
- **C** produce an electrophile ✓
- **D** absorb HCl

QUESTION

bi

Chlorobenzene on treatment with sodium in dry ether gives diphenyl. Then name of the reaction is:

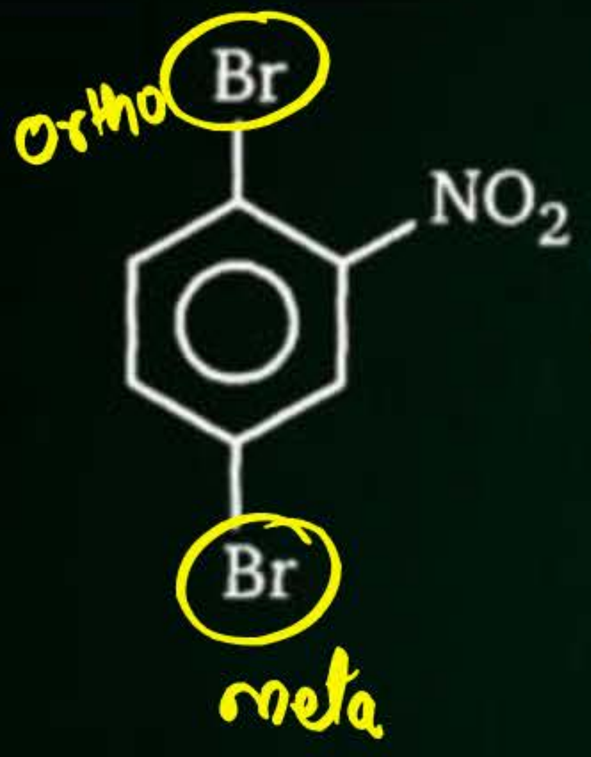
A [✓ Fitting reaction]

B Wurtz fitting reaction

C Wurtz reaction

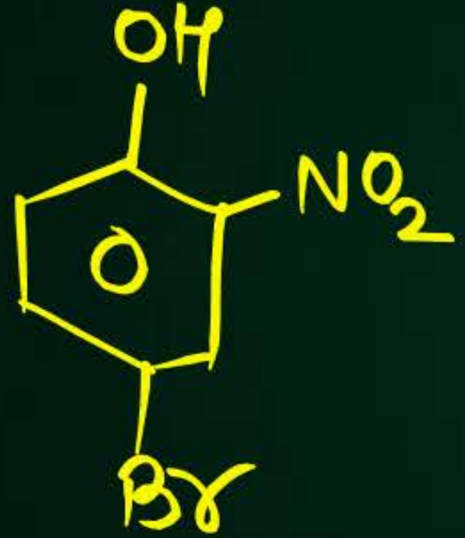
D Sandmeyer reaction

QUESTION



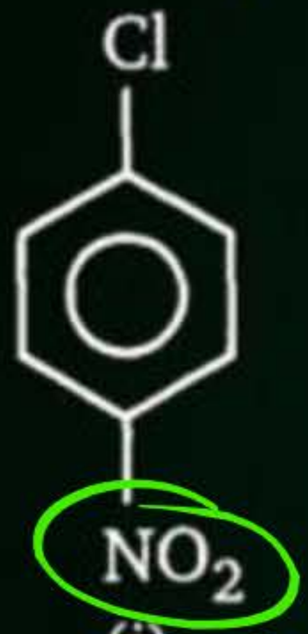
ortho
Br
NO_2
Br
meta

$\xrightarrow{HO^-}$ (A); Product of the given reaction

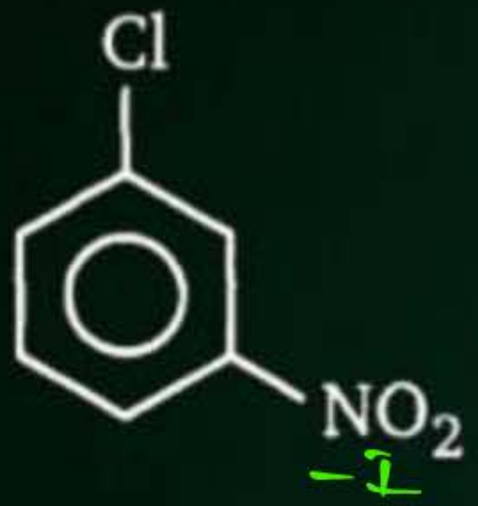


QUESTION

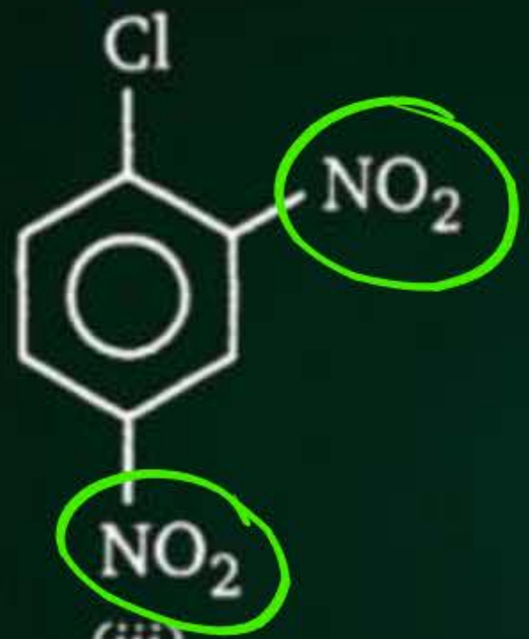
Arrange in their decreasing order of rate in S_NAr.



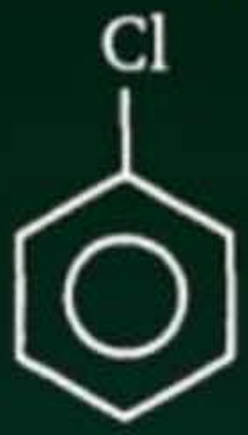
(i)



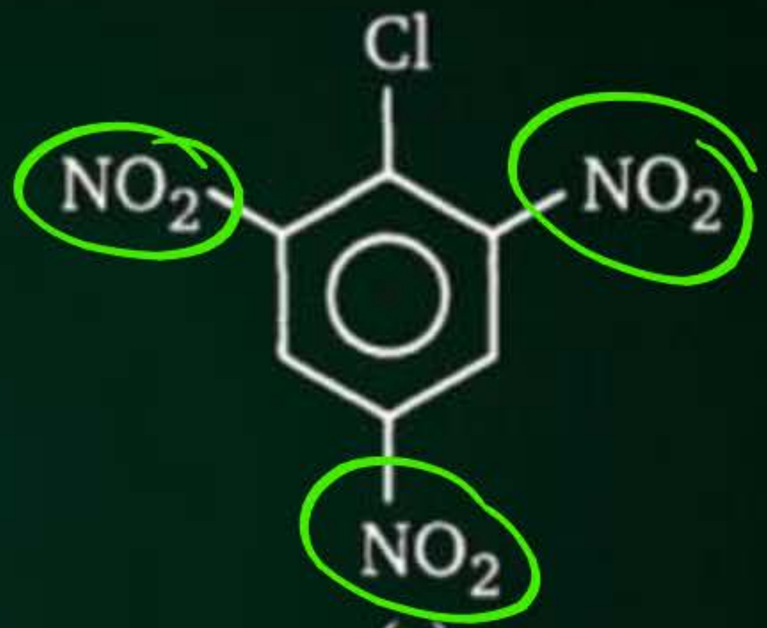
(ii)



(iii)



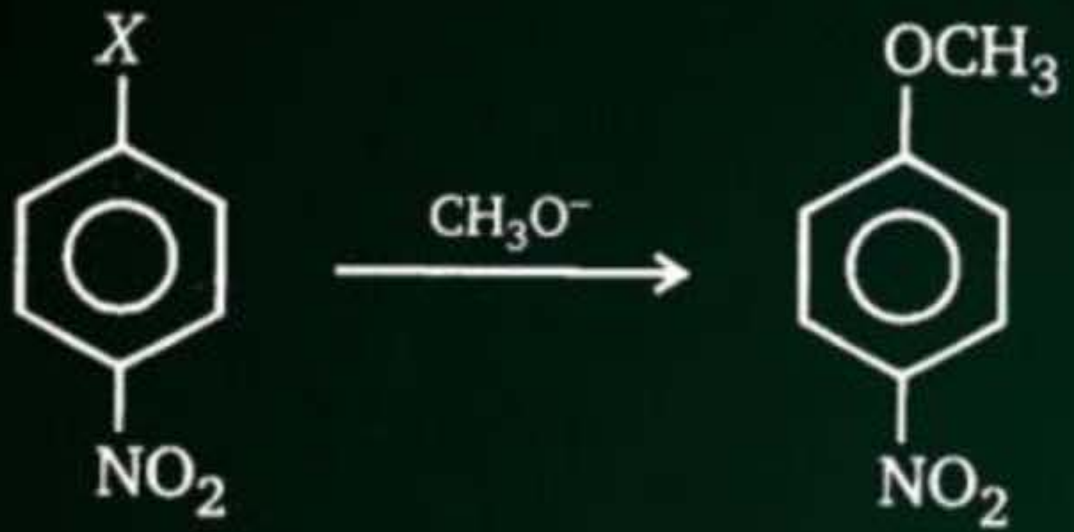
(iv)



(v)

- A i > ii > iv > iii > v
- B ii > i > iii > v > iv
- [✓ C] v > iii > i > ii > iv
- D v > iii > ii > i > iv

QUESTION



X
NO₂
CH₃O⁻
OCH₃
NO₂

above reaction is an example of Nucleophilic aromatic substitution. Which of the following (–X) is most readily replaced.

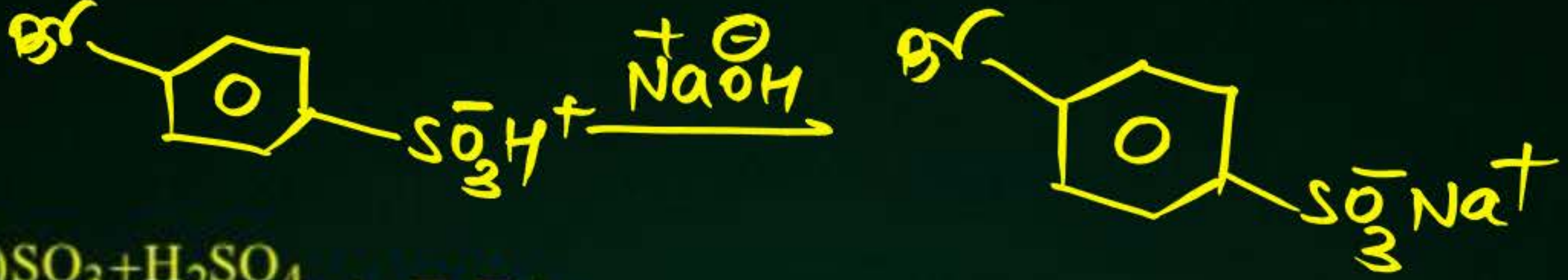
[✓ A] –F

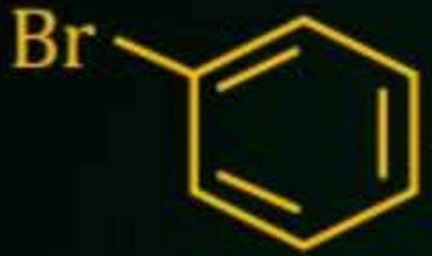
B –Cl

C –Br

D –I

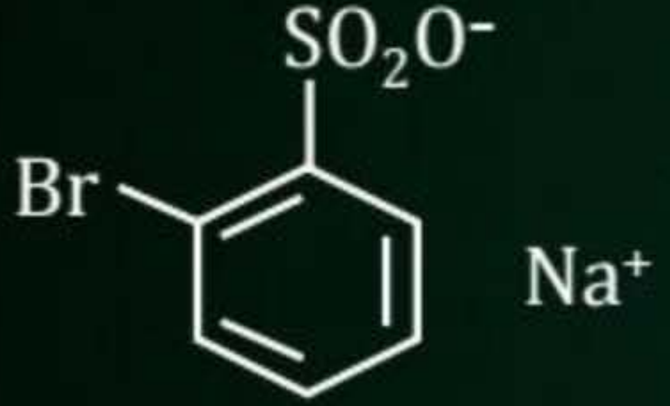
QUESTION



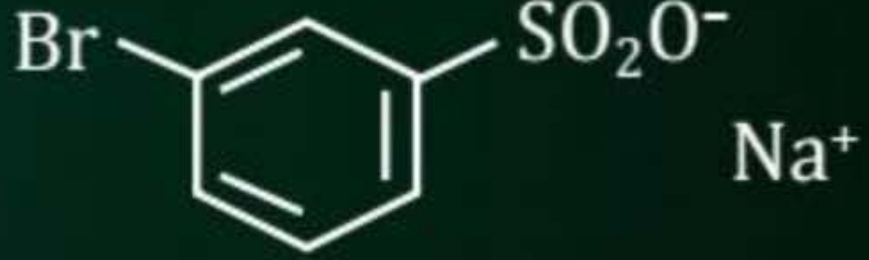


$\xrightarrow[\text{(ii) NaOH}]{\text{(i)}SO_3+H_2SO_4}$ P. P is:

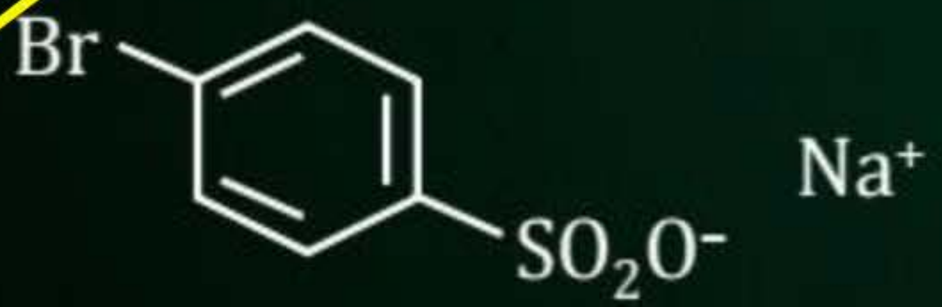
A



B

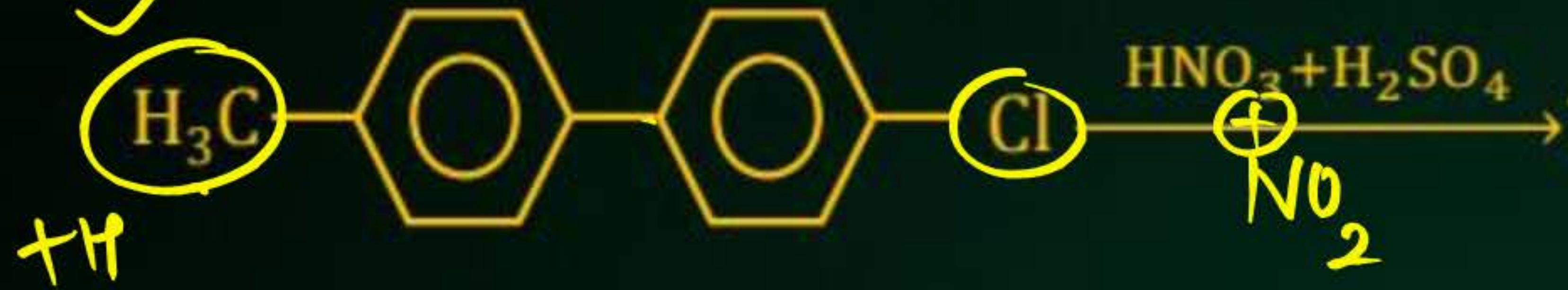


C



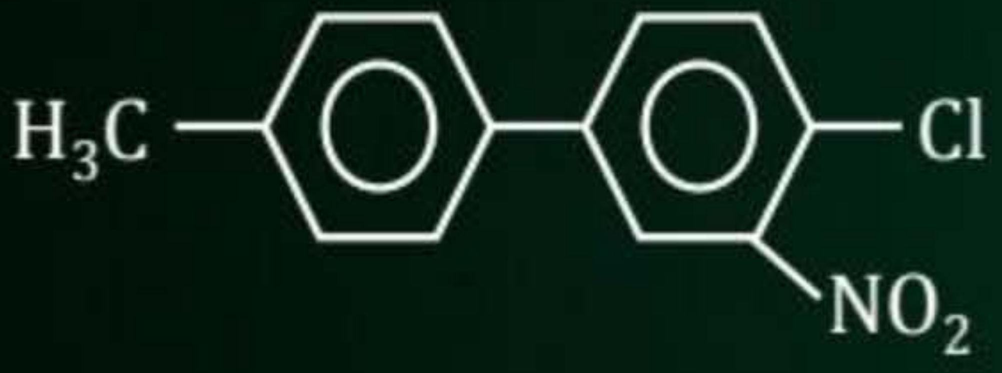
D None of these

QUESTION

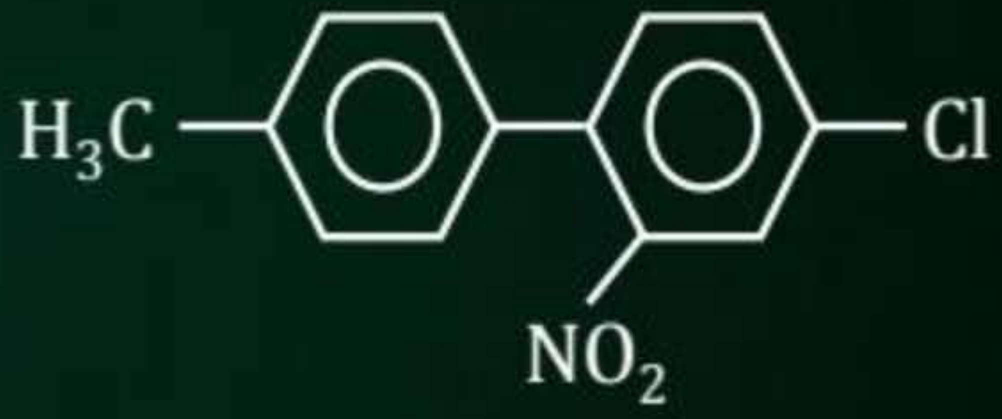

H$_3$C
Cl
HNO$_3$+H$_2$SO$_4$
+H
$\overset{+}{N}O_2$

? Identify the major product:

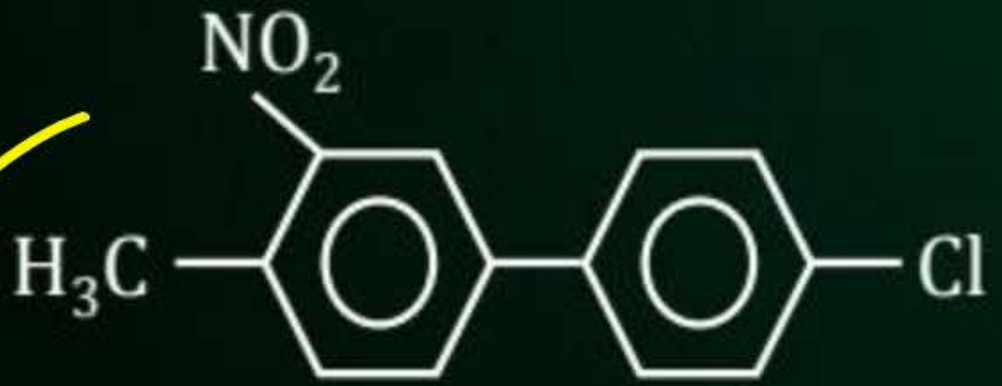
A



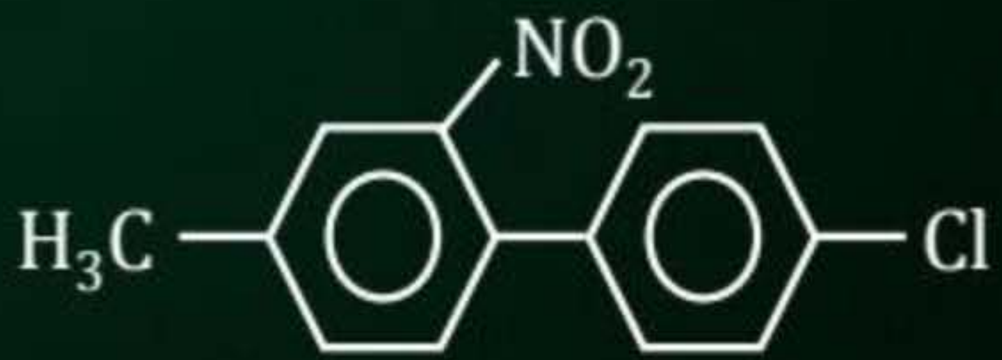
B



[✓ **C**]

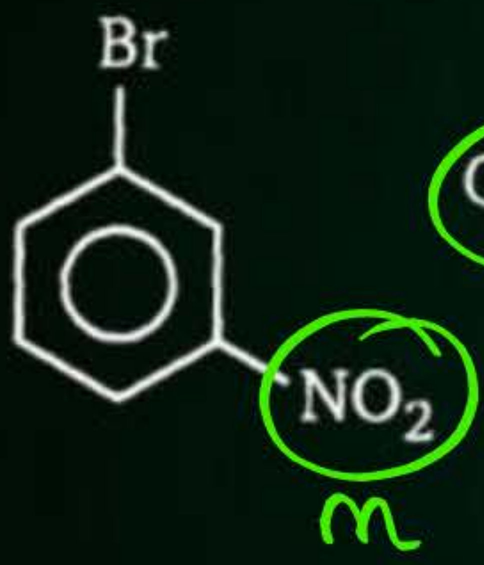


D

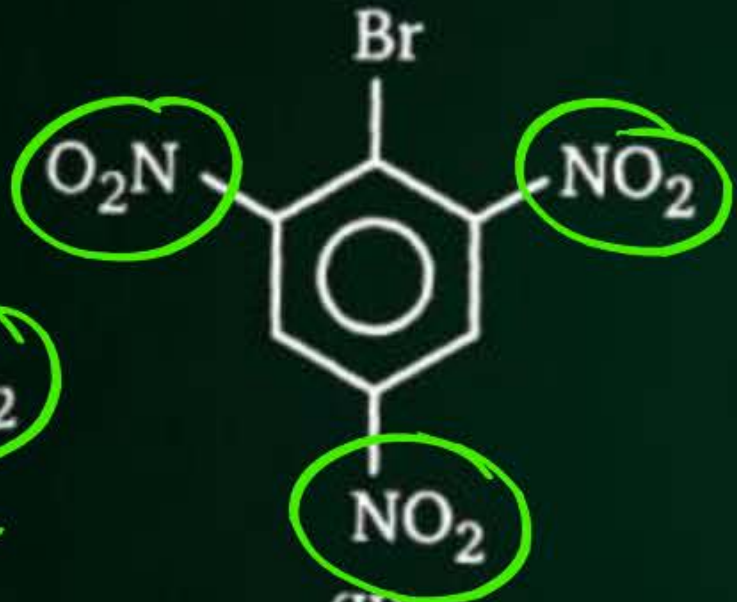


QUESTION

The decreasing order of reactivity of given compound towards nucleophilic substitution with aqueous NaOH is:

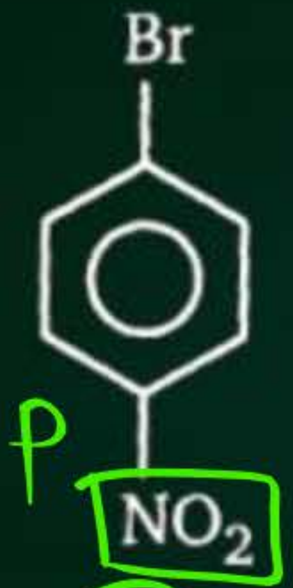


(I)

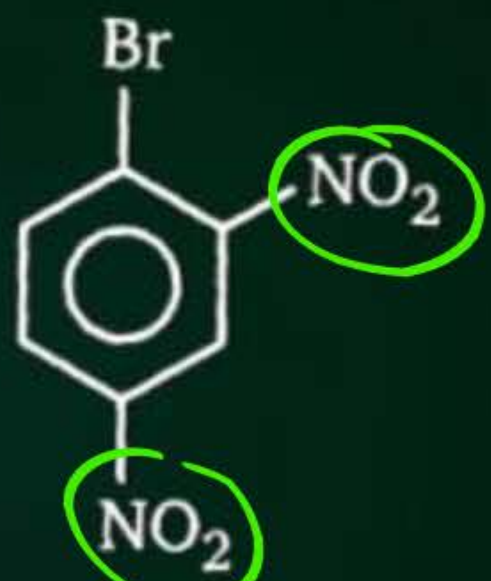


Br
O2N
NO2
NO2

(II)



(III)



(IV)

A ~~I~~ > II > III > IV

[✓ B] II > IV > III > I

C ~~IV~~ > II > III > I

D II > IV > I > III

Home Work

QUESTION 01

Nitration of chlorobenzene takes place at

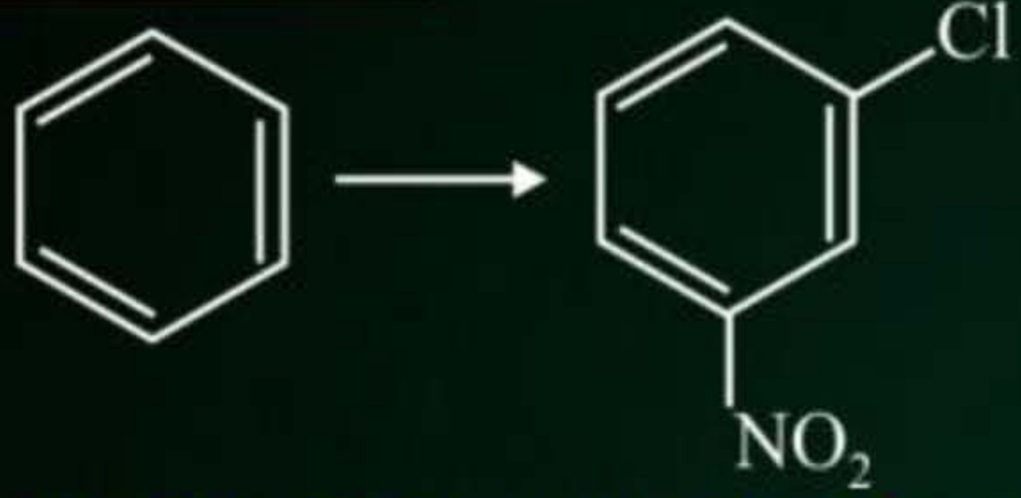
A o-Position

B m-Position

C p-Position

D Both o-and p-positions

QUESTION 02



The Set of reagents for above conversion is:

A (i) $\text{Conc}\cdot HNO_3 + \text{conc}\cdot H_2SO_4$
(ii) Cl_2, sunlight

B (i) Cl_2, Fe, dark
(ii) $\text{Conc}\cdot HNO_3 + \text{conc}\cdot H_2SO_4$

C (i) $\text{Conc}\cdot HNO_3 + \text{conc}\cdot H_2SO_4$
(ii) $Cl_2/Fe/\text{dark}$

D (i) HNO_2
(ii) Cu/HCl

QUESTION 03

In the following sequence of reactions, B is:

$$C_6H_6 \xrightarrow[\text{FeCl}_3]{\text{Cl}_2} \text{A} \xrightarrow{\text{Na}} \text{B}$$

A chlorobenzene

B benzyl chloride

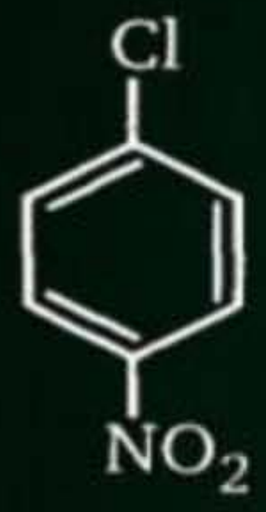
C diphenyl

D chlorophenylmethane

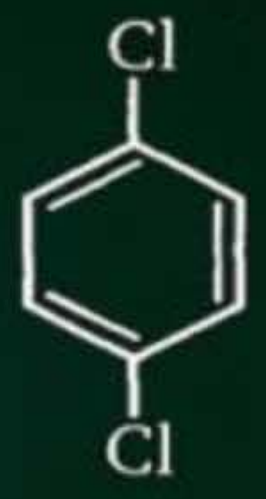
QUESTION 04

Which one of the following undergoes nucleophilic aromatic substitution at the fastest rate?

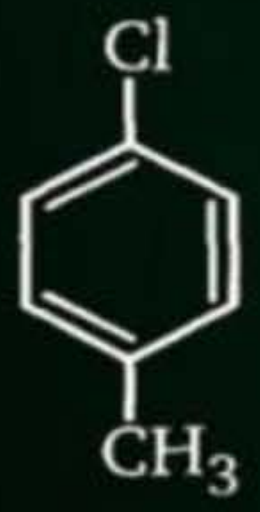
A



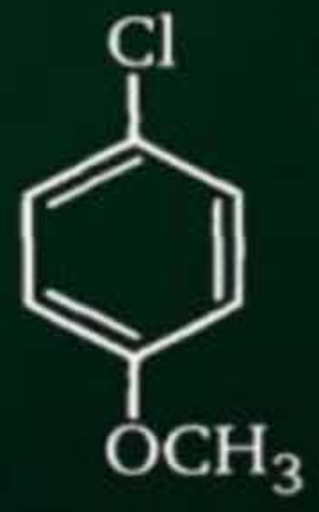
B



C

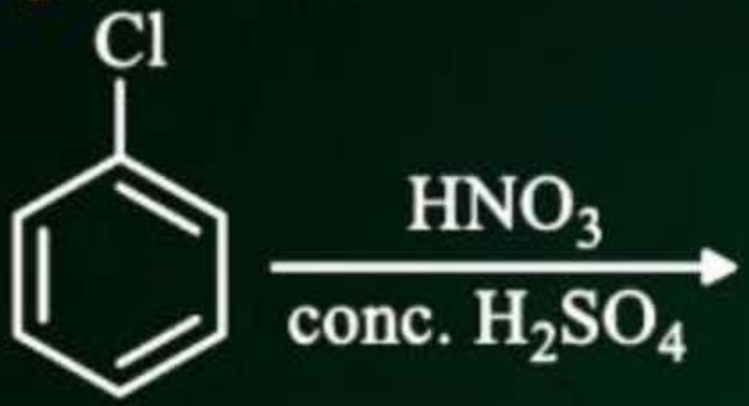


D



QUESTION 05

The major product formed in the given reaction is:


Cl
HNO_3
conc. H_2SO_4

A 1-Chloro-2-nitrobenzene

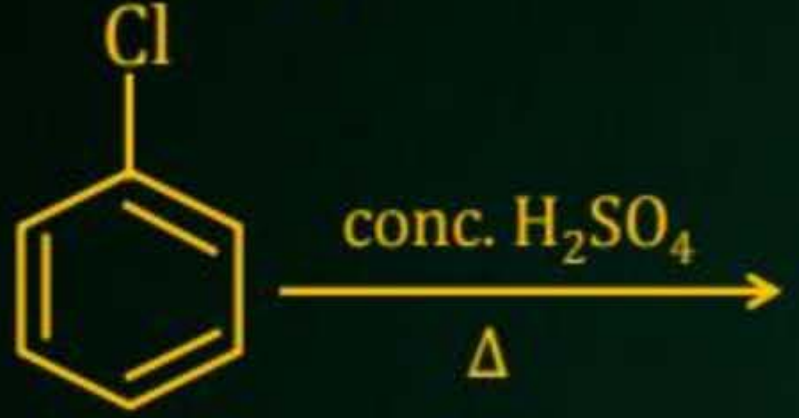
B 1-Chloro-4-nitrobenzene

C 1-Chloro-3-nitrobenzene

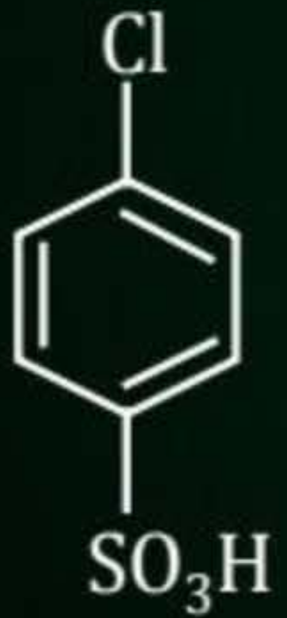
D 2, 4, 6-trinitrobenzene

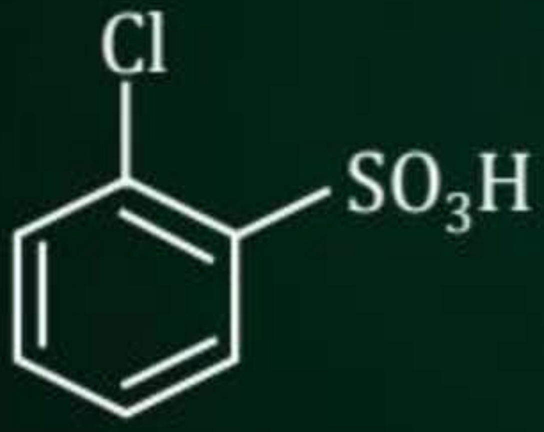
QUESTION 06

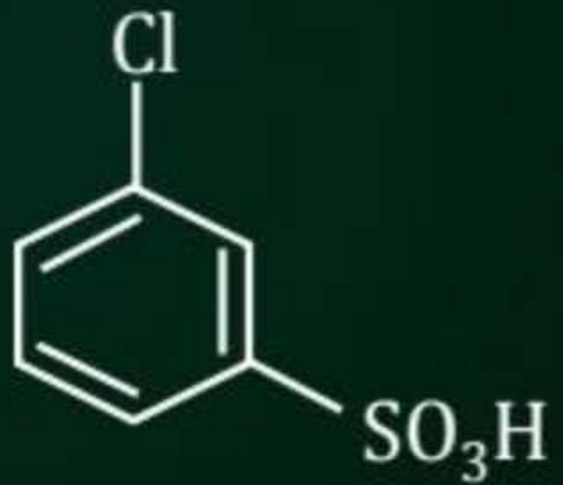
The major product obtained in the given reaction is:

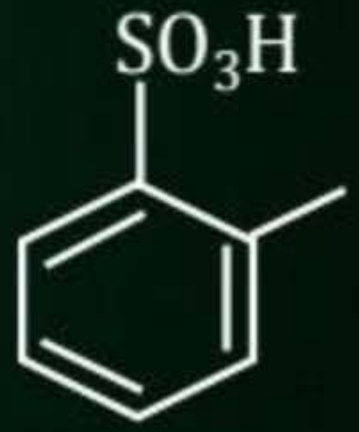


Cl
conc. H_2SO_4
Δ

A


B


C


D


QUESTION 07

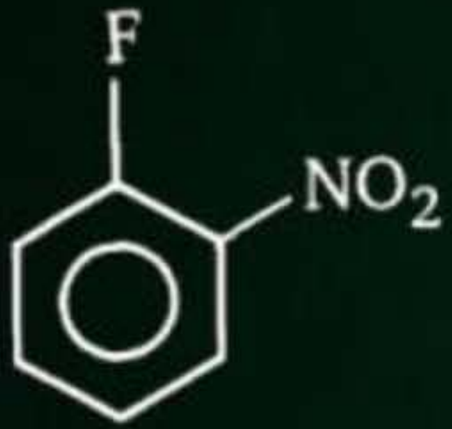
The decreasing order of reactivity of m-nitrobromobenzene (I) 2, 4, 6-trinitrobromobenzene (II) p-nitrobromobenzne (III) and 2, 4-dinitrobromobenzene (IV) towards OH^- ions is:

- **A** $I > II > III > IV$
- **B** $II > IV > III > I$
- **C** $IV > II > III > I$
- **D** $II > IV > I > III$

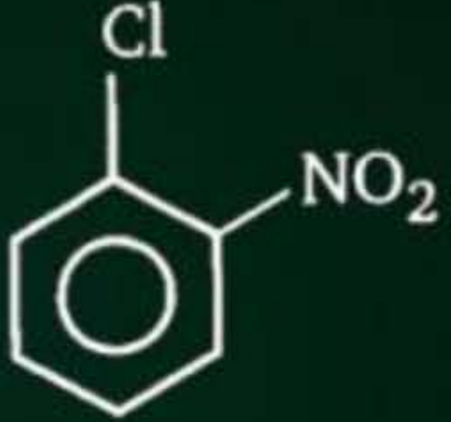
QUESTION 08

Which of the following 2-halo nitrobenzene is most reactive towards nucleophilic aromatic substitution?

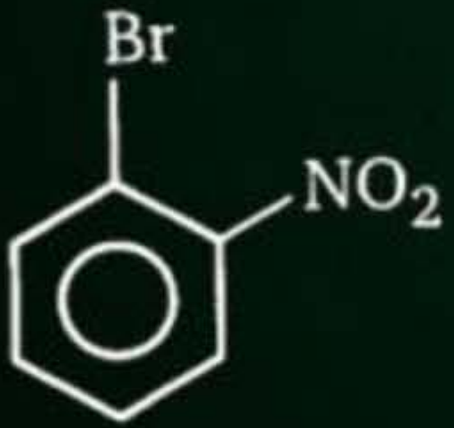
A



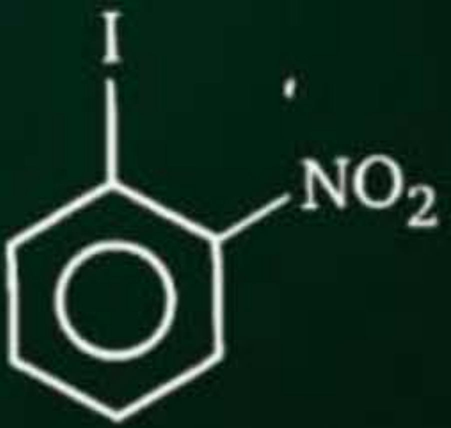
B



C



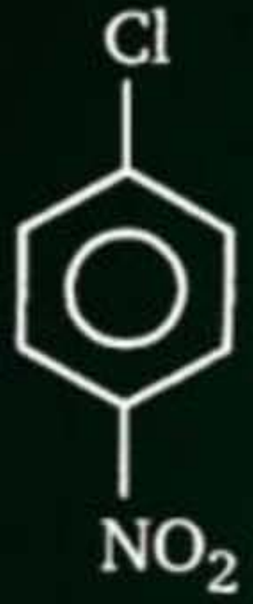
D



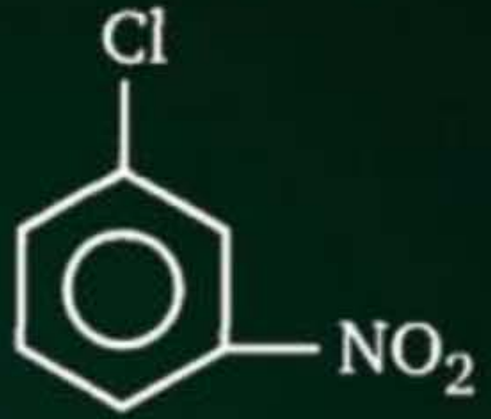
QUESTION 09

Which one of the following compounds is most reactive for $\mathrm{Ar}S_{N^2}$ reaction?

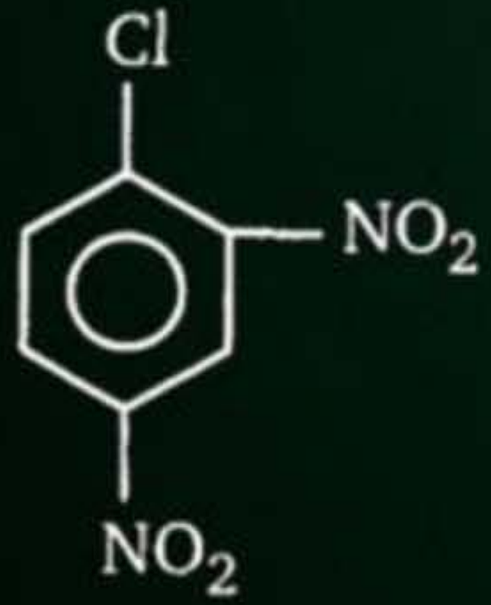
A



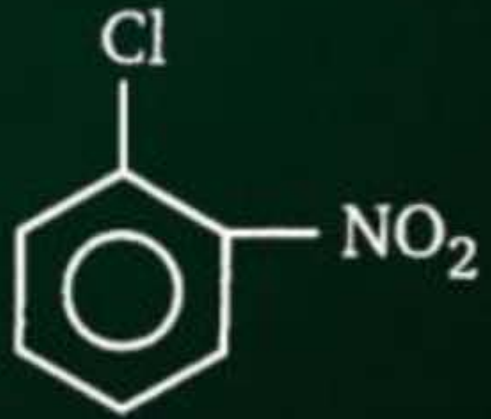
B



C



D



QUESTION 10

In the compound C_6H_5X which of the following is predominantly ortho/para directing?

Ⓐ $X = -NO_2, X = -Cl, X = -OH$

Ⓑ $X = -OMe, X = -CN, X = -NH_2$

Ⓒ $X = -NHCOCH_3, X = -Cl, X = -CO_2H$

Ⓓ $X = -NHCOCH_3, X = -CH_3, X = -Br$

ANSWER KEY

1. D
2. C
3. C
4. A
5. B
6. A
7. B
8. A
9. C
10. D

Home Work From PW Module (Yakeen NEET)

Prarambh: Q 22, 24, 43, 44

Prabal: Q 17, 18

Parikshit: Q 33

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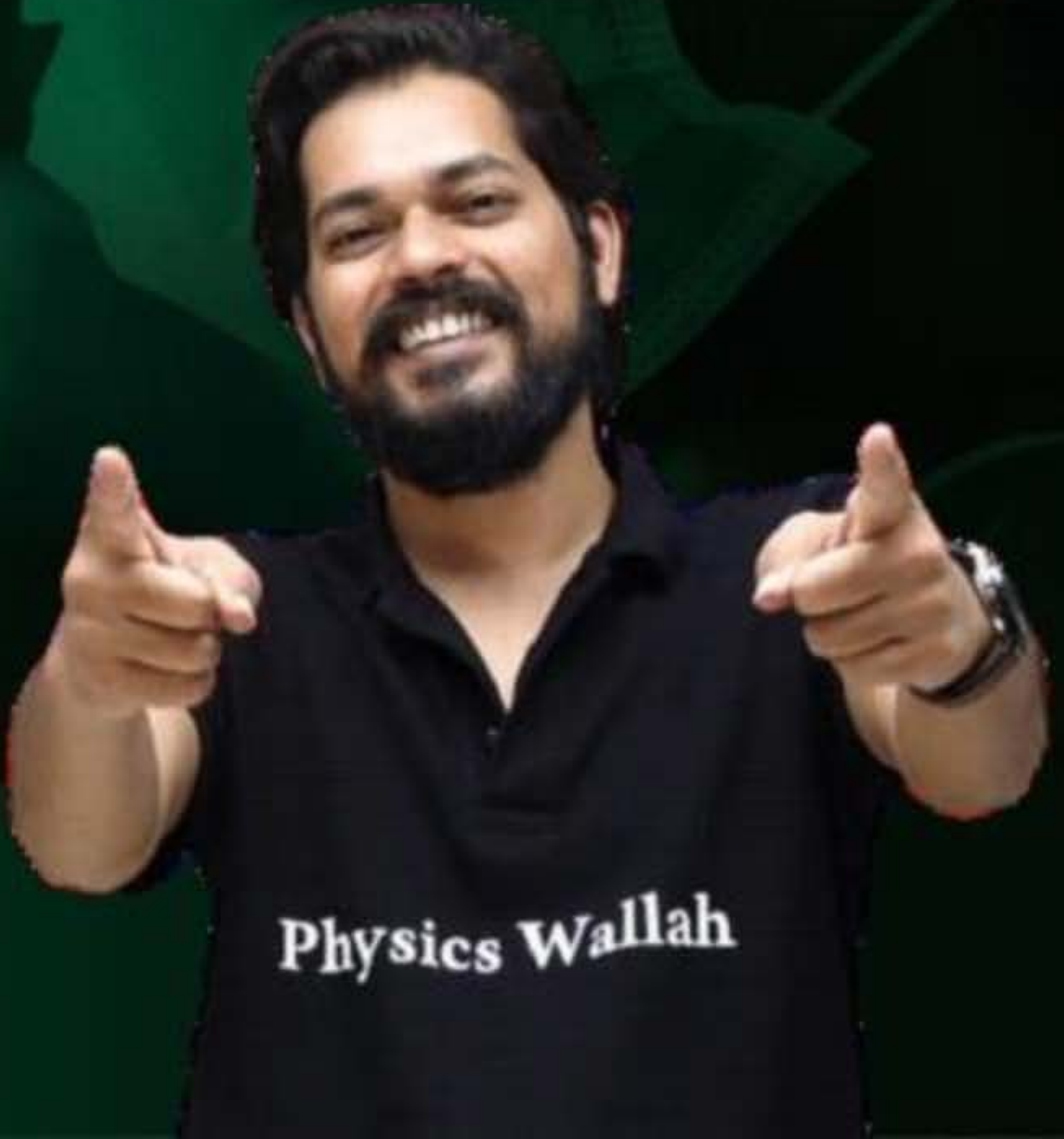
YAKEEN 2.0

FOR NEET 2025

Lecture- 07 **Organic Chemistry**

Haloalkanes and Haloarenes

By- Pankaj Sir(POPU MAMA)


Physics Wallah

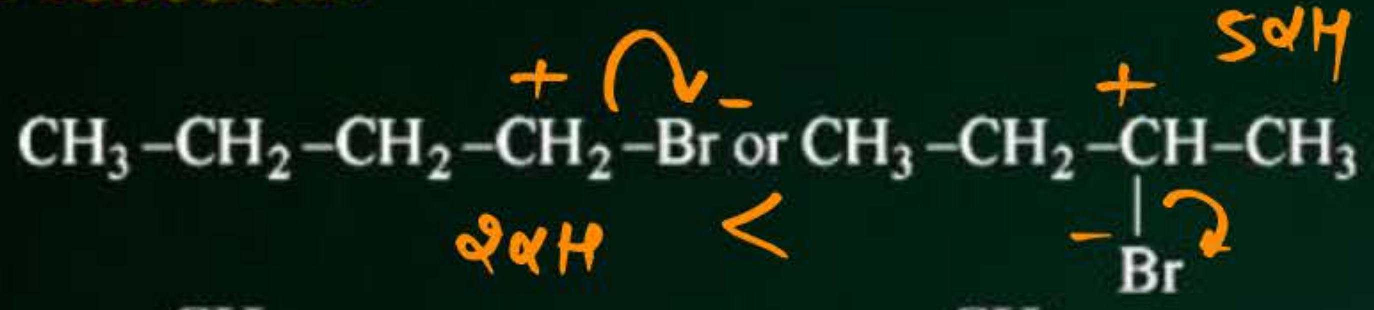
Topics *to be covered*

1. Practice Session

PRACTICE SESSION

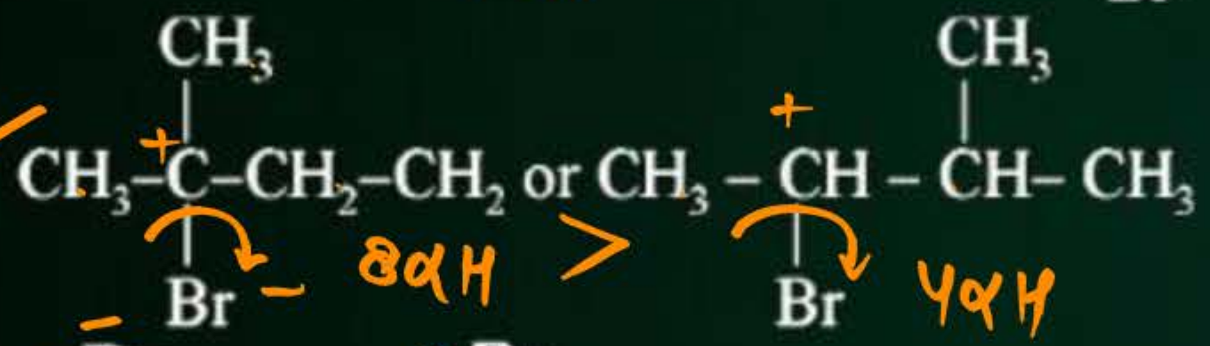
QUESTION

Among the given pairs, in which pair first compound reacts faster than second compound in S_N1 reaction?

(A) 

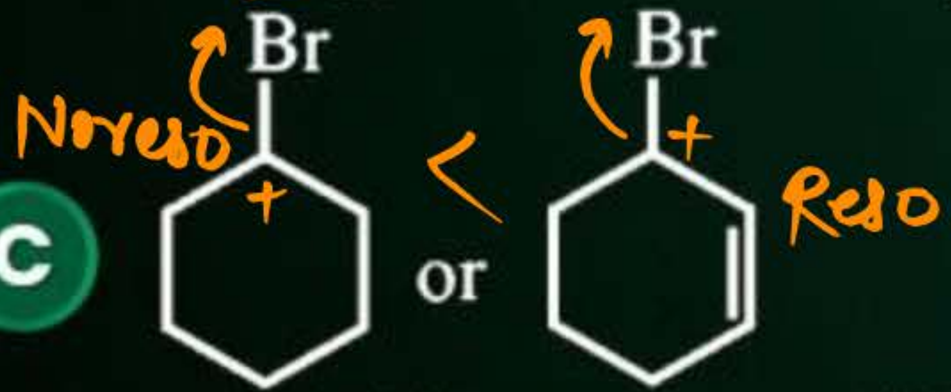
$CH_3-CH_2-CH_2-\overset{+}{CH_2}-Br$ or $CH_3-CH_2-\underset{Br}{\overset{+}{CH}}-CH_3$

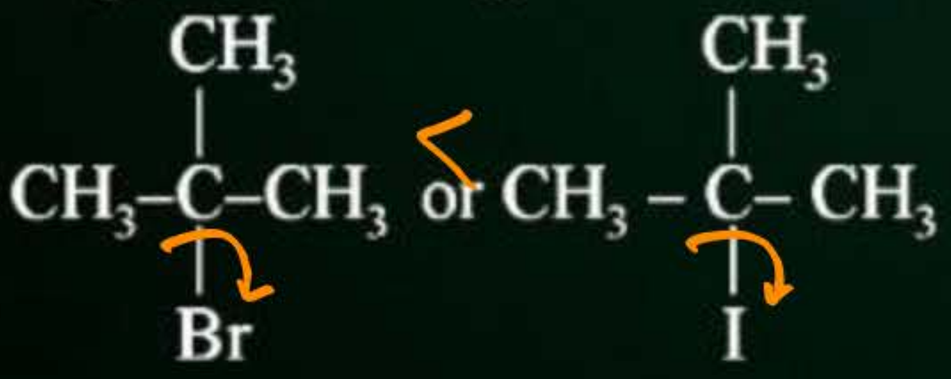
2αH < 5αH

(B) ✓ 

$CH_3-\underset{Br}{\overset{CH_3}{\overset{+}{C}}}-CH_2-CH_3$ or $CH_3-\underset{Br}{\overset{+}{CH}}-\overset{CH_3}{CH}-CH_3$

8αH > 4αH

(C) 

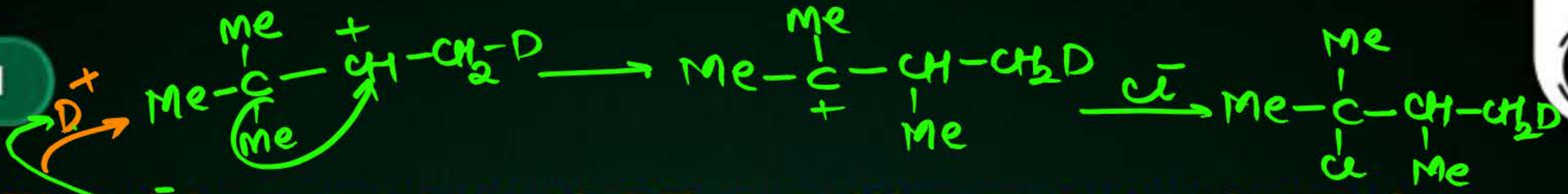


(D) $CH_3-\underset{Br}{\overset{CH_3}{C}}-CH_3$ < $CH_3-\underset{I}{\overset{CH_3}{C}}-CH_3$

L.A

$I^{\ominus} > Br^{\ominus}$

QUESTION



D^+
Me
Me−C−CH−CH$_2$−D
Me
Me−C−CH−CH$_2$D
Me
Cl$^-$
Me−C−CH−CH$_2$D
Cl Me

Me$_3$C—$\overset{}{\underset{+}{C}}$H = $\overset{-}{C}$H$_2$ on reaction with DCl gives (A) as major product and on reaction with $\overset{+}{I}\overset{-}{Cl}$ gives (B) as major product. (A) and (B) are:

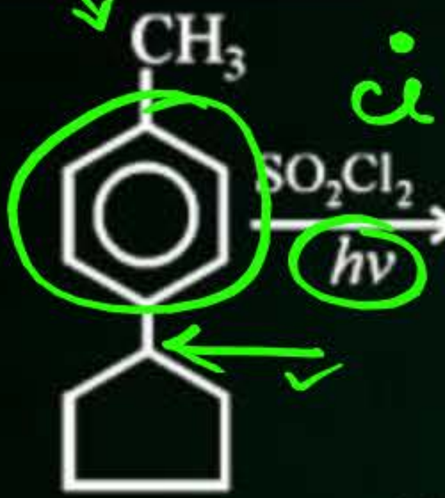
(A) ✓ $\underline{Me_2C(Cl)}CHMeCH_2D$, $Me_3C—\underbrace{CHClCH_2I}$

(B) $\underline{Me_2C(Cl)}CHMeCH_2D$, $Me_2C\cancel{(C}l)CHMeCH_2I$

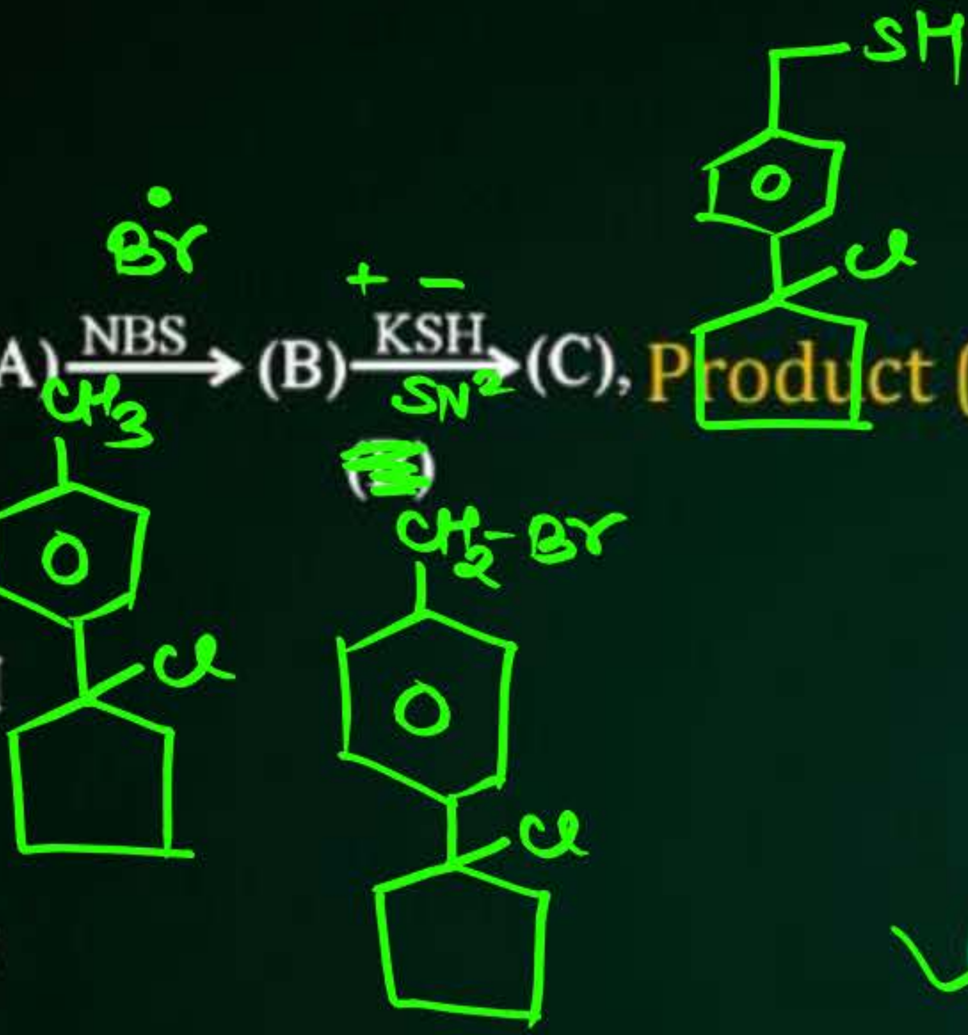
(C) $Me\cancel{_2C}—CHClCH_2D$, $Me_3C—CHClCH_2I$

(D) $Me\cancel{_2C}—CHClCH_2D$, $Me_2C(Cl)CHMeCH_2I$

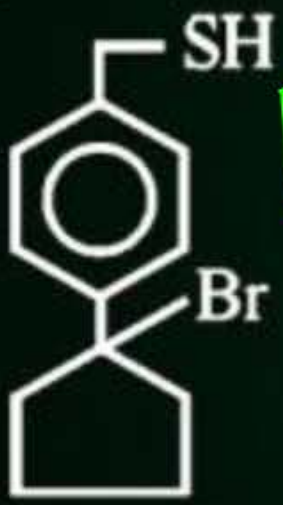
QUESTION



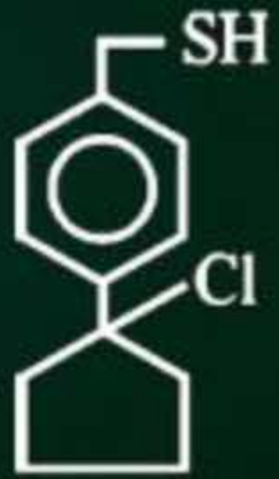
$\xrightarrow[hv]{SO_2Cl_2}$ (A) $\xrightarrow{NBS}$ (B) $\xrightarrow[SN^2]{KSH}$ (C), Product (C) is:


Ċl
Ḃr
+ −
CH$_3$
Cl
CH$_2$-Br
Cl
SH
Cl

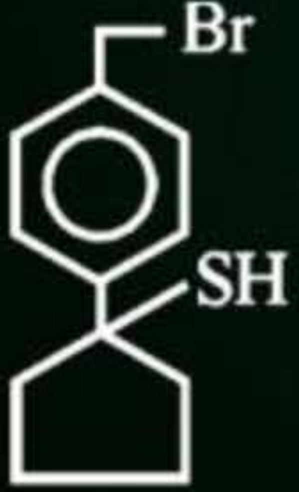
A



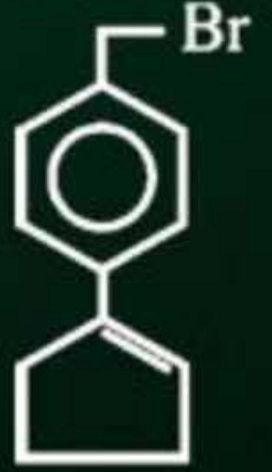
✓ **B**



C



D



QUESTION

Consider the following reaction:

$MeCH(D)\overset{\downarrow}{\dot{C}}\underline{H}Me_2 + \boxed{\dot{Br}} \rightarrow (X) + HBr$ (X) is:

A $Me\dot{C}(D)CHMe_2$

B $MeCH(D)CH(Me)\dot{C}H_2$

C $Me\dot{C}(H)CHMe_2$

[✓ D] $MeCH(D)\dot{C}Me_2$

QUESTION

$r = k[RX][\underline{Nu}]$

Select the reagent that will yield the greater substitution of reaction with $\underbrace{CH_3CH_2Br}$:

SH↓ Nu↑

A $\underbrace{CH_3CH_2\overset{-}{O}}\overset{+}{K}$ in dimethyl sulfoxide ($\underline{DMSO}$) ✓

B $\underbrace{(CH_3)_3C\overset{-}{O}}\overset{+}{K}$ in dimethyl sulfoxide ($\underline{DMSO}$)

C Both (A) and (B) will give comparable amounts of substitution

D Neither (A) nor (B) will be any amount of substitution

QUESTION

$-I$

$CN > Cl$

$S_N 2$

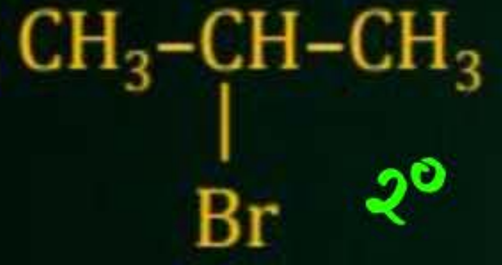
ROR ∝ ewg

The decreasing order of rate of S_N2 is:

(I) ewg $Cl-CH_2-CH_2-Br$ 1°

(II) ewg $N\equiv C-CH_2-Br$ 1°

(III)



$CH_3-\underset{\displaystyle Br}{\underset{|}{CH}}-CH_3$ 2°

(IV) CH_3-CH_2-Br 1°

[✓ A] II > I > IV > III

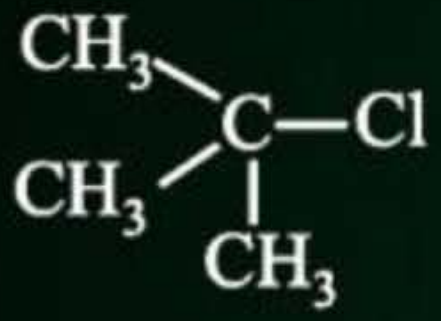
✗ B II > III > I > IV

C II > I > III > IV

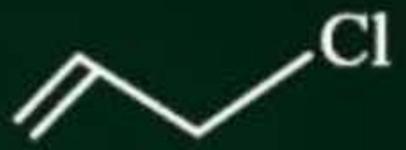
✗ D IV > I > II > III

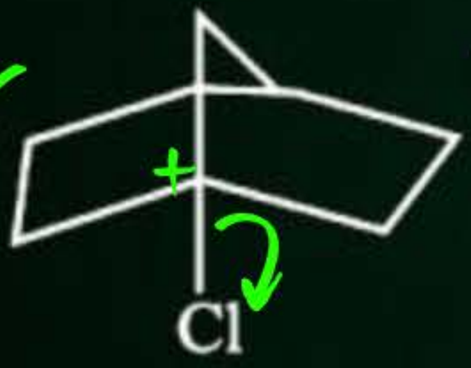
QUESTION

Which one of the following compounds is $\underbrace{\text{inactive}}_{\text{NO Rxn}}$ towards S_N1 reaction?

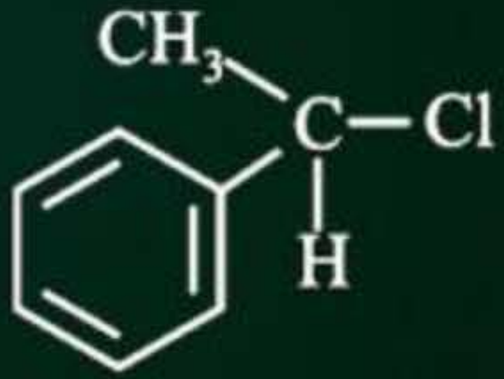
A


$(CH_3)_3C{-}Cl$

B


[✓ C]


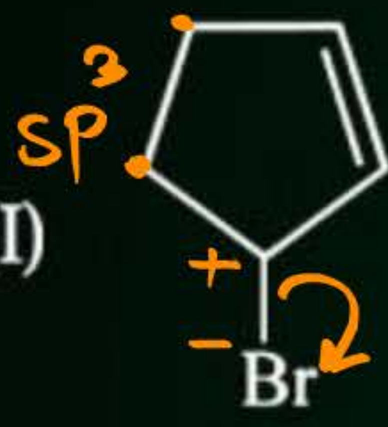
Bredt's rule

D


QUESTION

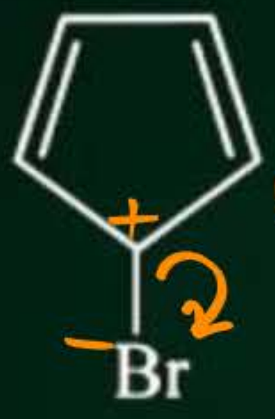
Among the bromides I–III given below, the order of reactivity in S_N1 reaction is:

(I)



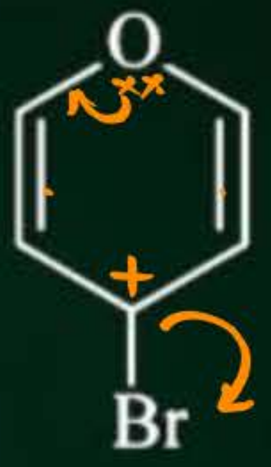
Non Aro

(II)



4πe⁻
AA

(III)



6πe⁻
Aro

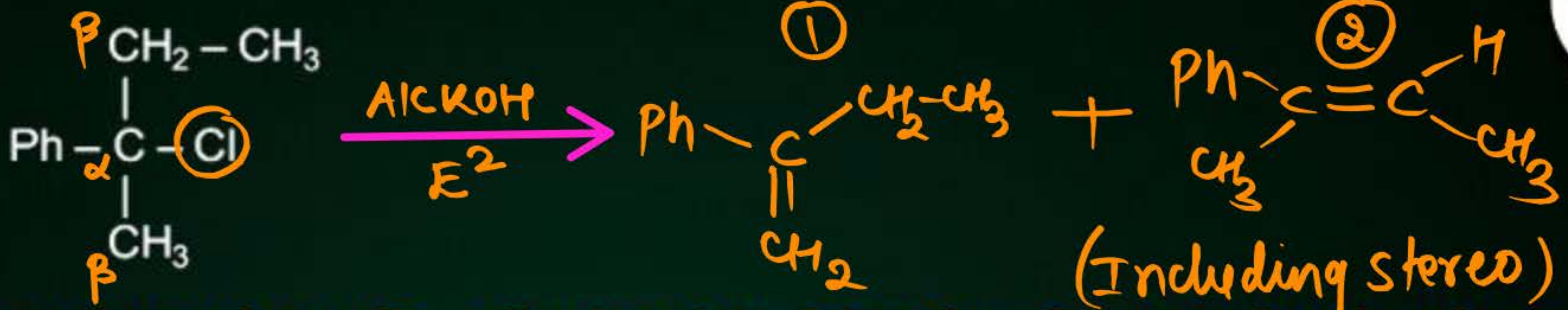
[✓ A] III > I > II

B III > II > I

C II > III > I

D II > I > III

QUESTION


β
α
β
Ph
Cl
AlcKOH
E2
①
Ph
CH2-CH3
CH2
+
②
Ph
H
CH3
CH3

(Including stereo)

The total number of product (E_2 elimination bimolecular product) when above compound react with alcoholic KOH ?

A 2

B [✓ 3]

C 4

D 5

QUESTION

Alkyl Halide
↑

Increasing the concentration of an electrophile in a typical S_N2 reaction by a factor of 3 and the concentration of the nucleophile by a factor of 3 will change the reaction rate to:

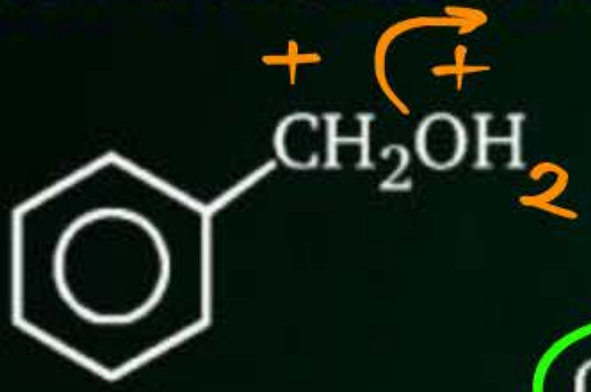
$r = k[RX][Nu]$

$3 \times 3 = 9$

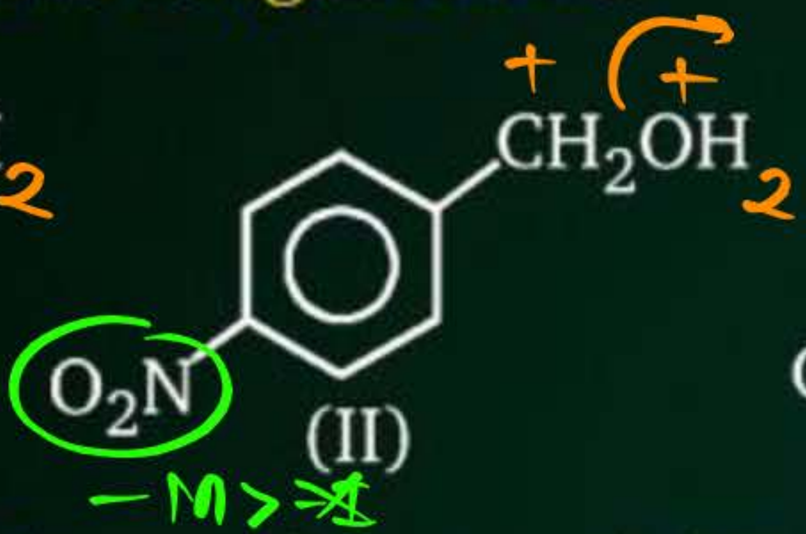
- A increase by a factor of 6
- [✓ B] increase by a factor of 9
- C decrease by a factor of 3
- D remain about the same

QUESTION

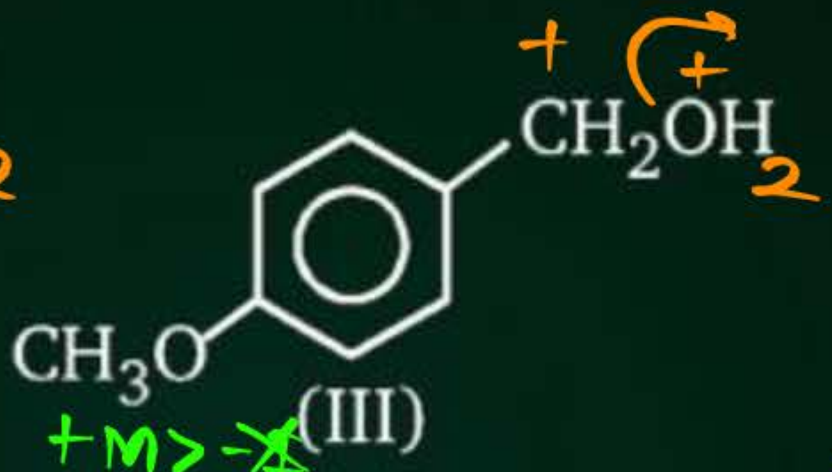
Consider the following alcohols:



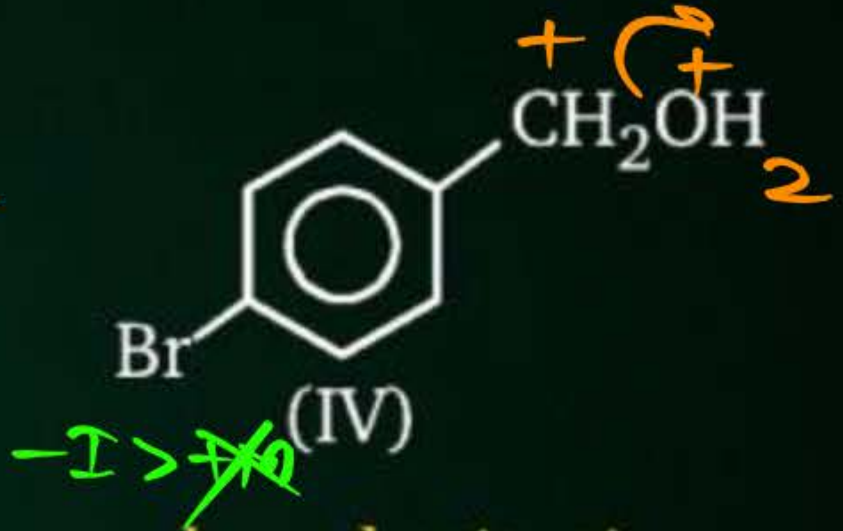
(I)


CH2OH2
+ +
O2N
−M > −I

(II)


CH2OH2
+ +
CH3O
+M > −I

(III)


CH2OH2
+ +
Br
−I > +M

(IV)

The order of decreasing reactivities of these alcohols towards substitution with HBr is:

[✓ A] III > I > IV > II

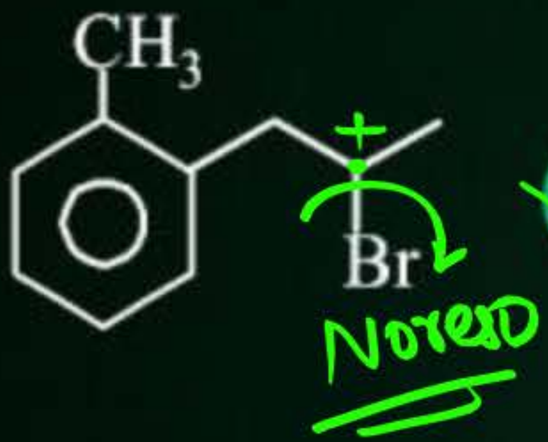
B III > I > II > IV

C I > III > IV > II

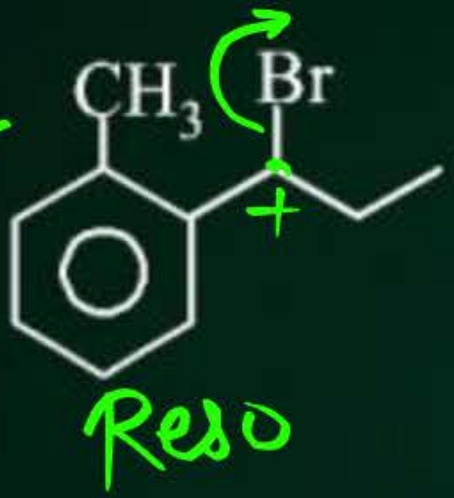
D I > III > II > IV

QUESTION

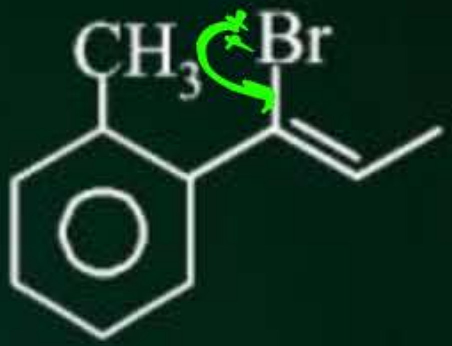
Which compound undergoes hydrolysis by the S_N1 mechanism at the fastest rate?

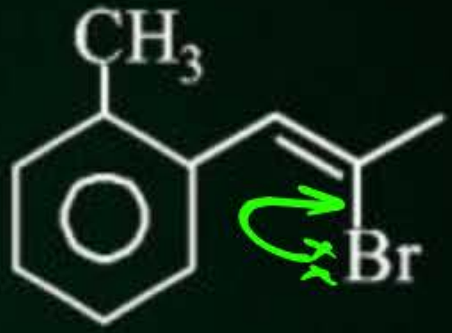
A


Noreso

B ✓


Reso

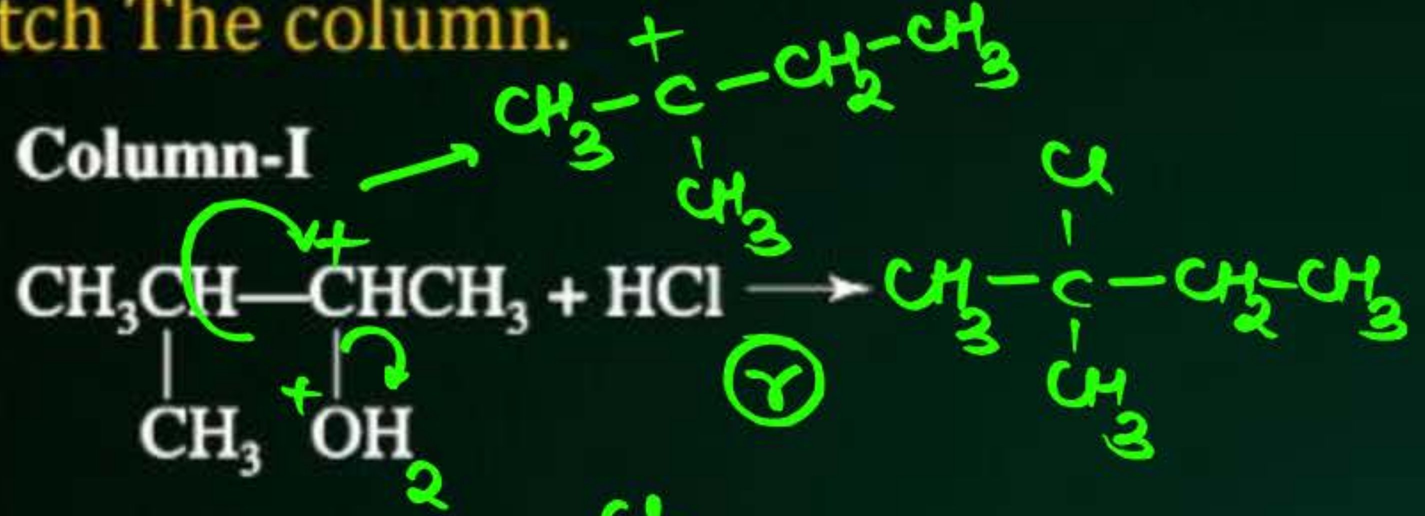
C ✗


D ✗


QUESTION

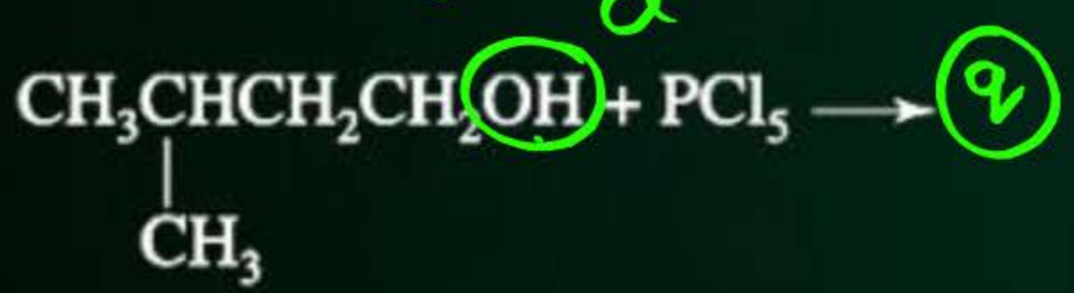
Match The column.

Column-I



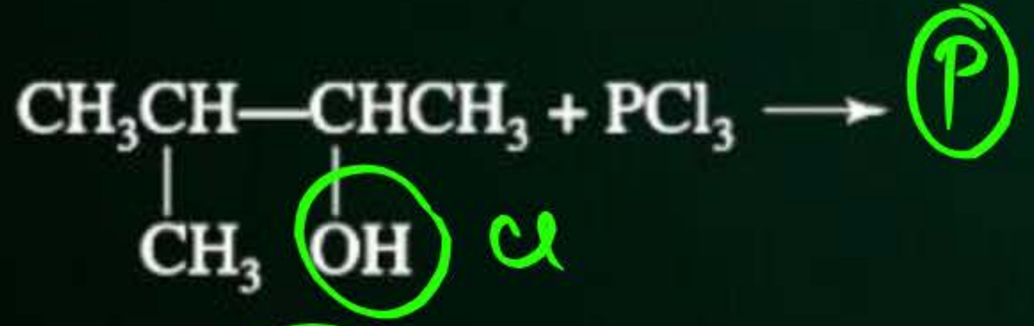
(A) $\underset{CH_3}{CH_3CH}-\underset{\overset{+}{O}H_2}{CHCH_3} + HCl \longrightarrow CH_3-\overset{Cl}{\underset{CH_3}{C}}-CH_2-CH_3$ (r)

$\longrightarrow CH_3-\overset{+}{\underset{CH_3}{C}}-CH_2-CH_3$



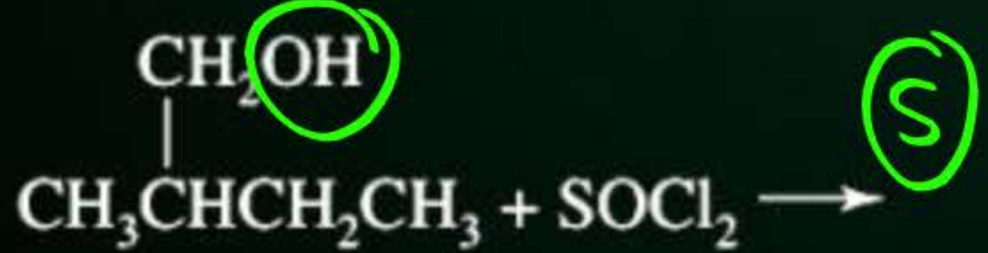
(B) $\underset{CH_3}{CH_3CH}CH_2CH_2OH + PCl_5 \longrightarrow$ (q)

Cl



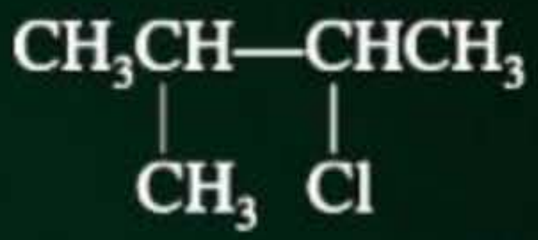
(C) $\underset{CH_3}{CH_3CH}-\underset{OH}{CHCH_3} + PCl_3 \longrightarrow$ (p)

Cl

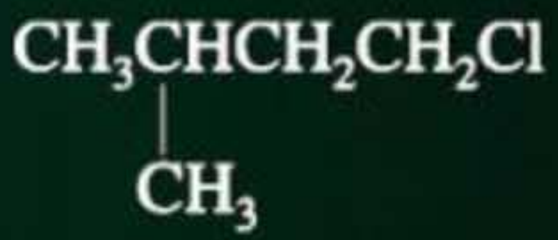


(D) $CH_3\overset{CH_2OH}{CH}CH_2CH_3 + SOCl_2 \longrightarrow$ (S)

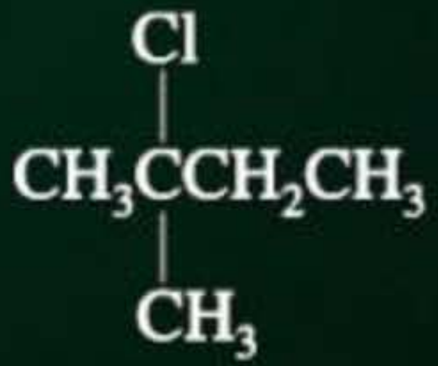
Column-II



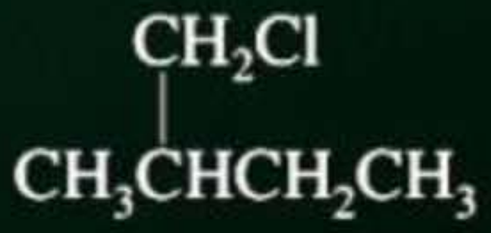
(p) $\underset{CH_3}{CH_3CH}-\underset{Cl}{CHCH_3}$



(q) $\underset{CH_3}{CH_3CH}CH_2CH_2Cl$



(r) $CH_3\overset{Cl}{\underset{CH_3}{C}}CH_2CH_3$



(s) $CH_3\overset{CH_2Cl}{CH}CH_2CH_3$

[✓ Ⓐ A → r; B → q; C → p; D → s]

Ⓑ A → q; B → p; C → s; D → r

Ⓒ A → s; B → r; C → q; D → p

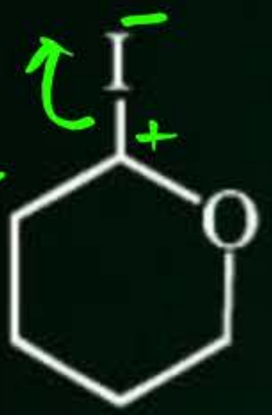
Ⓓ A → p; B → s; C → r; D → q

QUESTION

L.A $\underbrace{I^- > Br^- > Cl^-}$

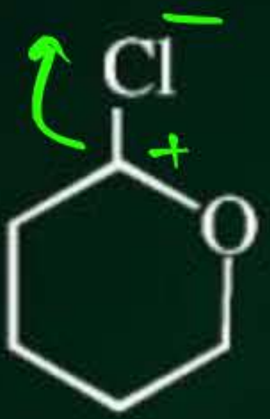
Which one of the following compounds will be most reactive for S_N1 reactions?

A ✓



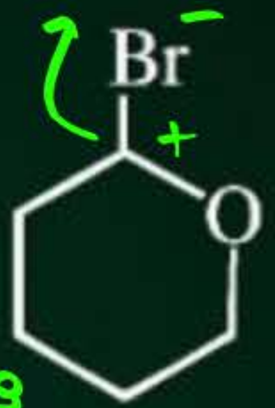
BB

B



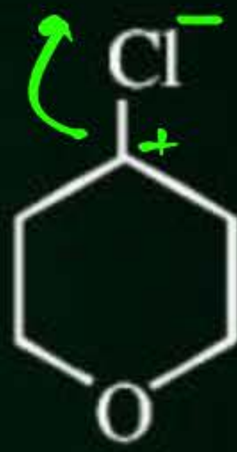
BB

C



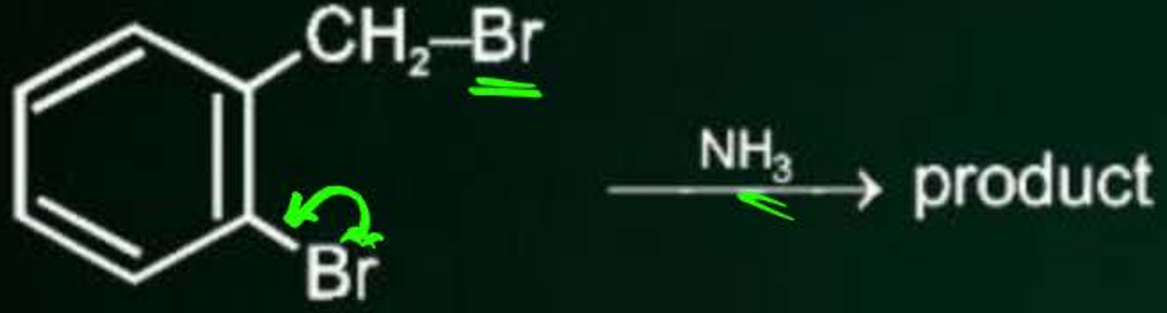
BB

D

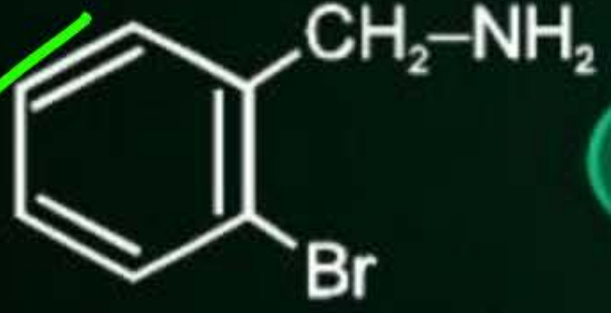


QUESTION

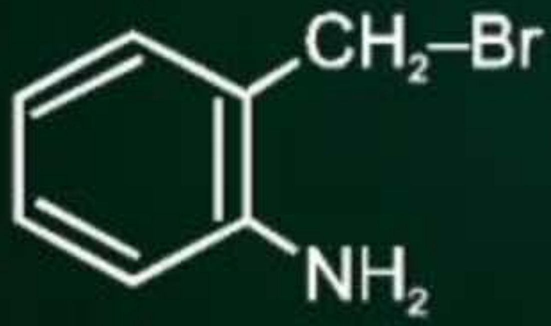
What is the major product obtained in the following reaction?


CH₂–Br
Br
NH₃
product

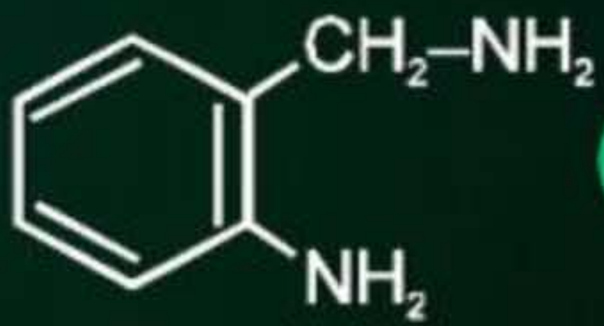
[✓ A]



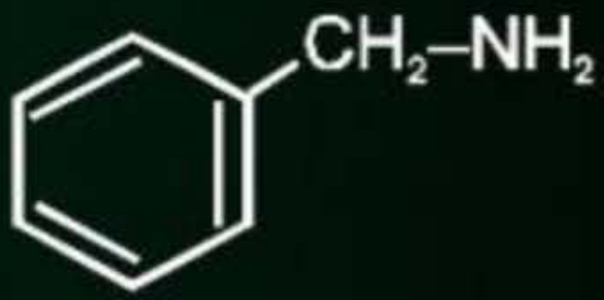
B



C

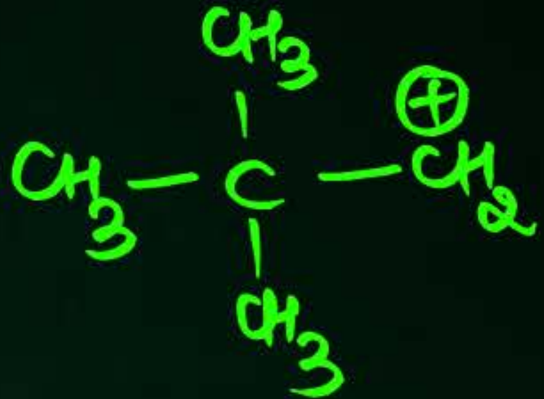


D



QUESTION

Yakeen 2.0


CH3
CH3
C
⊕ CH2
CH3

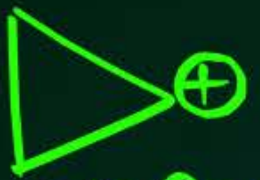
The compound most reactive towards S_N1 reaction is:

✓ (A) $Me\ddot{O}\overset{+}{C}H_2\overset{-}{Cl}$

BB

(B) $Me_3C—\overset{+}{C}H_2\overset{-}{Cl}$

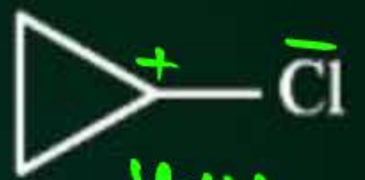
0αH



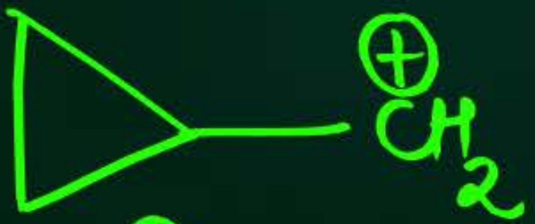
No Dance

(C) $PhCH_2\overset{+}{C}H_2\overset{-}{Cl}$

2αH

(D) 

4αH



Dance

QUESTION

Less handle

$Me_3C-\overset{\beta}{C}HMe\overset{\alpha}{C}H\underline{Br}\overset{\beta}{M}e$ on reaction with $Et_3C\bar{O}-\overset{+}{K}$ mainly gives:

mama mausi

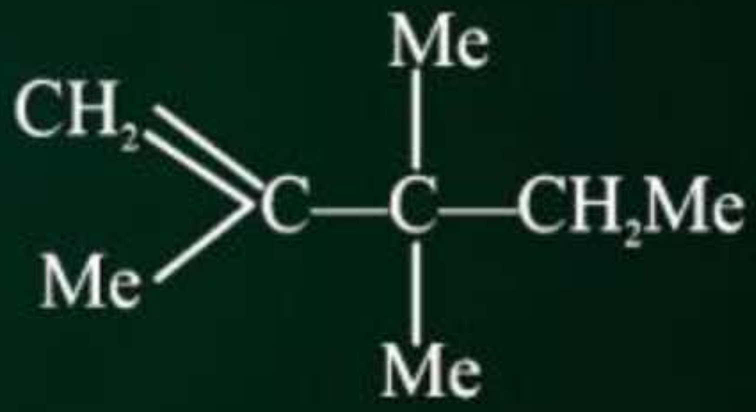
(Bulky base)

A $Me_3CC(Me) = CHMe$

B $Me_2CHCMe = CMe_2$

[✓ **C**] $Me_3CCHMeCH = CH_2$

D



$CH_2=C(Me)-C(Me)_2-CH_2Me$

QUESTION

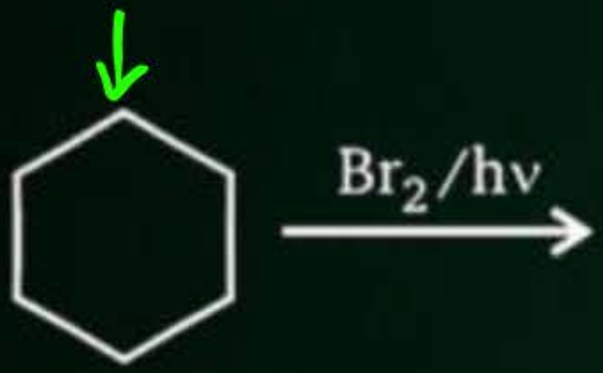
Which of the following is incorrect?

- A S_N2 reaction proceeds with complete inversion.
- B In S_N1 reaction rearrangement occurs.
- C In S_N1 reaction inverted product is major over product formed by retention of configuration.
- [✓ D] S_N2 reaction is favoured by highly polar protic solvent.

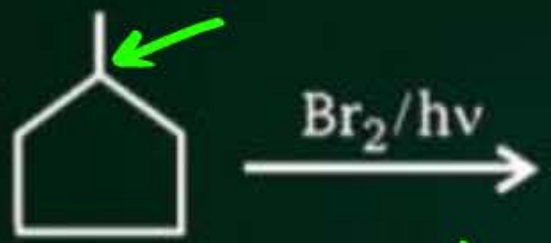
QUESTION

Among the following free radical bromination reactions, select those in which 2° halide is the major product-

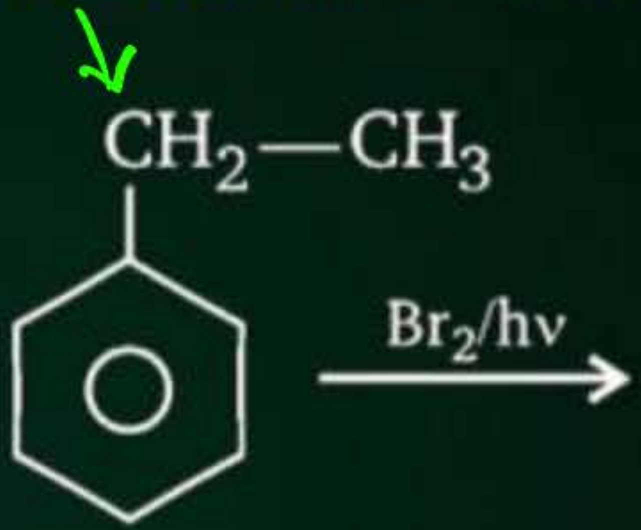
(P)



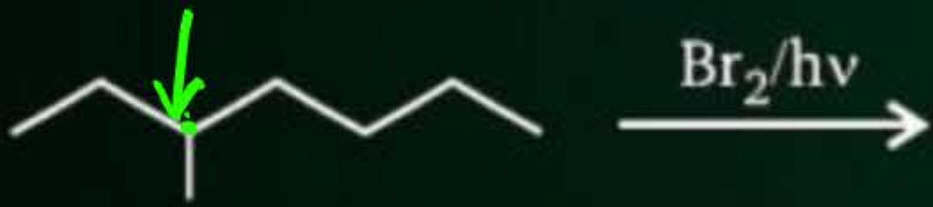
(Q)



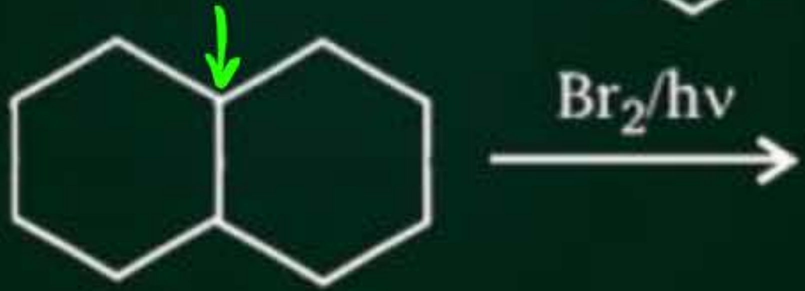
(R)


CH$_2$—CH$_3$
Br$_2$/hν

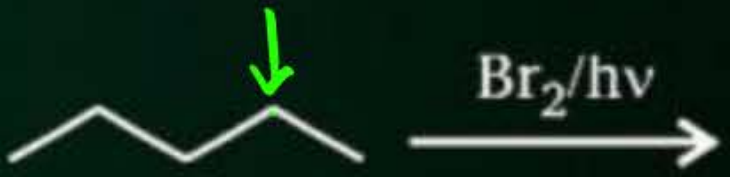
(S)



(T)

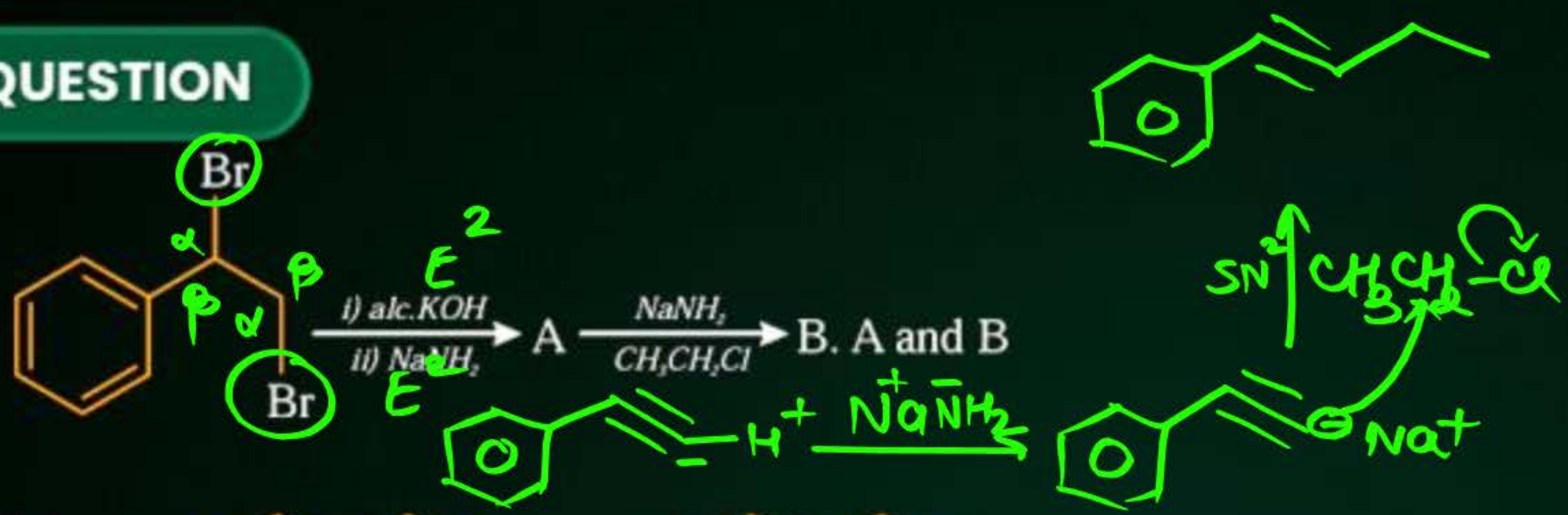


(U)

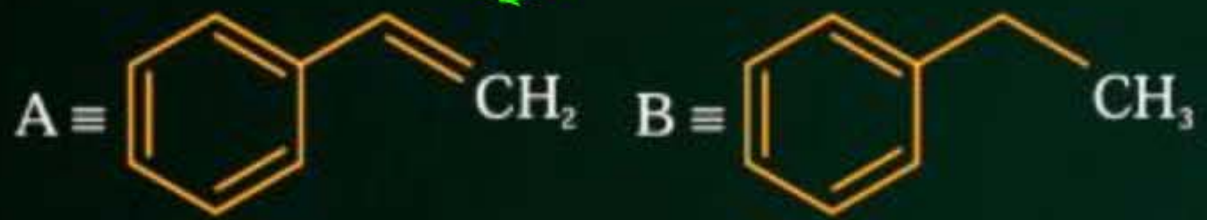


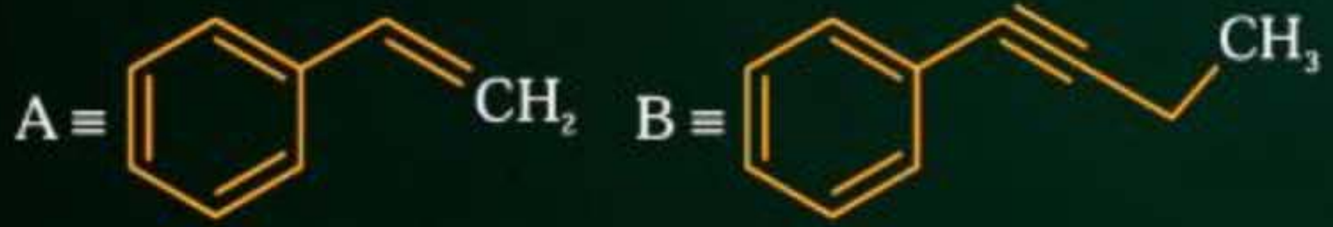
- A P, Q, R, S
- [✓ B] P, R, U
- C P, R, S, T
- D P, Q, R, S, t

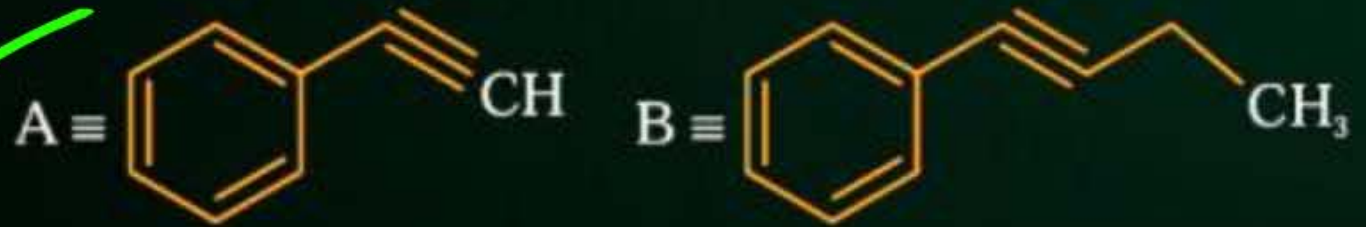
QUESTION


Br
Br
α
β
β
α
β
E2
E2
i) alc.KOH
ii) NaNH2
A
NaNH2
CH3CH2Cl
B.
H+
Na+ NH2-
Na+
SN2
CH3CH2-Cl

A and B

A 

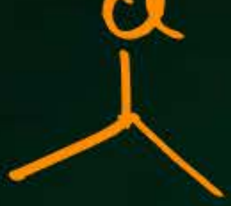
B 

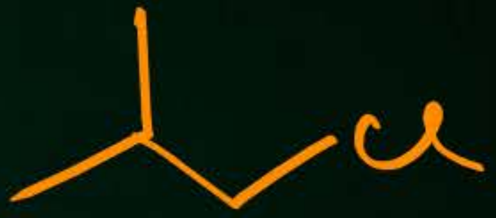
[✓ **C**] 

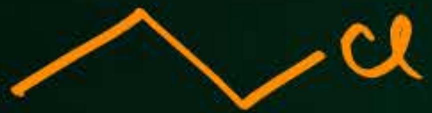
D None of these

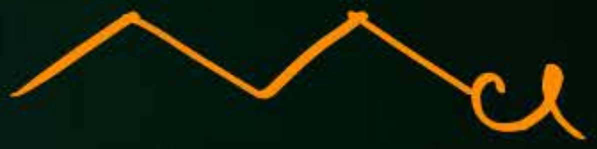
QUESTION 01

2° halide among the following is:

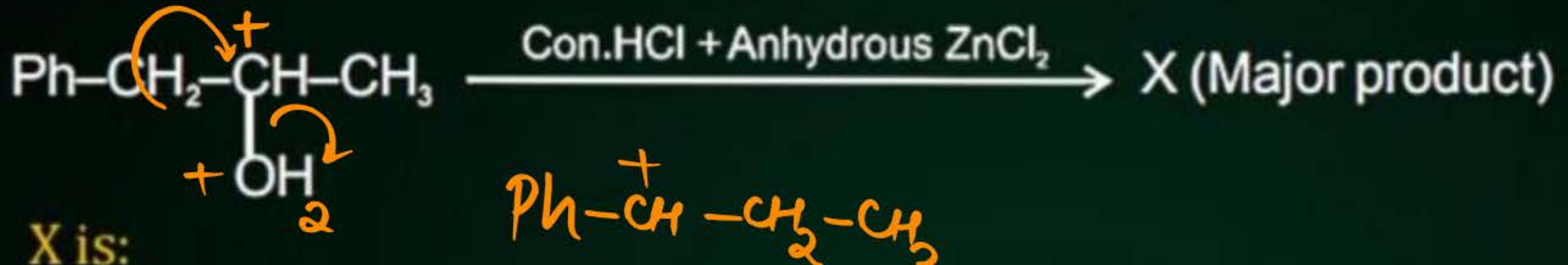
[✓ A] isopropyl chloride 

(B) isobutyl chloride 

(C) n-propyl chloride 

(D) n-butyl chloride 

QUESTION 02

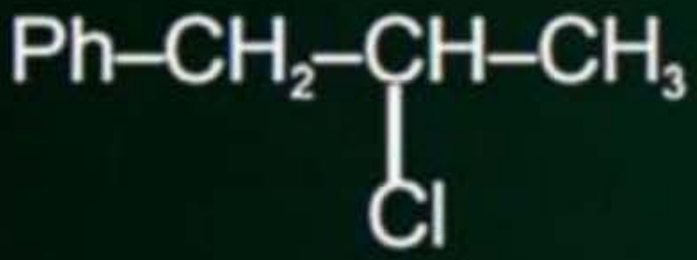


$$Ph-CH_2-\underset{\overset{+}{O}H_2}{\overset{+}{C}H}-CH_3 \xrightarrow{\text{Con.HCl + Anhydrous ZnCl}_2} X \text{ (Major product)}$$

$$Ph-\overset{+}{C}H-CH_2-CH_3$$

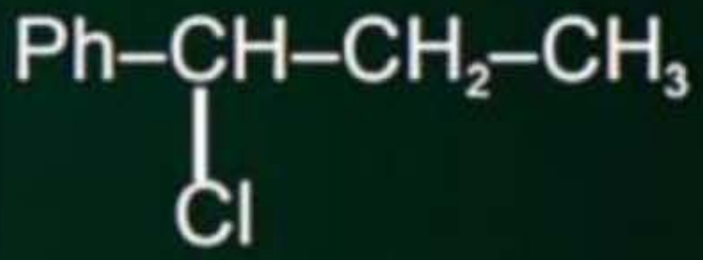
X is:

(A)



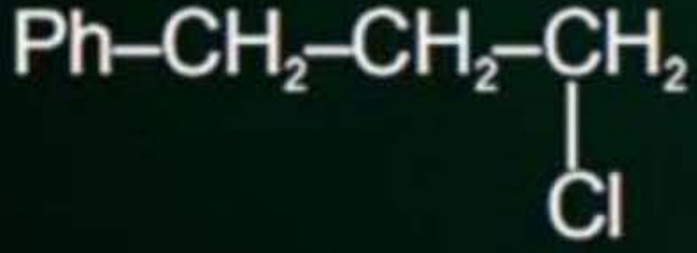
$$Ph-CH_2-\underset{Cl}{CH}-CH_3$$

[✓ (B)]



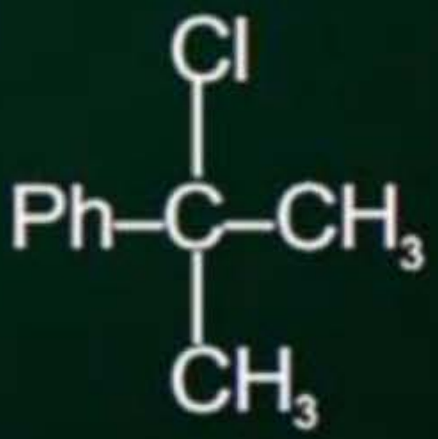
$$Ph-\underset{Cl}{CH}-CH_2-CH_3$$

(C)



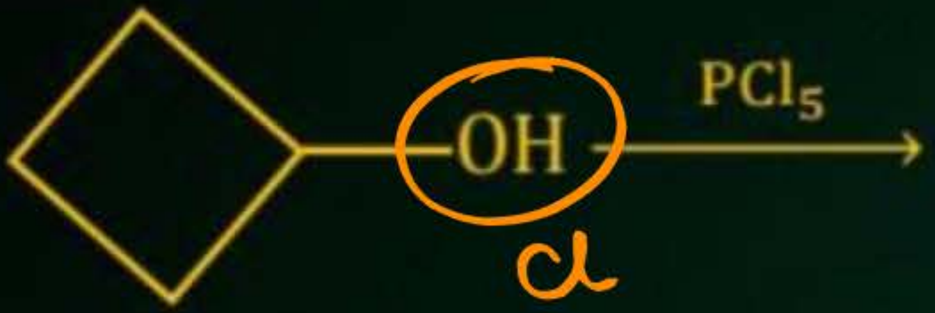
$$Ph-CH_2-CH_2-\underset{Cl}{CH_2}$$

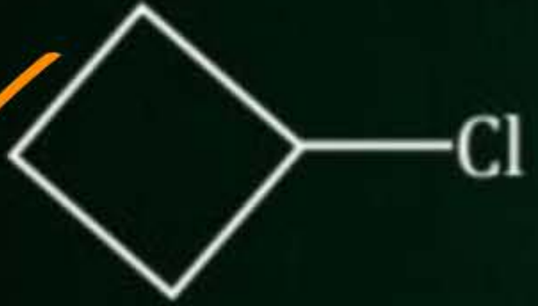
(D)

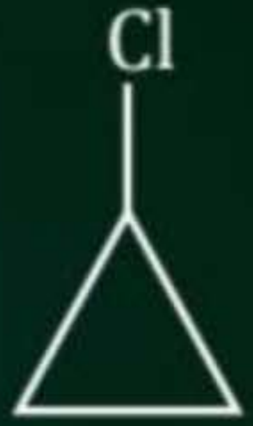


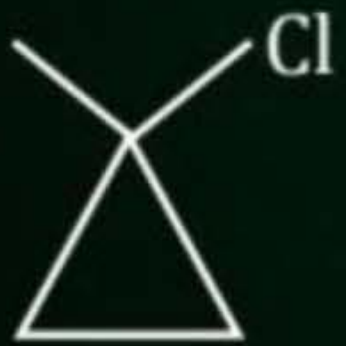
$$Ph-\overset{Cl}{\underset{CH_3}{C}}-CH_3$$

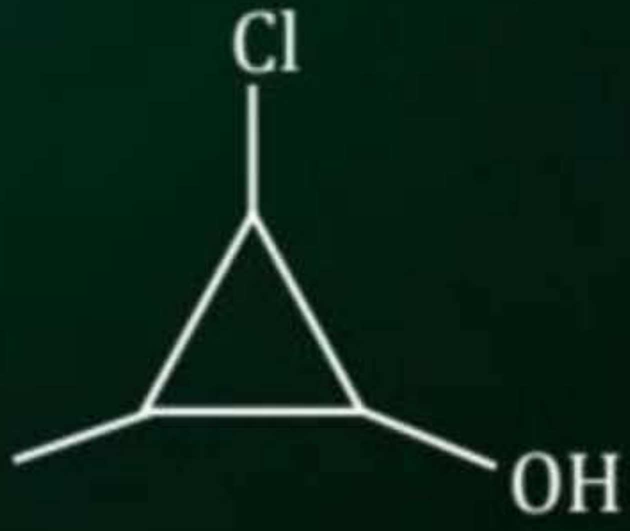
QUESTION 03



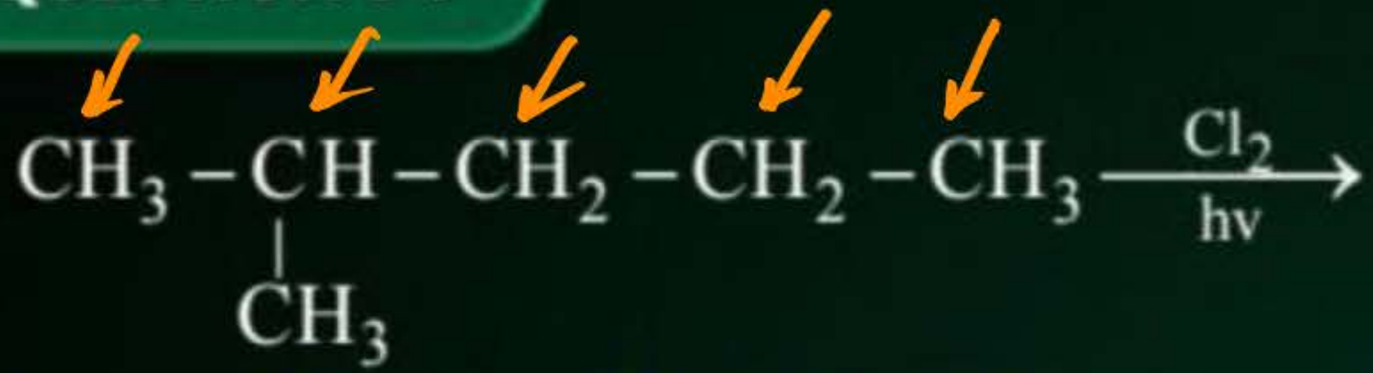
A


B


C


D


QUESTION 04



$$\mathrm{CH_3-\underset{\underset{CH_3}{|}}{C}H-CH_2-CH_2-CH_3} \xrightarrow[h\nu]{Cl_2}$$

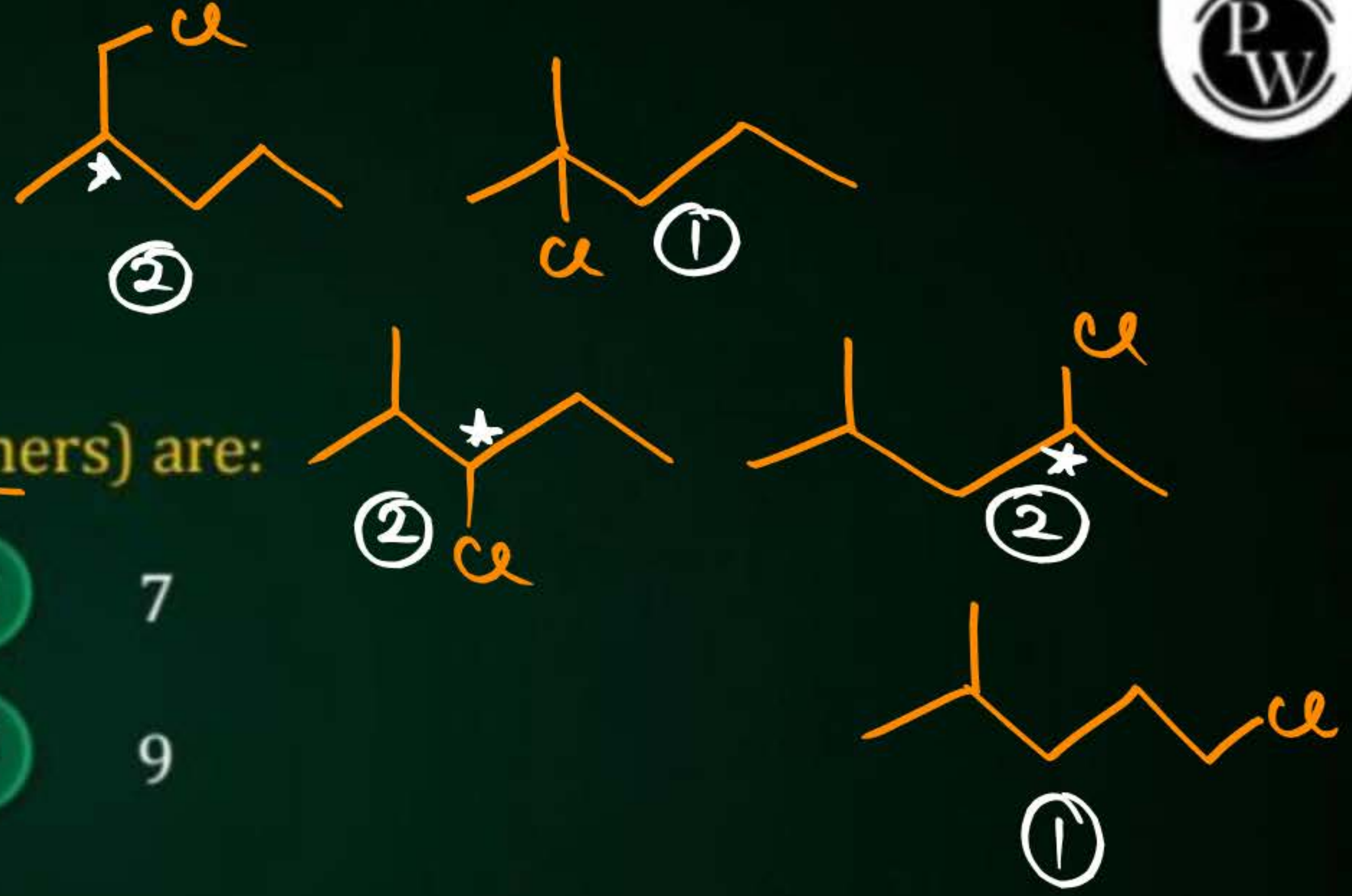
Mono-chloro product (including stereoisomers) are:

A 6

B 7

[✓ C 8]

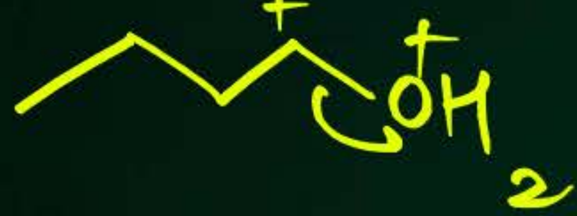
D 9


Cl
*
②
Cl
①
*
②
Cl
Cl
*
②
Cl
①

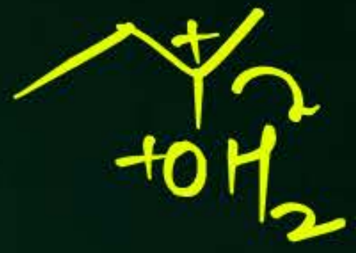
QUESTION 05

The compound that reacts fastest with conc. HCl is:

(A) butan-1-ol

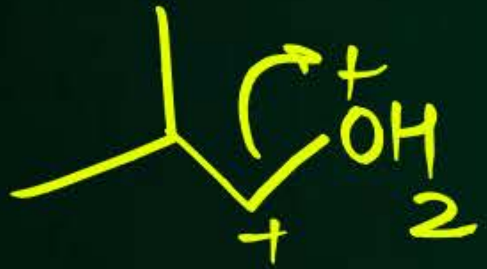


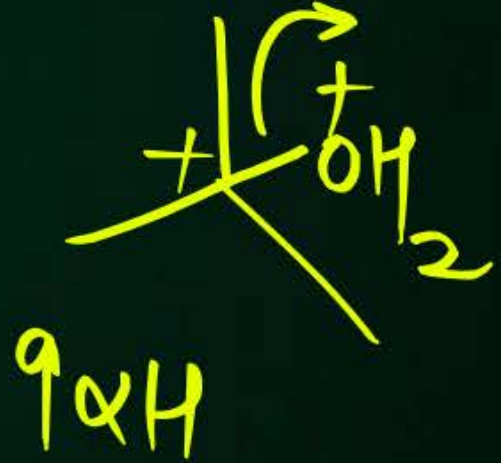
(B) butan-2-ol



(C) 2-methyl propan-1-ol

[✓ D] 2-methyl propan-2-ol





QUESTION 06

Which one is the Swartz reaction from the following?

Ⓐ $CH_3Cl + NaI \xrightarrow{\text{Dry Acetone}} CH_3I + NaCl$

Ⓑ $CH_3Br + NaI \xrightarrow{\text{Dry Acetone}} CH_3I + NaBr$

[✓ Ⓒ $CH_3Br + AgF \longrightarrow CH_3F + AgBr$]

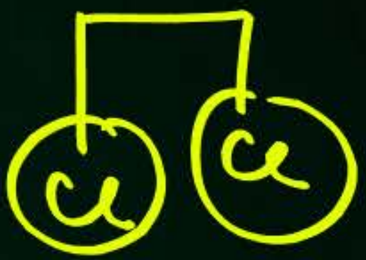
Ⓓ $2CH_3Cl + 2Na \xrightarrow{\text{Dry Acetone}} CH_3—CH_3 + 2Na$

QUESTION 07

Which of the following is an example of vic dihalide?

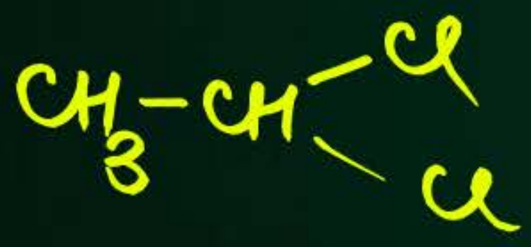
(A) Dichloromethane CH_2Cl_2

[✓ (B)] 1, 2-dichloroethane



(C) Ethylidene chloride

(D) Allyl chloride


$CH_3-CH<^{Cl}_{Cl}$

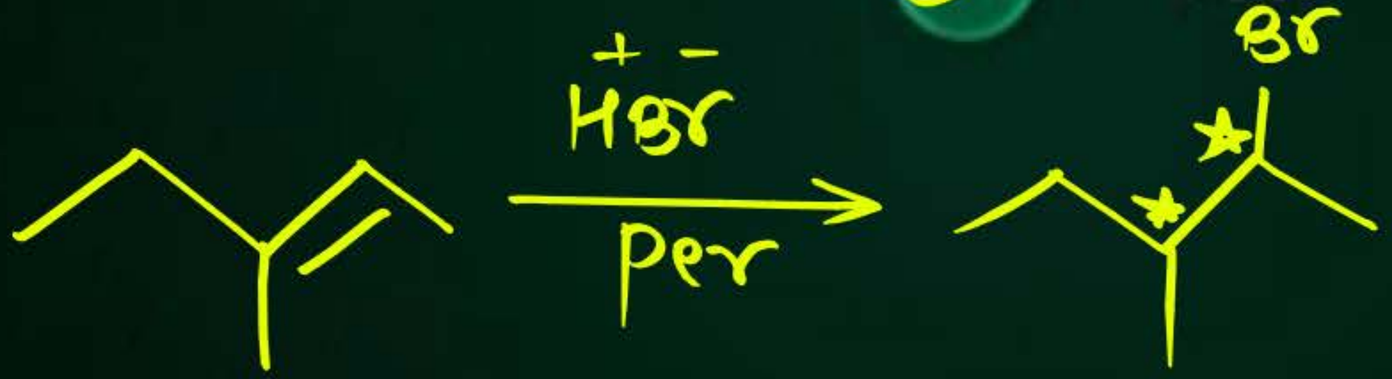
$CH_2=CH-CH_2-Cl$

QUESTION 08

3-methyl-pent-2-ene on reaction with HBr in presence of peroxide forms an addition product. The number of possible stereoisomers for the product is:

- **A** Six
- **B** Zero
- **C** Two
- [✓ **D**] Four

(Antimar)



$2^2 = \boxed{4}$

QUESTION 09

The reagent used to get alkyl halide from alcohol:

(A) PCl_5

(B) $SOCl_2$

[✓ (C) Both (A) and (B)]

(D) Cl_2

QUESTION 10

$SOCl_2$

When ethyl alcohol ($C_2H_5\boxed{OH}$) reacts with thionyl chloride, the product obtained is:

Ⓐ $CH_3CH_2Cl + HBr$

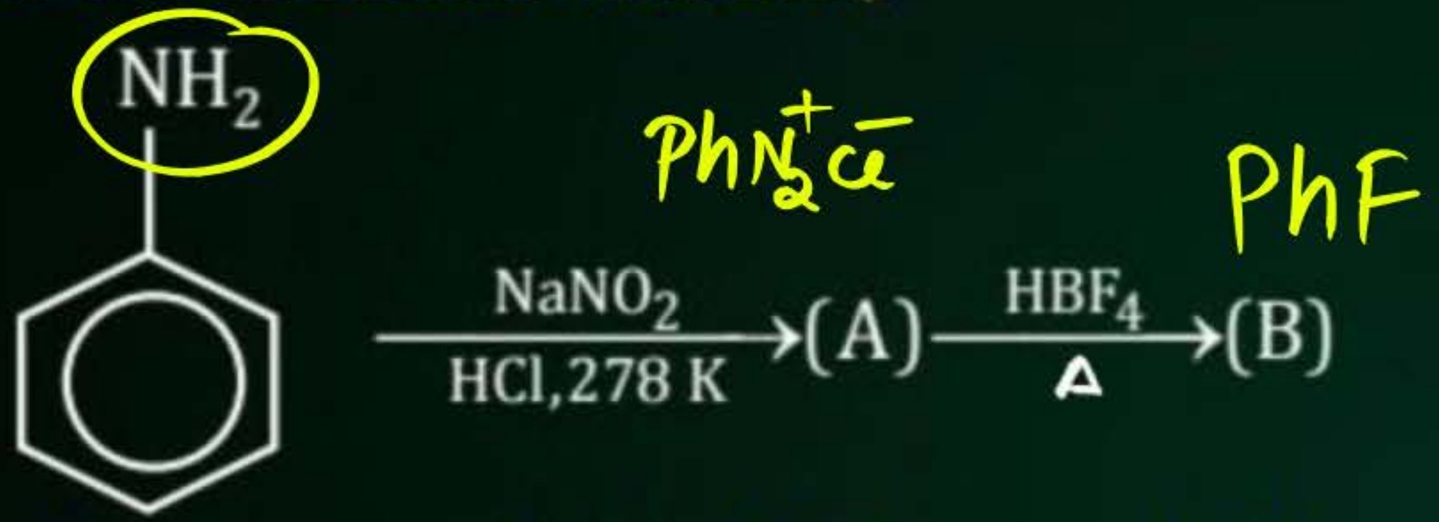
Ⓑ $C_2H_6 + HCl + SO_2$

Ⓒ $CH_3CH_2Cl + H_2O + SO_2$

✓ Ⓓ $CH_3CH_2Cl + \underbrace{HCl\uparrow + SO_2}\uparrow$

QUESTION 01

In the chemical reaction,



$\xrightarrow[\text{HCl, 278 K}]{\text{NaNO}_2} \text{(A)} \xrightarrow[\Delta]{\text{HBF}_4} \text{(B)}$

$PhN_2^+\bar{Cl}$

PhF

The compounds A and B respectively are:

A Nitrobenzene and chlorobenzene

B Nitrobenzene and fluorobenzene

[✓ **C** Benzene diazonium chloride and fluorobenzene]

D Phenol and benzene

QUESTION 02

The following is an example of Sandmeyer reaction

[✓ A] $C_6H_5N_2^+Cl^- \xrightarrow{\overset{+1}{Cu}Cl/HCl} C_6H_5Cl$

B $C_6H_5N_2^+Cl^- \xrightarrow{H_2O/\Delta} C_6H_5OH$

C $C_6H_5N_2^+Cl^- \xrightarrow[\Delta]{HBF_4} C_6H_5F$

D $C_6H_5N_2^+Cl^- \xrightarrow{KI/warm} C_6H_5I$

QUESTION 03

A direct iodination of benzene is not possible because

(A) Iodine is oxidizing agent.

(B) The product C_6H_5I is reduced to C_6H_6 by HI ✓ Red agent

(C) HI is unstable.

(D) Ring is deactivated.

QUESTION 04

Preparation of aryl halide by Benzene diazonium chloride and HBF_4 is called

Ⓐ Sandmeyer reaction

Ⓑ Gattermann reaction

[✓ Ⓒ Schiemann reaction]

Ⓓ Friedal Craft reaction

QUESTION 05

Chlorobenzene can be prepared by reacting benzene diazonium chloride with

A HCl

[✓ B Cu_2Cl_2/HCl]

C $Cl_2/AlCl_3$

D HNO_2

QUESTION 06

Chlorobenzene can be prepared by reacting aniline with:

$\hookrightarrow PhN_2^+Cl^- \xrightarrow[HCl]{Cu_2Cl_2} Ph-Cl$

A HCl and Cu_2Cl_2

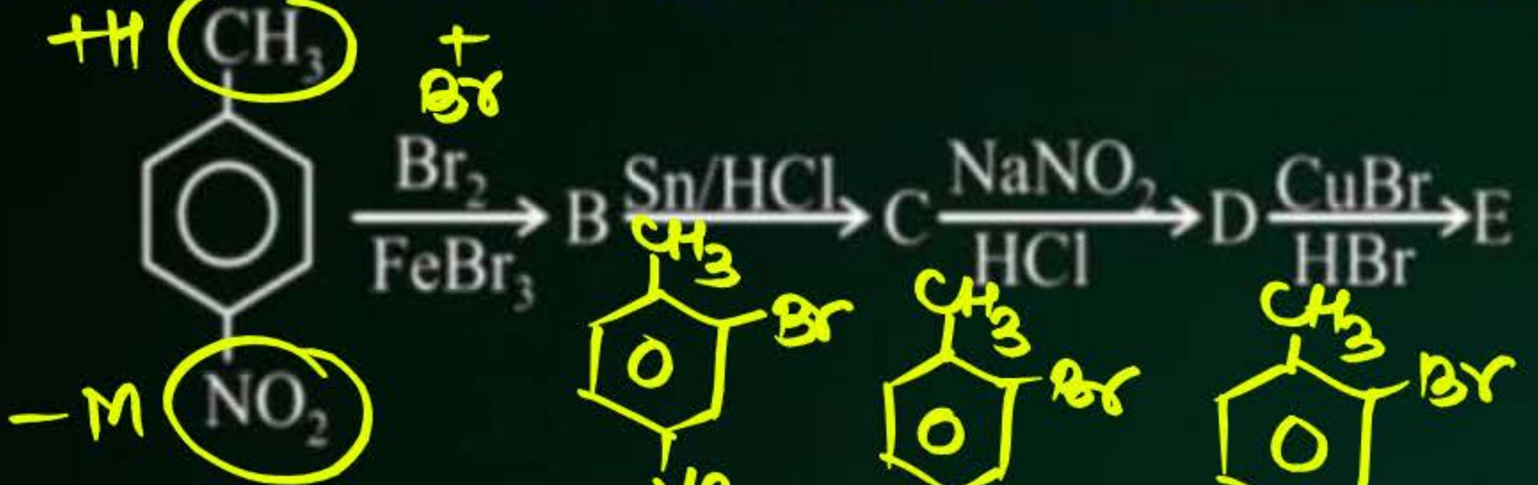
B chlorine in presence of U.V. light

C chlorine in presence of anhydrous $AlCl_3$

[✓ D nitrous acid followed by heating with Cu_2Cl_2/HCl]

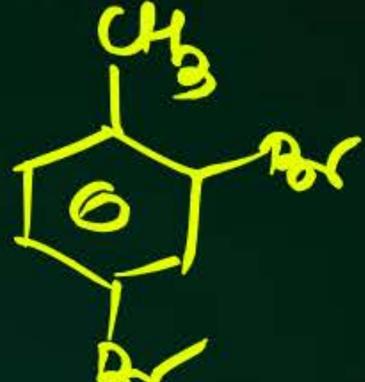
QUESTION 07

In a set of reactions p-nitrotoluene yielded a product E. The product E would be:

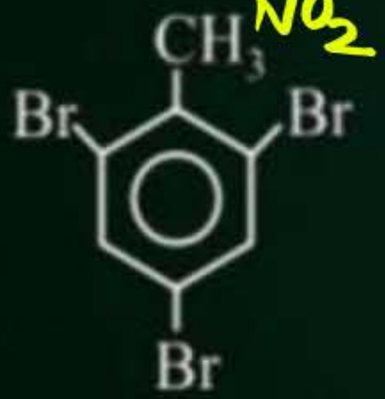


$$\xrightarrow[FeBr_3]{Br_2} B \xrightarrow{Sn/HCl} C \xrightarrow[HCl]{NaNO_2} D \xrightarrow[HBr]{CuBr} E$$

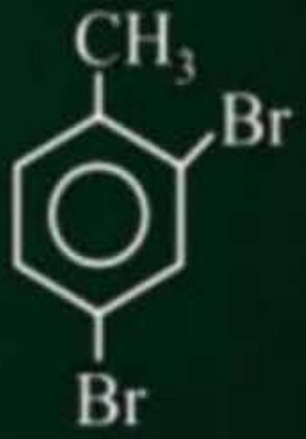
+H
CH3
−M
NO2
Br+
CH3
Br
NO2
CH3
Br
NH2
CH3
Br
N2+Cl−



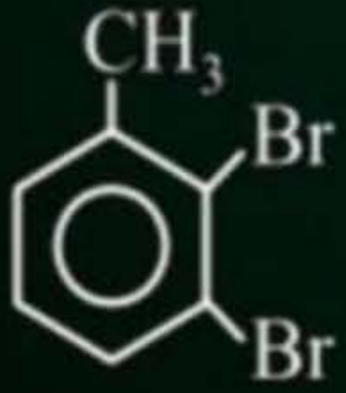
A



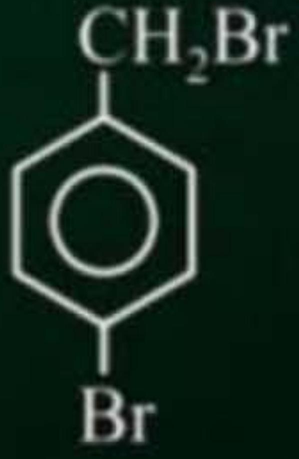
B ✓



C



D



QUESTION 08

Which of the following halogens can be introduced into the benzene ring via diazonium salts?

Ⓐ F

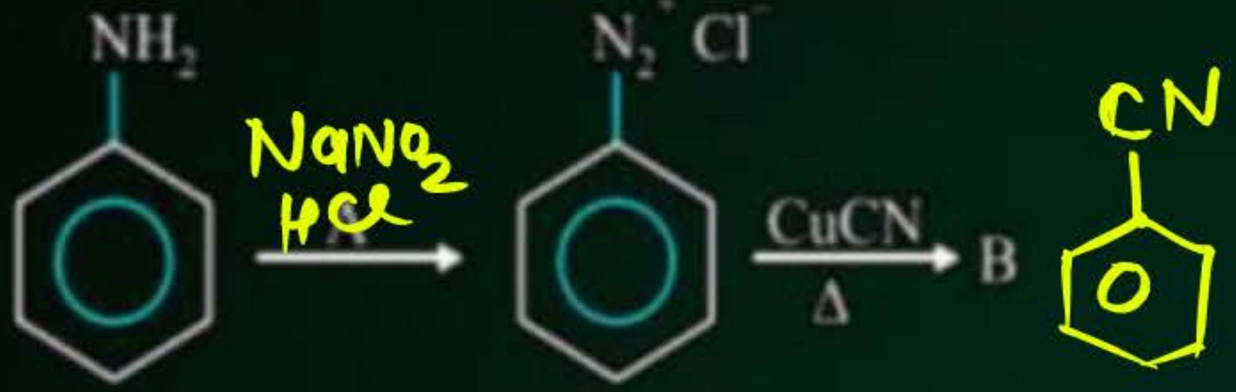
Ⓑ Cl

Ⓒ Br

[✓ Ⓓ All of these]

QUESTION 09

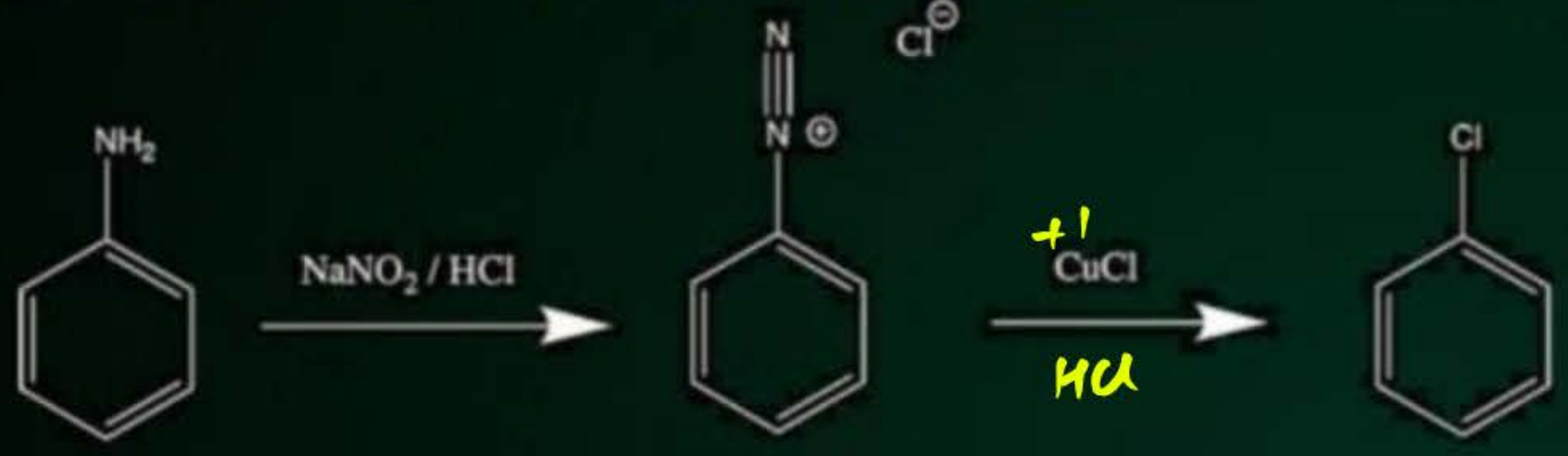
A and B are respectively:


NH$_2$
NaNO$_2$
HCl
$N_2^+Cl^-$
CuCN
Δ
B
CN

- A Phenol and methyl nitrile
- B HNO_3 and benzonitrile
- [✓ C] $NaNO_2/HCl$ and benzonitrile
- D HNO_2 and methyl cyanide

QUESTION 10

Name of the following reaction is:



NH_2
$NaNO_2$ / HCl
N
N⊕
$Cl^{\ominus}$
+1
CuCl
HCl
Cl

- A Wurtz reaction
- B [✓ Sandmeyer reaction]
- C Gattermann reaction
- D Friedel Crafts reaction

ANSWER KEY

1. C
2. A
3. B
4. C
5. B
6. D
7. B
8. D
9. C
10. B

QUESTION 01

Assertion: S_N1 reaction is carried out in the presence of a polar ✓ protic solvent.
Reason: A polar protic solvent increases the stability of carbocation due ✓ to solvation.

[✓ **A**] Both Assertion and Reason are correct and Reason is the correct explanation for Assertion.

B Both Assertion and Reason are correct but Reason is not the correct explanation for Assertion.

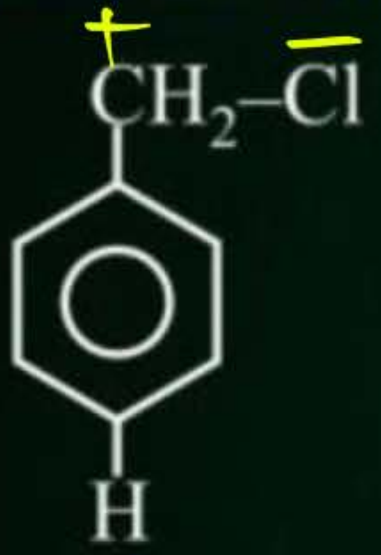
C Assertion is correct but Reason is incorrect.

D Assertion is incorrect but Reason are correct.

QUESTION 02

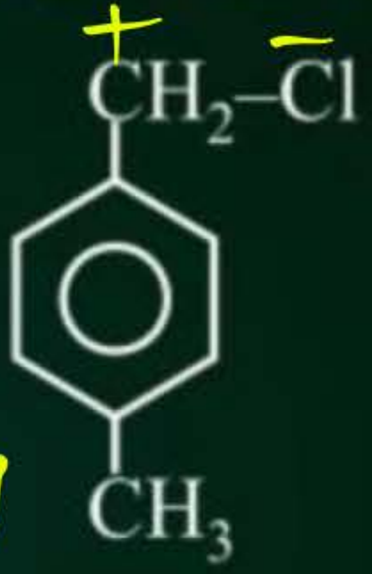
Which of the following is most reactive toward S_N1 reaction?

A



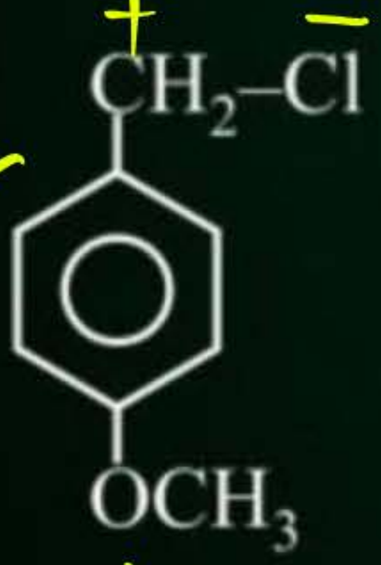
C > B > A > D

B



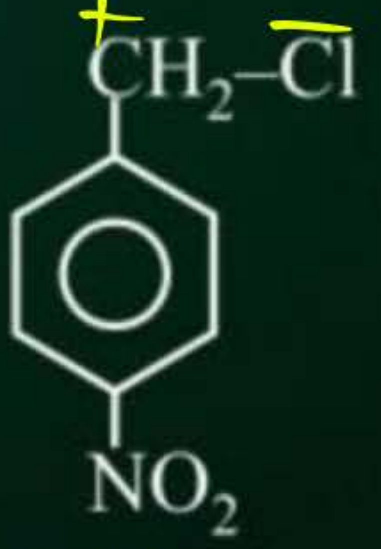
+H

C ✓



+M

D



−M

QUESTION 03

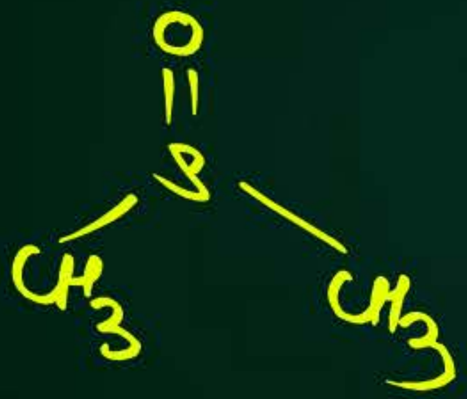
The rate of S_N2 reaction is maximum when the solvent is:

PAS

A methyl alcohol CH_3OH PPS

B water H_2O PPS

[✓ **C**] dimethyl sulphoxide



D benzene

nonpolar

QUESTION 04

For reaction $CH_3Br + OH^- \xrightarrow{SN^{2}} CH_3OH + Br^-$
the rate of reaction is given by the expression:

(A) Rate = $k[CH_3Br]$

(B) Rate = $k[OH^-]$

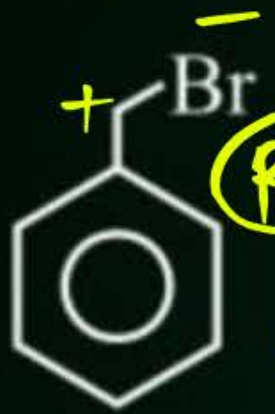
(C) Rate = $k[CH_3Br][OH^-]$ ✓

(D) Rate = $k[CH_3Br][H_2O]$

QUESTION 05

Which of the following cannot give S_N1 reaction easily?

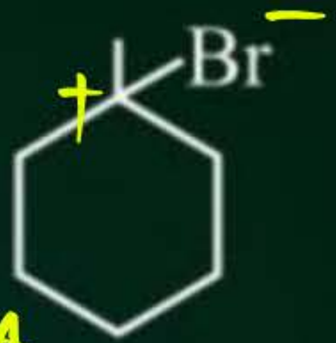
A



Reso

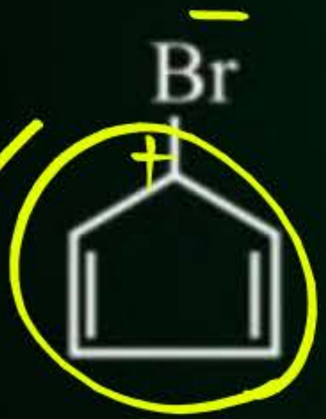
A

B



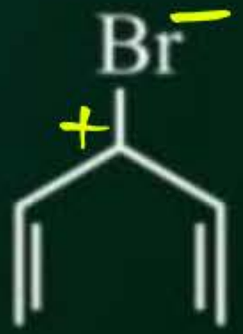
NA

C ✓



AA

D



NA

QUESTION 06

In S_N2 reaction the order of reactivity of the halides. CH_3X, C_2H_5X, n-C_3H_7X, n-C_4H_9X is:

A $CH_3X > C_2H_5X >$ n-$C_3H_7X >$ n-C_4H_9X ✓

B $C_2H_5X >$ n-$C_3H_7X >$ n-$C_4H_9X > CH_3X$

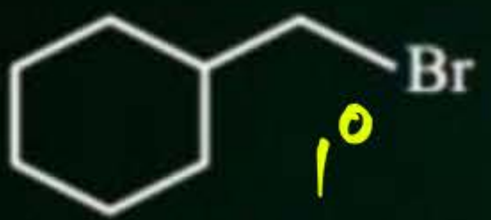
C $C_2H_5X >$ n-$C_3H_7X >$ n-$C_4H_9X < CH_3X$

D n-$C_4H_9X >$ n-$C_3H_7X > C_2H_5X > CH_3X$

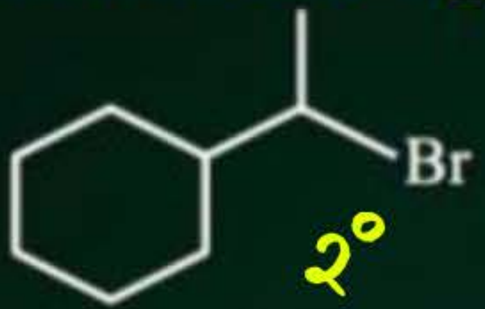
No. of C ↑ S.H ↑ ROR in S_N^2 ↓

QUESTION 07

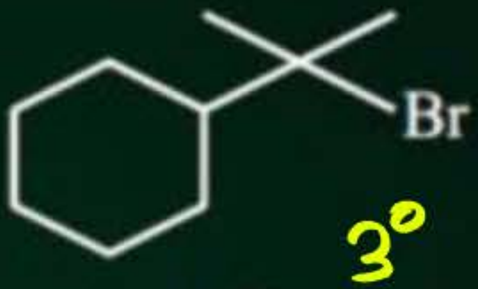
Arrange the following in decreasing order of S_N2:



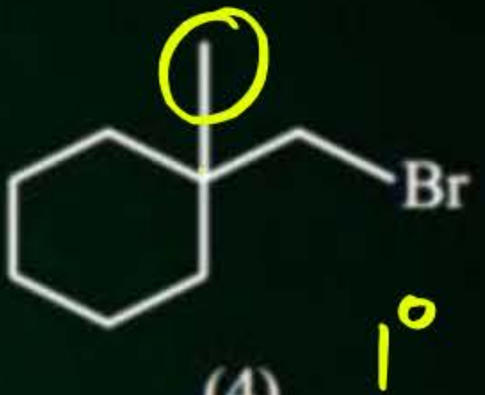
(1)



(2)



(3)



(4)

[✓ A] 1 > 4 > 2 > 3

B 1 > 4 > 3 > 2

1 > 4 > 2 > 3

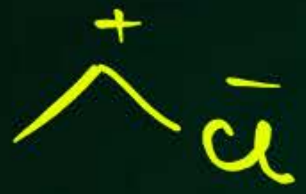
C 1 > 2 > 4 > 3

D 1 > 3 > 4 > 2

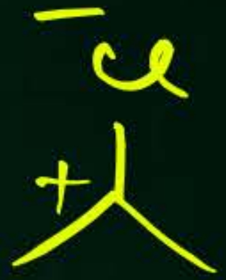
QUESTION 08

Which of the following undergoes nucleophilic substitution exclusively by S_N1 mechanism?

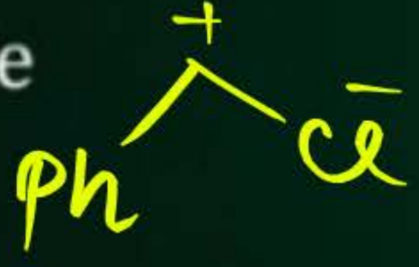
(A) Ethyl chloride



(B) Isopropyl chloride

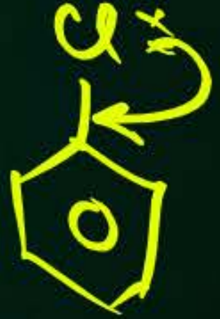


[✓ (C)] Benzyl chloride



Reso

(D) Chlorobenzene



QUESTION 09

The order of reactivities of the following alkyl halides for a S_N2 reaction is:

or
S_N1

A $RF > RCl > RBr > RI$

B $RCl > RBr > RF > RI$

C $RF > RBr > RCl > RI$

[✓ **D** $RI > RBr > RCl > RF$]

QUESTION 10

The correct order of reactivity towards nucleophilic substitution reaction is:

A $CH_3F > CH_3Cl > CH_3Br > CH_3I$

[✓ B $CH_3I > CH_3Br > CH_3Cl > CH_3F$]

C $CH_3I > CH_3Cl > CH_3Br > CH_3F$

D $CH_3I > CH_3Br > CH_3F > CH_3Cl$

ANSWER KEY

1. A
2. C
3. C
4. C
5. C
6. A
7. A
8. C
9. D
10. B

QUESTION 01

Alkyl halides can be converted into Grignard reagents by ____.

A Boiling them with Mg ribbon in alcoholic solution

[✓ B] Warming them with magnesium powder in dry ether

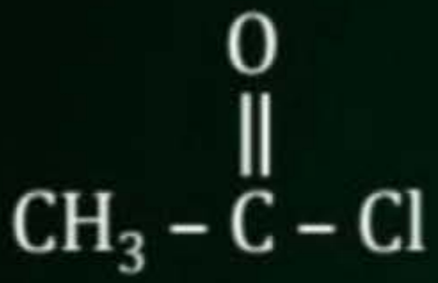
C Refluxing them with $MgCl_2$ solution

D Warming them with $MgCl_2$

QUESTION 02

Which of the following compounds will give acid base reaction with RMgX?

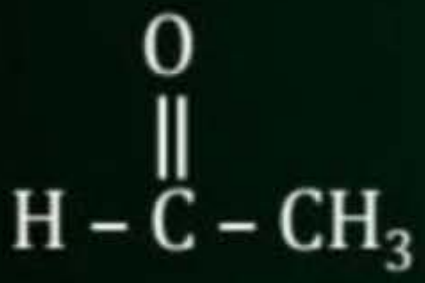
$\overset{+}{H}-\overset{-}{O}-H$

A 

$CH_3-\overset{\overset{\displaystyle O}{\|}}{C}-Cl$

B [✓ H_2S]

$\overset{+}{H}-\overset{-}{S}-H$

C 

$H-\overset{\overset{\displaystyle O}{\|}}{C}-CH_3$

D None of these

QUESTION 03

For preparation of Grignard reagent from haloalkanes which metal is used:

Ⓐ Na

Ⓑ [✓ Mg]

Ⓒ Ca

Ⓓ Ag

QUESTION 04

Which of the following compounds will form hydrocarbon on reaction with Grignard reagent?

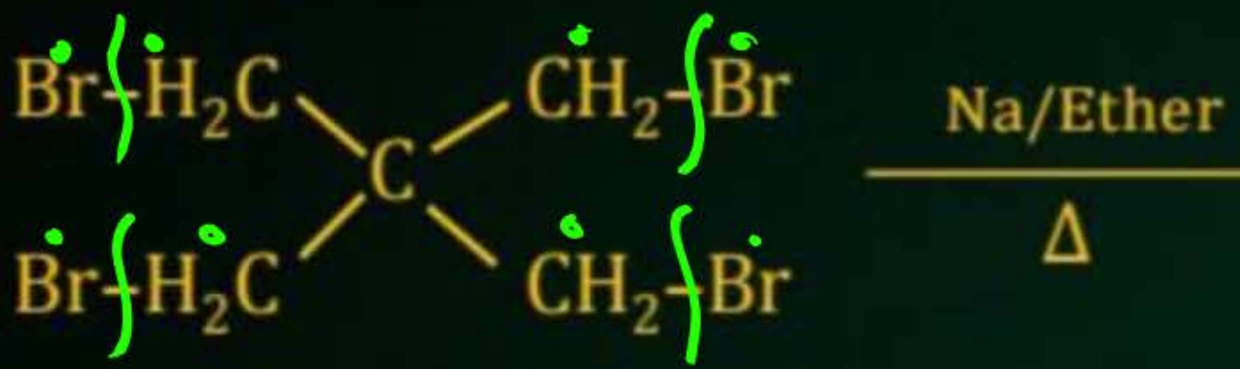
[✓ A] $CH_3CH_2OH^{+}$

B CH_3CHO

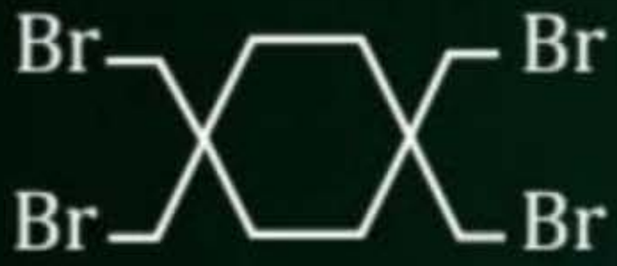
C CH_3COCH_3

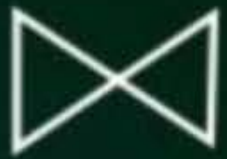
D $CH_3CO_2CH_3$

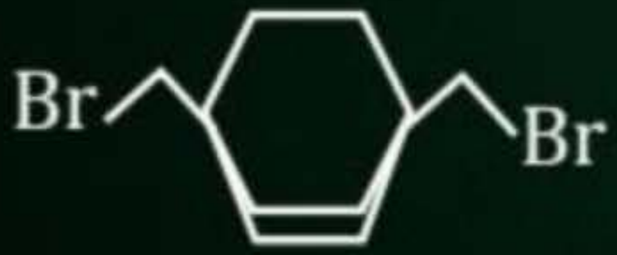
QUESTION 05

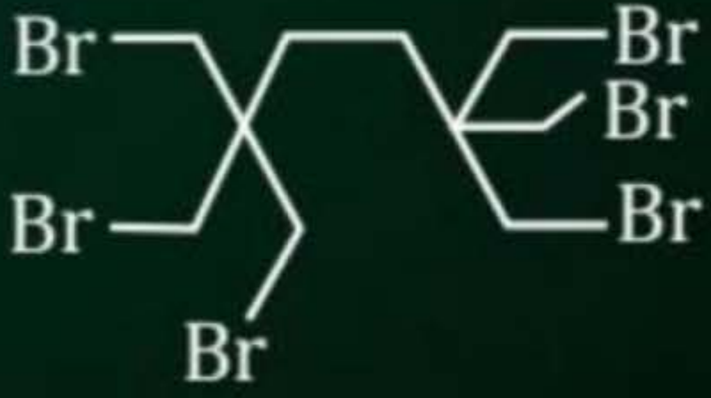


Major Product:

A


[✓ B]


C


D


QUESTION 06

Which of the following reactions is an example of nucleophilic substitution reaction?

A $RX + Mg \longrightarrow RMgX$

[✓ **B**] $R\underline{X} + KOH \longrightarrow R\underline{OH} + KX$

C $2RX + 2Na \longrightarrow R{-}R + 2NaX$

D $RX + H_2 \longrightarrow RH + HX$

QUESTION 07

Which one is an organometallic compound?

(A) C_2H_5ONa

(B) C_2H_5SNa

[✓ (C)] $\underbrace{C_2H_5MgI}$

(D) All of these

QUESTION 08

$(CH_3)_3\overset{-}{C}MgCl$ on reaction with D_2O produces

$\overset{+}{D}-\overset{-}{O}D$

[✓ A] $(CH_3)_3CD$

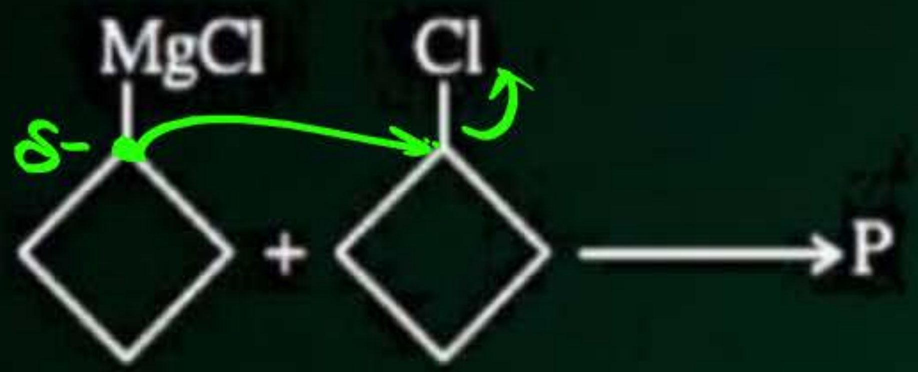
B $(CH_3)_3COD$

C $(CD)_3CD$

D $(CD)_3COD$

QUESTION 09

Product 'P' is:



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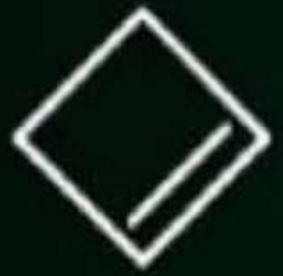
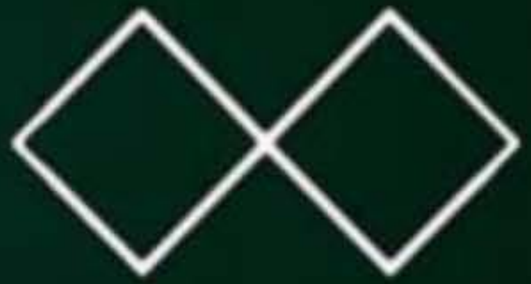
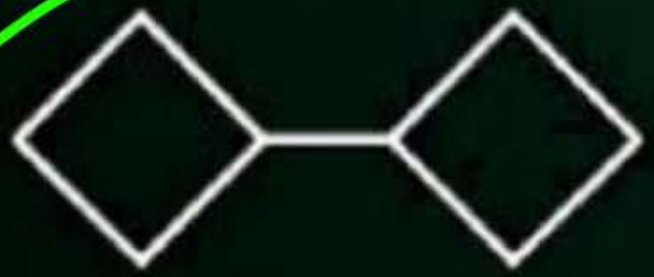
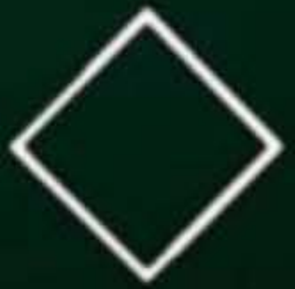


Ⓑ


Ⓒ


Ⓓ


QUESTION 10

In the reaction

$$\underset{\beta\ \ \alpha}{\mathrm{CH_3CH_2I}} \xrightarrow[E_2]{Alc.KOH} \underset{CH_2=CH_2}{\mathrm{X}} \xrightarrow{Br_2} \underset{\underset{Br}{\overset{|}{CH_2}}-CH_2-Br}{\mathrm{Y}} \xrightarrow{KCN\ (Excess)} \mathrm{Z},\ \mathrm{Z\ is:}$$

$$\begin{array}{l} CH_2-CN \\ | \\ CH_2-CN \end{array}$$

A $\mathrm{CH_3CH_2CN}$

B ✓ $\mathrm{CNCH_2CH_2CN}$

$\overset{|}{CN}$

C $\mathrm{BrCH_2CH_2CN}$

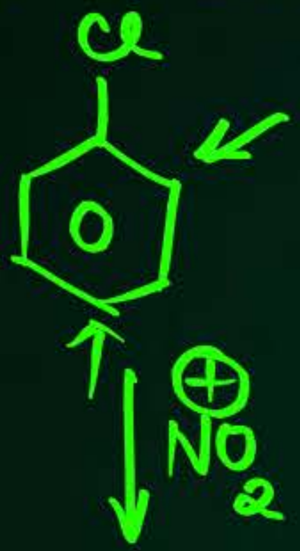
D $\mathrm{BrCH = CHCN}$

ANSWER KEY

1. B
2. B
3. B
4. A
5. B
6. B
7. C
8. A
9. C
10. B

QUESTION 01

Nitration of chlorobenzene takes place at



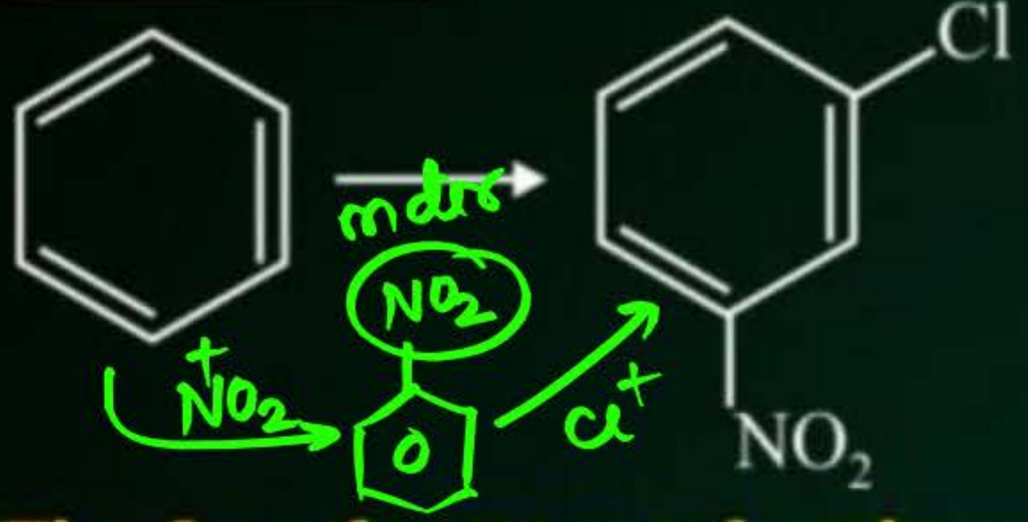
A o-Position

B m-Position

C p-Position

[✓ D] Both o-and p-positions

QUESTION 02


Cl
NO_2
meta
NO_2
$\overset{+}{N}O_2$
Cl^+

The Set of reagents for above conversion is:

[✓ **A**] (i) $\text{Conc}\cdot HNO_3 + \text{conc}\cdot H_2SO_4$
(ii) Cl_2, sunlight

B (i) Cl_2, Fe, dark
(ii) $\text{Conc}\cdot HNO_3 + \text{conc}\cdot H_2SO_4$

[✓ **C**] (i) $\text{Conc}\cdot HNO_3 + \text{conc}\cdot H_2SO_4$
(ii) Cl_2/Fe/dark

D (i) HNO_2
(ii) Cu/HCl

QUESTION 03

In the following sequence of reactions, B is:

$$C_6H_6 \xrightarrow[FeCl_3]{\overset{Cl^+}{Cl_2}} \underset{Ph-Cl}{A} \xrightarrow{Na} \underset{Ph-Ph}{B}$$

Ⓐ chlorobenzene

Ⓑ benzyl chloride

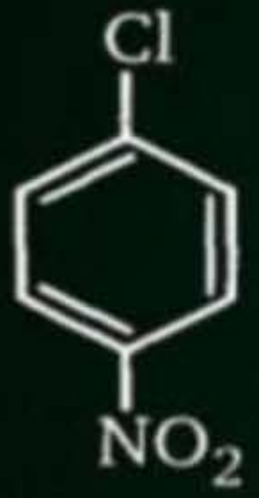
[✓ Ⓒ] diphenyl

Ⓓ chlorophenylmethane

QUESTION 04

Which one of the following undergoes nucleophilic aromatic substitution at the fastest rate?

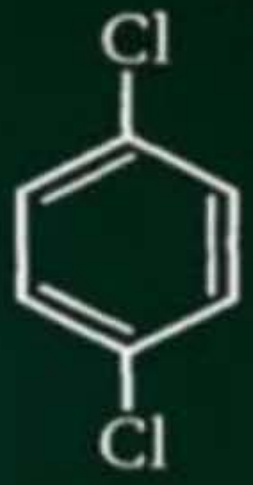
[✓ A]



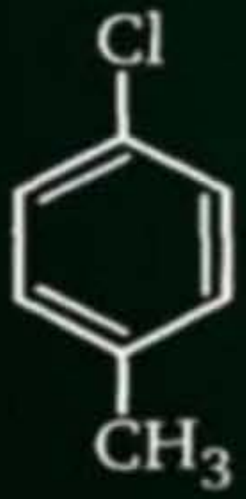
ewg $\propto$ RoR

ArS_N2

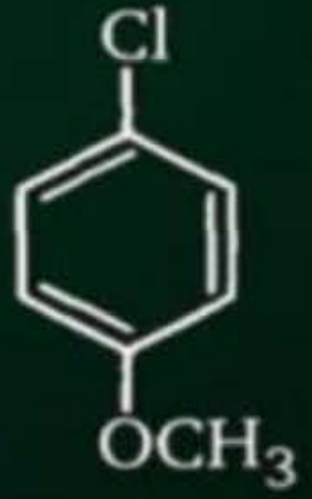
B



C

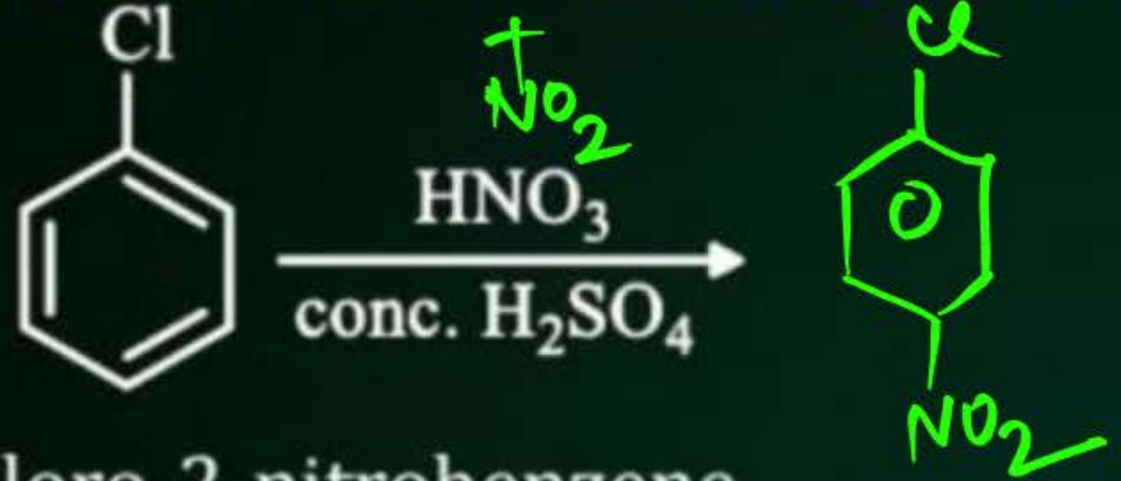


D



QUESTION 05

The major product formed in the given reaction is:



Cl
$\overset{+}{N}O_2$
HNO_3
conc. H_2SO_4
Cl
NO_2

A 1-Chloro-2-nitrobenzene

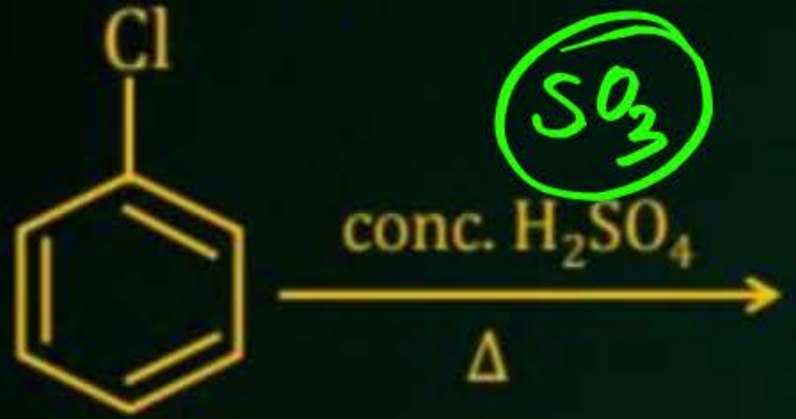
B [✓ 1-Chloro-4-nitrobenzene]

C 1-Chloro-3-nitrobenzene

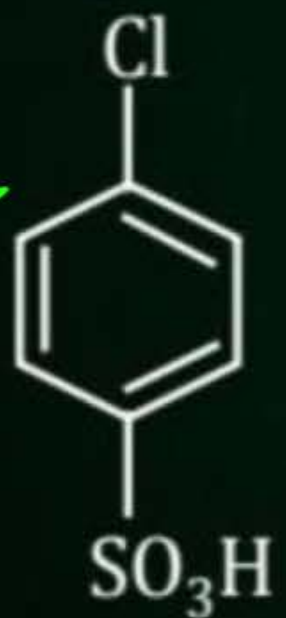
D 2, 4, 6-trinitrobenzene

QUESTION 06

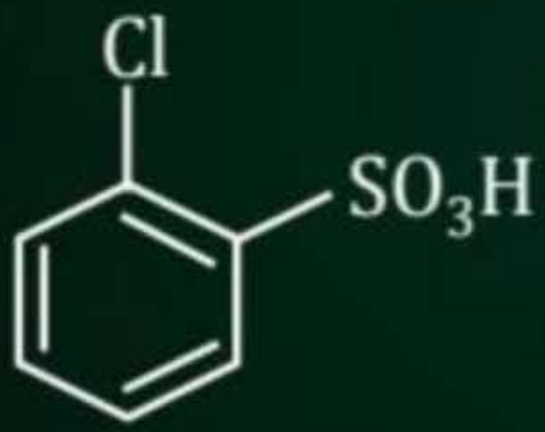
The major product obtained in the given reaction is:


Cl
SO_3
conc. H_2SO_4
Δ

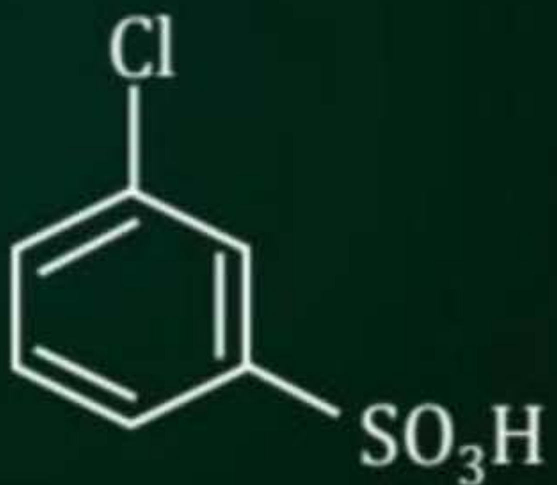
[✓ A]



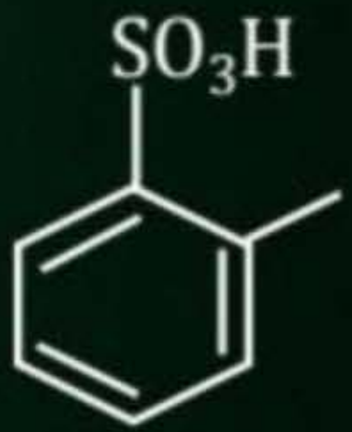
B



C



D



QUESTION 07

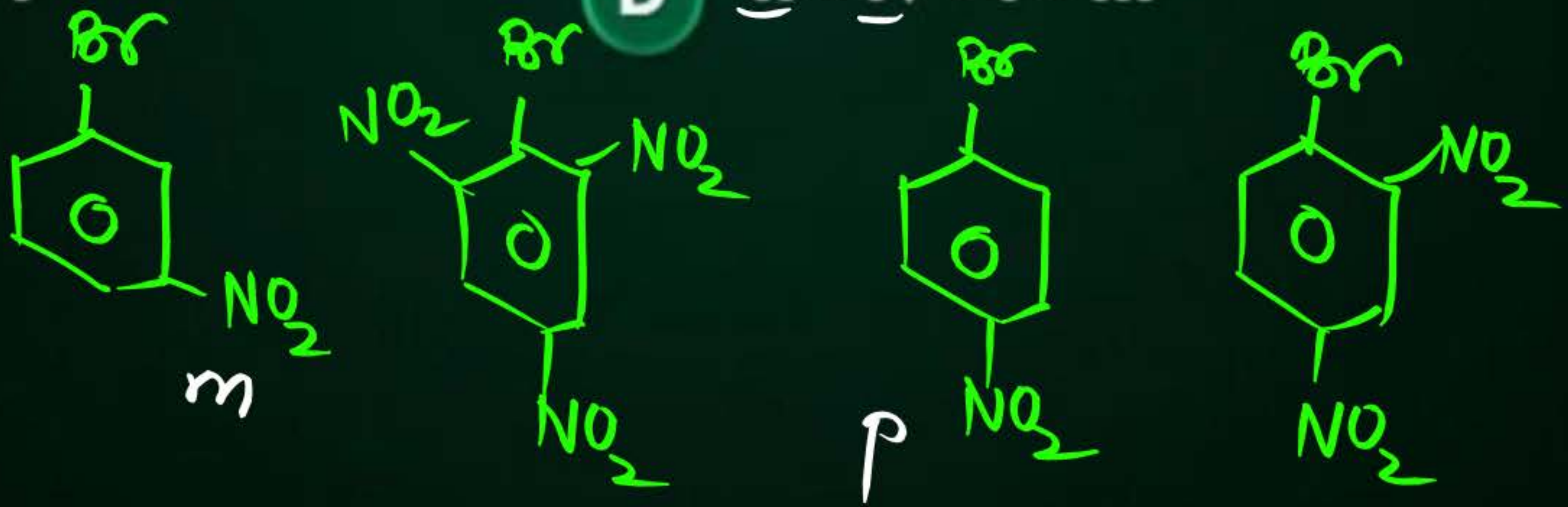
The decreasing order of reactivity of m-nitrobromobenzene (I) 2, 4, 6-trinitrobromobenzene (II) p-nitrobromobenzne (III) and 2, 4-dinitrobromobenzene (IV) towards OH^- ions is:

A) I > II > III > IV

[✓ B)] II > IV > III > I

C) IV > II > III > I

D) II > IV > I > III

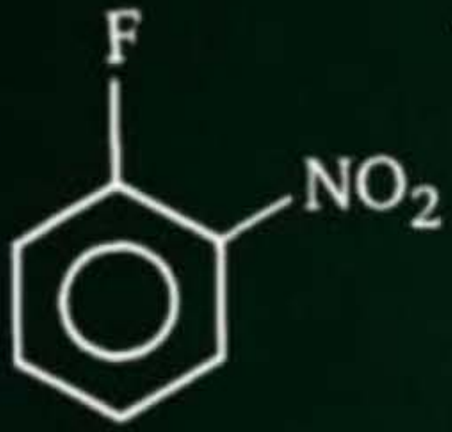

Br
NO_2
m
Br
NO_2
NO_2
NO_2
Br
p
NO_2
Br
NO_2
NO_2

QUESTION 08

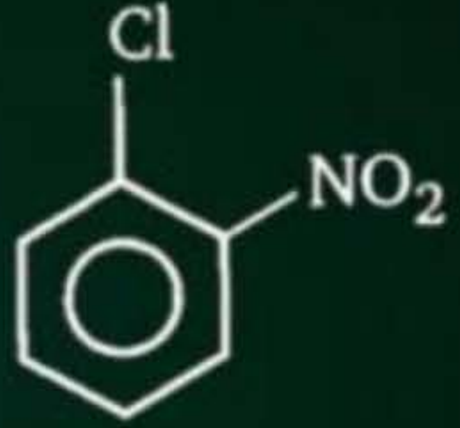
Which of the following 2-halo nitrobenzene is most reactive towards nucleophilic aromatic substitution?

$\underbrace{\text{RoR} \propto -I}$

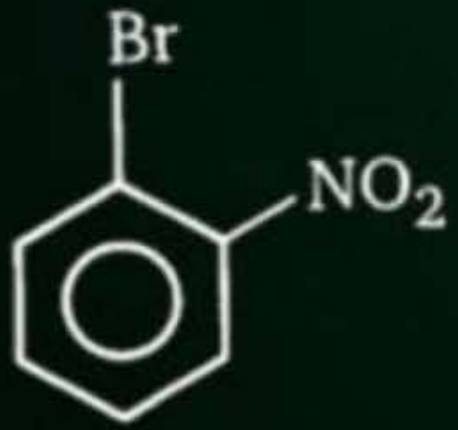
[✓ A]



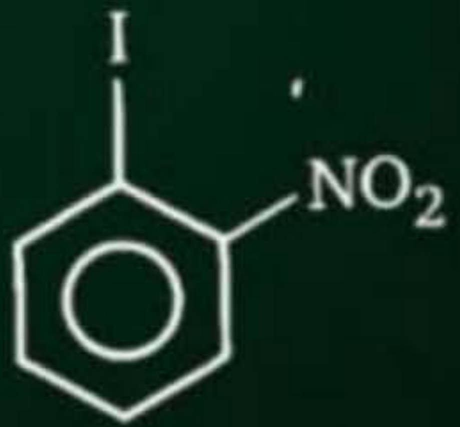
B



C



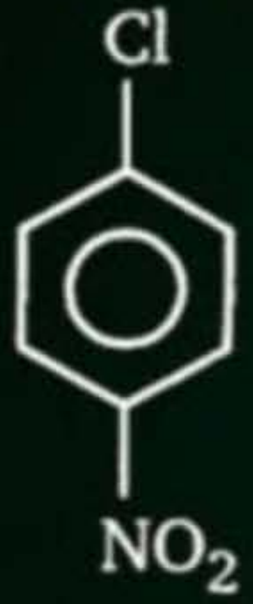
D



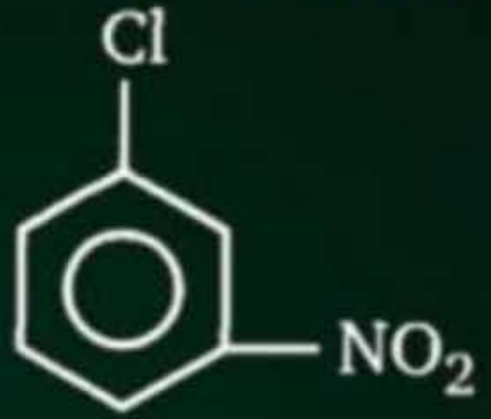
QUESTION 09

Which one of the following compounds is most reactive for ArS_{N^2} reaction?

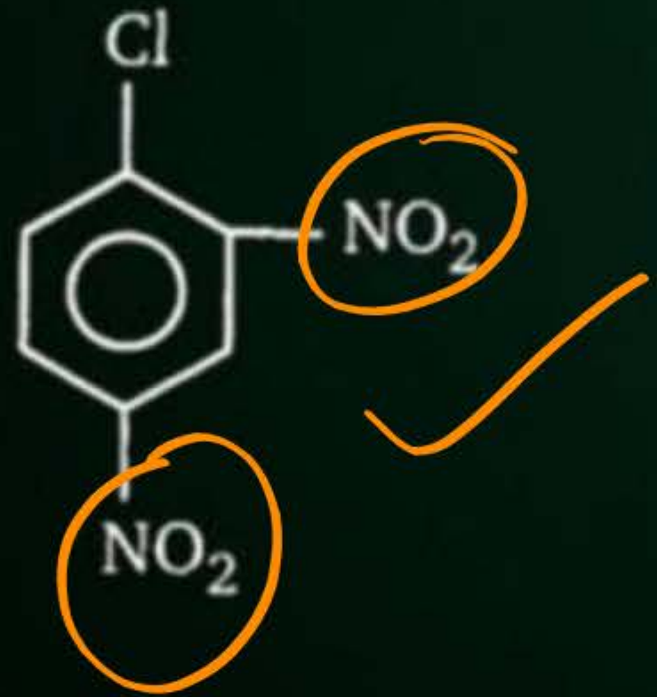
A



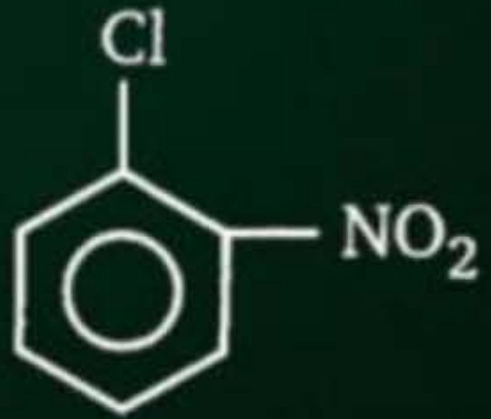
B



C



D



QUESTION 10

In the compound C_6H_5X which of the following is predominantly ortho/para directing?

(A) $X = \overset{-m}{-NO_2}, X = \overset{+M}{-Cl}, X = \overset{+M}{-OH}$

(B) $X = \overset{+M}{-OMe}, X = \overset{-M}{-CN}, X = \overset{+M}{-NH_2}$

(C) $X = \overset{+M}{-NHCOCH_3}, X = \overset{+M}{-Cl}, X = \overset{-M}{-CO_2H}$

[✓ (D)] $X = \overset{+M}{-NHCOCH_3}, X = \overset{+H}{-CH_3}, X = \overset{+M}{-Br}$

ANSWER KEY

1. D
2. C
3. C
4. A
5. B
6. A
7. B
8. A
9. C
10. D

Thank you!!

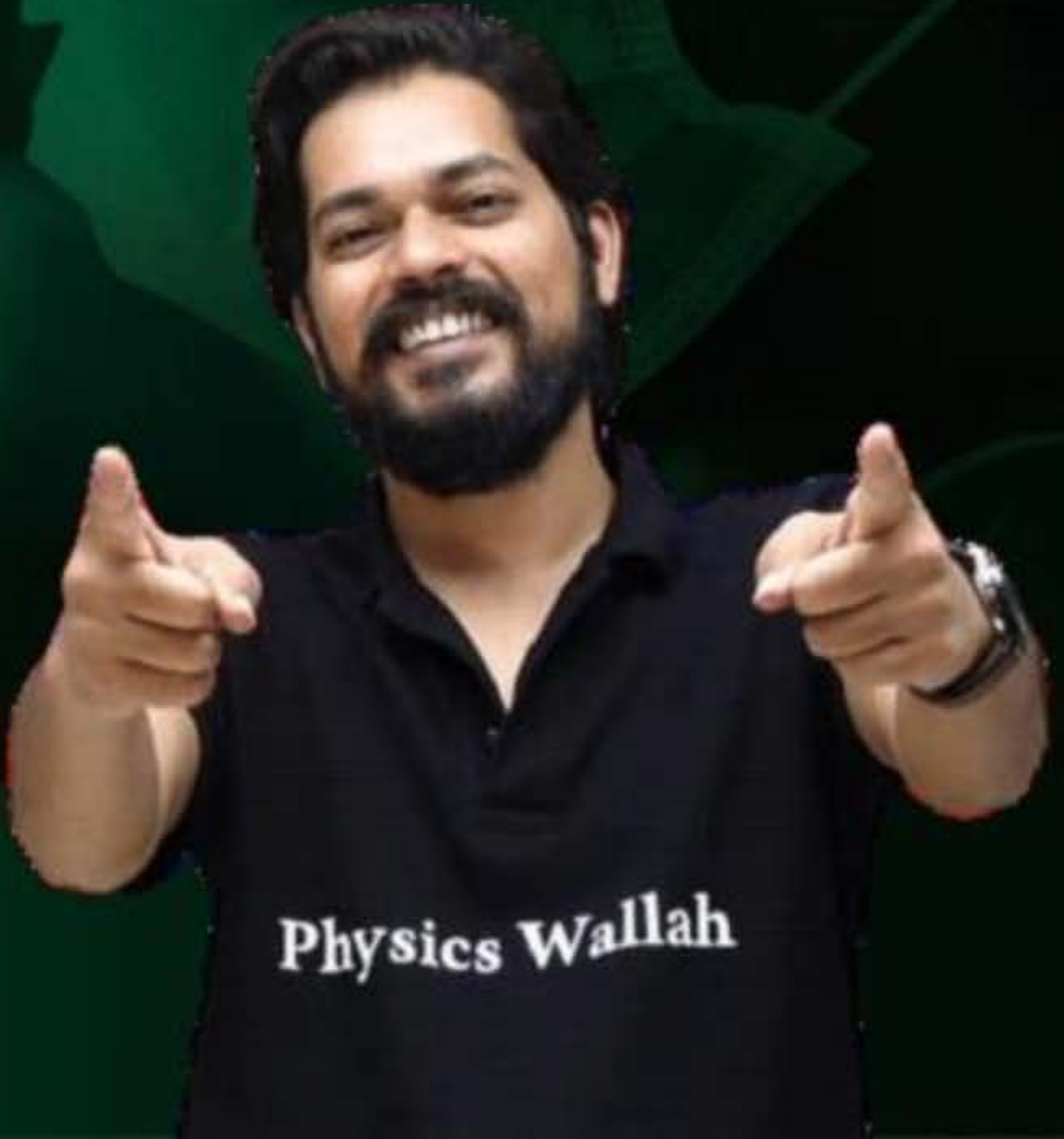
YAKEEN 2.0

FOR NEET 2025

Lecture- 08 | Organic Chemistry

Haloalkanes and Haloarenes

By- Pankaj Sir(POPU MAMA)


Physics Wallah

Topics *to be covered*

1. NEET/AIPMT & JEE Mains PYQs Discussion

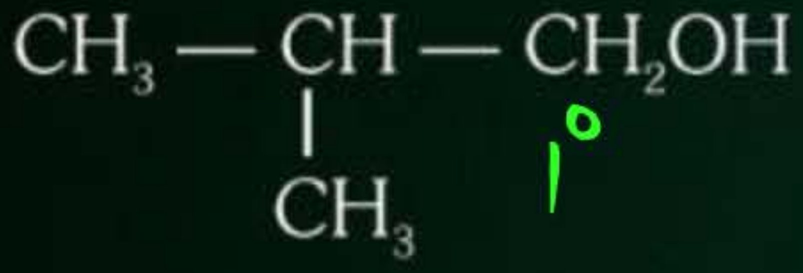
NEET/AIPMT PYQs

QUESTION [NEET 2024]

sec

Which one of the following alcohols reacts instantaneously with Lucas reagent?

Turant se pehle

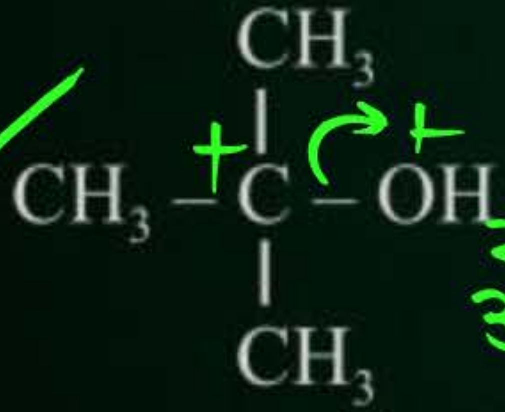
(A) 

$CH_3-CH(CH_3)-CH_2OH$

1°

(B) $CH_3-CH_2-CH_2-CH_2OH$

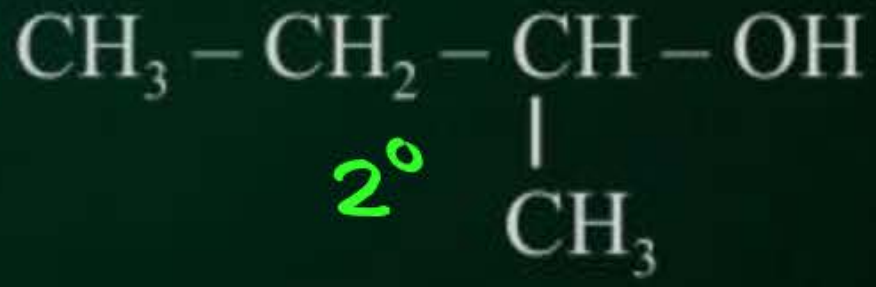
1°

(C) ✓ 

$CH_3-C(CH_3)_2-OH$

3°

9αH

(D) 

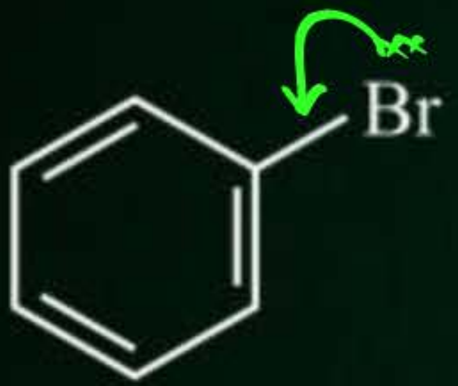
$CH_3-CH_2-CH(CH_3)-OH$

2°

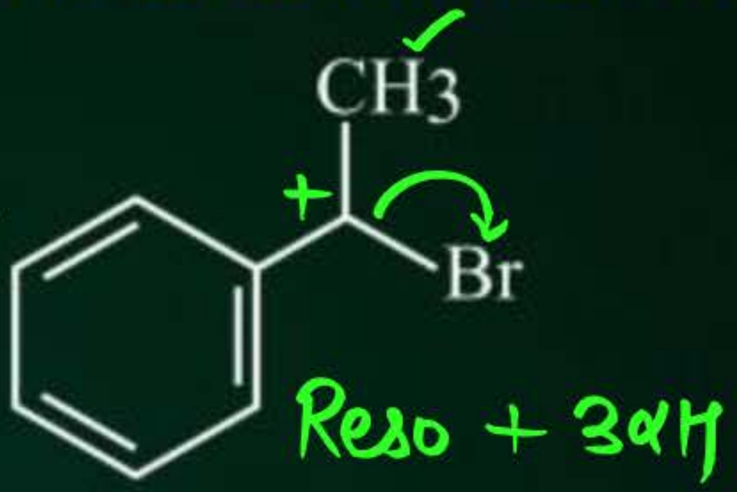
QUESTION [NEET 2024]

The compound that will undergo S_N1 reaction with the fastest rate is:

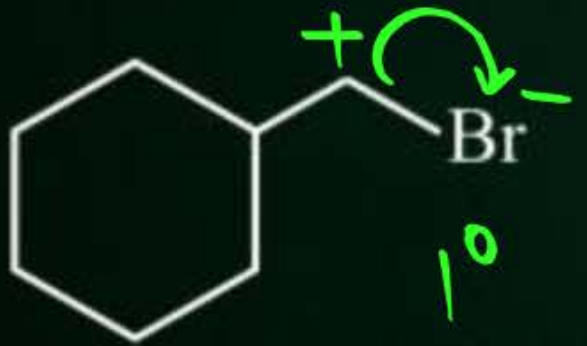
A



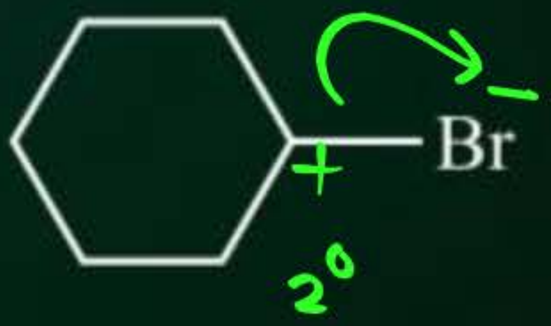
B ✓


CH3
+
Br
Reso + 3αH

C



D

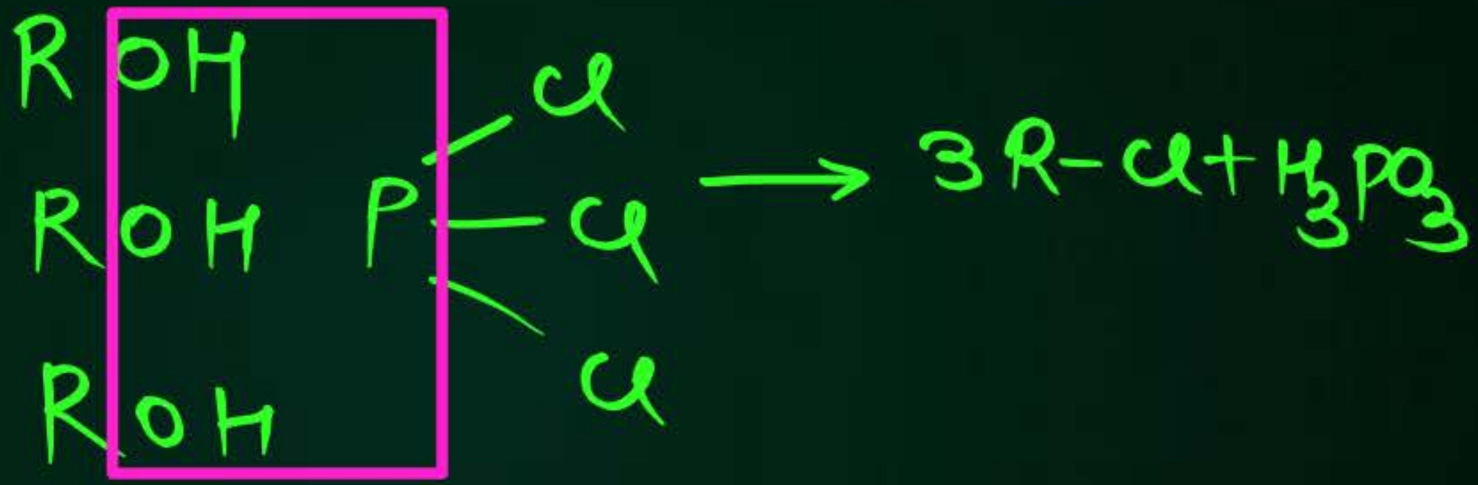


QUESTION [NEET 2024]

The products A and B obtained in the following reactions respectively are:

$3ROH + PCl_3 \rightarrow 3RCl + A$

$ROH + PCl_5 \rightarrow RCl + HCl + B$

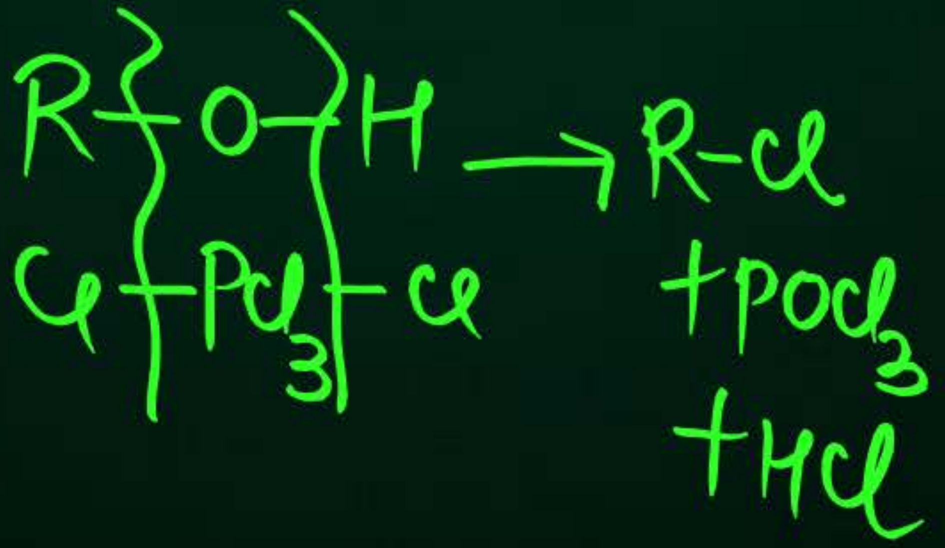

ROH
ROH
ROH
P
Cl
Cl
Cl
3R-Cl + H3PO3

A H_3PO_4 and $POCl_3$

[✓ **B**] H_3PO_3 and $POCl_3$

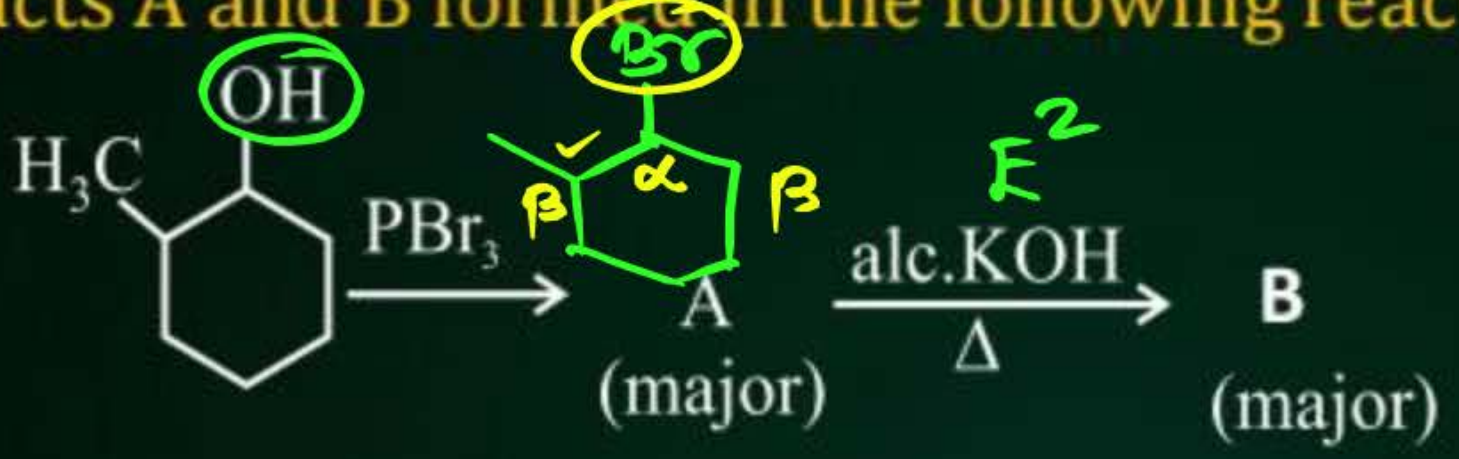
C $POCl_3$ and H_3PO_3

D $POCl_3$ and H_3PO_4


R-O-H
Cl-PCl3-Cl
R-Cl
+POCl3
+HCl

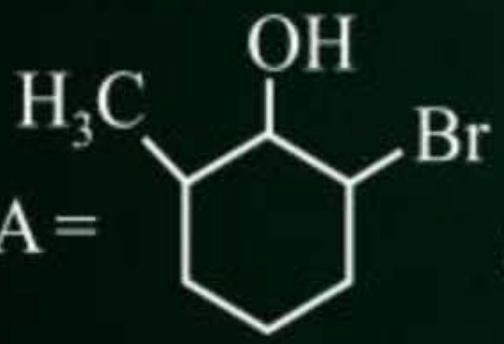
QUESTION [NEET 2024]

Major products A and B formed in the following reaction sequence are:

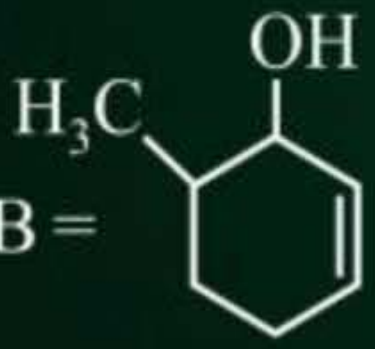


OH
H_3C
PBr_3
Br
β
α
β
A
(major)
E2
alc.KOH
Δ
B
(major)

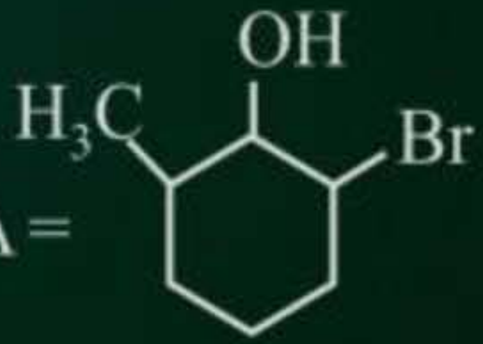
(A) A =



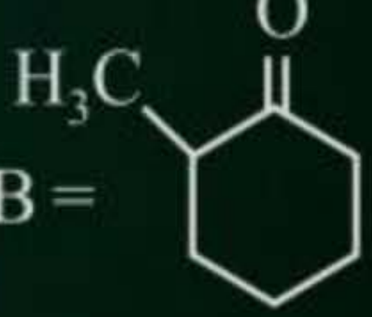
; B =



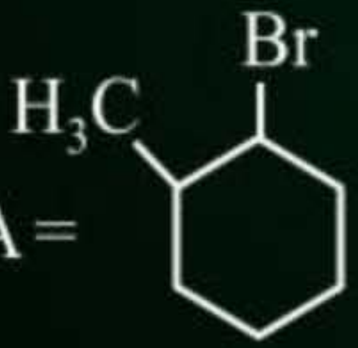
(B) A =



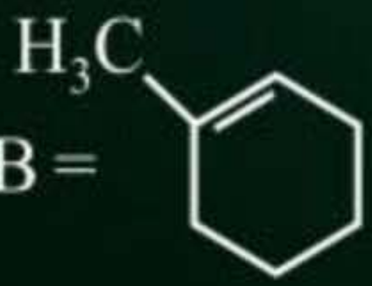
; B =



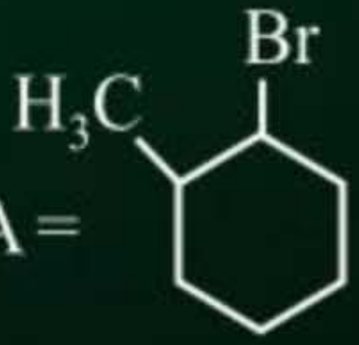
[✓ (C)] A =



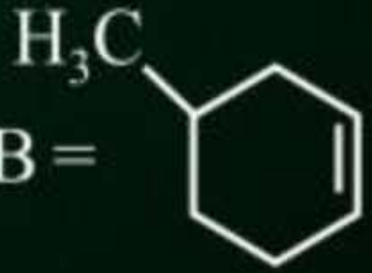
; B =



(D) A =



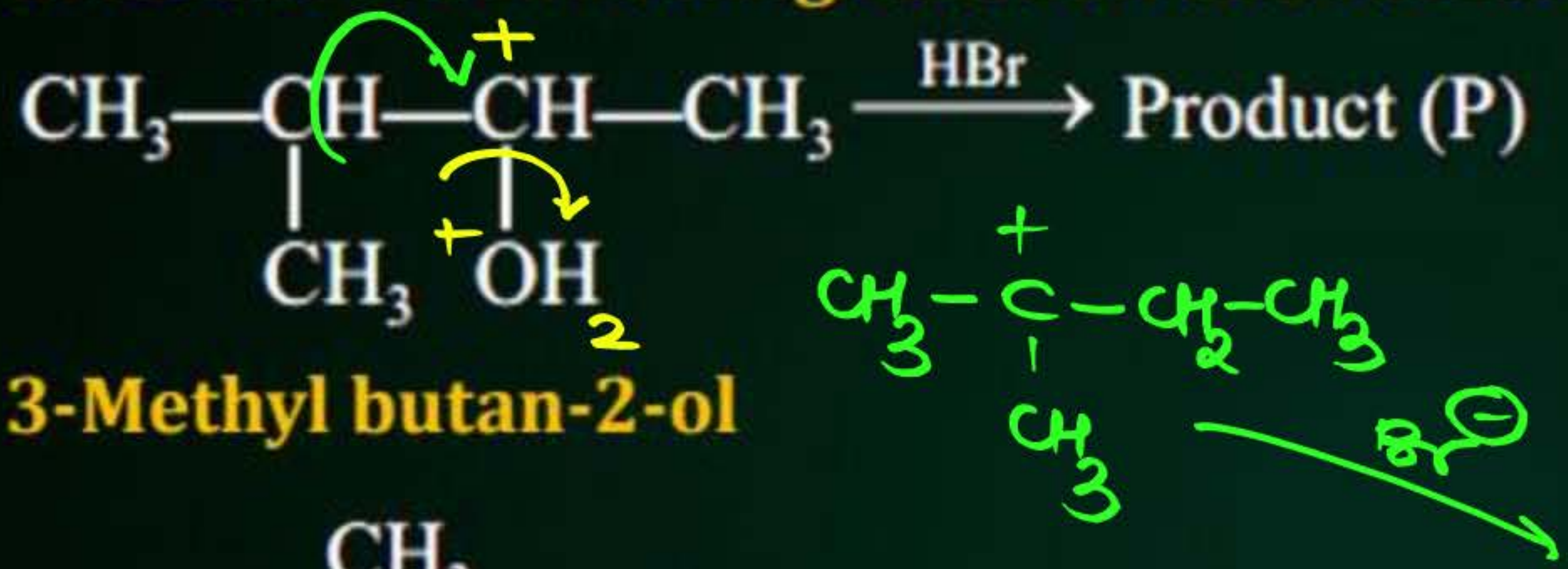
; B =



QUESTION [NEET 2023]

HX
1° cat (must)
2° cat / No cat
3° No cat

Consider the following reaction and identify the product (P).



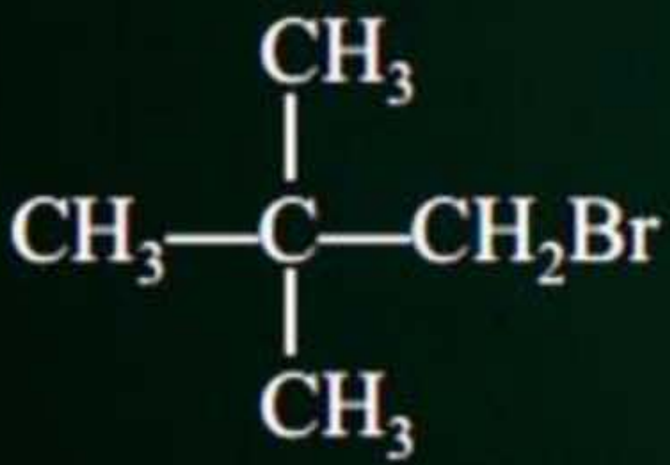
$CH_3-\underset{CH_3}{CH}-\underset{OH}{CH}-CH_3 \xrightarrow{HBr}$ Product (P)

$\overset{+}{O}H_2$

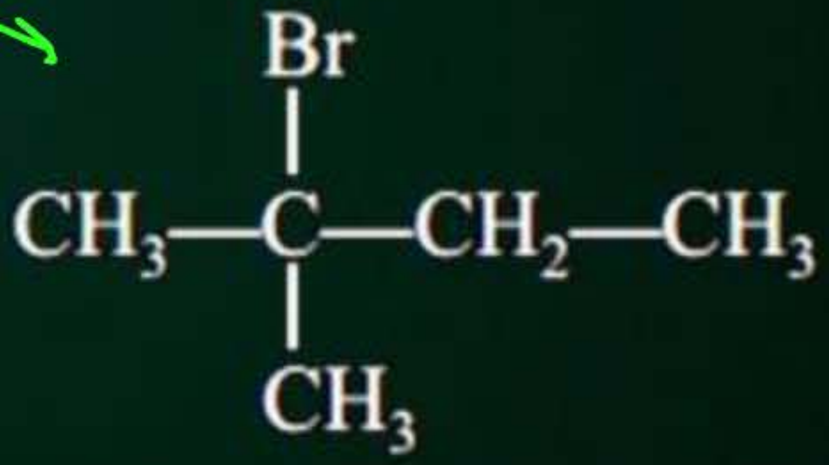
$CH_3-\underset{CH_3}{\overset{+}{C}}-CH_2-CH_3$

$Br^{\ominus}$

3-Methyl butan-2-ol

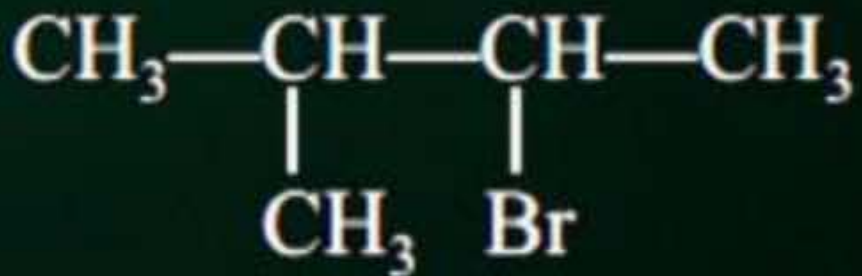
A 

$CH_3-\underset{CH_3}{\overset{CH_3}{C}}-CH_2Br$

B ✓ 

$CH_3-\underset{CH_3}{\overset{Br}{C}}-CH_2-CH_3$

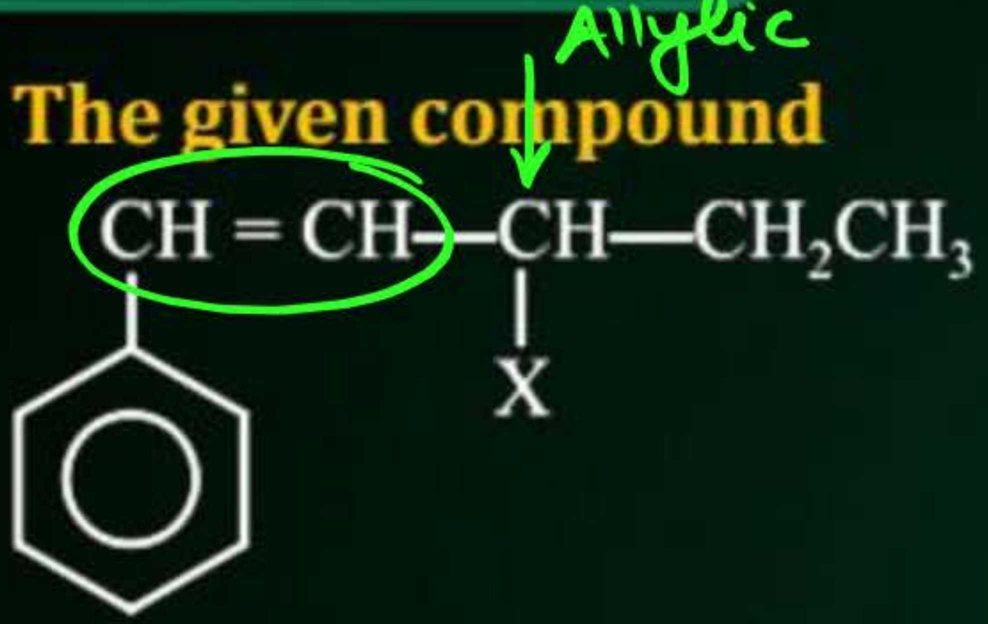
C $CH_3CH=CH-CH_3$

D 

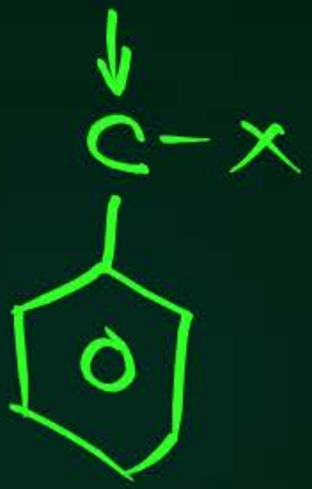
$CH_3-\underset{CH_3}{CH}-\underset{Br}{CH}-CH_3$

QUESTION [NEET 2023]

The given compound



is an example of ________.



- **A** Vinylic halide $CH_2=CH-X$
- **B** Benzylic halide
- **C** Aryl halide $Ph-X$
- [✓ **D**] Allylic halide

QUESTION [NEET 2022]

The incorrect statement regarding chirality is:

Ⓐ A racemic mixture shows zero optical rotation.

Ⓑ S_N1 reaction yields 1 : 1 mixture of both enantiomers.

Ⓒ The product obtained by S_N2 reaction of haloalkane having chirality at the reactive site shows inversion of configuration.

[✓ Ⓓ] Enantiomers are superimposable mirror images on each other.

QUESTION [NEET 2021]

C F Cl Br I

Size diff ↑ BE ↓

The correct sequence of bond enthalpy of 'C–X' bond is:

(A) ✓ $CH_3-F > CH_3-Cl > CH_3-Br > CH_3-I$

(B) $CH_3-F < CH_3-Cl > CH_3-Br > CH_3-I$

(C) $CH_3-Cl > CH_3-F > CH_3-Br > CH_3-I$

(D) $CH_3-F < CH_3-Cl < CH_3-Br < CH_3-I$

QUESTION [NEET 2021]

The major product formed in dehydrohalogenation reaction of 2-Bromo pentane is Pent-2-ene. This product formation is based on

Ⓐ Hund’s rule

Ⓑ Hofmann rule

Ⓒ Huckel’s rule

[✓ Ⓓ Saytzeff’s rule]

QUESTION [NEET 2020]

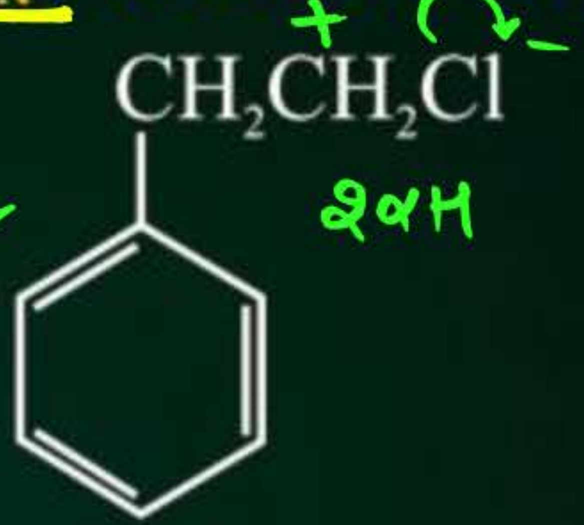
Which of the following will NOT undergo S_N1 reaction with OH^-?

$\boxed{A > C > D > B}$

9αH

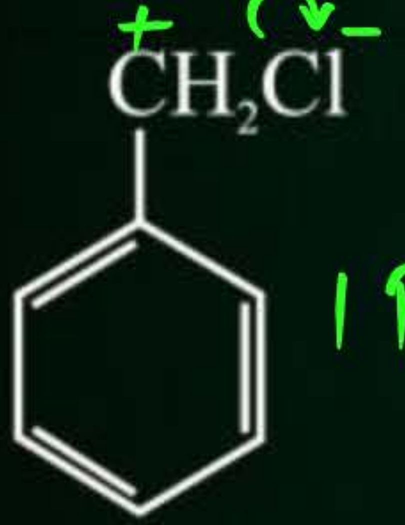
A $(CH_3)_3\overset{+}{C}\overset{-}{Cl}$

B ✓



$CH_2\overset{+}{C}H_2\overset{-}{Cl}$
2αH

C



$\overset{+}{C}H_2\overset{-}{Cl}$

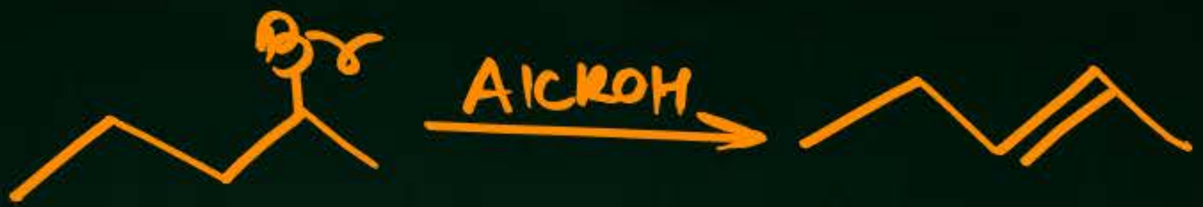
1 Ring-reso

D $CH_2 = CH - \overset{+}{C}H_2\overset{-}{Cl}$

Reso

Allyl Cation

QUESTION [NEET 2020]



Elimination reaction of 2-Bromo-pentane to form pent-2-ene is:

(1) β-Elimination reaction ✓

(2) Follows Zaitsev rule ✓

(3) Dehydrohalogenation reaction ✓

(4) Dehydration reaction ✗

A (1), (3), (4)

B (2), (3), (4)

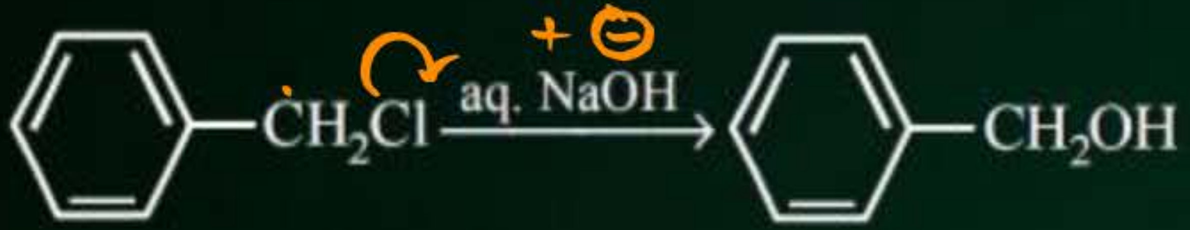
C (1), (2), (4)

[✓ **D**] (1), (2), (3)

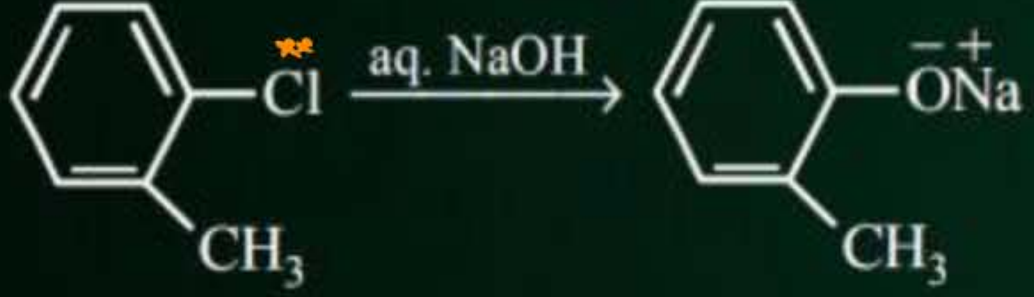
QUESTION [NEET Odisha 2019]

The hydrolysis reaction that takes place at the slowest rate among the following is:

(A)



(B) ✓



(C) $H_3C-CH_2-Cl \xrightarrow{\text{aq. Na}\overset{\ominus}{\text{O}}\text{H}} H_3C-CH_2-OH$

(D) $H_2C=CH-CH_2Cl \xrightarrow{\overset{\ominus}{\text{aq. NaOH}}} H_2C=CH-CH_2OH$

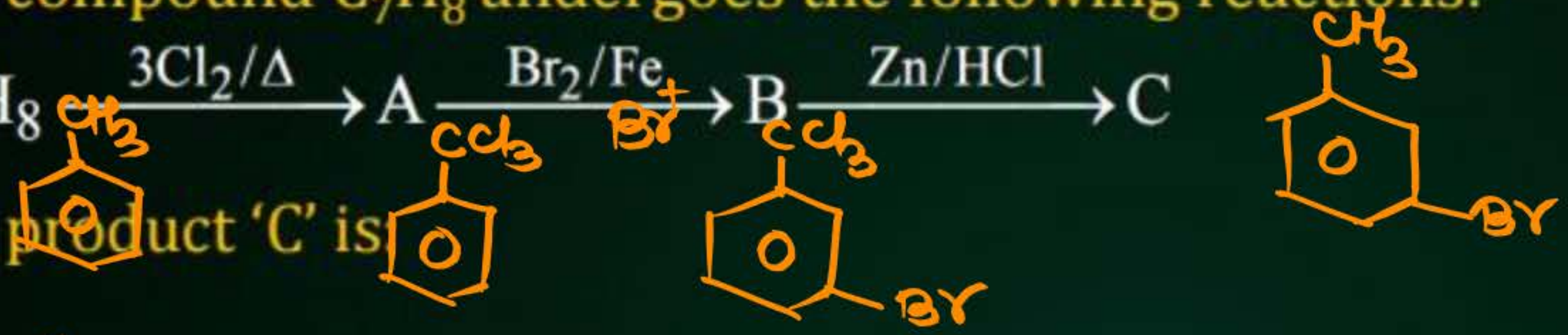
QUESTION [NEET 2018]

$\underset{H}{R}\big\}\underset{H}{X} \xrightarrow[HCl]{Zn} R-H$

$ZnCl_2 + H_2$

The compound C_7H_8 undergoes the following reactions:

$$C_7H_8 \xrightarrow{3Cl_2/\Delta} A \xrightarrow{Br_2/Fe} B \xrightarrow{Zn/HCl} C$$



The product 'C' is:

- [✓ A] m-bromotoluene
- B o-bromotoluene
- C p-bromotoluene
- D 3-bromo-2, 4, 6-trichlorotoluene

QUESTION [NEET 2016]

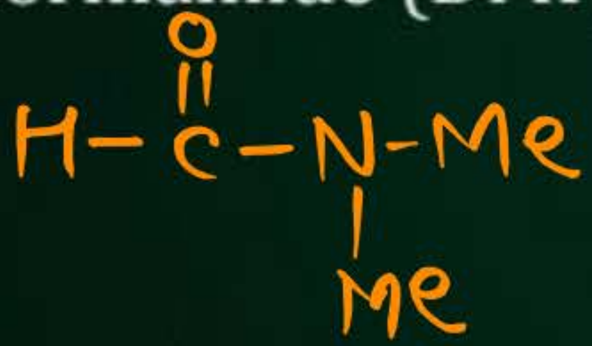
Consider the reaction

$$\mathrm{CH_3CH_2\underset{1^\circ}{C}H_2\underset{R-X}{Br}} + \overset{+}{\mathrm{Na}}\overset{-}{\mathrm{C}}\mathrm{N} \xrightarrow{S_N2} \mathrm{CH_3CH_2CH_2\,CN + NaBr}$$

This reaction will be the fastest in:

(A) ✓ N, N'-dimethylformamide (DMF)

(B) Water



$$\mathrm{H-\overset{\overset{\displaystyle O}{\|}}{C}-\underset{\underset{\displaystyle Me}{|}}{N}-Me}$$

PAS

(C) Ethanol

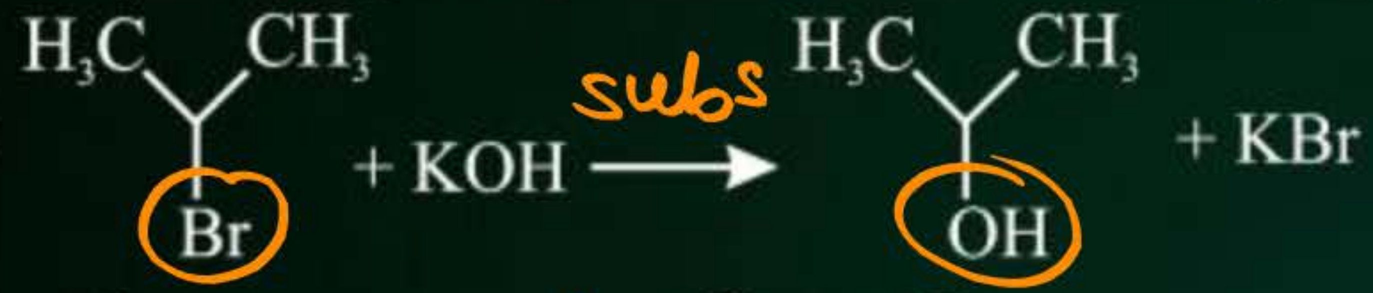
(D) Methanol

QUESTION [NEET 2016]

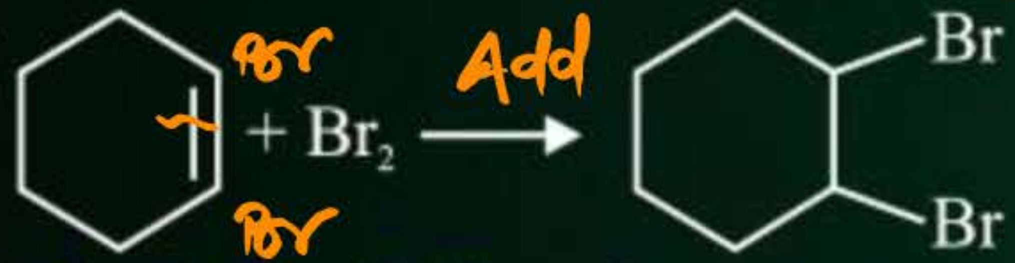
For the following reaction:

(A) $CH_3CH_2CH_2Br + KOH \xrightarrow{E} \overset{\text{Alkene}}{CH_3CH=CH_2} + KBr + H_2O$

(B)


H₃C
CH₃
Br
+ KOH
subs
H₃C
CH₃
OH
+ KBr

(C)


Br
+ Br₂
Br
Add
Br
Br

Which of the following statements is correct?

A (A) is substitution, (B) and (C) are addition reactions.

B (A) and (B) are elimination reactions and (C) is addition reaction.

[✓ C] (A) is elimination, (B) is substitution and (C) is addition reaction.

D (A) is elimination, (B) and (C) are substitution reactions.

QUESTION [NEET 2015 Re]

Which of the following reaction(s) can be used for the preparation of alkyl halides? 1°

(I) $CH_3CH_2OH + HCl \xrightarrow{\text{anh.}\,ZnCl_2}$ ✓

(II) $CH_3CH_2OH + HCl \longrightarrow$ ✗

(III) $(CH_3)_3COH + HCl \longrightarrow$ ✓

(IV) $(CH_3)_2CHOH + HCl \xrightarrow{\text{anh.}\,ZnCl_2}$ ✓

A (III) and (IV) only

[✓ B] (I), (III) and (IV) only

C (I) and (II) only

D (IV) only

QUESTION [NEET 2015]

In a S_N1 reaction on chiral centers, there is:

A 100% inversion

B 100% racemization

[✓ C] Inversion more than retention leading to partial racemization

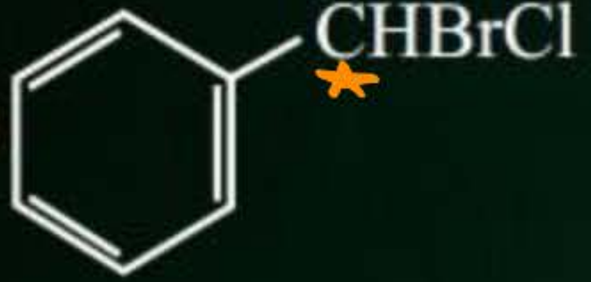
51 49

D 100% retention

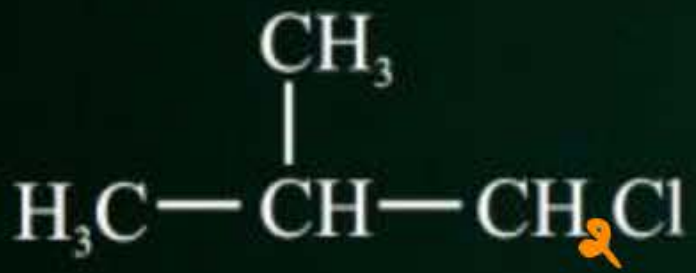
QUESTION [NEET 2014]

Which of the following compounds will undergo $\underbrace{\text{racemization}}$ when solution of KOH hydrolyses?

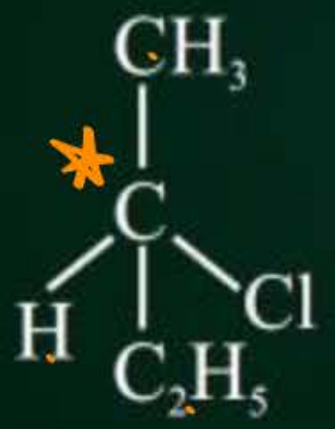
$\underline{\underline{S_N1}}$

(i)


(ii) $CH_3CH_2CH_2Cl$

(iii)


$$H_3C-\overset{\overset{\displaystyle CH_3}{|}}{CH}-CH_2Cl$$

(iv)


A (ii) and (iv)

B (iii) and (iv)

[✓ **C** (i) and (iv)]

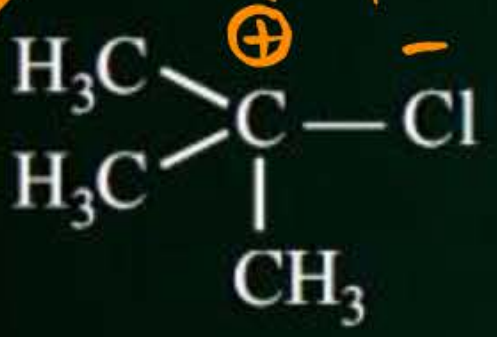
D (i) and (ii)

QUESTION [NEET 2015]

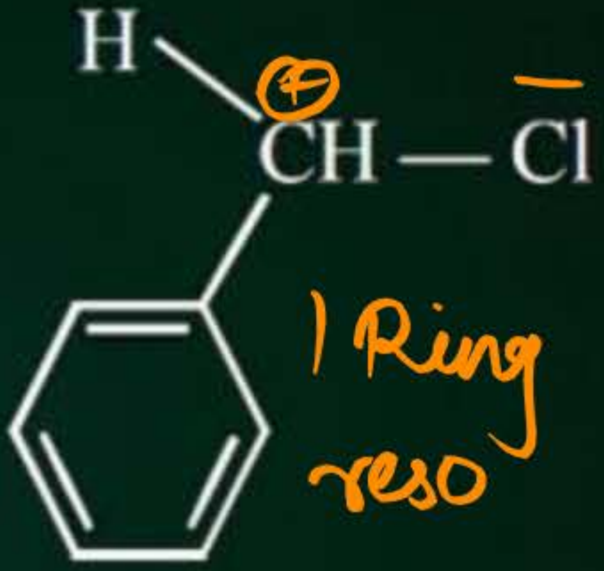
In which of the following compounds, the C – Cl bond ionization shall give most stable carbonium ion?

A ✓

9αH

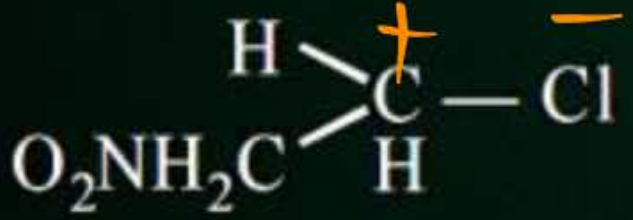


B



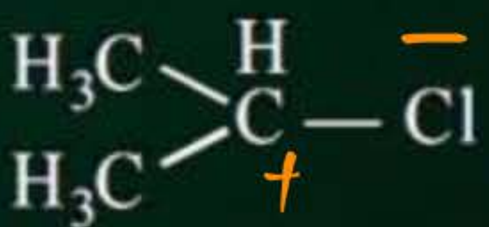
1 Ring reso

C



2αH

D



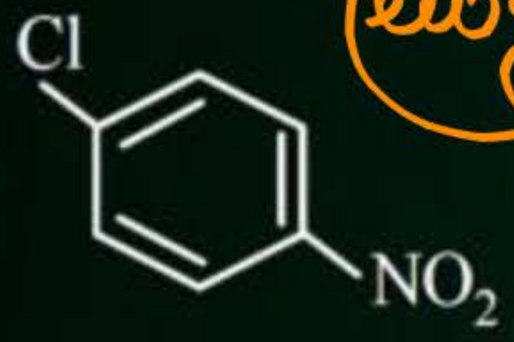
6αH

QUESTION [AIPMT 2011]

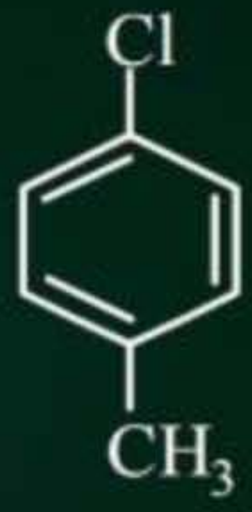
Which of the following compounds undergoes nucleophilic substitution reaction most easily?

ewg

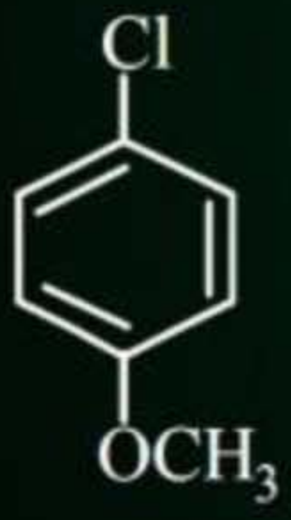
[✓ A]



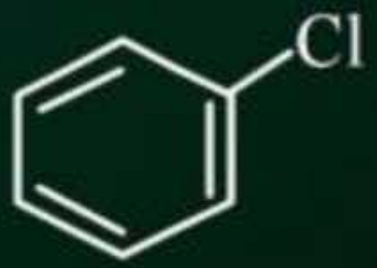
B



C



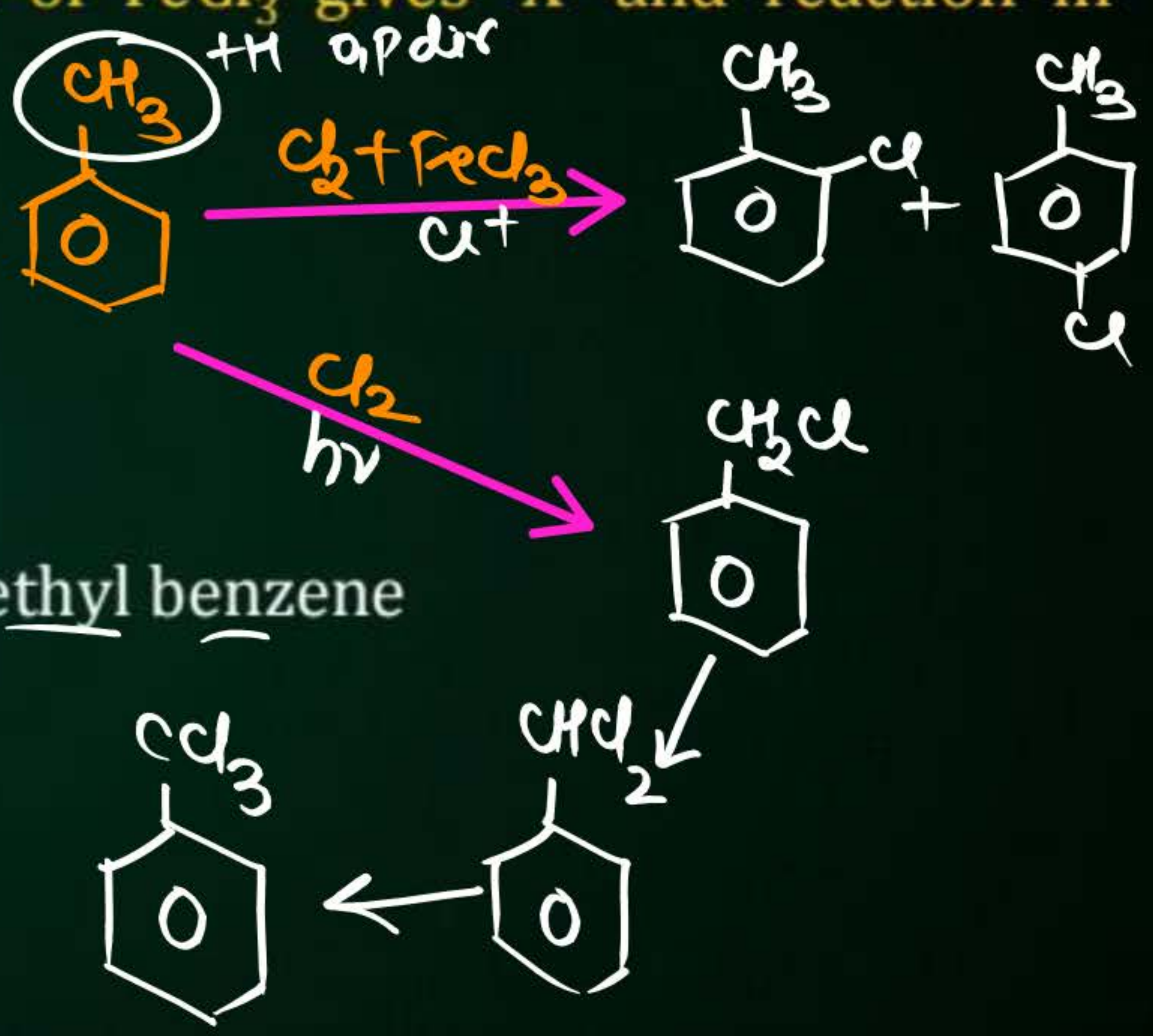
D



QUESTION [AIPMT 2010]

The reaction of toluene with Cl_2 in presence of $FeCl_3$ gives 'X' and reaction in presence of light gives 'Y'. Thus, 'X' and 'Y' are:

- **A** X = Benzal chloride, Y = o-Chlorotoluene
- **B** X = m-Chlorotoluene, Y = p-Chlorotoluene
- **C** X = o- and p-Chlorotoluene, Y = Trichloromethyl benzene
- **D** X = Benzyl chloride, Y = m-Chlorotoluene


CH3
+H o,p dir
Cl2 + FeCl3
Cl+
CH3
Cl
+
CH3
Cl
Cl2
hν
CH2Cl
CHCl2
CCl3

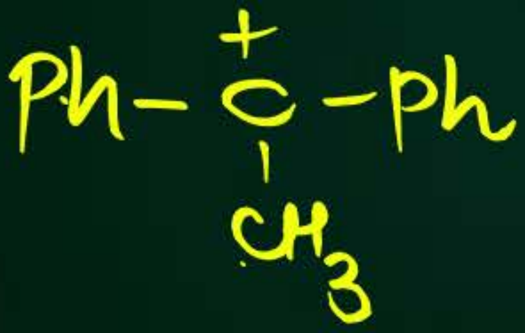
QUESTION [AIPMT 2010]

Which one is most reactive towards S_N1 reaction?

A $C_6H_5\overset{+}{C}H(C_6H_5)\overset{-}{Br}$ $Ph-\overset{+}{C}H-Ph$

B $C_6H_5\overset{+}{C}H(CH_3)\overset{-}{Br}$ $Ph-\overset{+}{C}H-CH_3$

[✓ C] $C_6H_5\overset{+}{C}(CH_3)(C_6H_5)\overset{-}{Br}$



$Ph-\underset{CH_3}{\overset{+}{C}}-Ph$

D $C_6H_5\overset{+}{C}H_2\overset{-}{Br}$

$Ph-\overset{\oplus}{C}H_2$

QUESTION [AIPMT 2009]

Benzene reacts with $\overset{+}{CH_3}\overset{-}{Cl}$ in the presence of anhydrous $AlCl_3$ to form:

- A chlorobenzene
- B Benzyl chloride
- C xylene
- [✓ D] toluene

QUESTION [AIPMT 2009]

Which of the following reactions is an example of nucleophilic substitution reaction?

coupling

A $2\,RX + 2Na \rightarrow R{-}R + 2NaX$

Red^n

B $RX + H_2 \rightarrow RH + HX$

G.R

C $RX + Mg \rightarrow RMgX$

[✓ D] $RX + K\overset{-}{O}H \rightarrow ROH + KX$

QUESTION [AIPMT 2008]

In a S_N2 substitution reaction of the type

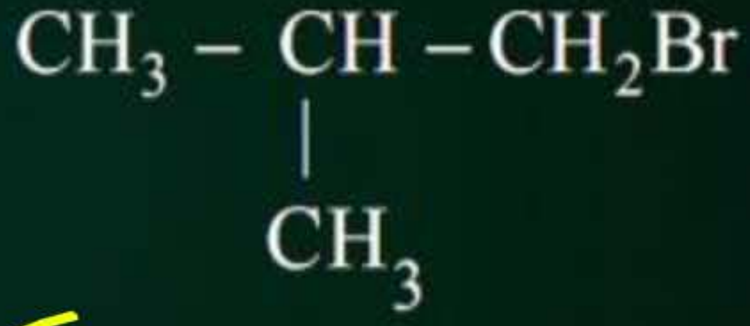
$R-Br+Cl^- \xrightarrow{DMF} R-Cl+Br^-$

Which one of the following has the highest reactivity rate?

SH↓ ROR↑

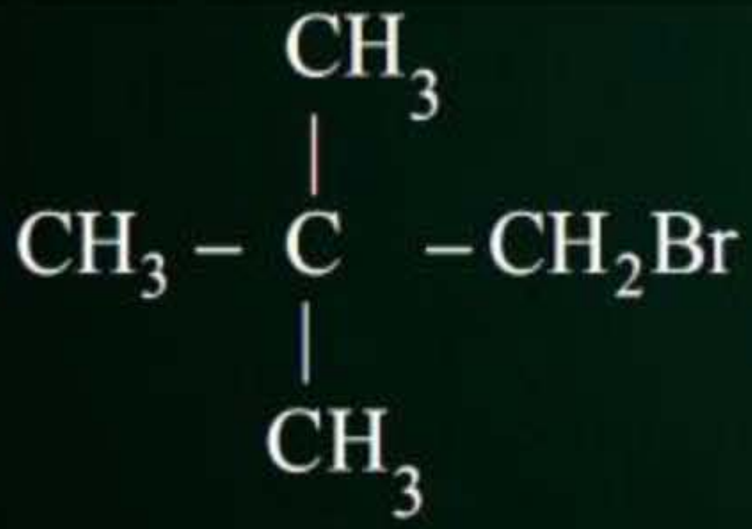
(A) $CH_3-CH_2-CH_2Br$

(B)



$CH_3-\underset{\underset{CH_3}{|}}{CH}-CH_2Br$

(C)



$CH_3-\overset{\overset{CH_3}{|}}{\underset{\underset{CH_3}{|}}{C}}-CH_2Br$

[✓ (D)] CH_3-CH_2-Br

QUESTION [AIPMT 2005]

Which of the following undergoes nucleophilic substitution exclusively by S_N1 mechanism?

Stability of 1^{st} $C^{\oplus}$

A. Ethyl chloride

B. Isopropyl chloride

C. Chlorobenzene

[✓ D] Benzyl chloride

$Ph-\overset{+}{C}H_2-\overset{-}{Cl}$

Reso

QUESTION [AIPMT 2004]

Which of the following is least reactive in a nucleophilic substitution reaction?

A $(CH_3)_3C{-}Cl$

[✓ B] $CH_2=CHCl$

SN^1 ×

SN^2 ×

C CH_3CH_2Cl

D $CH_2=CHCH_2Cl$

QUESTION [AIPMT 2002]

Reactivity order of halides for dehydrohalogenation is:

- A $R-F > R-Cl > R-Br > R-I$
- [✓ B] $R-I > R-Br > R-Cl > R-F$
- C $R-I > R-Cl > R-Br > R-F$
- D $R-F > R-I > R-Br > R-Cl$

QUESTION [AIPMT 1998]

Elimination

2-Bromopentane is heated with potassium ethoxide in ethanol. The major product obtained is:

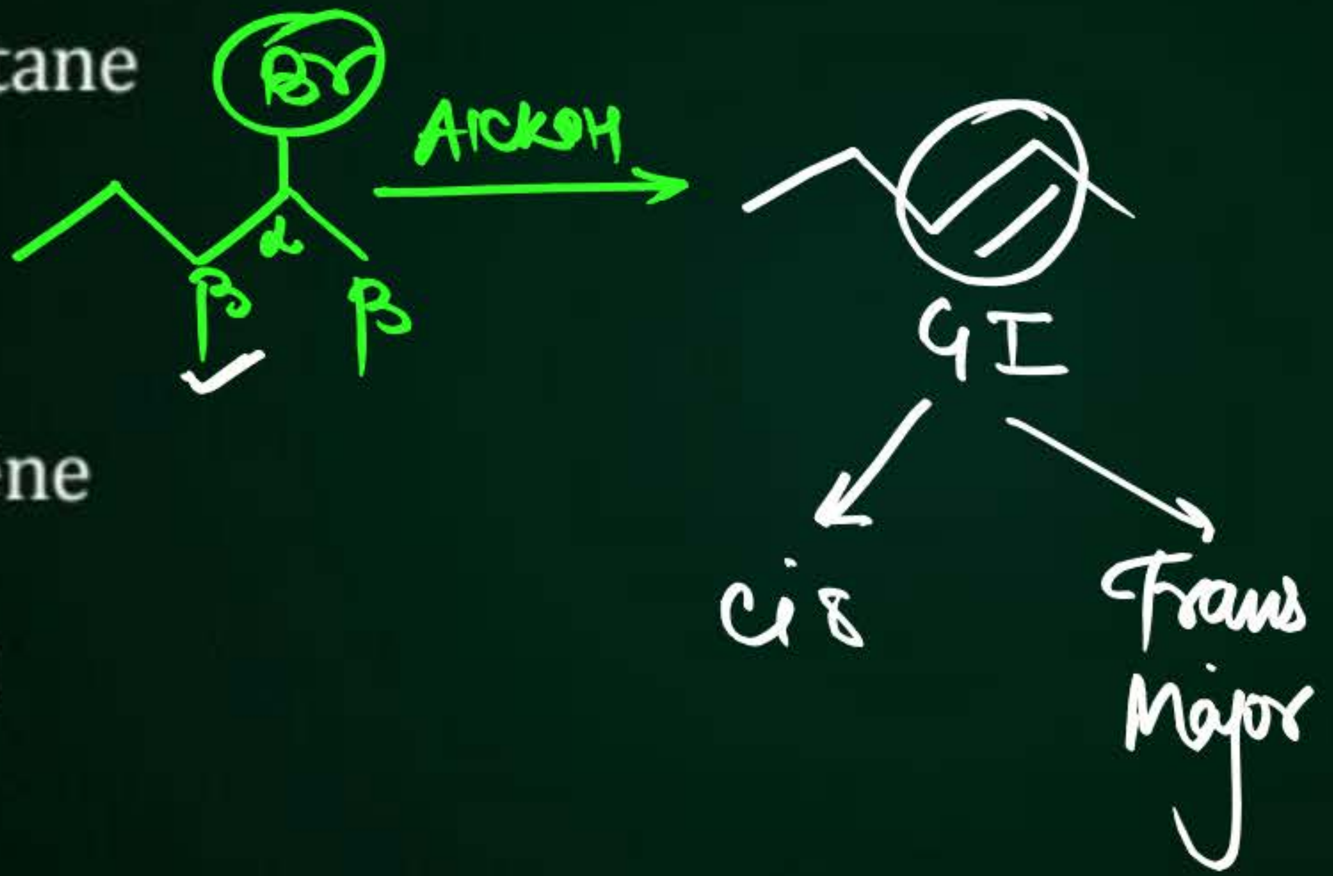
Alc KOH

A 2-ethoxy pentane

B pentene-1

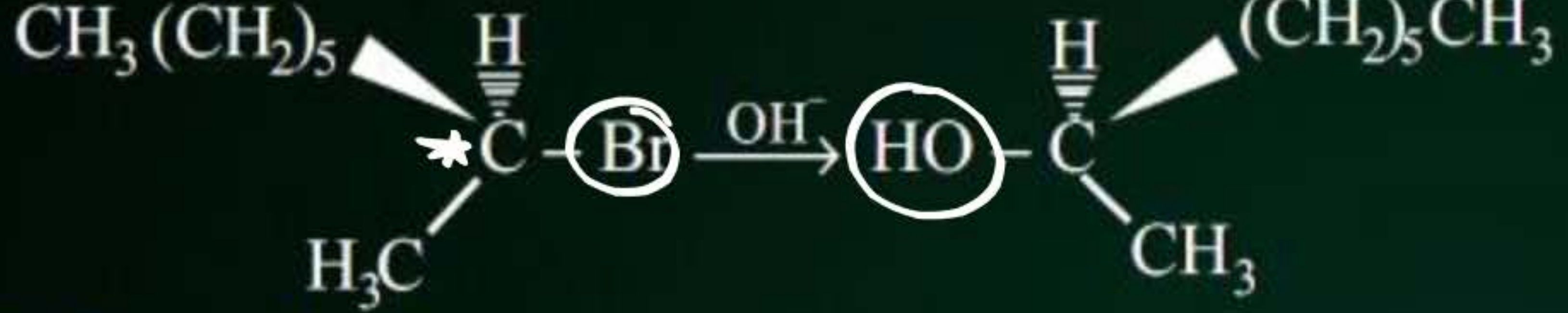
[✓ **C** trans-2-pentene]

D cis-pentene-2


Br
α
β
β
Alc KOH
GI
cis
Trans
Major

QUESTION [AIPMT 1997]

The reaction:



$CH_3(CH_2)_5$
H
*
C
Br
OH^-
HO
H_3C
H
C
$(CH_2)_5CH_3$
CH_3

is described as

- (A) E1
- (B) S_N1
- (C) E2
- [✓ (D) S_N2]

QUESTION [AIPMT 1993]

When chlorine is passed through propene at 400°C, which of the following is formed?

$$\left[\overset{Cl}{CH}-CH_2\right]_n$$

$$\overset{\downarrow}{CH_3}-CH=CH_2 \xrightarrow[400^\circ C]{Cl_2 \quad \dot{Cl}} \underset{Cl}{\underset{|}{CH_2}}-CH=CH_2$$

- **A** ✗ PVC (poly vinyl chloride)
- **B** Allyl chloride ✓
- **C** Alkyl chloride
- **D** 1, 2-Dichloroethane

QUESTION [AIPMT 1997]

The replacement of chlorine of chlorobenzene to give phenol requires drastic conditions but the chlorine of 2, 4-dinitrochlorobenzene is readily replaced since,

A ✗ nitro groups make the aromatic ring electron rich at ortho/para positions.

B ✗ nitro groups withdraw electrons from the meta position of the aromatic ring.

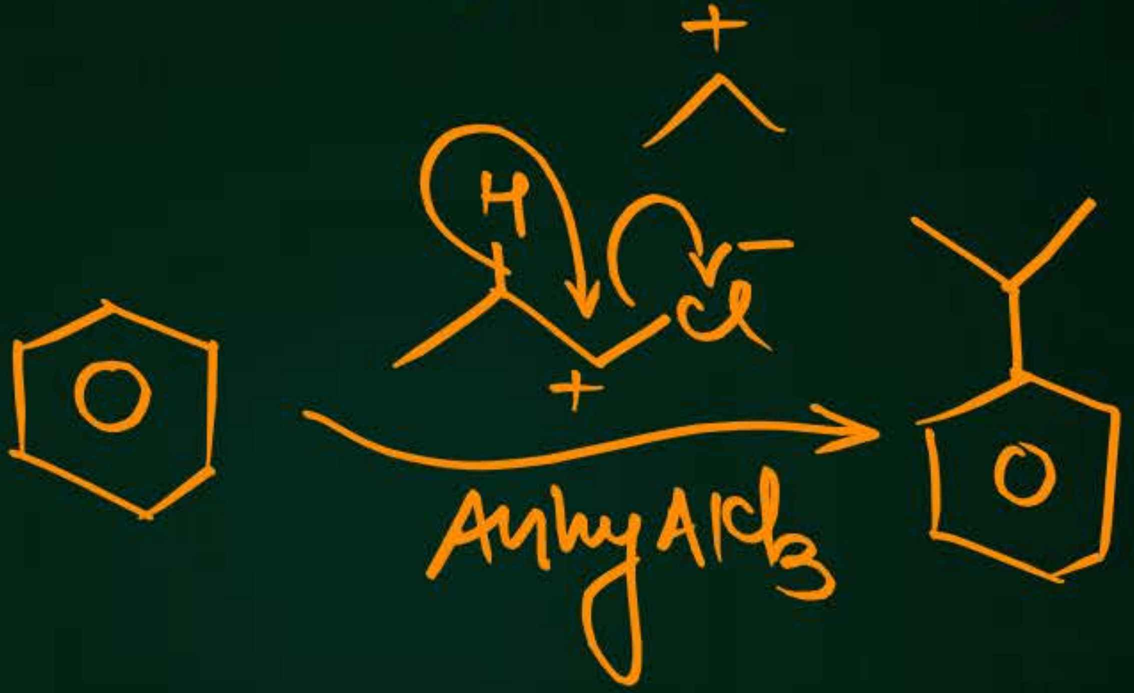
C ✗ nitro groups donate electrons at meta position.

[✓ **D**] nitro groups withdraw electrons from ortho/para positions of the aromatic ring.

QUESTION [AIPMT 1993]

Benzene reacts with n-propyl chloride in the presence of anhydrous $AlCl_3$ to give

- A 3-Propyl–1–chlorobenzene
- B n-Propyl benzene
- C No reaction
- [✓ D] Isopropyl benzene



QUESTION [AIPMT 1993]

Chlorobenzene reacts with Mg in dry ether to give a compound (A) which further reacts with ethanol to yield

A Phenol

B [✓ Benzene]

C Ethyl benzene

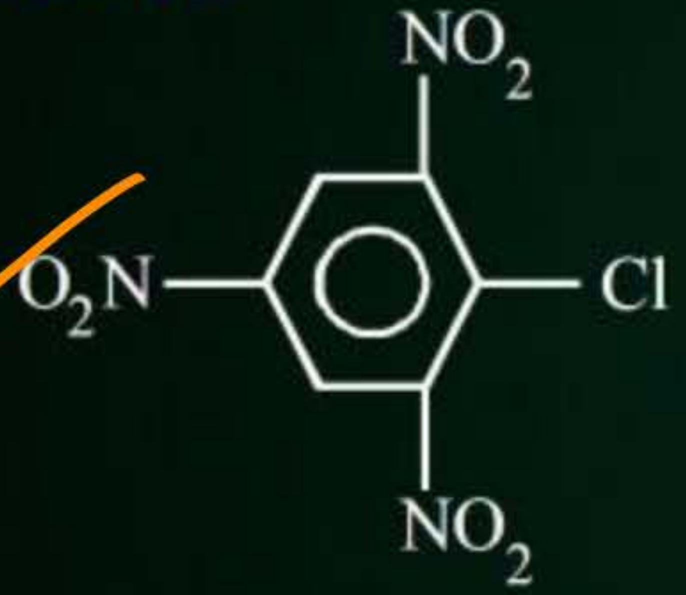
D Phenyl ether

$$Ph-Cl \xrightarrow[\text{dry ether}]{Mg} \underset{\overset{\ominus}{Ph}MgCl}{Ⓐ} \xrightarrow{C_2H_5\bar{O}H^+} Ph-H$$

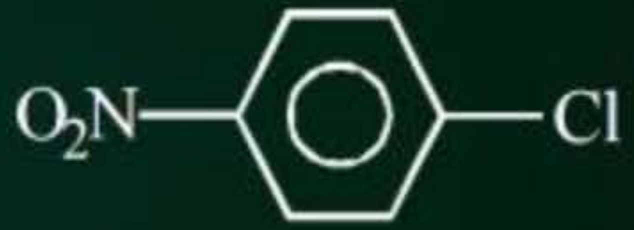
QUESTION [AIPMT 1989]

Which chloro derivative of benzene among the following would undergo hydrolysis most readily with aqueous sodium hydroxide to furnish the corresponding hydroxy derivative?

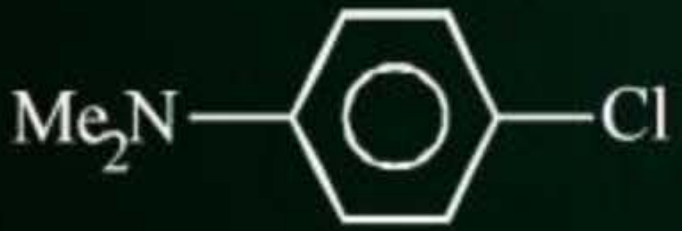
[✓ A]



B



C



D C_6H_5Cl

JEE Mains PYQs

Home work

QUESTION (JEE Mains 1st Feb 2024, Morning Shift)

Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).

Assertion (A): Haloalkanes covalent react with $\overset{+-}{\text{KCN}}$ ionic to form alkyl cyanides as a main product while with AgCN form isocyanide as the main product.

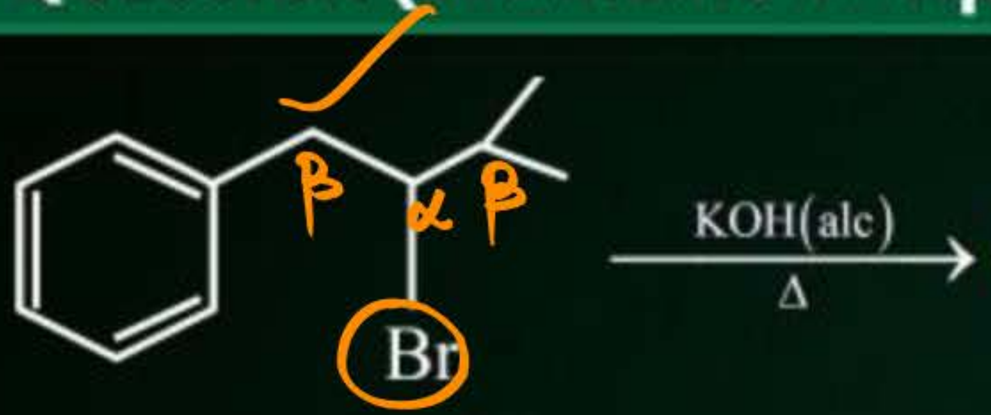
Reason (R): KCN and AgCN both are highly ionic compounds.

In the light of the above statement, choose the most appropriate answer from the options given below:

- [✓ A] (A) is correct but (R) is not correct.
- B Both (A) and (R) are correct but (R) is not the correct explanation of (A).
- C (A) is not correct but (R) is correct.
- D Both (A) and (R) are correct and (R) is the correct explanation of (A).

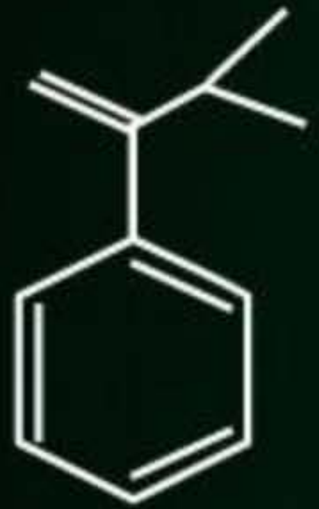
Ans : (A)

QUESTION (JEE Mains 4th April 2024, Evening Shift)

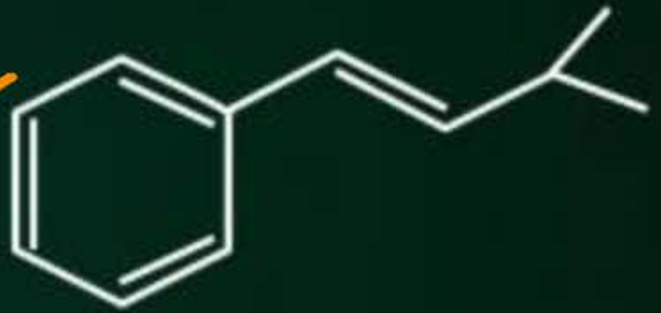

β
α
β
Br
KOH(alc)
Δ

major product "P". Product P is:

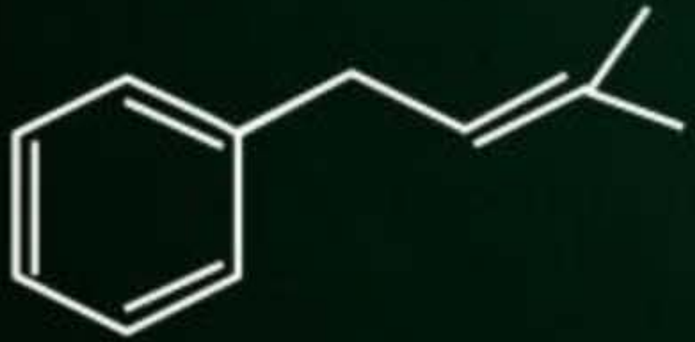
A



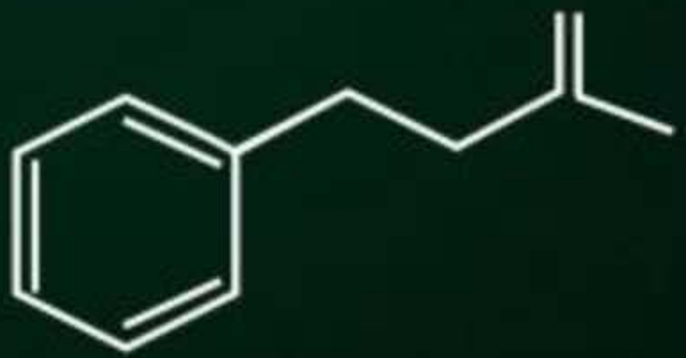
B



C



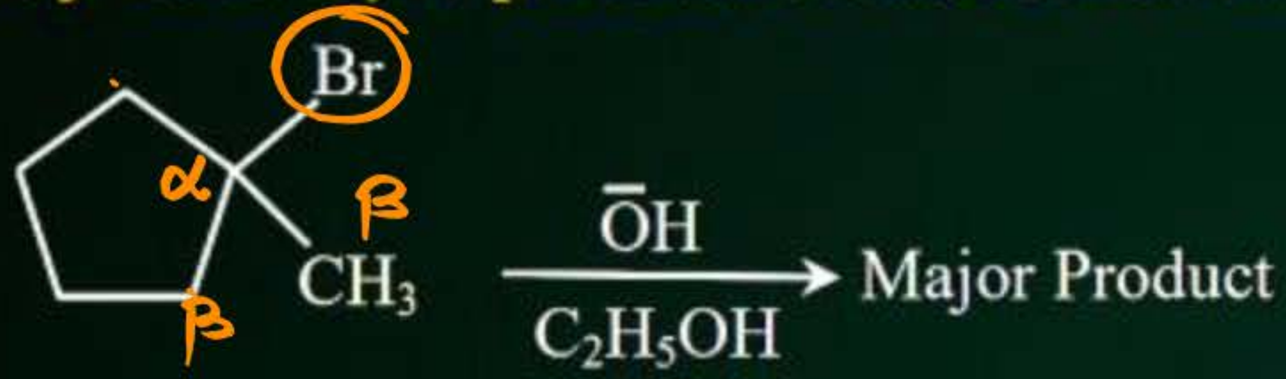
D



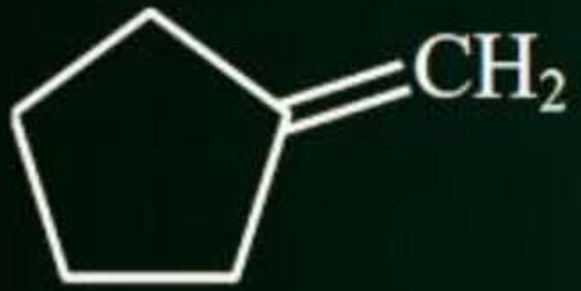
Ans. (B)

QUESTION (JEE Mains 5th April 2024, Evening Shift)

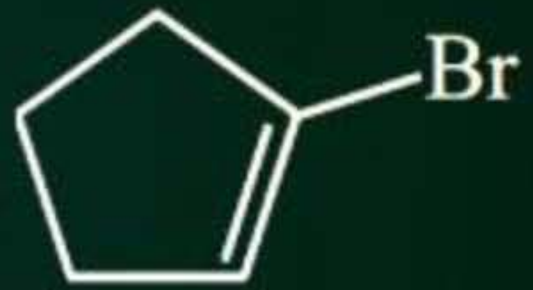
Identify the major product in the following reaction.


Br
α
β
β
CH₃
$\bar{O}H$
C_2H_5OH
Major Product

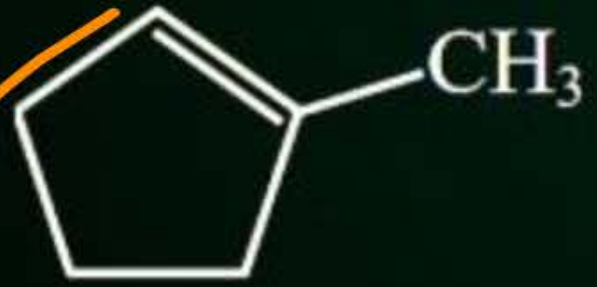
A



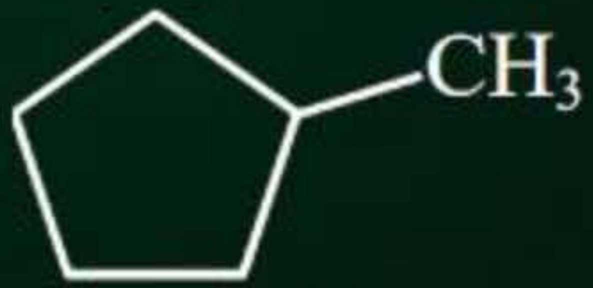
B



C



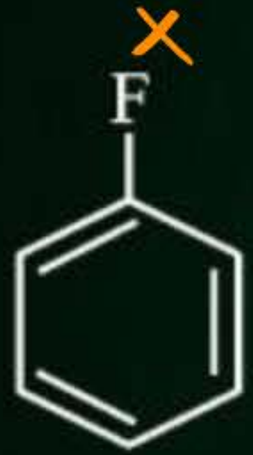
D



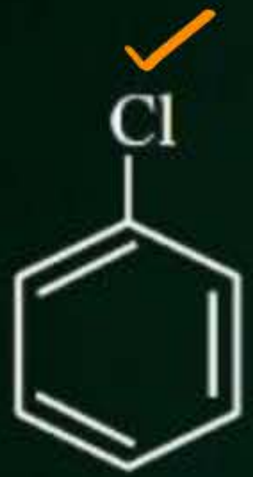
Ans. (C)

QUESTION (JEE Mains 5th April 2024, Morning Shift)

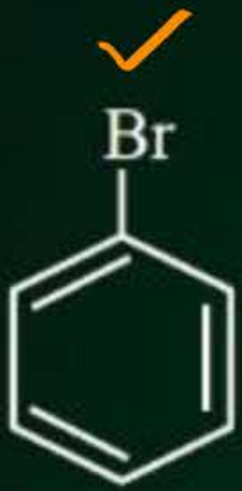
The number of halobenzenes from the following that can be prepared by Sandmeyer's reaction is ....



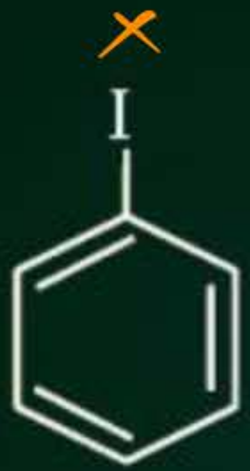
I



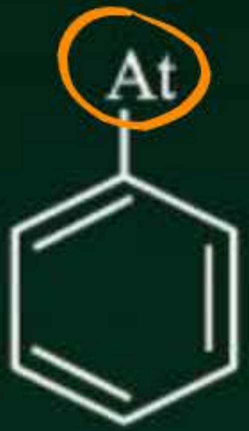
II



III



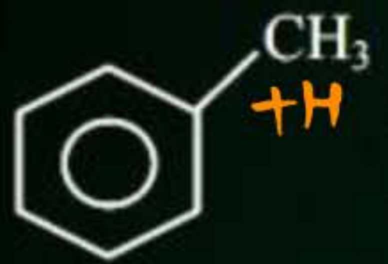
IV



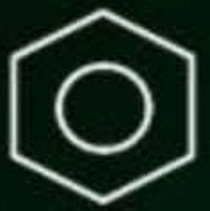
V

Ans. (2)

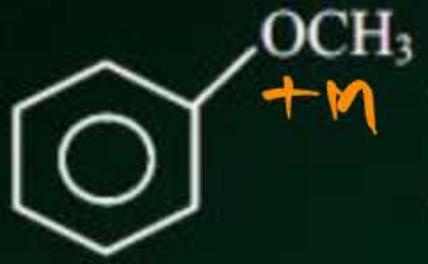
QUESTION (JEE Mains 6th April 2024, Evening Shift)



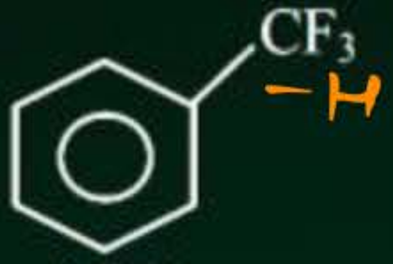
(I)



(II)



(III)



(IV)

↗ ROR $\propto$ edg $\propto \frac{1}{ewg}$

The **correct** arrangement for decreasing order of electrophilic substitution for above compounds.

A (IV) > (I) > (II) > (III)

[✓ B] (III) > (I) > (II) > (IV)

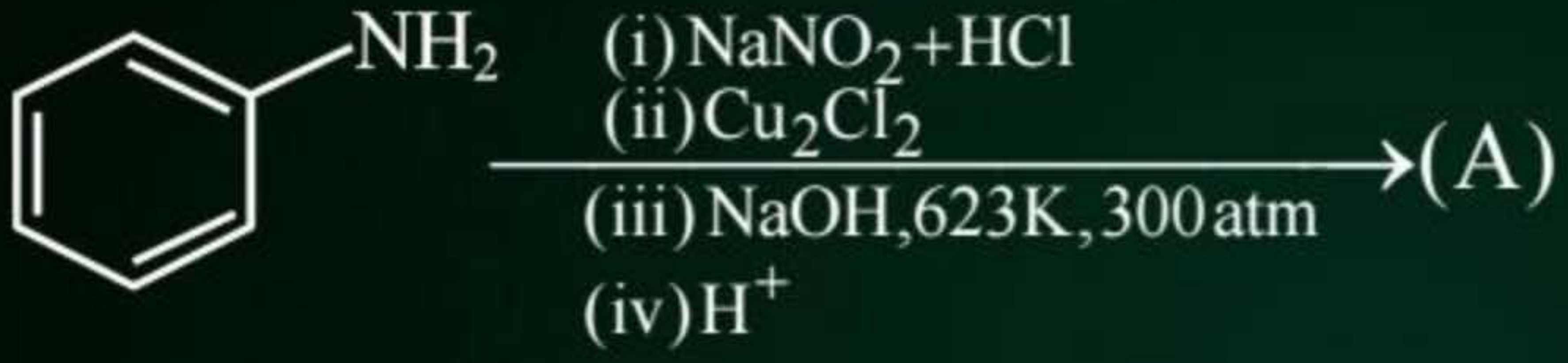
C (II) > (IV) > (III) > (I)

D (III) > (IV) > (II) > (I)

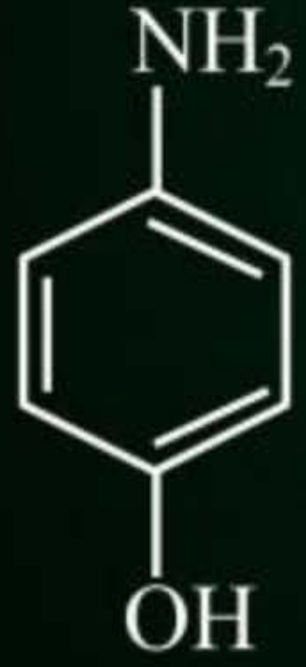
Ans. (B)

QUESTION (JEE Mains 6th April 2024, Evening Shift)

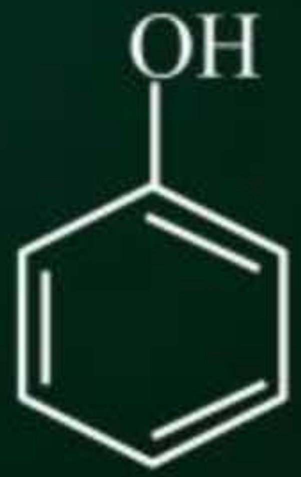
Identify the product (A) in the following reaction.

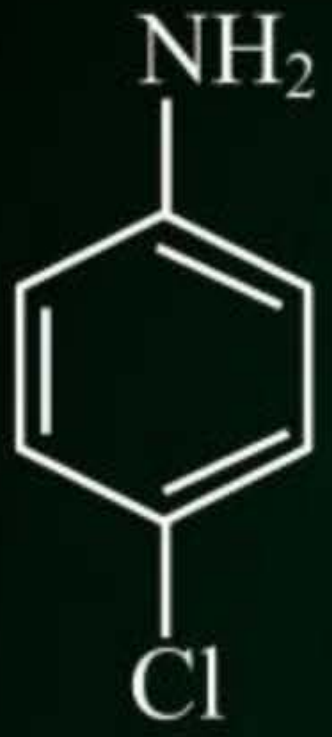

NH2
(i) NaNO2+HCl
(ii) Cu2Cl2
(iii) NaOH,623K, 300 atm
(iv) H+
(A)

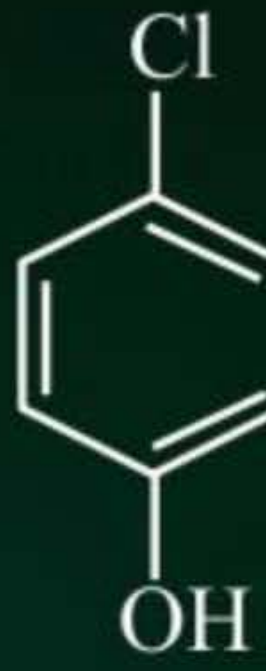
A



B



C 

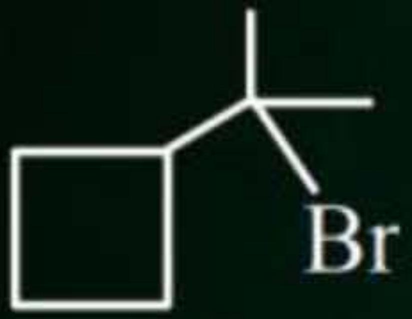
D 

Ans. (B)

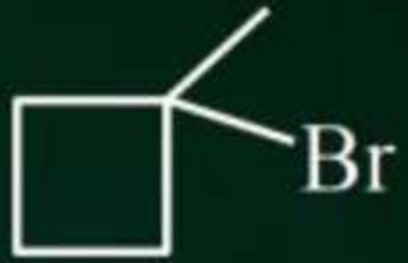
QUESTION (JEE Mains 8th April 2024, Morning Shift)

Which among the following compounds will undergo fastest S_N2 reaction?

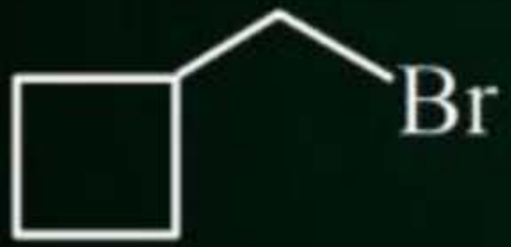
A



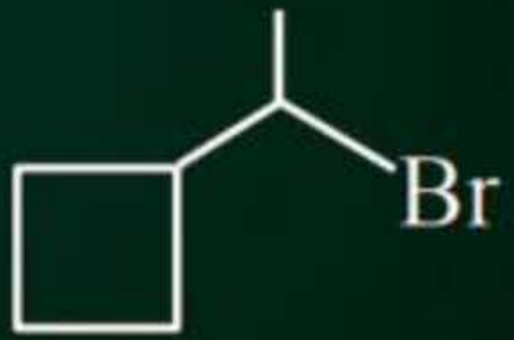
B



C

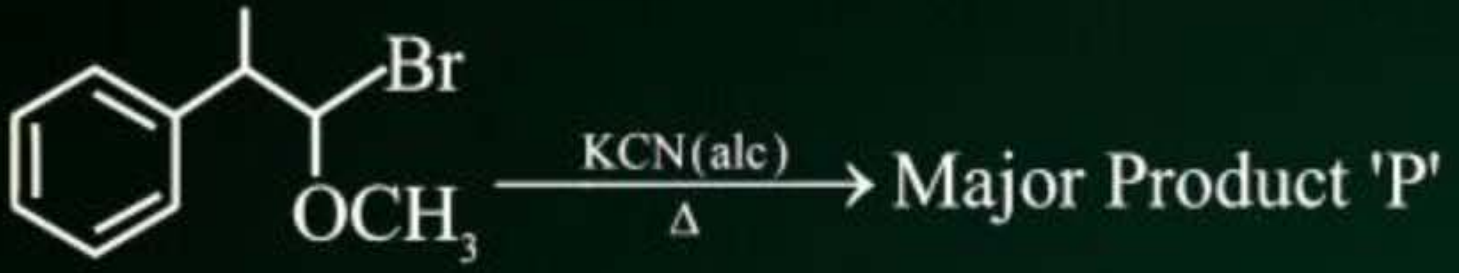


D



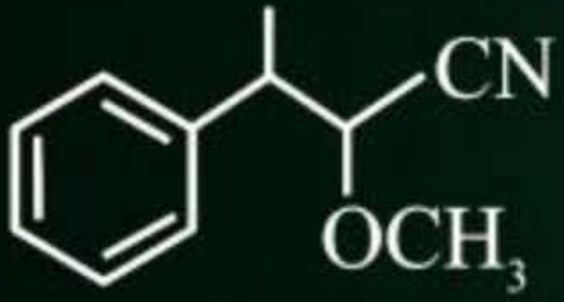
Ans. (C)

QUESTION (JEE Mains 9th April 2024, Evening Shift)

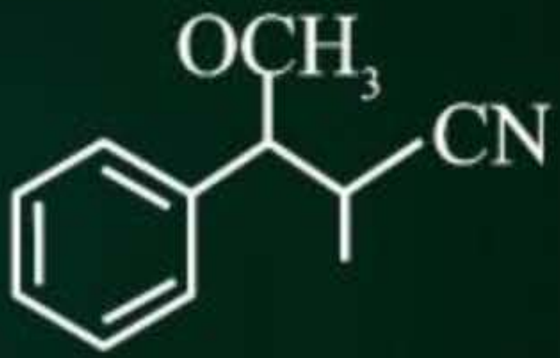

Br
OCH3
KCN(alc)
Δ
Major Product 'P'

In the above reaction product 'P' is:

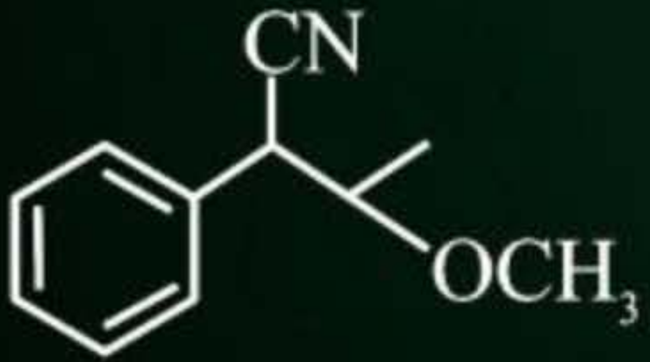
A



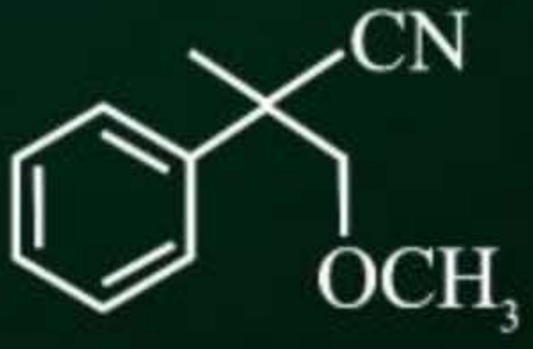
B



C



D



Ans. (A)

QUESTION (JEE Mains 30th January 2024, Evening Shift)

Given below are two statements:

Statement – I: High concentration of strong nucleophilic reagent with secondary alkyl halides which do not have bulky substituents will follow S_N2 mechanism.

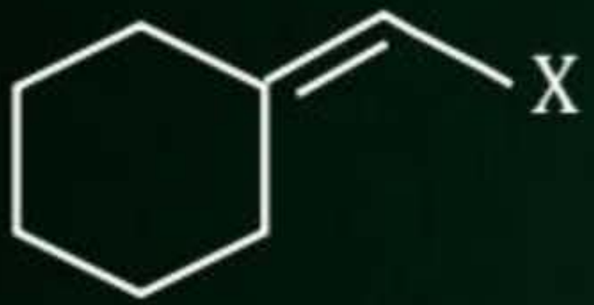
Statement – II: A secondary alkyl halide when treated with a large excess of ethanol follows S_N1 mechanism.

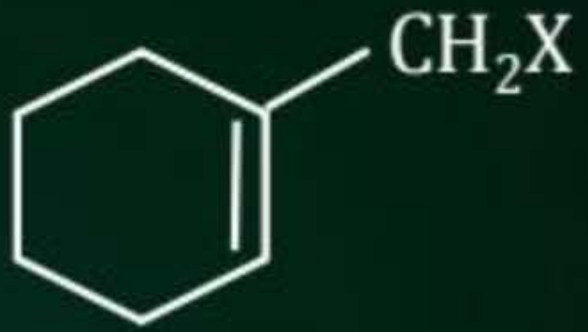
- (A) Statement I is true but Statement II is false.
- (B) Statement I is false but Statement II is true.
- (C) Both statement I and Statement II are false.
- (D) Both statement I and Statement II are true.

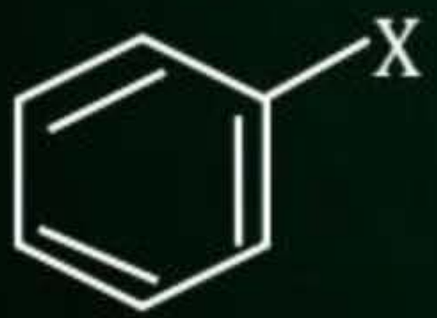
Ans. (D)

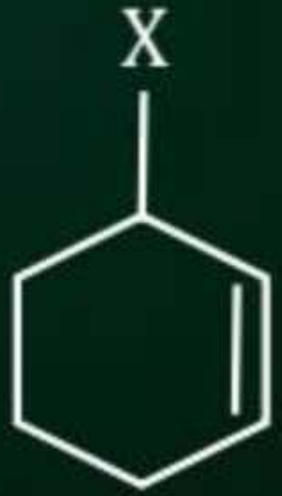
QUESTION (JEE Mains 30th January 2024, Morning Shift)

Example of vinylic halide is:

(A)


(B)


(C)


(D)


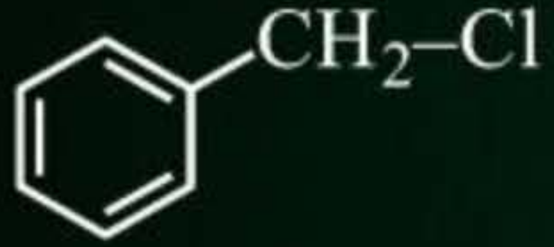
Ans. (A)

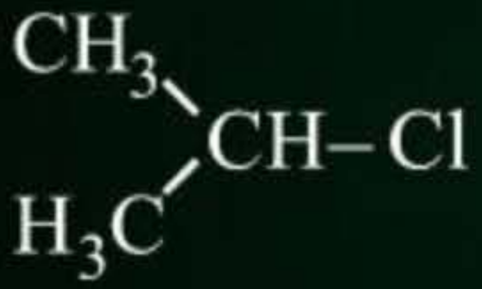
QUESTION (JEE Mains 27th January 2024, Evening Shift)

Which among the following halide/s will not show S_N1 reaction:

A. $H_2C=CH-CH_2Cl$

B. $CH_3-CH=CH-Cl$

C. 

D. 

Choose the **most appropriate** answer from the options given below:

A (A), (B) and (D) only

B (A) and (B) only

C (B) and (C) only

D (B) only

Ans. (D)

QUESTION (JEE Mains 27th January 2024, Morning Shift)

The correct statement regarding nucleophilic substitution reaction in a chiral alkyl halide is:

A Retention occurs in S_N1 reaction and inversion occurs in S_N2 reaction.

B Racemisation occurs in S_N1 reaction and retention occurs in S_N2 reaction.

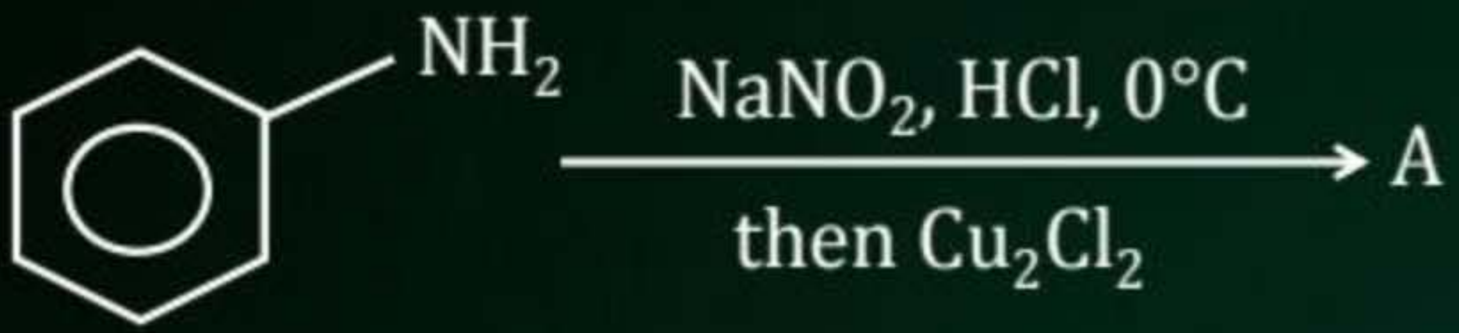
C Racemisation occurs in both S_N1 and S_N2 reactions.

D Racemisation occurs in S_N1 reaction and inversion occurs in S_N2 reaction.

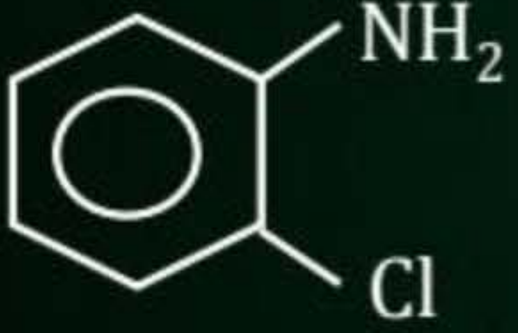
Ans. (D)

QUESTION (JEE Mains 29th January 2024, Evening Shift)

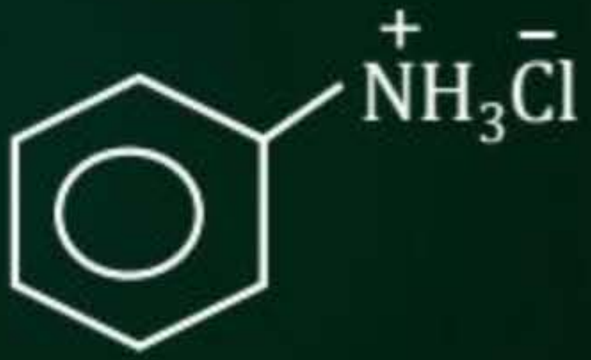
The product A formed in the following reaction is:


NH_2
$NaNO_2$, HCl, 0°C
then Cu_2Cl_2
A

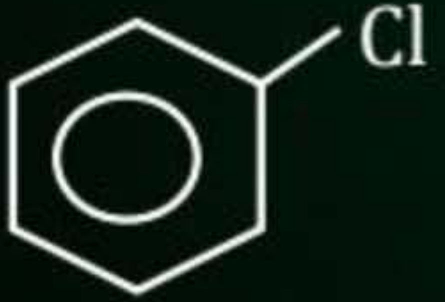
A



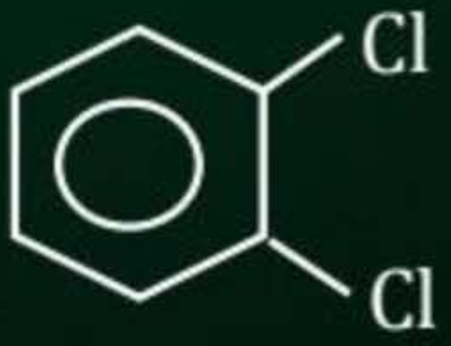
B


$\overset{+}{N}H_3\overset{-}{Cl}$

C



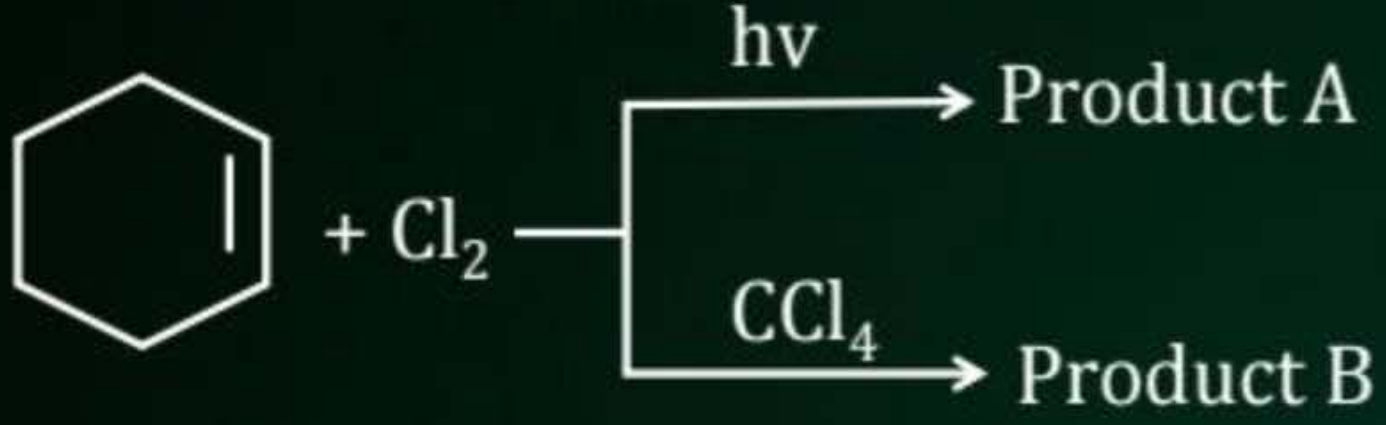
D



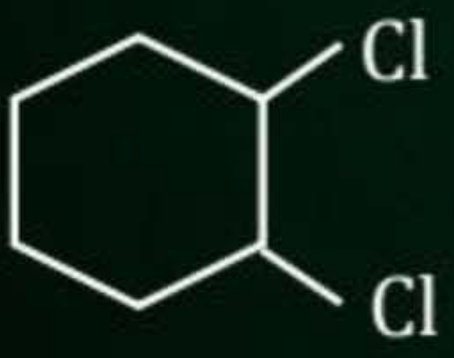
Ans. (C)

QUESTION (JEE Mains 29th January 2024, Morning Shift)

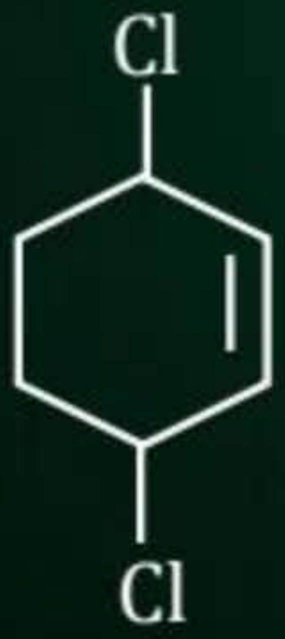
Identify product A and product B.


+ Cl_2
hv
Product A
CCl_4
Product B

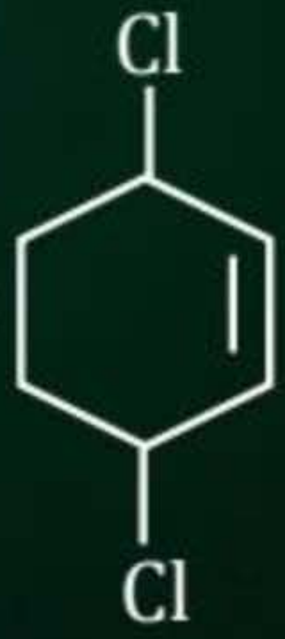
Ⓐ A:



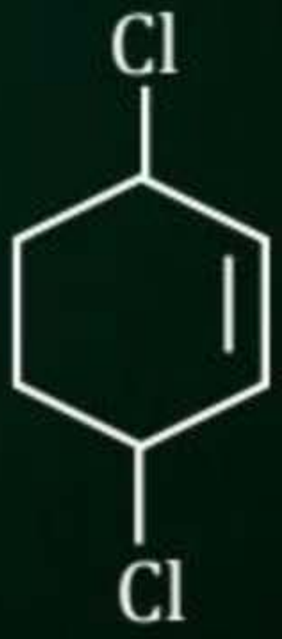
B:

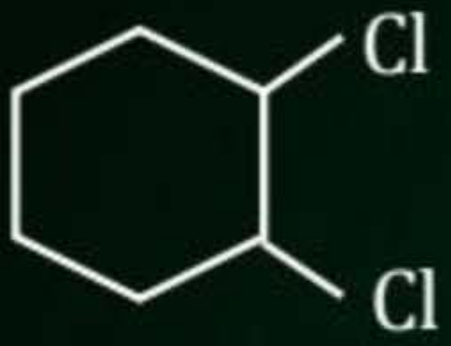


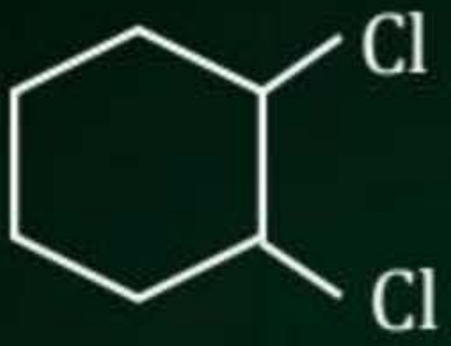
Ⓑ A:

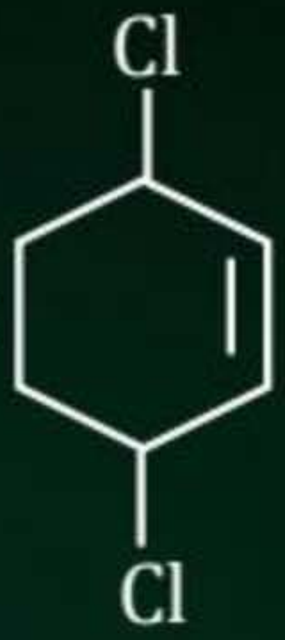


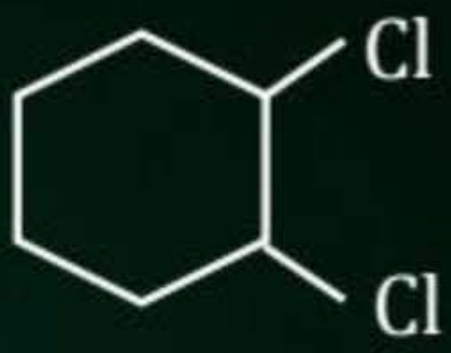
B:



Ⓒ A: 

B: 

Ⓓ A: 

B: 

Ans. (D)

QUESTION (JEE Mains 30th January 2024, Morning Shift)

Given below are two statement one is labeled as Assertion (A) and the other is labeled as Reason (R).

Assertion (A): $CH_2 = CH - CH_2 - Cl$ is an example of allyl halide.

Reason (R): Allyl halides are the compounds in which the halogen atom is attached to sp^2 hybridized carbon atom.

In the light of the two above statements, choose the most appropriate answer from the options given below:

A (A) is true but (R) is false.

B Both (A) and (R) are true but (R) is not the correct explanation of (A).

C (A) is false but (R) is true.

D Both (A) and (R) are true and (R) is the correct explanation of (A).

Ans. (A)

QUESTION (JEE Mains 31st January 2024, Evening Shift)

The product (C) in the below mentioned reaction is:

$$CH_3-CH_2-CH_2-Br \xrightarrow[\Delta]{KOH_{(alc)}} A \xrightarrow{HBr} B \xrightarrow[KOH_{(aq)}]{\Delta} C$$

(A) Propan-1-ol

(B) Propene

(C) Propyne

(D) Propan-2-ol

Ans. (D)

QUESTION [13 April, 2023 (Shift-II)]

Match List-I with List-II.

	List-I - Reagent		List-II – Product
(A)	KOH (alc)	(I)	Nitrile
(B)	KCN (alc)	(II)	Ester
(C)	$AgNO_2$	(III)	Alkene
(D)	$H_3CCOOAg$	(IV)	Nitroalkane

A (A)-(IV), (B)-(III), (C)-(II), (D)-(I)

B (A)-(III), (B)-(I), (C)-(IV), (D)-(II)

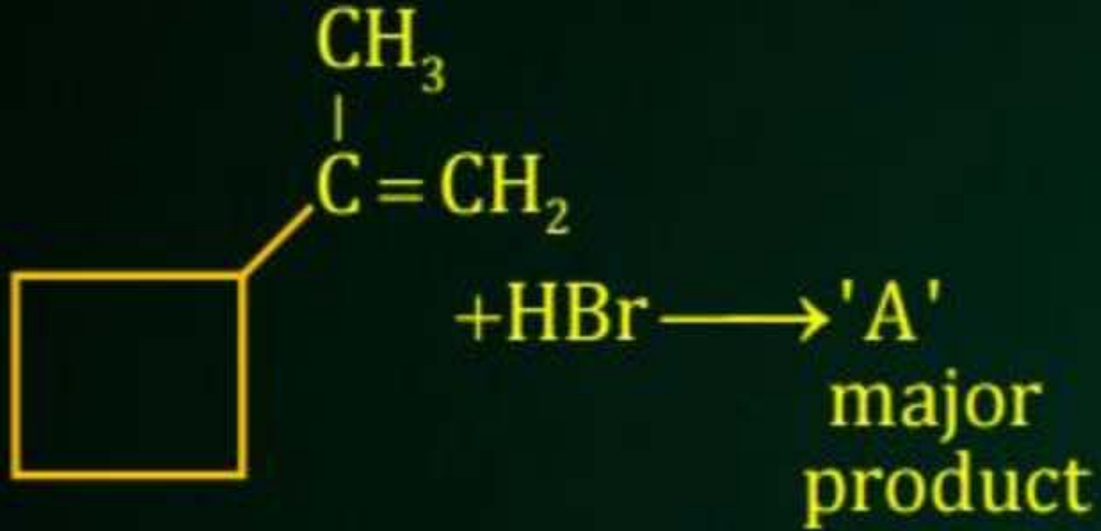
C (A)-(I), (B)-(II), (C)-(III), (D)-(IV)

D (A)-(I), (B)-(III), (C)-(IV), (D)-(II)

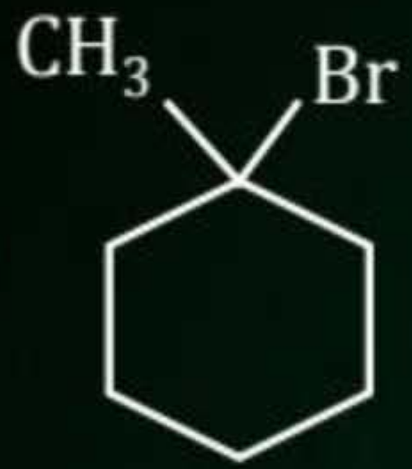
Ans : (B)

QUESTION [24 Jan, 2023 (Shift-I)]

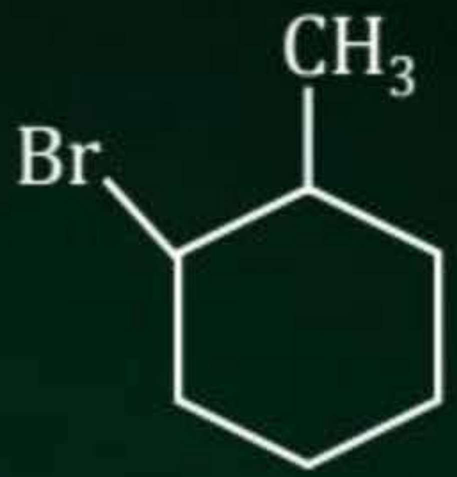
In the following given reaction 'A' is:


CH3
C = CH2
+HBr → 'A'
major product

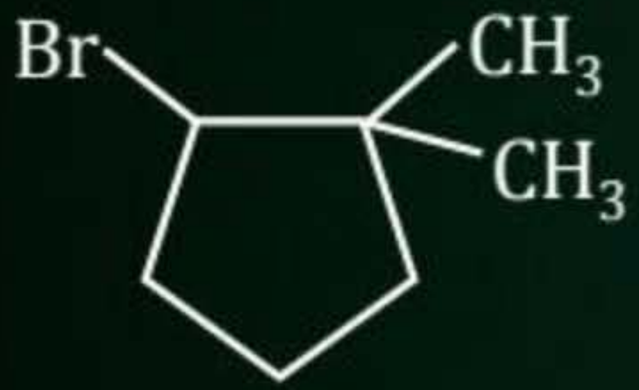
A



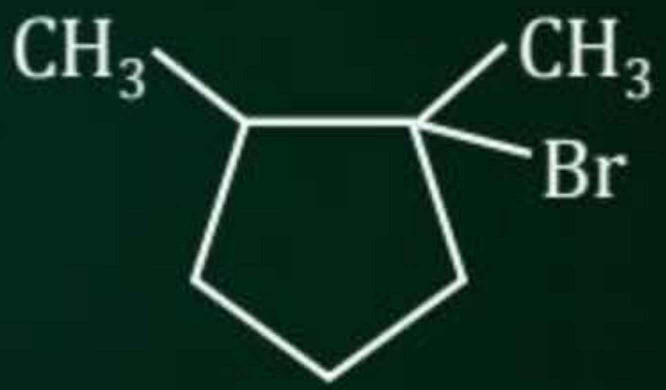
B



C



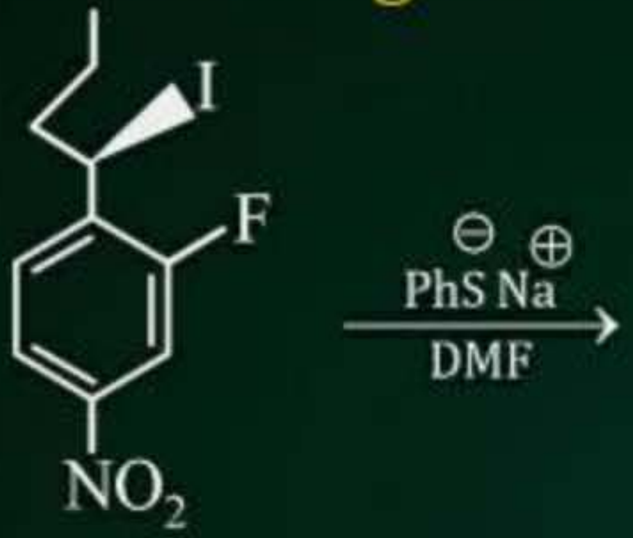
D



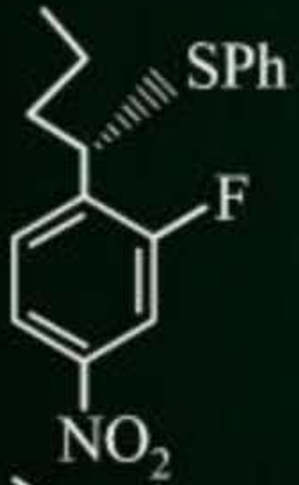
Ans. (D)

QUESTION [27 June, 2023 (Shift-I)]

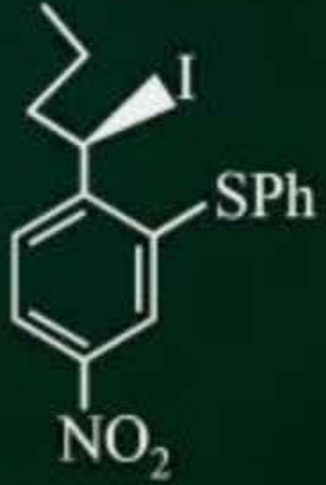
The major product of the following reaction is:


I
F
NO2
PhS⁻ Na⁺
DMF

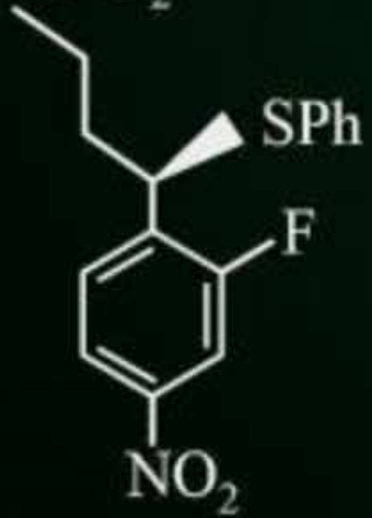
A



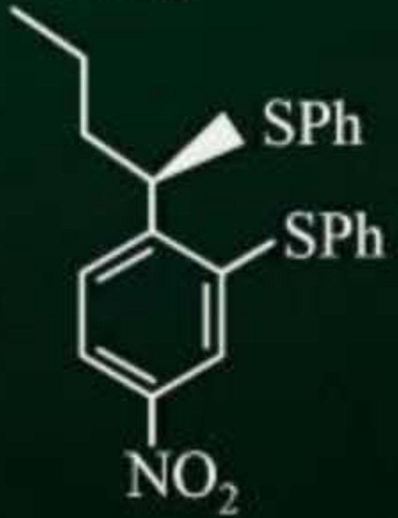
B



C



D



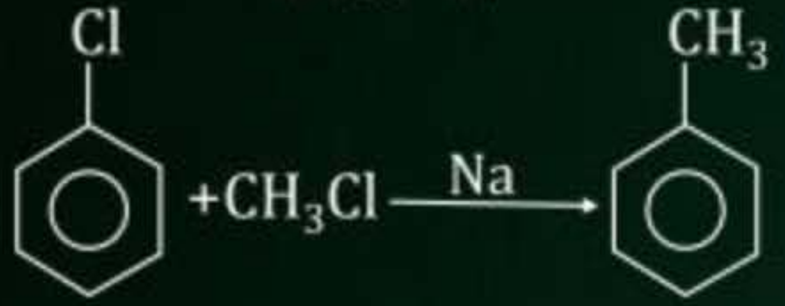
Ans : (A)

QUESTION [30 Jan, 2023 (Shift-I)]

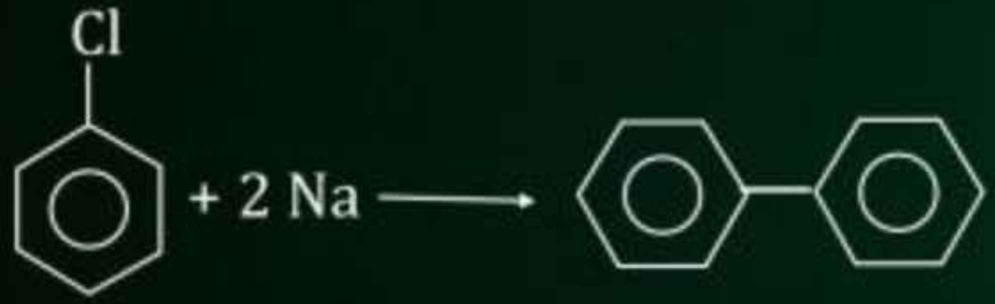
Match List-I with List-II

List -I

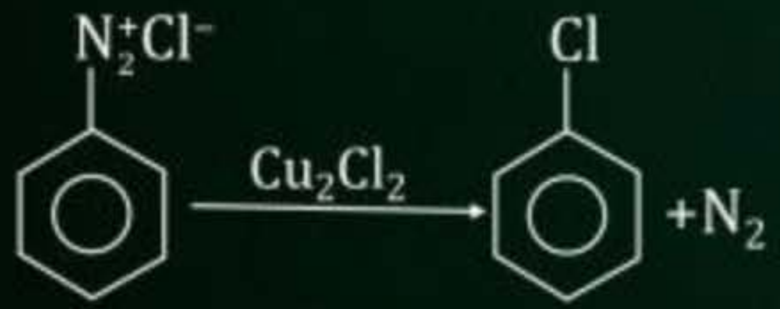
(A)


Cl
+CH3Cl
Na
CH3

(B)



(C)


N2+Cl−
Cu2Cl2
Cl
+N2

(D) $C_2H_5Cl + NaI \longrightarrow C_2H_5I + NaCl$

List -II

(I) Fitting reaction

(II) Wurtz Fitting reaction

(III) Finkelstein reaction

(Iv) Sandmeyer reaction

Choose the correct answer from the option given below:

A (A) - (II), (B) - (I), (C) - (III), (D) - (IV)

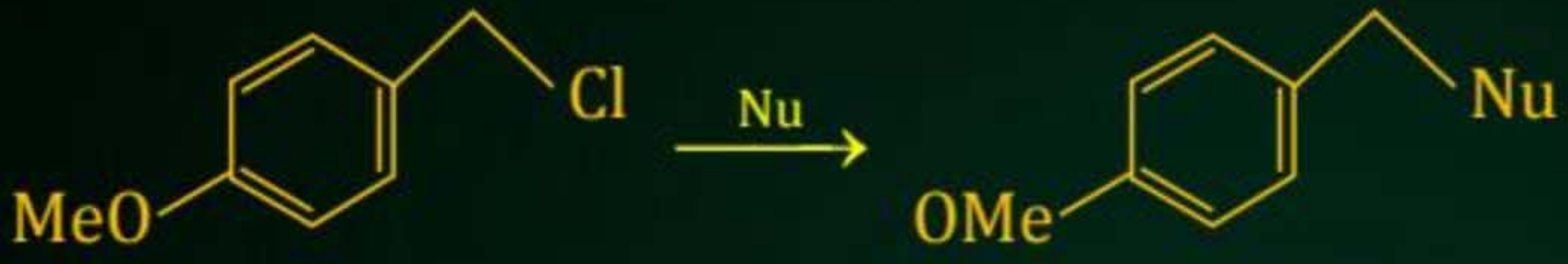
B (A) - (III), (B) - (II), (C) - (IV), (D) - (I)

C (A) - (IV), (B) - (II), (C) - (III), (D) - (I)

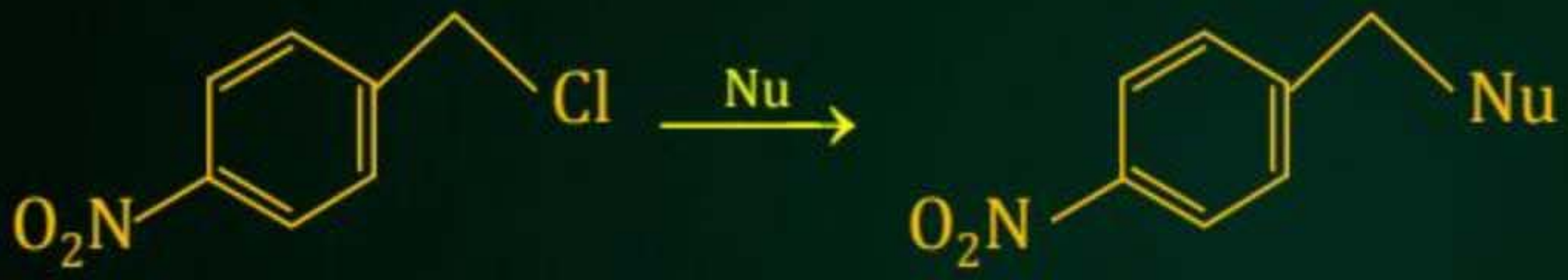
D (A) - (II), (B) - (I), (C) - (IV), (D) - (III)

Ans : (D)

QUESTION [11 April, 2023 (Shift-I)]


MeO
Cl
Nu
OMe
Nu

(I)


O_2N
Cl
Nu
O_2N
Nu

(II)

Where Nu = Nucleophile

Find out the correct statement from the options given below for the above 2 reactions.

A Reaction (I) is of 2nd order and reaction (II) is of 1st order.

B Reaction (I) and (II) both are of 2nd order.

C Reaction (I) is of 1st order and reaction (II) is of 2nd order.

D Reactions (I) and (II) both are of 1st order.

Ans : (C)

QUESTION [13 April, 2023 (Shift-I)]

2-Methyl propyl bromide reacts with $C_2H_5O^-$ and gives 'A' whereas on reaction with C_2H_5OH it gives 'B'. The mechanism followed in these reactions and the products 'A' and 'B' respectively are:

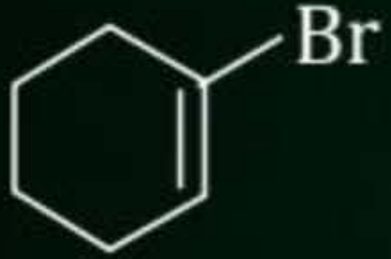
- **A** S_N2, A = iso-butyl ethyl ether; S_N1, B = tert-butyl ethyl ether
- **B** S_N1, A = tert-butyl ethyl ether; S_N1, B = 2-butyl ethyl ether
- **C** S_N1, A = tert-butyl ethyl ether; S_N2, B = isobutyl ethyl ether
- **D** S_N2, A = 2-butyl ethyl ether; S_N2, B = isobutyl ethyl ether

Ans. (A)

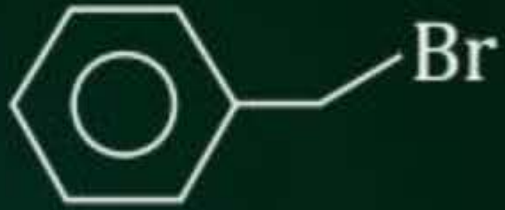
QUESTION [11 April, 2023 (Shift-II)]

Compound from the following that will not produce precipitate on reaction with $AgNO_3$ is:

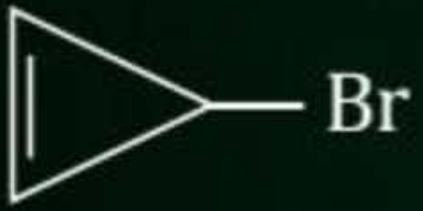
A



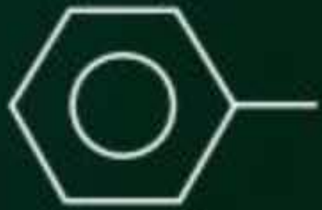
B



C



D

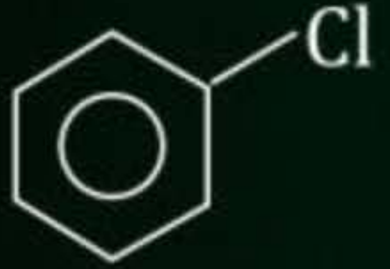
 $CH = CH - CH_2 - Br$

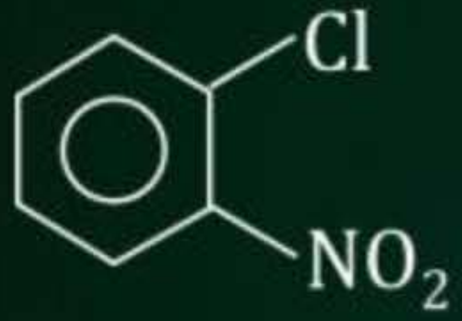
Ans. (A)

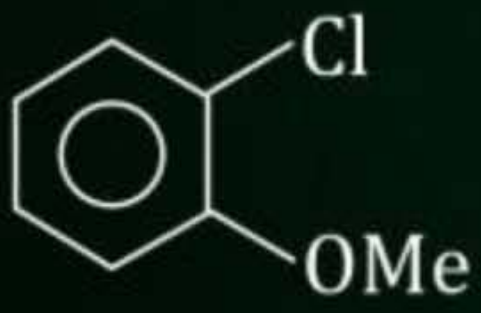
QUESTION [8 April, 2023 (Shift-II)]

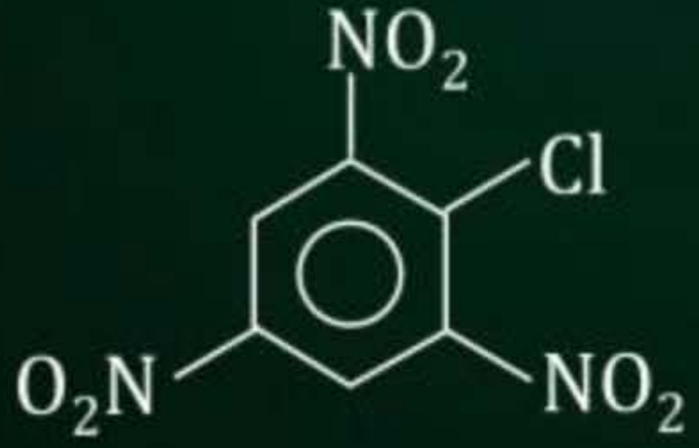
The correct order of reactivity of following haloarenes towards nucleophilic substitution with aqueous NaOH is:

Choose the correct answer from the options given below:

A.


B.


C.


D.

NO_2
Cl
O_2N
NO_2

A $A > B > D > C$

B $C > A > D > B$

C $D > C > B > A$

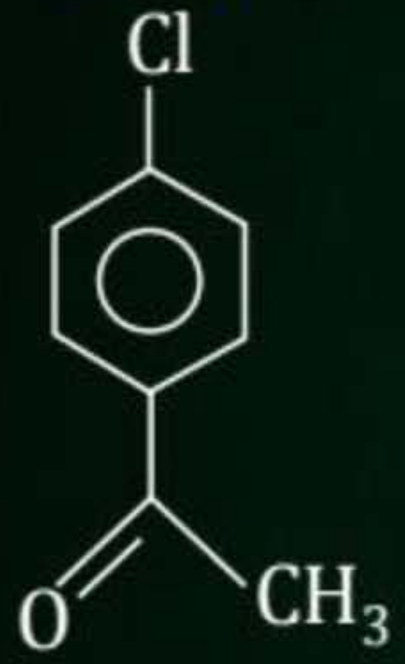
D $D > B > A > C$

Ans : (D)

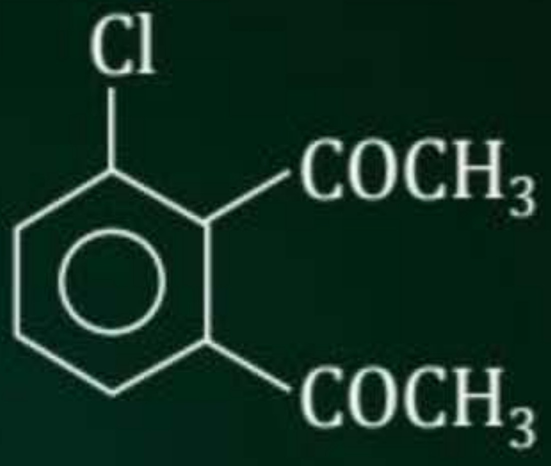
QUESTION [15 April, 2023 (Shift-I)]

The major product formed in the Friedel-Craft acylation of chlorobenzene is:

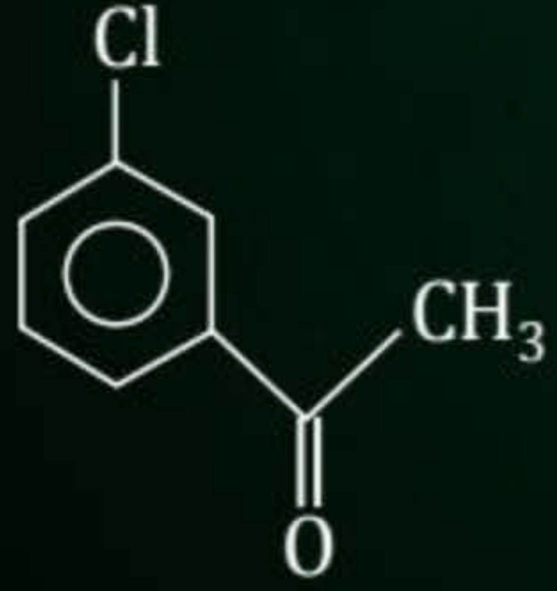
(A)



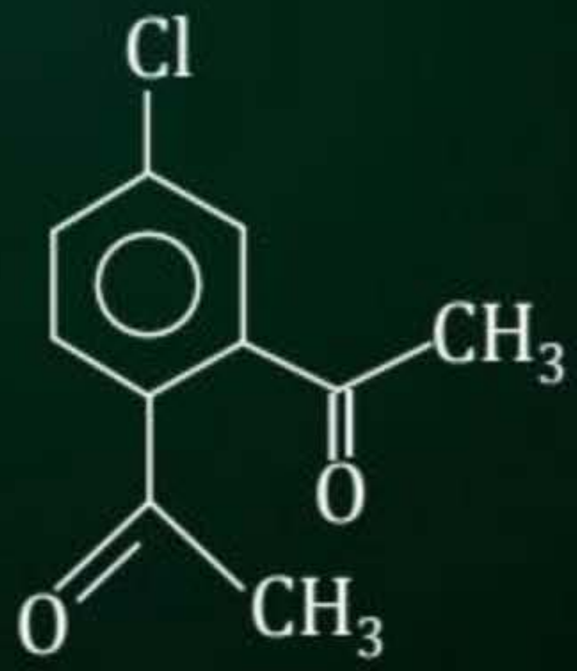
(B)


Cl
COCH3
COCH3

(C)



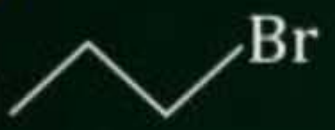
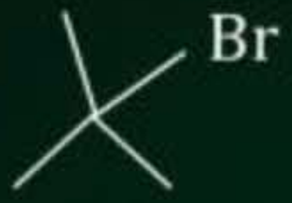
(D)

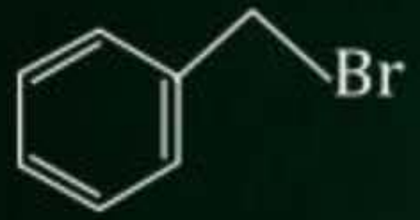
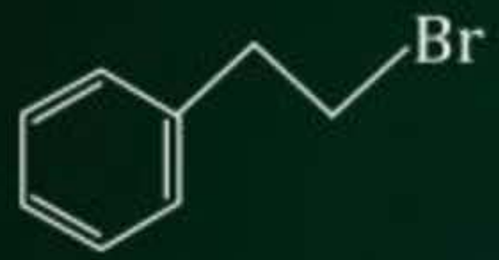

Cl
CH3
O
O
CH3

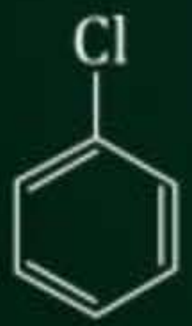
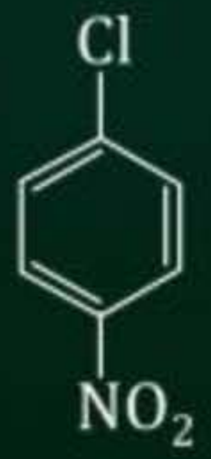
Ans. (A)

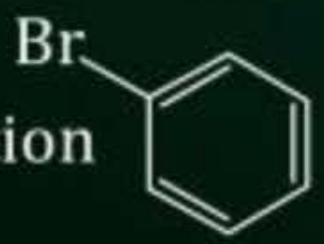
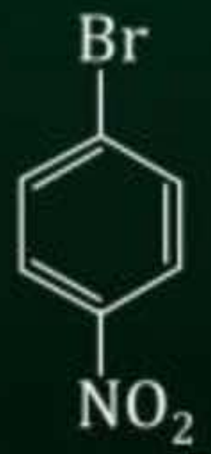
QUESTION [15 April, 2023 (Shift-I)]

Identify the correct order of reactivity for the following pairs towards the respective mechanism:

(A) S_N2  > 

(B)  > 

(C) Electrophilic substitution  > 

(D) Nucleophilic substitution  < 

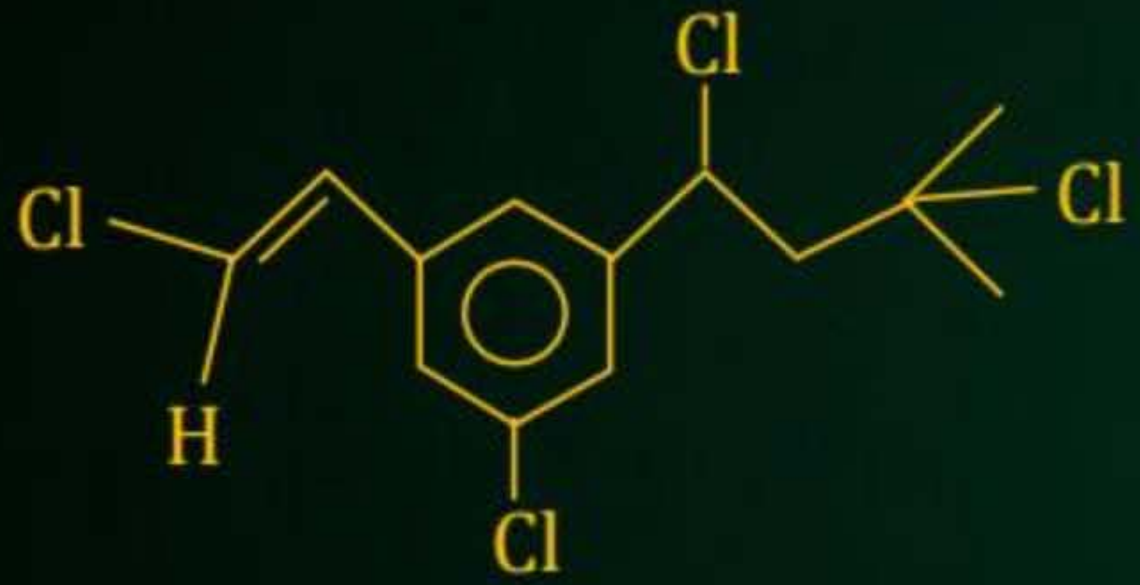
The correct answer form the options given below:

- A (A), (B) & (D) only
- B (A), (B), (C) & (D)
- C (A), (C) & (D) only
- D (B), (C) & (D) only

Ans : (B)

QUESTION [24 Jan, 2023 (Shift-I)]

Number of moles of AgCl formed in the following reaction is ______

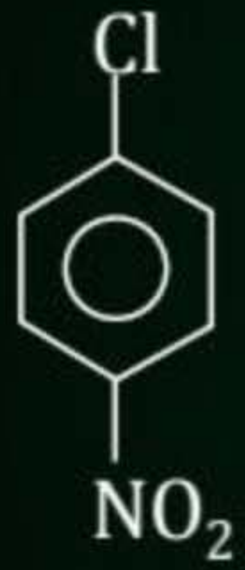


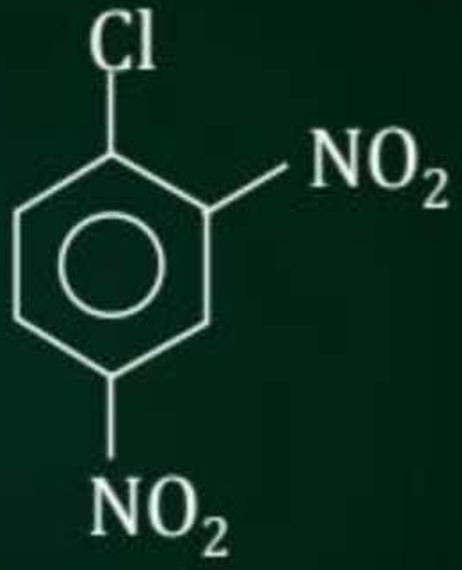
$\xrightarrow{AgNO_3} (A) + X\,AgCl \downarrow$

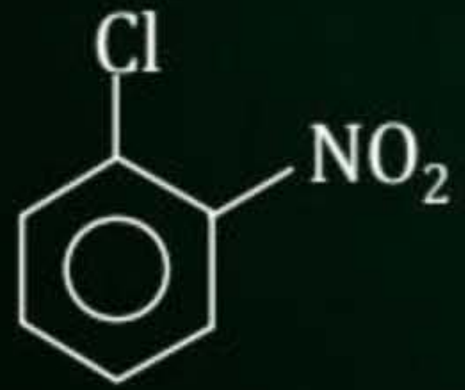
Ans : (2)

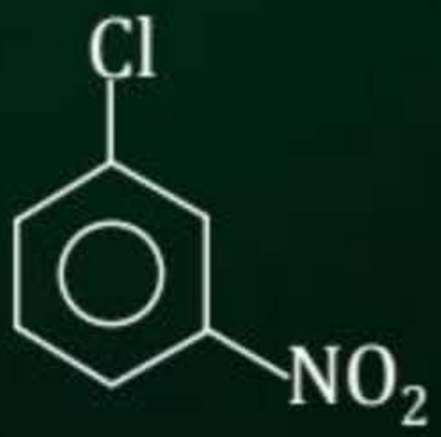
QUESTION [25 Jan, 2023 (Shift-I)]

The compound which will have the lowest rate towards nucleophilic aromatic substitution on treatment with OH^- is:

A


B


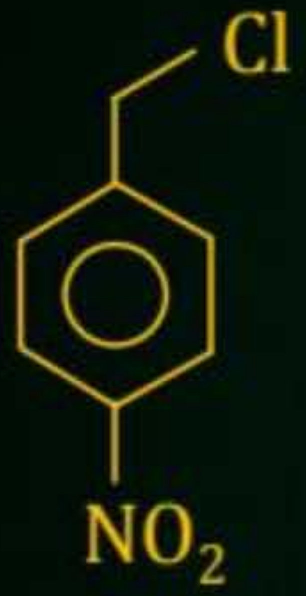
C


D


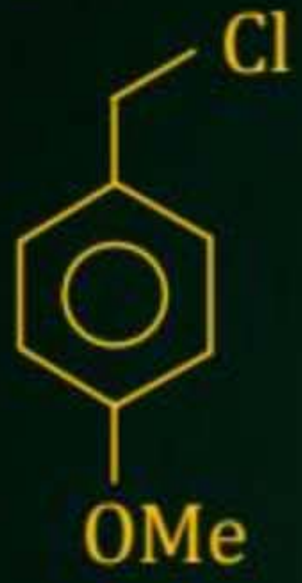
Ans. (D)

QUESTION [30 Jan, 2023 (Shift-II)]

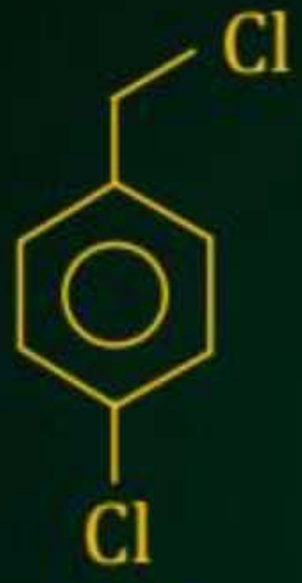
Decreasing order towards S_N1 reaction for the following compounds is:



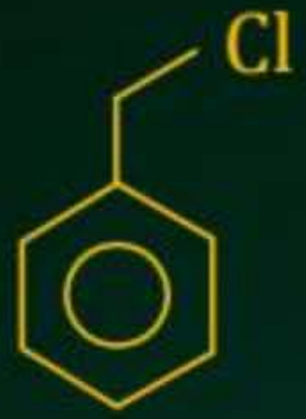
(a)



(b)



(c)



(d)

A (a) > (c) > (d) > (b)

B (a) > (b) > (c) > (d)

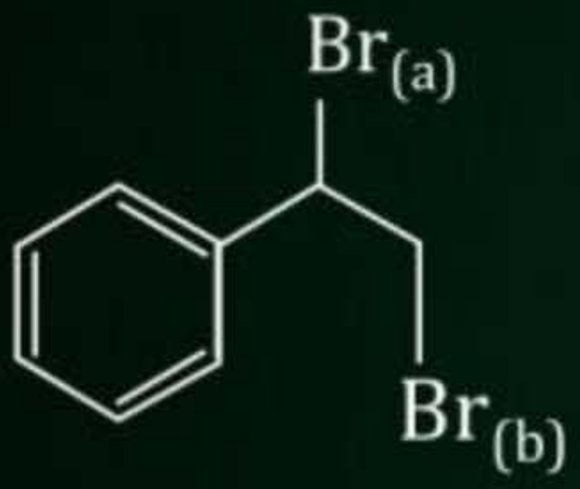
C (b) > (d) > (c) > (a)

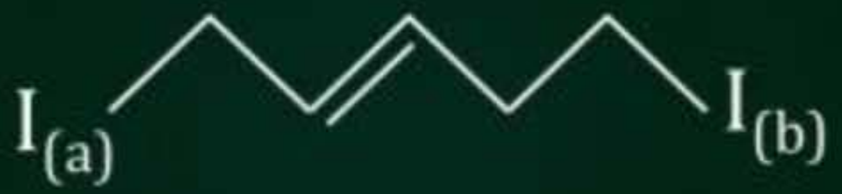
D (d) > (b) > (c) > (a)

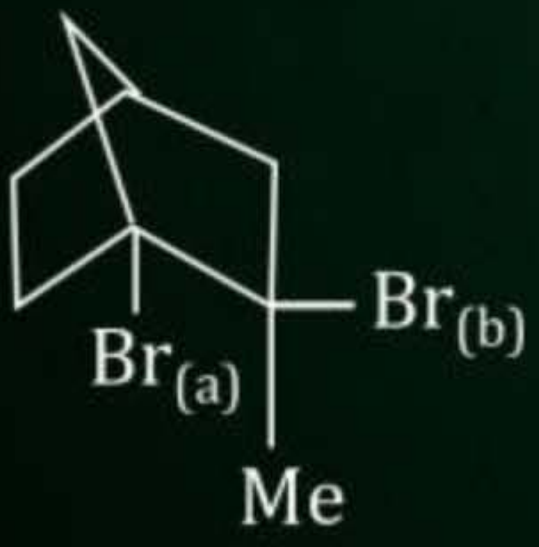
Ans. (C)

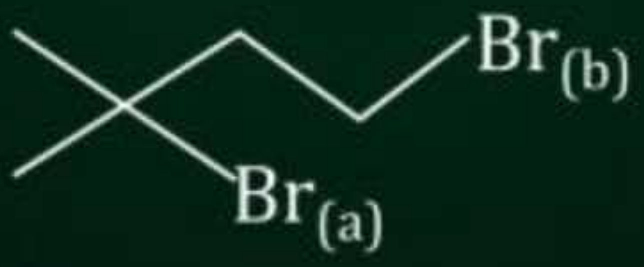
QUESTION [8 April, 2023 (Shift-I)]

Choose the halogen which is most reactive towards S_N1 reaction in the given compounds (A, B, C & D)?

A. 

B. 

C. 

D. 

(A) A-$Br_{(b)}$; B-$I_{(b)}$; C-$Br_{(b)}$; D-$Br_{(b)}$

(B) A-$Br_{(a)}$; B-$I_{(a)}$; C-$Br_{(b)}$; D-$Br_{(a)}$

(C) A-$Br_{(b)}$; B-$I_{(a)}$; C-$Br_{(a)}$; D-$Br_{(a)}$

(D) A-$Br_{(b)}$; B-$I_{(a)}$; C-$Br_{(a)}$; D-$Br_{(a)}$

Ans : (B)

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SOLUTION

Thank you!!

YAKEEN 2.0

FOR NEET 2025

Lecture- 09 | **Organic Chemistry**

Haloalkanes and Haloarenes

By- Pankaj Sir(POPU MAMA)

Physics Wallah

Topics *to be covered*

1. Nucleophilicity ✓
2. Polyhalogen Compounds ✓ CH_2Cl_2, $CHCl_3$, CCl_4
   CHI_3
3. Benzyne Mechanism ✓
4. Practice

Nucleophilicity

Nucleophilicity is the ability to donate electron pair.

→ L.P X^-, ^-OH, H_2O, $^-NH_2$, NH_3, ROH etc

→ π $e^{\ominus}$s
- Alkene
- Alkyne
- Benzene

$$Nu^{\ominus}: + E^{\oplus} \longrightarrow Nu{-}E$$

easy donation of L.P , Nucleo ↑

OP Points:

1. Negatively charged Nu is more nucleophilic than corresponding neutral atom.

$\overset{\ominus}{N}H_2 > NH_3$

$\overset{\ominus}{O}H > H_2O$

$R\overset{\ominus}{O} > ROH$

OP Points:

2. If donor atom is same or belongs to same period then left to right nucleophilicity decreases in PPS and increases in PAS.

(solvation) $\overset{\ominus}{CH_3}$ $\overset{\ominus}{NH_2}$ $\overset{\ominus}{O}H$ $F^{\ominus}$

In PPS

Size $C > N > O > F$

Electron density $\bar{C} < \bar{N} < \bar{O} < F^{-}$

Solvation $C^{\ominus} < N^{\ominus} < O^{\ominus} < F^{\ominus}$

Nu $C^{\ominus} > N^{\ominus} > O^{\ominus} > F^{\ominus}$

(Repulsion) $\overset{\ominus}{CH_3}$ $\overset{\ominus}{NH_2}$ $\overset{\ominus}{O}H$ $F^{\ominus}$

In PAS

Size $C > N > O > F$

$e^{\ominus}$ density $\bar{C} < \bar{N} < \bar{O} < F^{-}$

repulsion $\bar{C} < \bar{N} < \bar{O} < F^{-}$

Nu $\bar{C} < \bar{N} < \bar{O} < F^{-}$

OP Points:

3. Top to bottom nucleophilicity increases in PPS and decreases in PAS.

solvation
In PPS $F^- \quad Cl^- \quad Br^- \quad I^-$

size $F < Cl < Br < I$

$e^\ominus$ density $F^- > Cl^- > Br^- > I^-$

solvation $F^- > Cl^- > Br^- > I^-$

Nu $F^- < Cl^- < Br^- < I^-$

Repulsion
In PAS $F^- \quad Cl^- \quad Br^- \quad I^-$

size $F < Cl < Br < I$

$e^\ominus$ density $F^- > Cl^- > Br^- > I^-$

repulsion $F^- > Cl^- > Br^- > I^-$

Nu $F^- > Cl^- > Br^- > I^-$

OP Points:

4. If Lone pair containing atom present adjacent to nucleophilic atom then it will more nucleophilic.

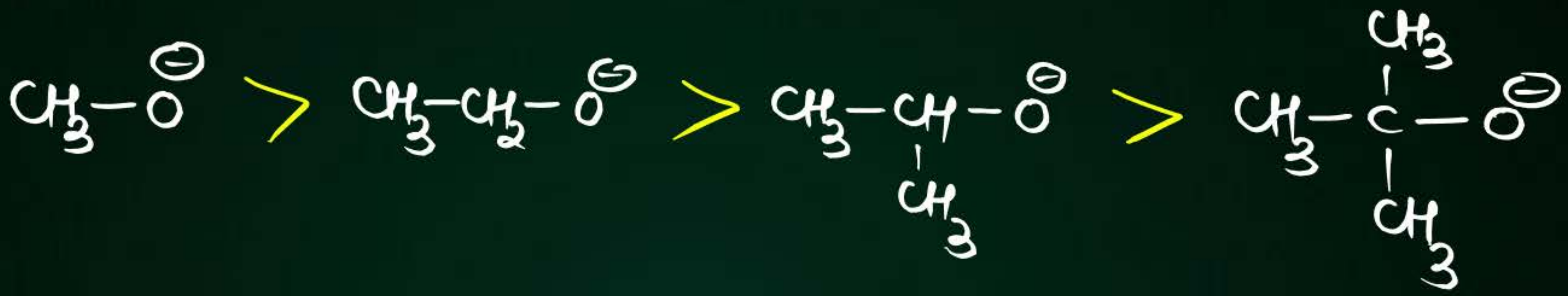
$$\overset{\times\times}{N}H_2-\overset{\times\times}{N}H_2 > \overset{\times\times}{N}H_3$$

$$H\overset{\times\times}{O}-\overset{\times\times}{O}H > H_2\overset{\times\times}{O}$$

$$R-\overset{\times\times}{O}-\overset{\times\times}{O}-R > R\overset{\times\times}{O}H/R$$

OP Points:

5. Nucleophilicity is inversely proportional to steric hinderance.



$$CH_3-O^{\ominus} > CH_3-CH_2-O^{\ominus} > CH_3-\underset{CH_3}{\underset{|}{CH}}-O^{\ominus} > CH_3-\overset{CH_3}{\overset{|}{\underset{CH_3}{\underset{|}{C}}}}-O^{\ominus}$$

QUESTION (NCERT Exercise)

Identify the reagents shown in bold in the following equations as nucleophiles or electrophiles:

Nu

A $CH_3COOH + \mathbf{HO^-} \rightarrow CH_3COO^- + H_2O$

Nu

B $CH_3COCH_3 + \mathbf{CN^-} \rightarrow (CH_3)_2\,C(CN)(OH)$

C $C_6H_6 + \mathbf{CH_3CO^+} \rightarrow C_6H_5COCH_3$

E

QUESTION (NCERT Exemplar)

Electrophiles are electron seeking species. Which of the following groups contain only electrophiles?

A ✗ $\underset{E}{\overset{\square}{B}F_3}, \underset{Nu}{\overset{\times\times}{N}H_3}, \underset{Nu}{H_2\overset{\times\times}{O}}$

B $\underset{E}{\overset{\square}{Al}Cl_3}, \underset{E}{\overset{d}{\overset{\square}{S}}O_3}, \underset{E}{NO_2^+}$

C $\underset{E}{NO_2^+}, \underset{E}{CH_3^+}, \underset{E}{CH_3-\overset{+}{C}=O}$

[✓ D] Both (B) & (C)

QUESTION (NCERT Exemplar)

Nucleophile is a species that should have

A ✓ a pair of electrons to donate

B posit✗ive charge

C ✓ negative charge

[✓ D] Both (A) & (C)

QUESTION [AIPMT 2007]

PPS

For (i) I^- (ii) Cl^- (iii) Br^- the increasing order of nucleophilicity would be

[✓ **A** $Cl^- < Br^- < I^-$]

B $I^- < Cl^- < Br^-$

C $Br^- < Cl^- < I^-$

D $I^- < Br^- < Cl^-$

F^- Cl^- Br^- I^-

Nu $(F^- < Cl^- < Br^- < I^-)$

in PPS

QUESTION

$RSH > ROH$

Basic (PPS)

Stable $RS^- > RO^-$ $(\underbrace{RS^- < RO^-})$

Nu $O^- < S^-$ in PPS

Consider thiol anion ($RS^\ominus$) and alkoxy anion ($RO^\ominus$). Which of the following statements is correct?

A $RS^\ominus$ is less basic but more nucleophilic than $RO^\ominus$ ✓

B $RS^\ominus$ is more basic and more nucleophilic than $RO^\ominus$

C $RS^\ominus$ is more basic but less nucleophilic than $RO^\ominus$

D $RS^\ominus$ is less basic and less nucleophilic than $RO^\ominus$

A.S ↑ stability of anion

Aajsheekha

Nu vs B

$Nu^\ominus + E^+ \longrightarrow Nu-E$

$B^\ominus + H^+ \longrightarrow B-H$

For B.S

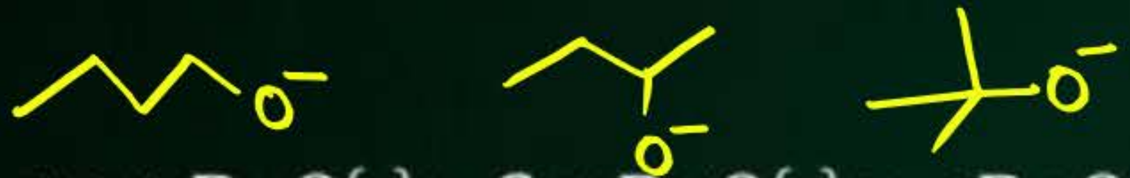
As ↑ stability of anion ↑

Basicity ↓

QUESTION

Which sequence of nucleophilicity is correct?

[✓ A] $nBuO^{(-)} > SecBuO^{(-)} > tert\ BuO^{(-)}$



B $tert\ BuO^{(-)} > SecBuO^{(-)} > nBuO^{(-)}$

C $SecBuO^{(-)} > tertBuO^{(-)} > nBuo^{(-)}$

D $SecBuO^{(-)} > n\text{-}BuO^{(-)} > tertBuO^{(-)}$

QUESTION

The most reactive nucleophile among the following is:

[✓ A] CH_3O^-

B $C_6H_5O^-$

C $(CH_3)_2CHO^-$

D $(CH_3)_3CO^-$

QUESTION

PPS

Nucleohpilicity order is correctly represented by:

A $CH_3^- < NH_2^- < HO^- < F^-$

B $NH_3^- > F^- > HO^- > CH_3^-$

C $CH_3^- = NH_2^- > HO^- = F^-$

[✓ D] $CH_3^- > NH_2^- > HO^- > F^-$

QUESTION

$F^- > Cl^- > Br^- > I^-$

$$Nu^- + Me-X \xrightarrow[25^\circ]{DMF} Me-Nu + X^-$$

This is a S_N2 reaction where nucleophile attack Me–X in the rate determining step to give the product. Rate of this reaction increases with concentration as well as nucleophile. Match the column I with column II for the above reaction

Column I (Nucleophile)		Column II (Relative rate)	
(A)	$F^\ominus$ Ⓢ	(P)	3.25
(B)	$Cl^\ominus$ Ⓠ	(Q)	6.25
(C)	$Br^\ominus$ Ⓟ	(R)	1.0
(D)	$I^\ominus$ Ⓡ	(S)	7.75

Polyhalogen Compounds

$CH_2Cl_2 \rightarrow$ Paint remover
$\rightarrow$ metal cleaning
$\rightarrow$

CH_2Cl_2

1. **Dichloromethane:** Dichloromethane is widely used as a solvent as a paint remover, as a propellant in aerosols, and as a process solvent in the manufacture of drugs.
2. It is also used as a metal cleaning and finishing solvent.
3. Methylene chloride harms the human central nervous system.
4. Exposure to lower levels of methylene chloride in air can lead to slightly impaired hearing and vision.
5. Higher levels of methylene chloride in air cause dizziness, nausea, tingling and numbness in the fingers and toes.
6. In humans, direct skin contact with methylene chloride causes intense burning and mild redness of the skin.
7. Direct contact with the eyes can burn the cornea.

2. Trichloromethane (Chloroform):

1. Chloroform is employed as a solvent for fats, alkaloids, iodine and other substances.
2. The major use of chloroform today is in the production of the freon refrigerant R-22.
3. It was once used as a general anaesthetic in surgery but has been replaced by less toxic, safer anaesthetics such as ether.
4. As might be expected from its use as an anaesthetic inhaling chloroform vapours depresses the central nervous system. Breathing about 900 parts of chloroform per million parts of air (900 parts per million) for a short time can cause dizziness, fatigue, and headache.
5. Chronic chloroform exposure may cause damage to the liver (where chloroform is metabolised to phosgene) and to the kidneys, and some people develop sores when the skin is immersed in chloroform.
6. Chloroform is slowly oxidized by air in the presence of light to an extremely poisonous gas, carbonyl chloride, also known as phosgene.
7. It is therefore stored in closed dark colored bottles completely filled so that air is kept out.

$$\underbrace{2CHCl_3 + O_2} \xrightarrow{\text{light}} \underset{\text{Phosgene}}{\underline{2COCl_2}} + 2HCl$$

3. Triiodomethane (Iodoform):

Haloform Rxn

1. It was used earlier as an antiseptic but the antiseptic properties are due to the liberation of free iodine and not due to iodoform itself.
2. Due to its objectionable smell, it has been replaced by other formulations containing iodine.

4. Tetrachloromethane (Carbon Tetrachloride):

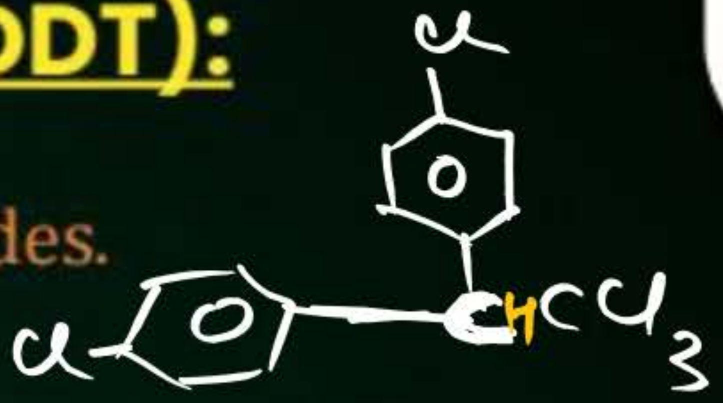
CCl_4 Fire Exting

1. It is produced in large quantities for use in the manufacture of refrigerants and propellants for aerosol cans.
2. It is also used as feedstock in the synthesis of chlorofluorocarbons and other chemicals, pharmaceutical manufacturing, and general solvent use.
3. Until the mid 1960s, it was also widely used as a cleaning fluid both in industry, as a degreasing agent, and in the home, as a spot remover and as fire extinguisher.
4. There is some evidence that exposure to carbon tetrachloride causes liver cancer in humans.
5. The most common effects are dizziness, light headedness, nausea and vomiting which can cause permanent damage to nerve cells.
6. In severe cases, these effects can lead rapidly to stupor, coma, unconsciousness or death.
7. Exposure to CCl_4 can make the heart beat irregularly or stop. The chemical may irritate the eyes on contact. When carbon tetrachloride is released into the air, it rises to the atmosphere and depletes the ozone layer.

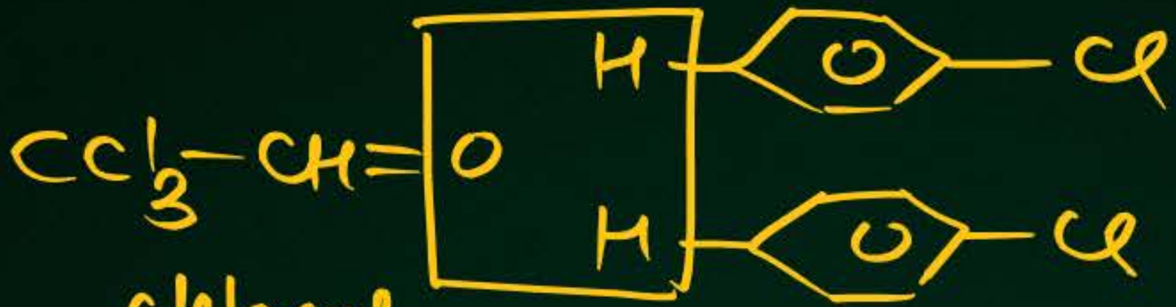
5. Freons:

1. Chlorofluorocarbon compounds of methane and ethane are collectively known as freons.
2. They are extremely stable, unreactive, non-toxic, noncorrosive and easily liquefiable gases.
3. Freon 12 (CCl_2F_2) is one of the most common freons in industrial use.
4. It is manufactured from tetrachloromethane by Swarts reaction. These are usually produced for aerosol propellants, refrigeration and air conditioning purposes.
5. By 1974, total freon production in the world was about 2 billion pounds annually.
6. Most freon even that used in refrigeration, eventually makes its way into the atmosphere where it diffuses unchanged into the stratosphere. In stratosphere, freon is able to initiate radical chain reactions that can upset the natural ozone balance.

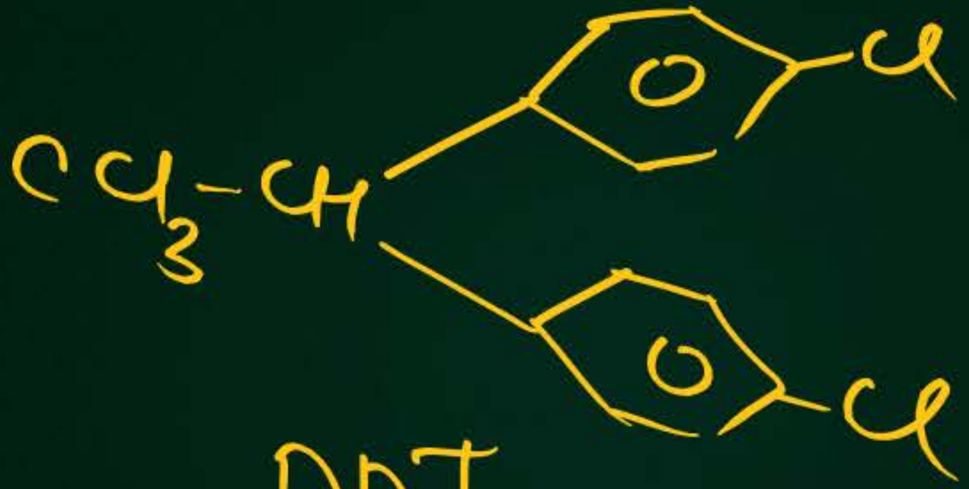
6. p, p′-dichloro diphenyl trichloro-ethane (DDT):



1. DDT was the first chlorinated non biodegradable organic insecticides.
2. Paul Muller of Geigy Pharmaceuticals in Switzerland discovered.
3. The use of DDT increased enormously on a worldwide basis after World War II, primarily because of its effectiveness against the mosquito that spreads malaria and lice that carry typhus.
4. However, problems related to extensive use of DDT began to appear in the late 1940s.
5. Many species of insects developed resistance to DDT, and it was also discovered to have a high toxicity towards fish.
6. The chemical stability of DDT and its fat solubility compounded the problem. DDT is not metabolised very rapidly by animals; instead, it is deposited and stored in the fatty tissues. If ingestion continues at a steady rate, DDT builds up within the animal over time. The use of DDT was banned in the United States in 1973, although it is still in use in some other parts of the world.


CCl3–CH=O
H
H
Cl
Cl

Chloral


CCl3–CH
Cl
Cl

✓

DDT

QUESTION [AIIMS 2015]

Assertion: $CHCl_3$ is stored in dark bottles. ✓

Reason: $CHCl_3$ is oxidised in dark. ✗

$CHCl_3 + O_2 \xrightarrow{\boxed{h\nu}} COCl_2$

Phosgene

A. If both Assertion and Reason are correct and the Reason is the correct explanation of Assertion.

B. If both Assertion and Reason are correct but Reason is not the correct explanation of Assertion.

C. If Assertion is correct but Reason is incorrect. ✓

D. If both the Assertion and Reason are incorrect.

QUESTION (JEE Mains 1st Feb 2024, Evening Shift)

Match List-I with List-II.

	List-I Compound			List-II Use
(A)	Carbon tetrachloride CCl_4 (III)		(I)	Paint remover
(B)	Methylene chloride CH_2Cl_2 (I)		(II)	Refrigerators and air conditioners
(C)	DDT (IV)		(III)	Fire extinguisher
(D)	Freons CF_2Cl_2 (II)		(IV)	Non Biodegradable insecticide

Choose the correct answer from the options given below:

- A (A)-(I), (B)-(II), (C)-(III), (D)-(IV)
- [✓ B] (A)-(III), (B)-(I), (C)-(IV), (D)-(II)
- C (A)-(IV), (B)-(III), (C)-(II), (D)-(I)
- D (A)-(II), (B)-(III), (C)-(I), (D)-(IV)

QUESTION (JEE Mains 6th April 2024, Morning Shift)

Match List I with List II.

List-I (Compound)		List-II (Uses)	
A.	Iodoform (III)	I.	Fire extinguisher
B.	Carbon tetrachloride (I)	II.	Insecticide
C.	CFC (freons) (IV)	III.	Antiseptic
D.	DDT (II)	IV.	Refrigerants

Choose the correct answer from the options given below:

A A-I, B-II, C-III, D-IV

B A-III, B-II, C-IV, D-I

[✓ C A-III, B-I, C-IV, D-II]

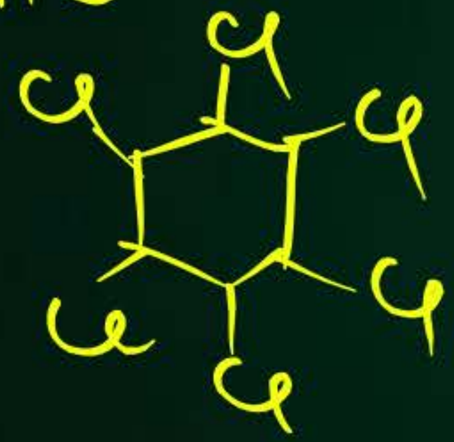
D A-II, B-IV, C-I, D-III

QUESTION (JEE Mains 31 Jan 2023, Shift-II)

In the following halogenated organic compounds the one with maximum number of chlorine atoms in its structure is:

A Chloral CCl_3CHO

[✓ **B** Gammaxene]



C Chloropicrin CCl_3NO_2

D Freon-12 CF_2Cl_2

QUESTION (JEE Mains 11 April 2023, Shift-II)

Which of the following compounds is an example of Freon?

[✓ A] $C_2Cl_2F_2$

B C_2HF_3

C $C_2H_2F_2$

D C_2F_4

QUESTION (JEE Mains 24 Jan 2023, Shift-I)

Which of the following is true about freons?

[✓ A] These are chlorofluorocarbon compounds.

B These are chemicals causing skin cancer.

C These are radicals of chlorine and chlorine monoxide.

D All radicals are called freons.

QUESTION

Which of the following is used in fire extinguishers?

Ⓐ CH_4

Ⓑ $CHCl_3$

Ⓒ CH_2Cl_2

[✓ Ⓓ CCl_4]

QUESTION

Iodoform is used as

- **A** anaesthetic
- **B** [✓ antiseptic]
- **C** analgesic
- **D** anti febrin

QUESTION

$CHCl_3$ on oxidation by air in presence of light gives

Ⓐ [✓ Phosgene]

Ⓑ Formic aicd

Ⓒ Chloropicrin

Ⓓ CCl_4

QUESTION

The following is used in paint removing

A $CHCl_3$

B [✓ CH_2Cl_2]

C CCl_4

D CH_3Cl

QUESTION

First chlorinated insecticide

Ⓐ [✓ DDT]

Ⓑ gammaxene

Ⓒ iodoform

Ⓓ freon

QUESTION

In fire extinguishers, following is used

(A) $CHCl_3$

(B) CS_2

[✓ (C) CCl_4]

(D) CH_2Cl_2

QUESTION

The following is used for metal cleaning and finishing

Ⓐ $CHCl_3$

Ⓑ CHI_3

[✓ Ⓒ CH_2Cl_2]

Ⓓ C_6H_6

QUESTION

The following is used as anaesthetic

A C_2H_4

[✓ B] $CHCl_3$

C CH_2Cl_2

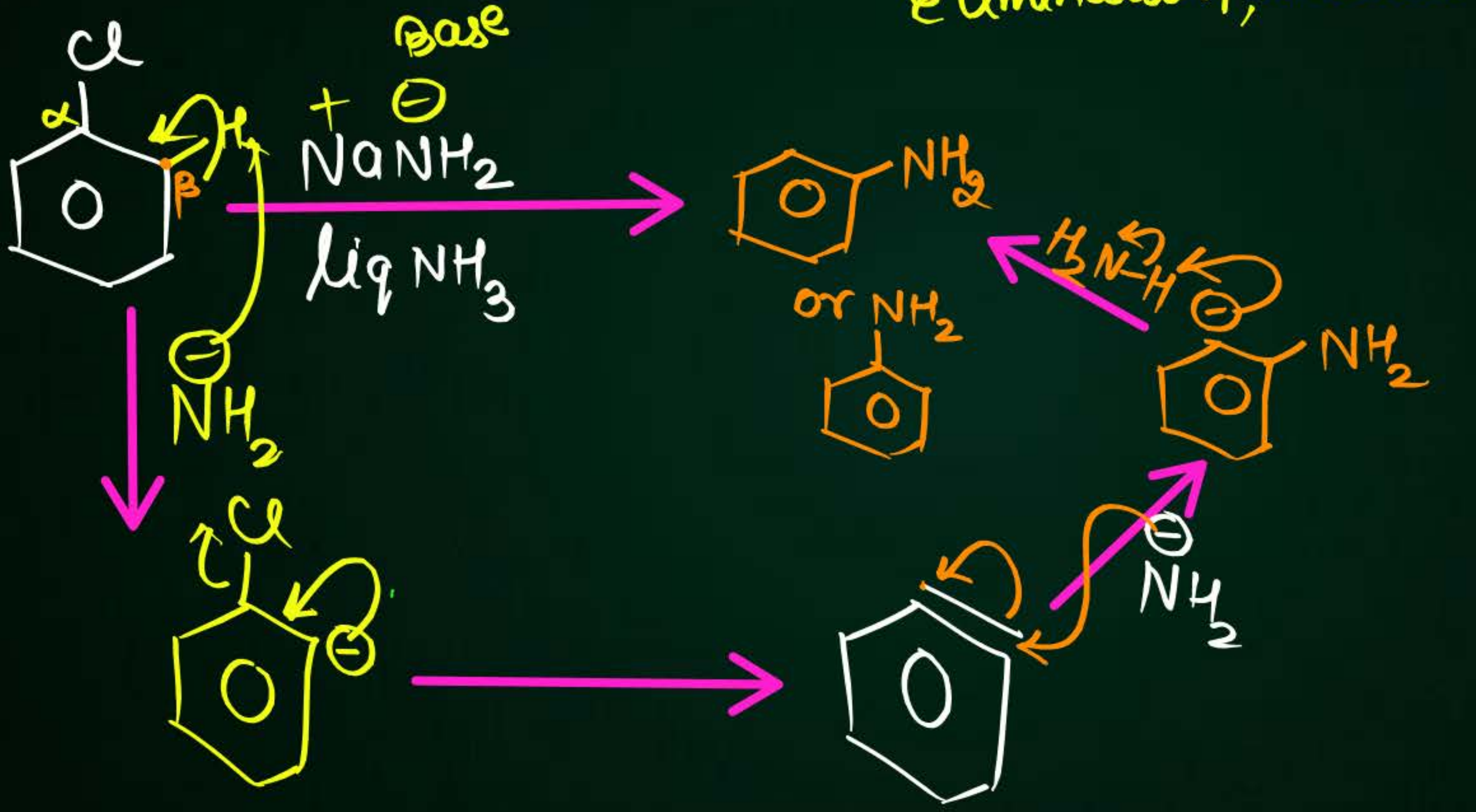
D DDT

Benzyne Mechanism (SN_{EA})

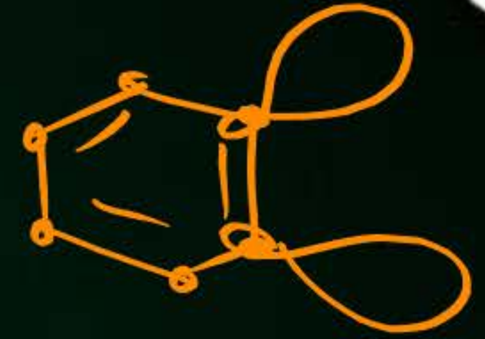
Inductive

Elimination, addition

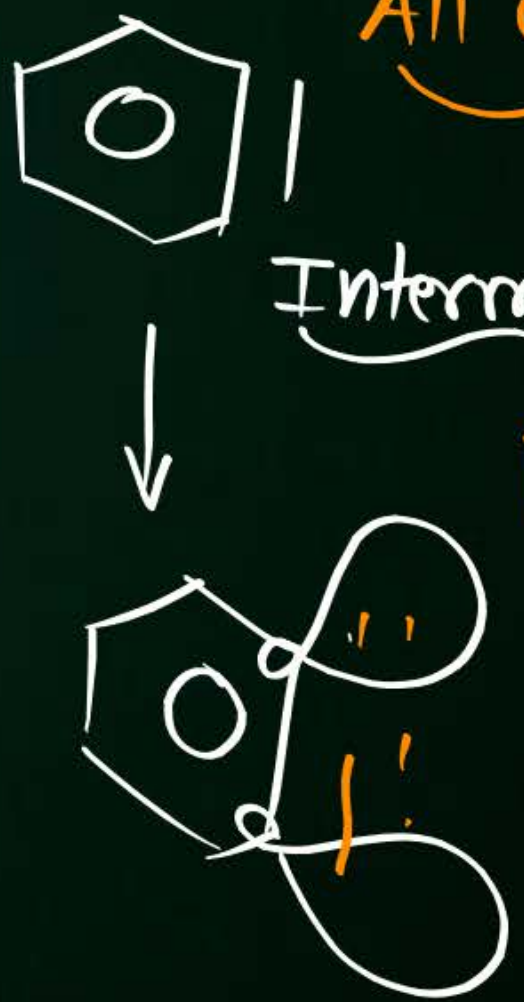
$\overset{\ominus}{N}H_2$ strong Base



Base
Cl
α
β
H
$\overset{+}{Na}\overset{\ominus}{N}H_2$
liq NH_3
$\overset{\ominus}{N}H_2$
NH_2
or NH_2
H_2N-H
$\ominus$
NH_2
Cl
$\ominus$
$\overset{\ominus}{N}H_2$



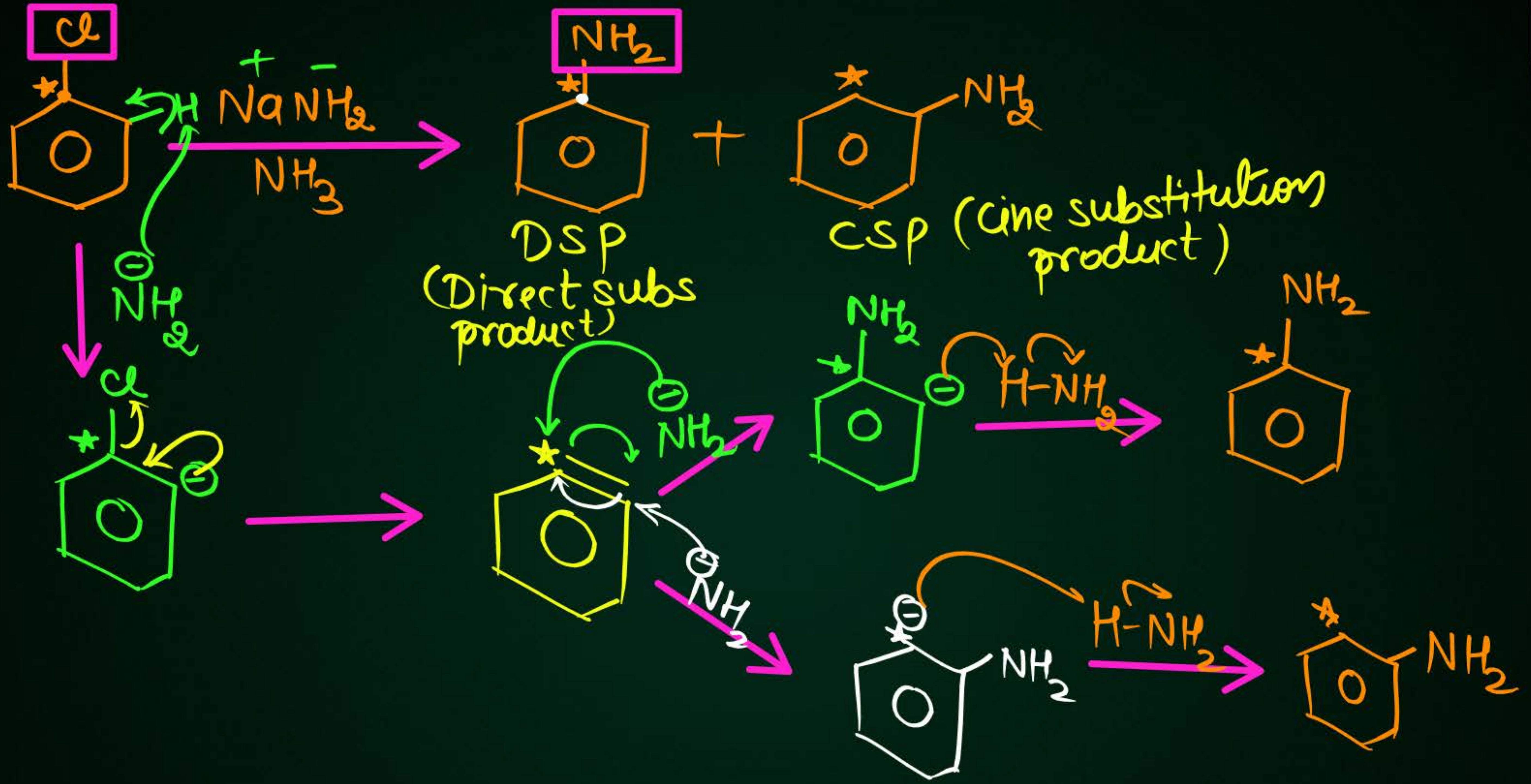
All 6 C → sp^2



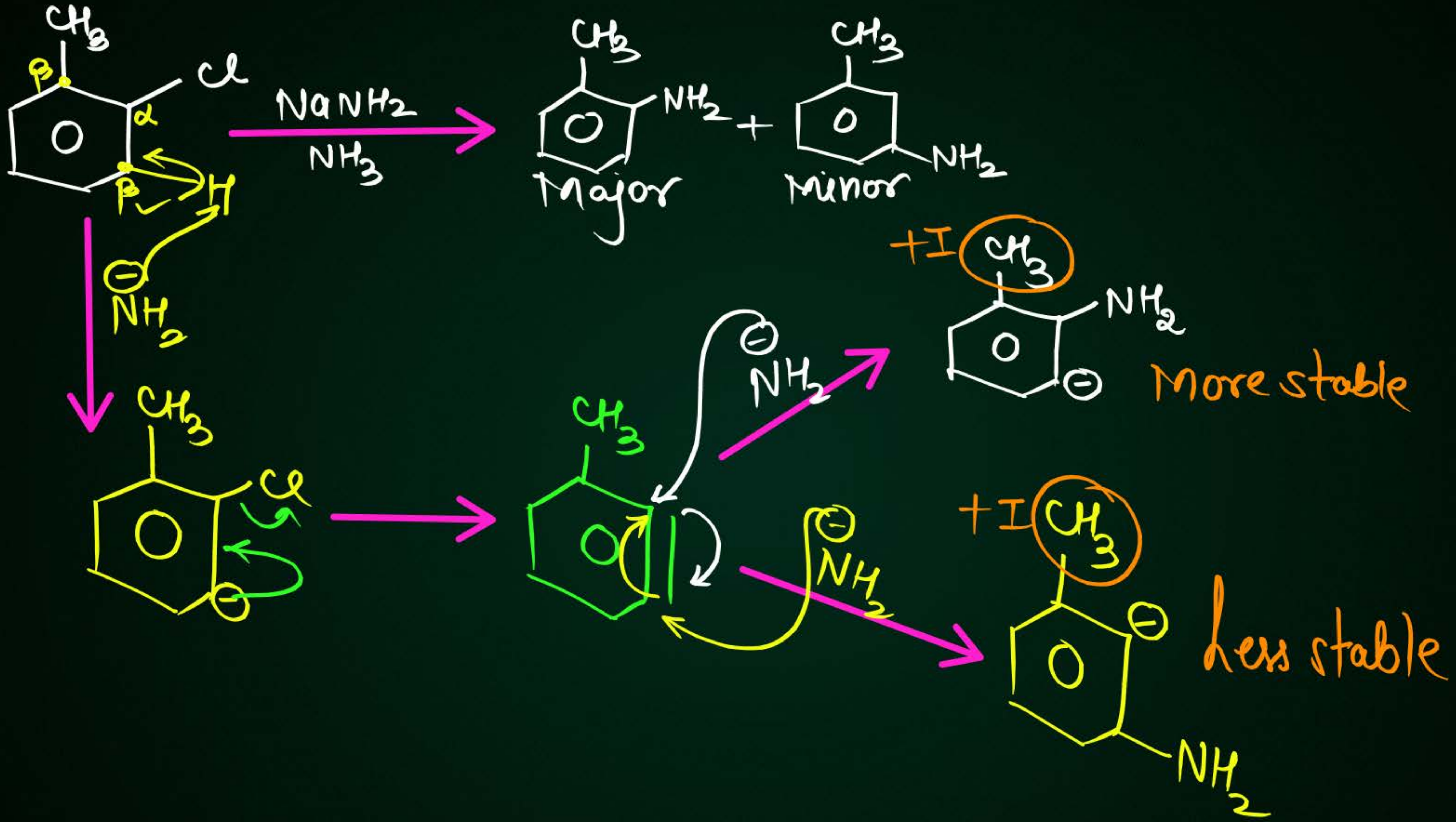
Intermediate

Poor overlap

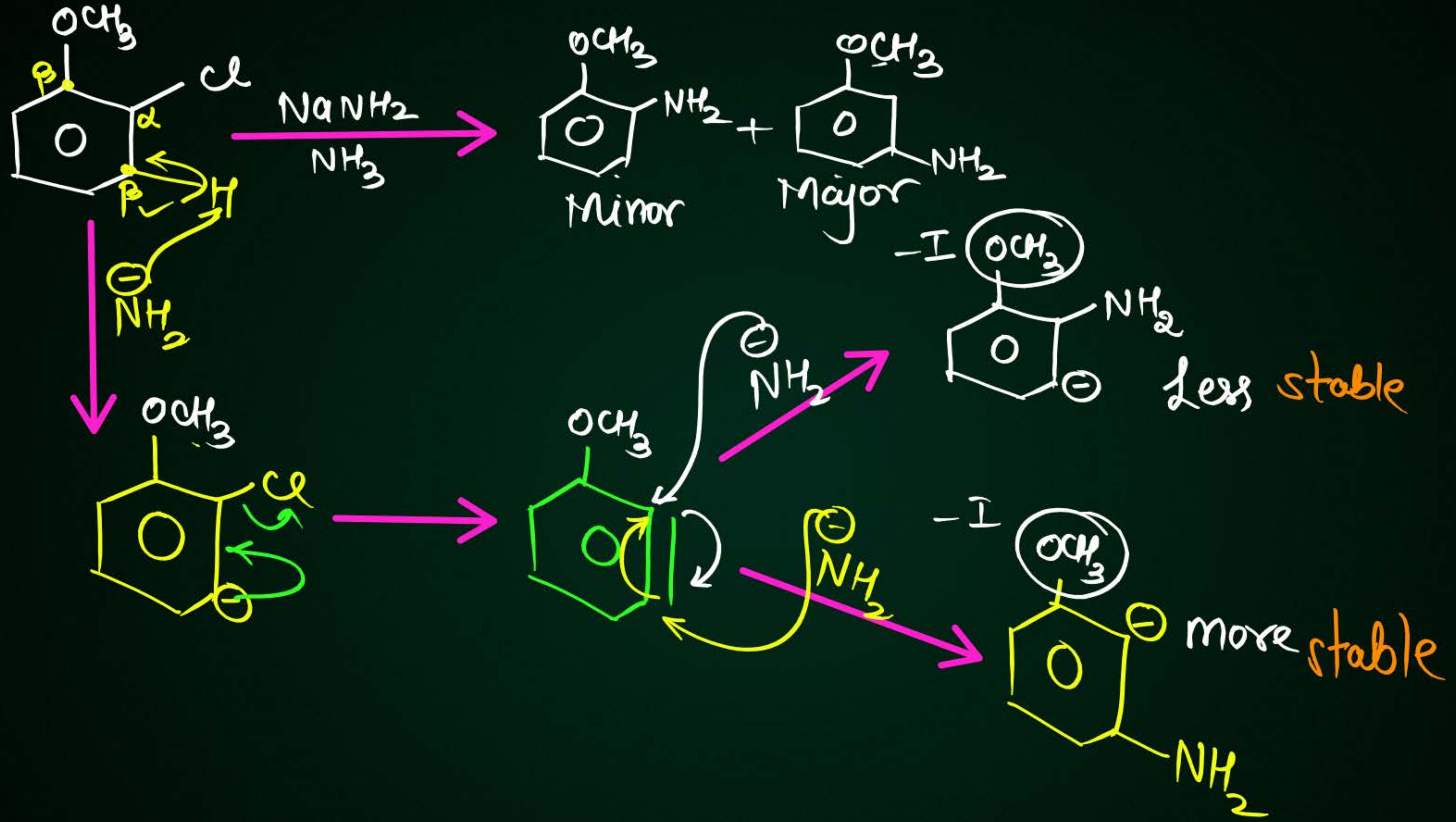
sp^2-sp^2 hybrid orbital


Cl
NaNH2
NH3
NH2
DSP
(Direct subs product)
CSP (cine substitution product)
⊖NH2
Cl
⊖
⊖NH2
⊖NH2
NH2
⊖
H-NH2
NH2
⊖
NH2
H-NH2
NH2

Q.

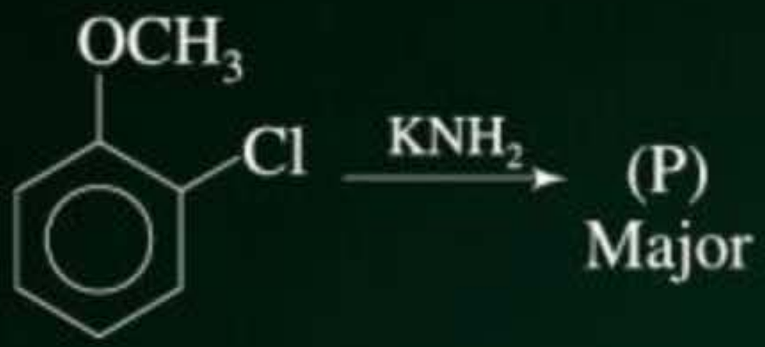

CH3
Cl
β
α
β
H
NaNH2
NH3
NH2
CH3
NH2
Major
+
CH3
NH2
Minor
⊖NH2
CH3
Cl
⊖
CH3
⊖NH2
⊖NH2
+I
CH3
NH2
⊖
More stable
+I
CH3
⊖
NH2
Less stable

Q/

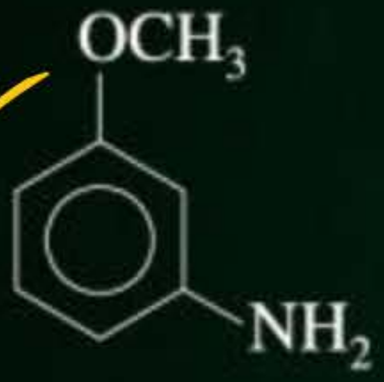

OCH3
β
Cl
α
β
H
NaNH2
NH3
OCH3
NH2
+
OCH3
NH2
Minor
Major
⊖NH2
OCH3
Cl
⊖
OCH3
⊖NH2
⊖NH2
-I
OCH3
NH2
⊖
Less stable
-I
OCH3
⊖
more stable
NH2

QUESTION

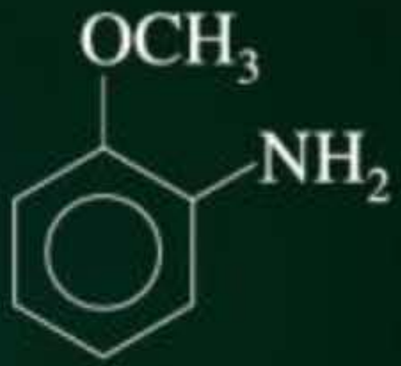
What is P?


OCH_3
Cl
KNH_2
(P)
Major

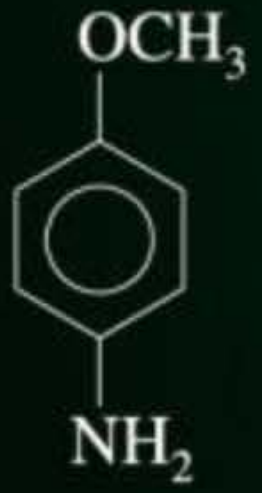
[✓ A]



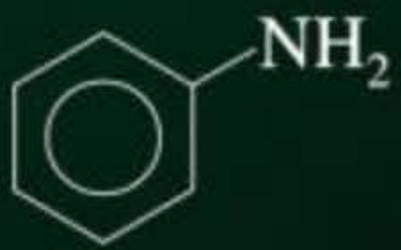
B



C



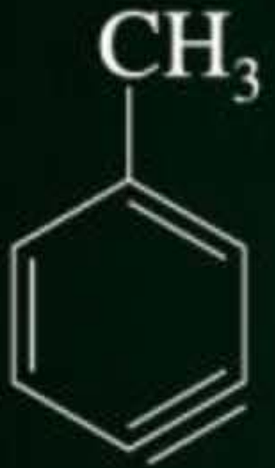
D

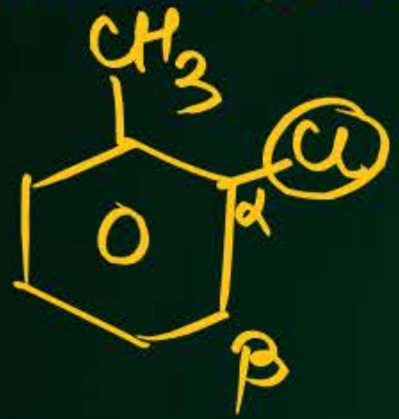


QUESTION

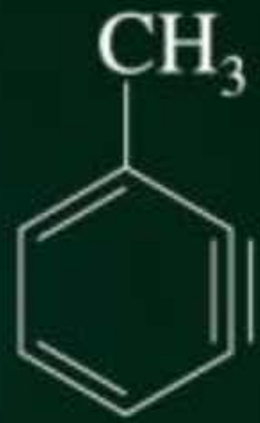
o-Chlorotoluene reacts with $NaNH_2$ in liquid ammonia to give o-toluidine and m-toluidine. This reaction proceeds through the intermediate

(A)



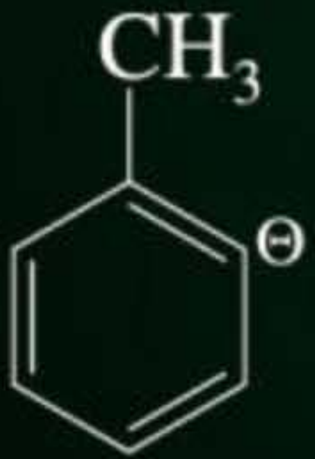


[✓ (B)]

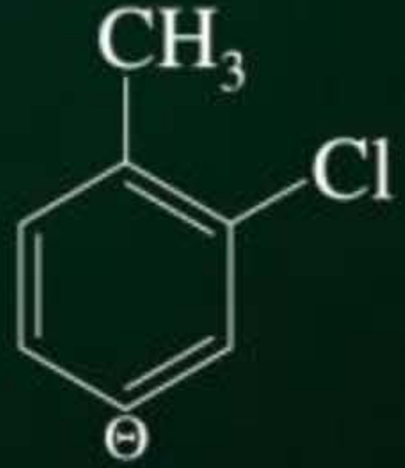


2016/2017

(C)



(D)



Home Work

QUESTION 01

Statement-1: Nucleophilicity order in polar-protic solvent is $I^- < Br^- < Cl^- < F^-$

Statement-2: Due to bigger size of I^- it is less solvated in polar-protic solvent.

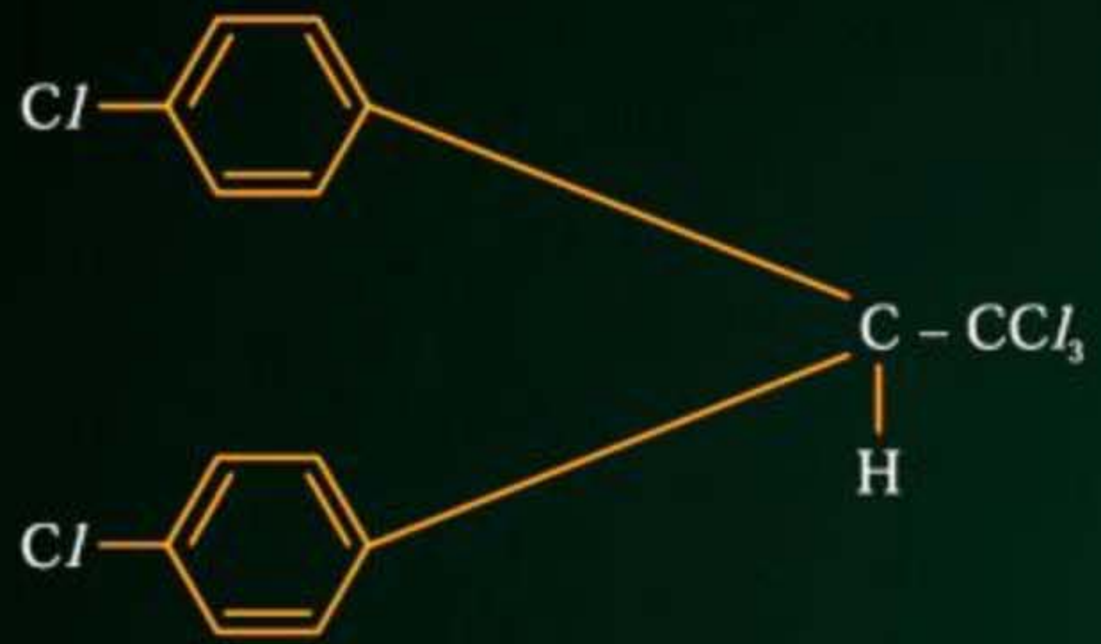
(A) Statement-1 is true, statement-2 is true and statement-2 is correct explanation for statement-1.

(B) Statement-1 is true, statement-2 is true and statement-2 is NOT the correct explanation for statement-1.

(C) Statement-1 is true, statement-2 is false.

(D) Statement-1 is false, statement-2 is true.

QUESTION 02


Cl
C – CCl3
H
Cl

The above structural formula refers to

(A) BHC

(B) DNA

(C) DDT

(D) RNA

QUESTION 03

Consider the species.

(I) $\overset{\ominus}{O}H$ (II) $CH_3-\overset{\ominus}{O}$ (III) $\overset{\ominus}{C}H_3$ (IV) $\overset{\ominus}{N}H_2$

Arrange these nucleophilic species in their decreasing order of nucleophilicity:

A III > IV > I > II

B II > I > III > IV

C I > II > III > IV

D III > I > II > IV

QUESTION 04

Which is the MOST basic nucleophile in the following series?

(A) F^-

(B) CH_3CH_2OH

(C) H_2O

(D) $CH_3CH_2O^-$

QUESTION 05

The nucleophilicities of CH_3^-, NH_2^-, OH^- and F^- decrease in which order?

(A) $CH_3^- > NH_2^- > OH^- > F^-$

(B) $OH^- > NH_2^- > CH_3^- > F^-$

(C) $NH_2^- > OH^- > CH_3^- > F^-$

(D) $CH_3^- > OH^- > F^- > NH_2^-$

QUESTION 06

Triiodomethane has antiseptic property because of

- (A) Liberation of iodoform
- (B) Liberation of free iodine
- (C) Formation of phosgene gas
- (D) None of the above

QUESTION 07

Which is the incorrect order of nucleophilicity in protic solvent.

A $OH^- > H_2O$

B $NH_2^- > NH_3$

C $OH^- < NH_2^-$

D $H_2O > NH_3$

QUESTION 08

Which of the following statements are correct for nucleophile?

(A) All negatively charged species are nucleophiles.

(B) Nucleophiles are Lewis bases.

(C) Alkenes, alkynes, benzene and pyridine are nucleophiles.

(D) All are correct

QUESTION 09

Match the column I with column II and mark the appropriate choice

	Column I		**Column II**
a.	Carbon tetrachloride	(i)	Paint remover
b.	Methylene chloride	(ii)	Refrigerators and air conditioners
c.	DDT	(iii)	Fire-extinguisher
d.	Freons	(iv)	Non-biodegradable insecticide

A a→(ii), b→(iii), c→(i), d→(iv)

B a→(iv), b→(iii), c→(ii), d→(i)

C a→(i), b→(ii), c→(iii), d→(iv)

D a→(iii), b→(i), c→(iv), d→(ii)

QUESTION 10

Arrange the nucleophiles $\overset{(-)}{\mathrm{O}}\mathrm{H}$, $\overset{(-)}{\mathrm{Se}}\mathrm{H}$ and $\overset{(-)}{\mathrm{S}}\mathrm{H}$ in order of their nucleophilicity in dimethyl formamide (DMF) medium

- A $\overset{(-)}{\mathrm{O}}\mathrm{H} > \overset{(-)}{\mathrm{S}}\mathrm{H} > \overset{(-)}{\mathrm{Se}}\mathrm{H}$
- B $\overset{(-)}{\mathrm{Se}}\mathrm{H} > \overset{(-)}{\mathrm{O}}\mathrm{H} > \overset{(-)}{\mathrm{S}}\mathrm{H}$
- C $\overset{(-)}{\mathrm{Se}}\mathrm{H} > \overset{(-)}{\mathrm{S}}\mathrm{H} > \overset{(-)}{\mathrm{O}}\mathrm{H}$
- D $\overset{(-)}{\mathrm{S}}\mathrm{H} > \overset{(-)}{\mathrm{O}}\mathrm{H} > \overset{(-)}{\mathrm{Se}}\mathrm{H}$

ANSWER KEY

1. D
2. C
3. A
4. D
5. A
6. B
7. D
8. D
9. D
10. A

Home Work From PW Module (Yakeen NEET)

Prarambh: Q 47, 48, 49, 50, 51, 52, 53, 54

Parikshit: Q 09, 22, 23, 25

MARK THE DATE 4th May, 2025

Only 04 Months left for the NEET

Ab sirf practice aur practice,
Nahi toh Medical Dream miss!

10
NEET RANKERS TEST SERIES-2025
14
NTA NEET 2025
RANKERS TEST SERIES
Attempted by 1 LAKH+ Students Last Year
14 TEST BOOKLET
14 OMR SHEETS
NTA NEET 2025
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Available on :- amazon | Flipkart | PW Store

Thank you!!

G.O.C stability of Carbocation

Hydrocarbon & Haloalkanes & Haloarene

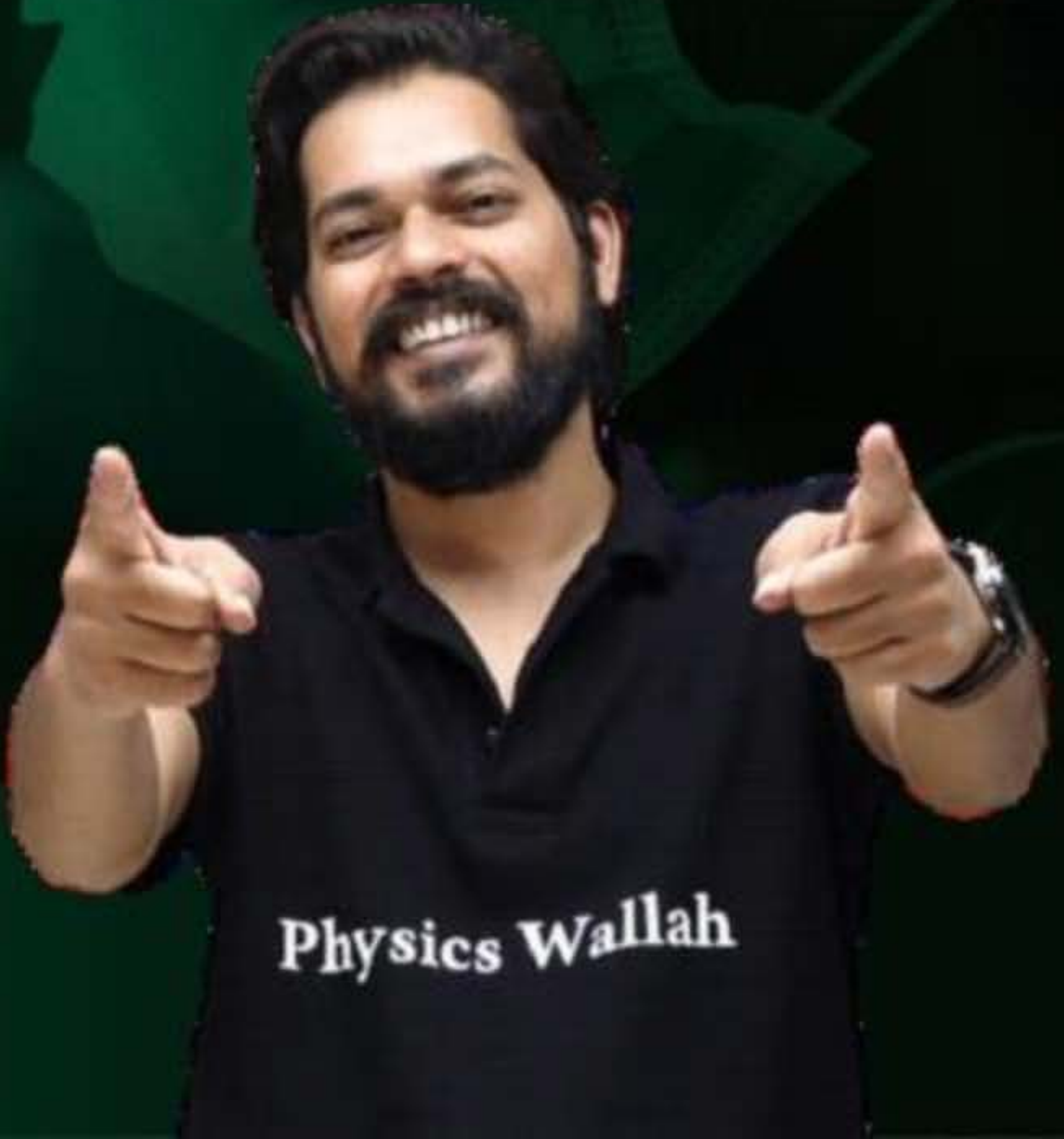
YAKEEN 2.0

FOR NEET 2025

Lecture- 01 | **Organic Chemistry**

Alcohols, Phenols and Ethers

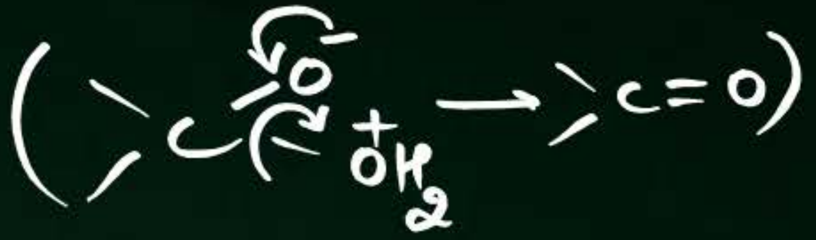
By- Pankaj Sir(POPU MAMA)

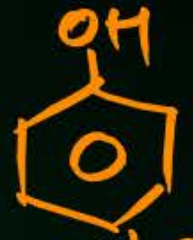

Physics Wallah

Topics *to be covered*

1. Basics/Introduction ✓
2. Methods of Preparation of Alcohols ✓
3. Practice

Basics

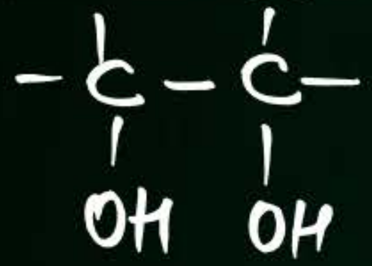



phenol

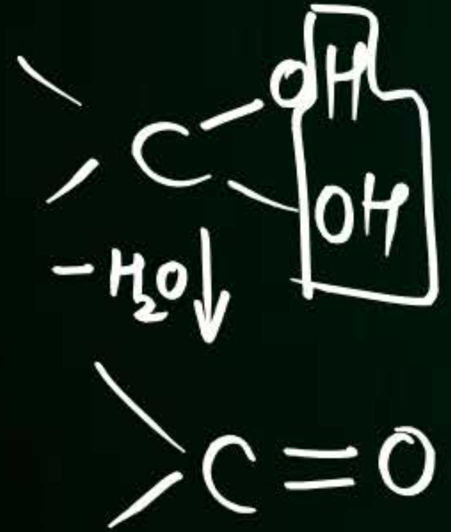
Degree of Alcohol

The degree of 'c' at which 'OH' group is present

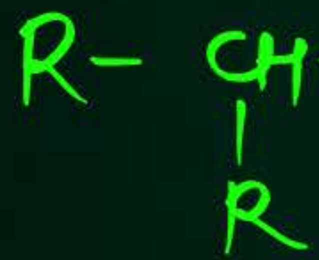
Vicinal diol



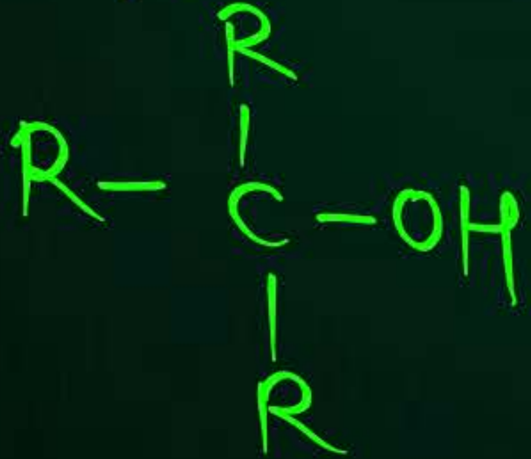
geminal diol



$R-\overset{\checkmark}{C}H_2-OH$ 1°



$R-\underset{\underset{R}{|}}{CH}-OH$ 2°



$R-\underset{\underset{R}{|}}{\overset{\overset{R}{|}}{C}}-OH$ 3°

Allylic Alcohol

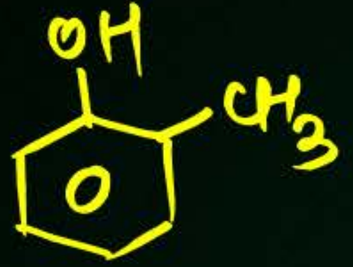
$CH_2=CH-\overset{\downarrow}{CH_2}-OH$

Benzylic Alcohol

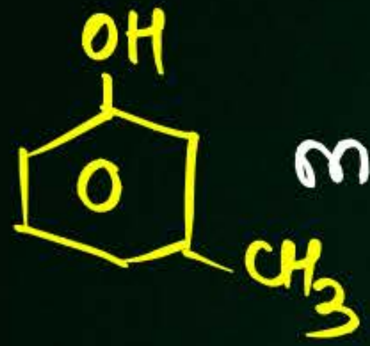
$Ph-\underset{\uparrow}{CH_2}-OH$

Vinyl alcohol

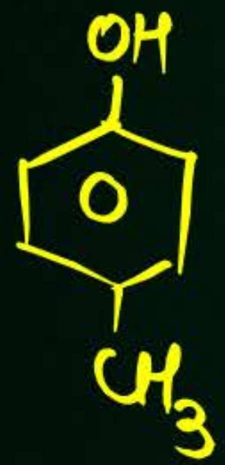
$CH_2=CH-OH$



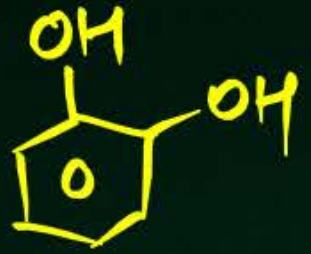
o-cresol



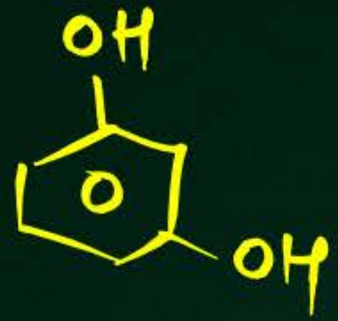
m-cresol



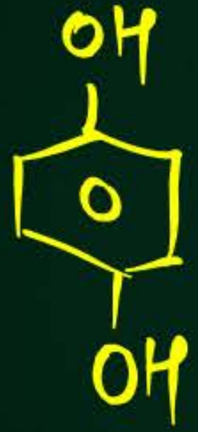
p-cresol



Catechol



Resorcinol



Hydroquinol

Methods of Preparation of Alcohols

E.A.R (Electrophilic add. Rxn)

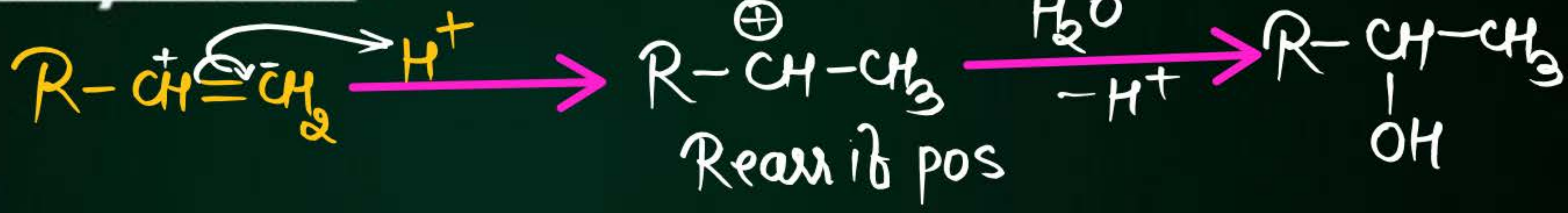
1. From Alkenes:

Reagent: H^+ / H_2O

conc. $H_2SO_4 + H_2O =$ dil H_2SO_4

A. By Acid Catalyzed Hydration: H^+

Pad chuke hai



$$R-\overset{+}{C}H=\overset{-}{C}H_2 \xrightarrow{H^+} R-\overset{\oplus}{C}H-CH_3 \xrightarrow[-H^+]{H_2O} R-\underset{OH}{\underset{|}{CH}}-CH_3$$

Rearr if pos

For NEET

Backlog clear kaise karein?

① Class 11th comp. wallah } youtube
② Class 12th Lakshy Neet } channel

③ Umeed series

B. By Hydroboration-Oxidation (HBO):

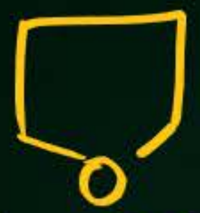
(NEET 2025)

Reagent

1. $B_2H_6 + THF$

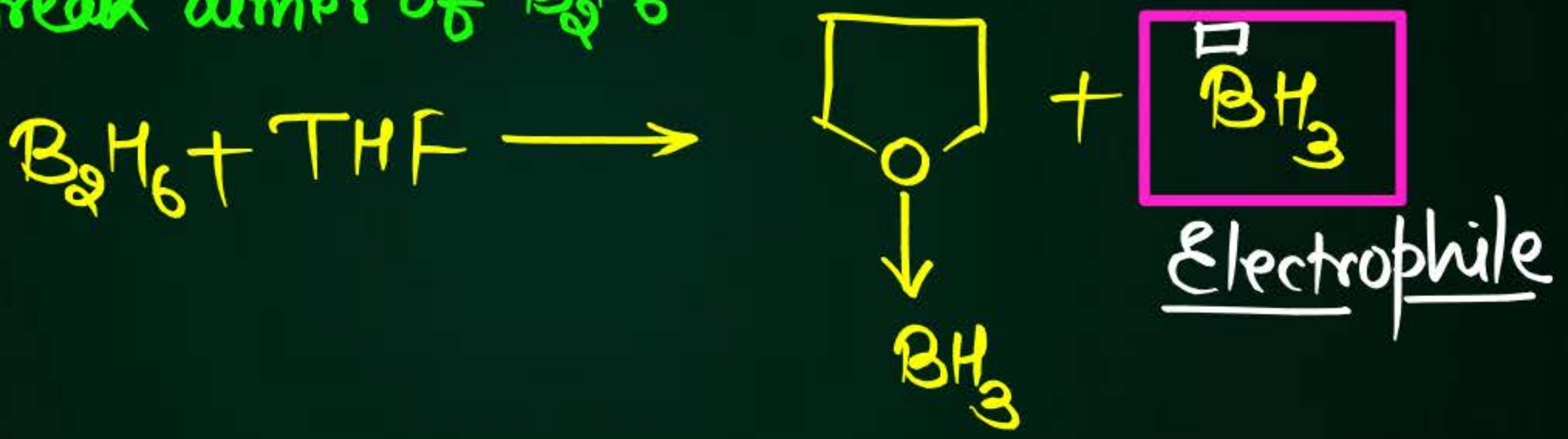
2. $H_2O_2 / \bar{O}H$

T.H.F → Tetra hydro furan



Q. Why THF?

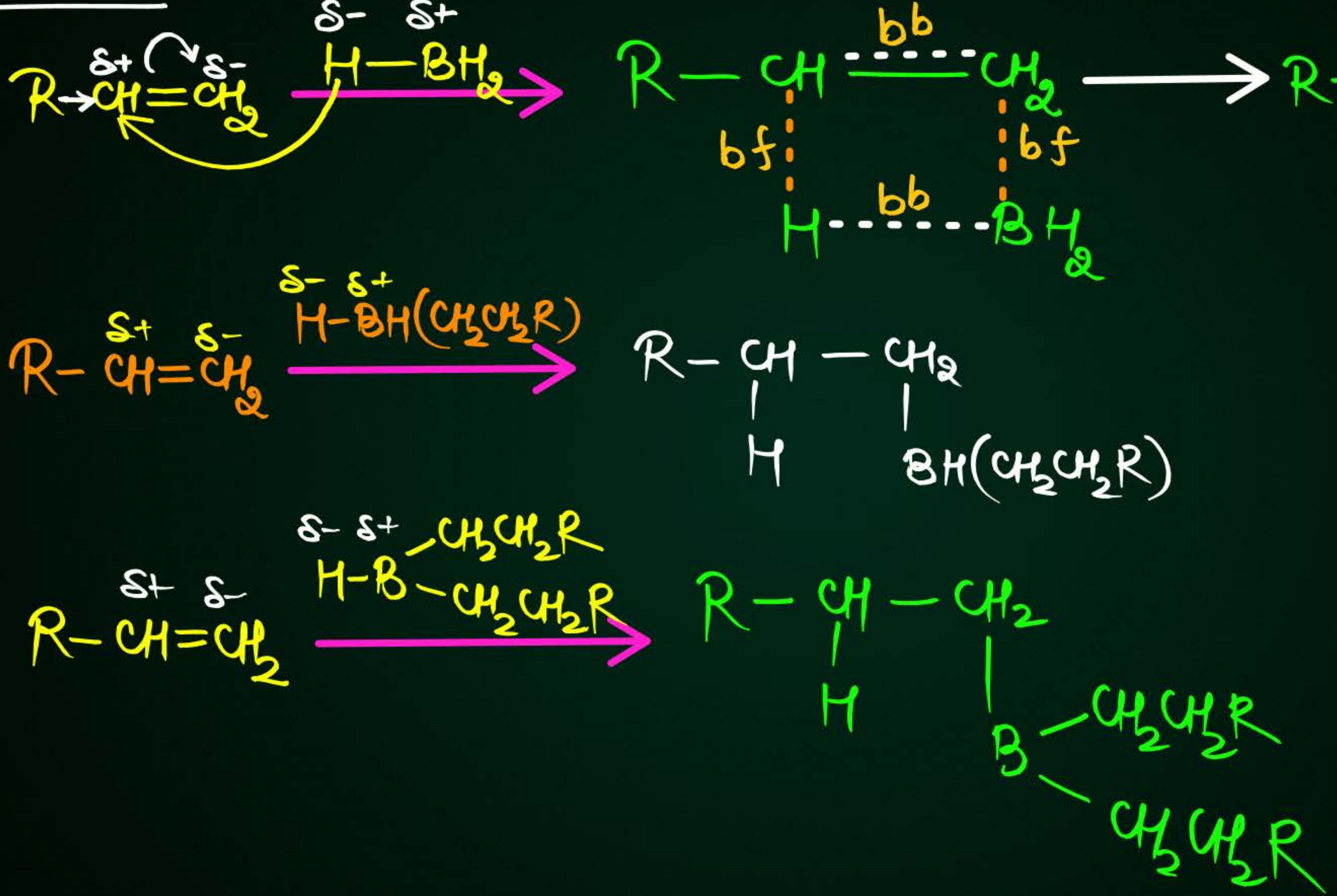
A. To break dimer of B_2H_6



$B_2H_6 + THF \longrightarrow$ (THF→BH_3) $+ \boxed{\overset{\square}{B}H_3}$

Electrophile

Mechanism* ÷ ① Hydroboration

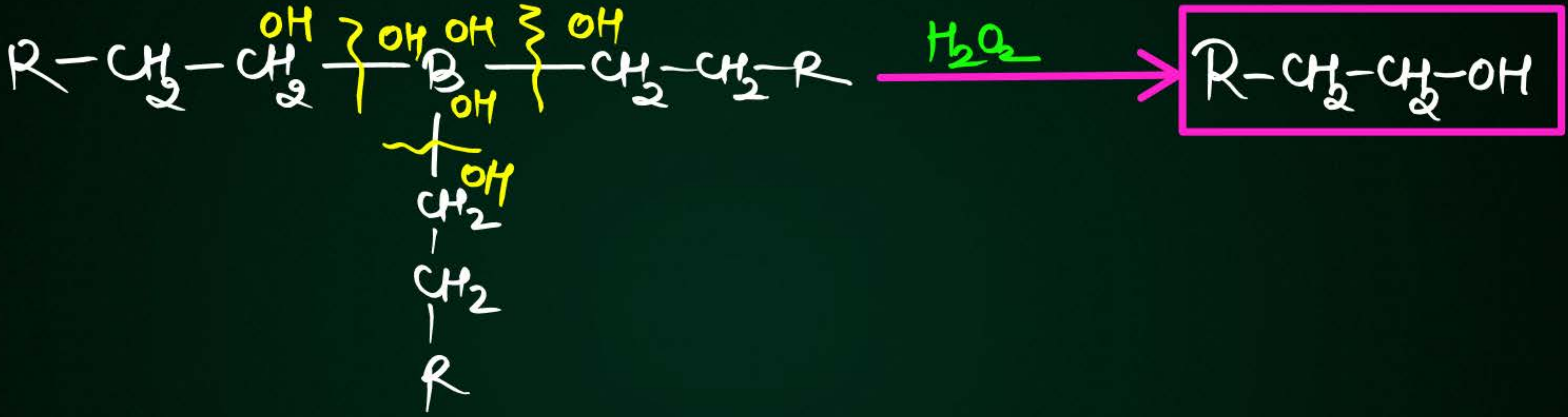


$$R \rightarrow \overset{\delta+}{CH} = \overset{\delta-}{CH_2} \xrightarrow{\overset{\delta-}{H}-\overset{\delta+}{B}H_2} \begin{matrix} R-CH & \overset{bb}{\cdots\cdots} & CH_2 \\ \vdots & & \vdots \\ H & \cdots\cdots & BH_2 \end{matrix} \longrightarrow \begin{matrix} R-CH & - & CH_2 \\ | & & | \\ H & & BH_2 \end{matrix}$$

$$R-\overset{\delta+}{CH} = \overset{\delta-}{CH_2} \xrightarrow{\overset{\delta-}{H}-\overset{\delta+}{B}H(CH_2CH_2R)} \begin{matrix} R-CH & - & CH_2 \\ | & & | \\ H & & BH(CH_2CH_2R) \end{matrix}$$

$$R-\overset{\delta+}{CH} = \overset{\delta-}{CH_2} \xrightarrow{\overset{\delta-}{H}-\overset{\delta+}{B}(CH_2CH_2R)_2} \begin{matrix} R-CH & - & CH_2 \\ | & & | \\ H & & B(CH_2CH_2R)_2 \end{matrix}$$

② oxidation



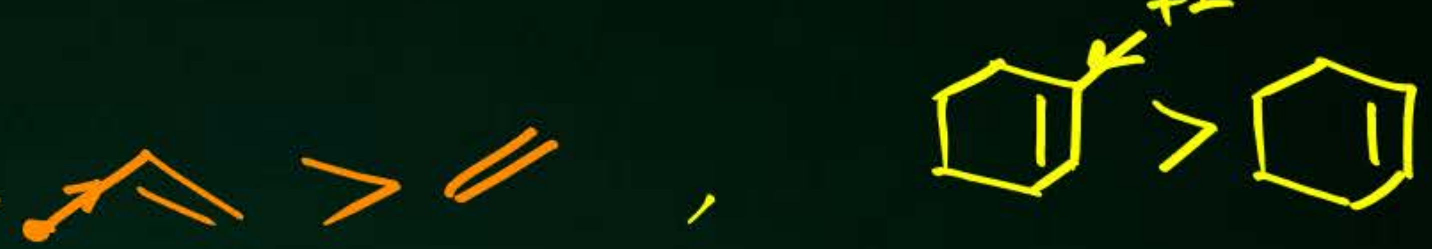
R–CH2–CH2–B–CH2–CH2–R
OH
OH
OH
OH
OH
OH
CH2
CH2
R
H2O2
R–CH2–CH2–OH

$$\mathrm{R{-}CH_2{-}CH_2{-}B(CH_2CH_2R)_2 \xrightarrow{H_2O_2} \boxed{R{-}CH_2{-}CH_2{-}OH}}$$

OP Points:

4 membered cyclic transition state

1. 4 MCTS is formed.
2. ROR α Nucleophilicity of alkene



3. No rearrangement occurs
4. Product appears like addition of H20 on alkene by [Anti Markovnikov's Rule]

(Aisa sach main nahi hota bas answer nikalne ke liye karte hai)

5. Syn addition of BH_3

Same side

$\overset{\delta-}{H}-\overset{\delta+}{BH_2}$

6. Addition of BH_3 is markovnikov add.

(ye sachai hai)

D.M

$R-CH=CH_2 \xrightarrow[\text{Antimar}]{H^+ \, OH^-} R-CH_2-CH_2-OH$

C. By Oxymercuration-Demercuration (OMDM):

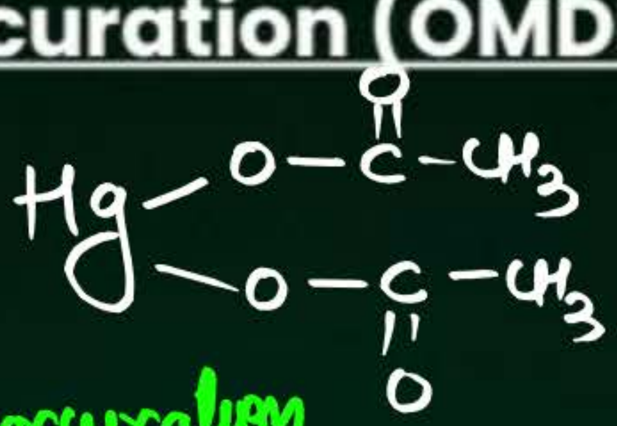
Reagent

(oxymercuration)

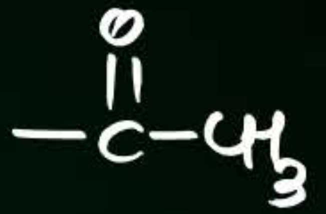
1) $Hg(OAc)_2 + H_2O$

2) $NaBH_4$

(demercuration)

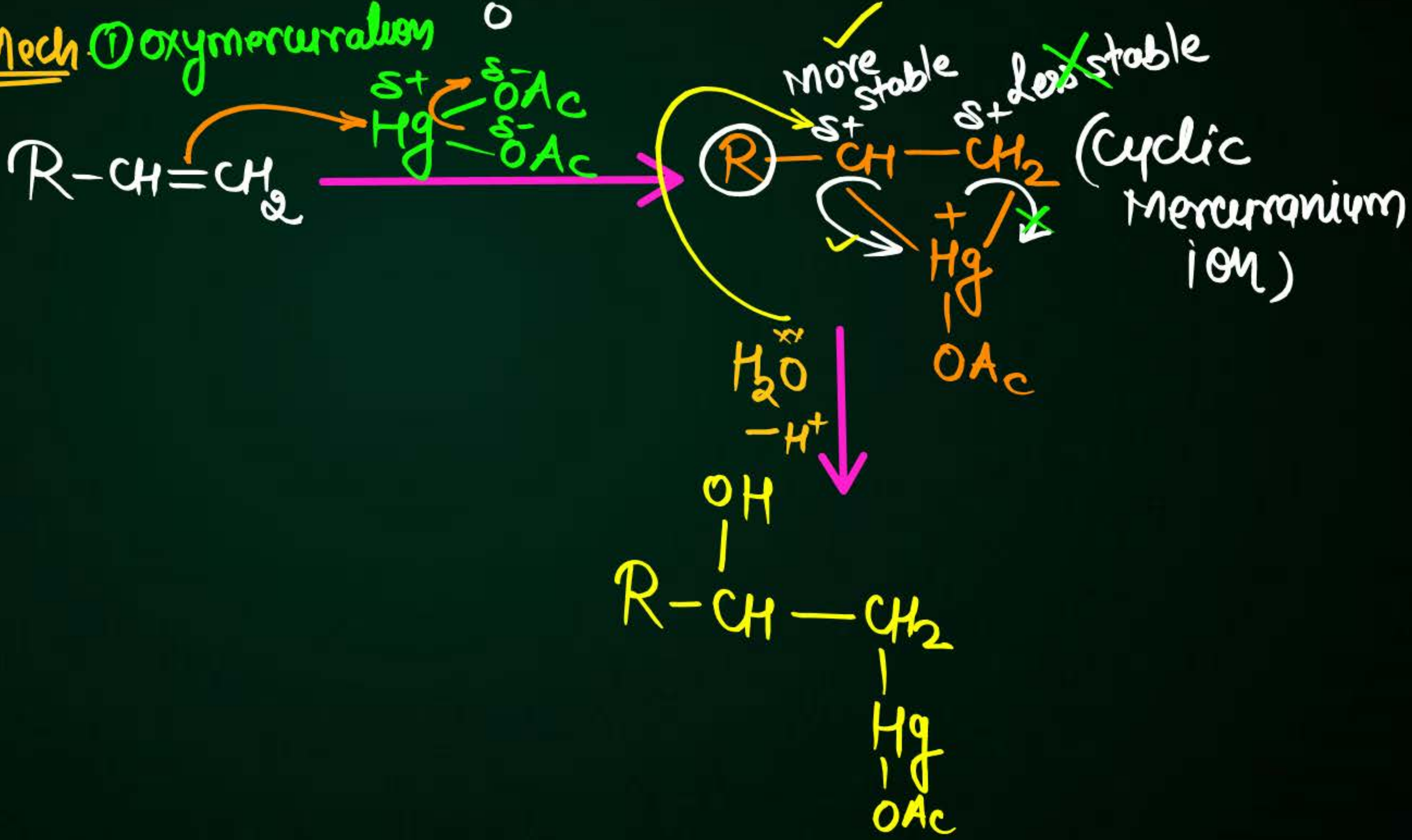


Ac → Acyl



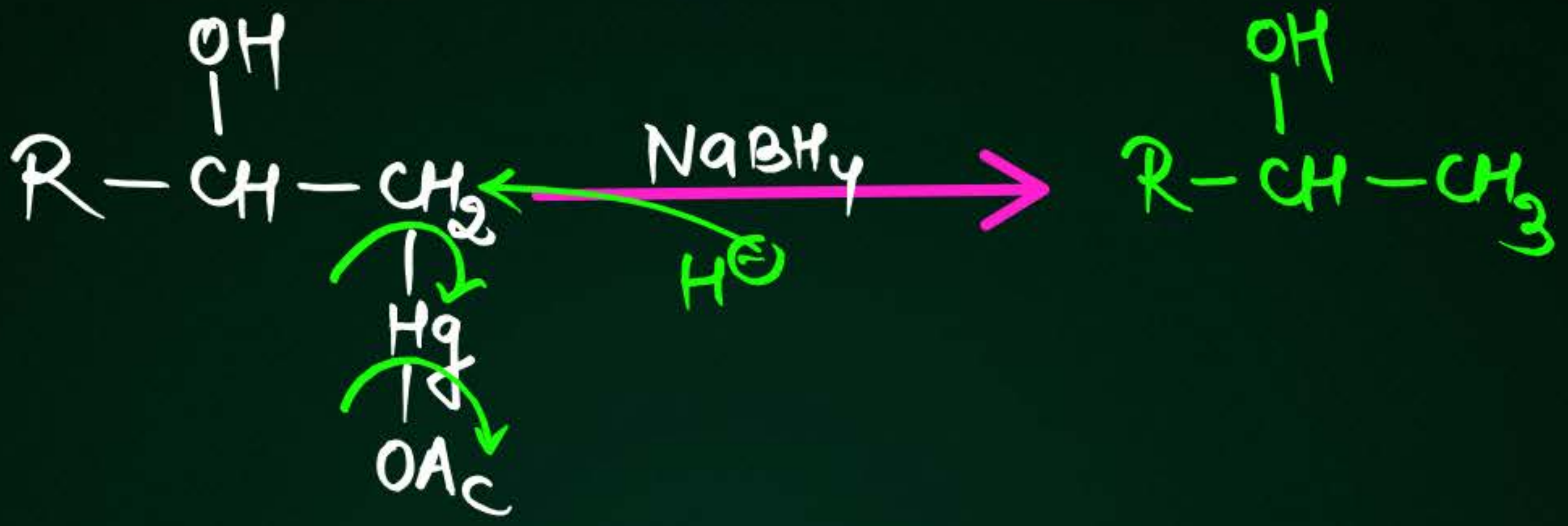
$-\overset{O}{\overset{\|}{C}}-CH_3$

Mech ① oxymercuration



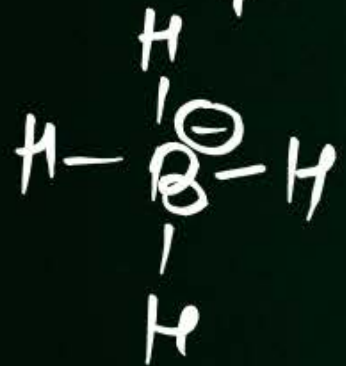
$\delta+$
$\delta-$ OAc
Hg
$\delta-$ OAc
R−CH=CH$_2$
More stable
$\delta+$
$\delta+$ less stable
R−CH−CH$_2$
+
Hg
OAc
(cyclic Mercuranium ion)
$H_2\ddot{O}$
$-H^+$
OH
R−CH−CH$_2$
Hg
OAc

② Demercuration



$$R-\overset{OH}{\overset{|}{C}}H-\underset{\underset{\underset{\underset{OAc}{|}}{Hg}}{|}}{CH_2} \xrightarrow[H^{\ominus}]{NaBH_4} R-\overset{OH}{\overset{|}{C}}H-CH_3$$

$Na^{+}\ BH_4^{-}$

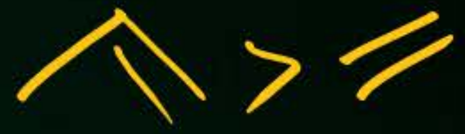


$$H-\underset{\underset{H}{|}}{\overset{\overset{H}{|}}{B^{\ominus}}}-H$$

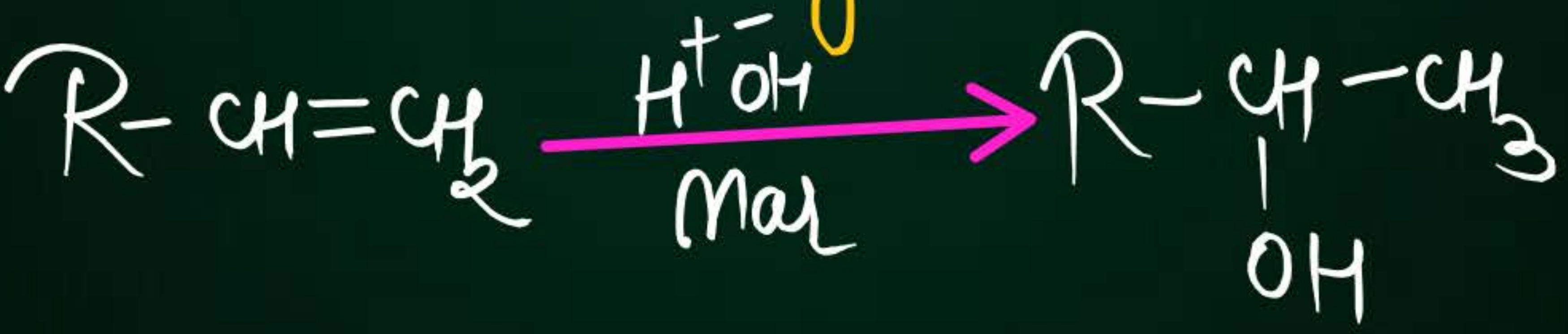
$(BH_3 + H^{\ominus})$

OP Points:

1. Non classical Carbocations formation is RDS
2. ROR α Nucleophilicity of alkene α Stability of partial positive C



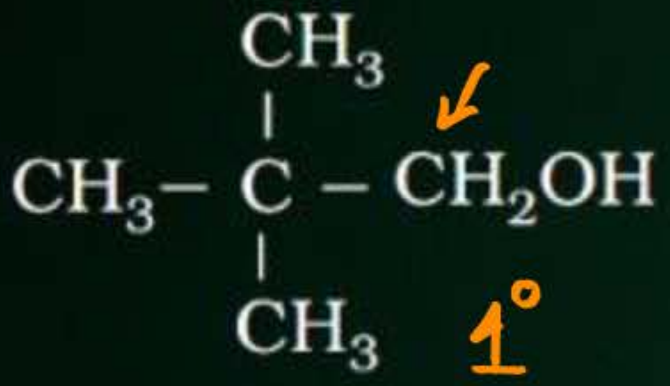
3. No rearrangement occurs
4. Cyclic mercuranium ion formation
5. Anti addition
6. Answer nikalne ke liye Markov laga do



$$R-CH=CH_2 \xrightarrow[Mar]{H^+\ \bar{O}H} R-\underset{\underset{OH}{|}}{CH}-CH_3$$

QUESTION (NCERT Example)

Classify the following as primary, secondary and tertiary alcohols:

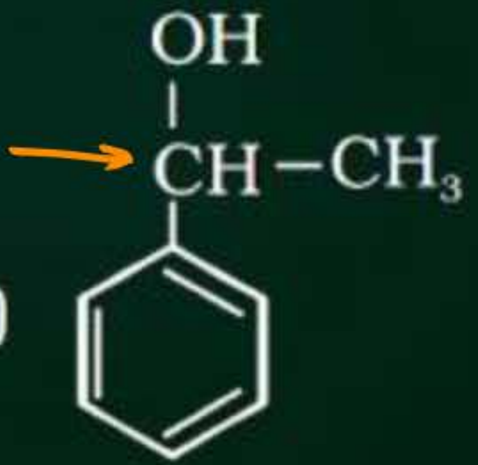
(i) 
$CH_3-\underset{CH_3}{\overset{CH_3}{C}}-CH_2OH$

1°

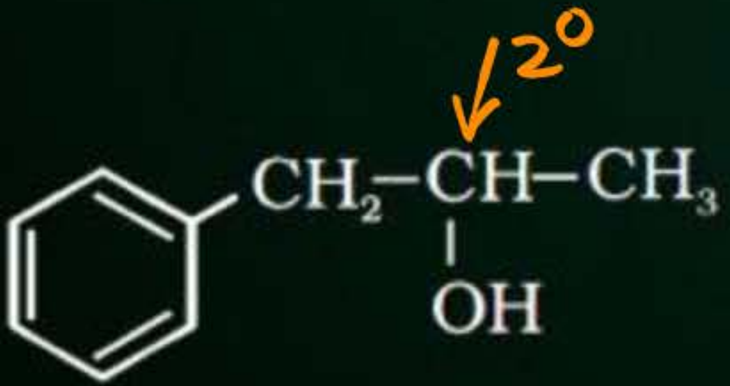
(ii) $H_2C=CH-\overset{\overset{1^\circ}{\downarrow}}{CH_2}OH$

(iii) $CH_3-CH_2-\overset{\swarrow}{CH_2}-OH$

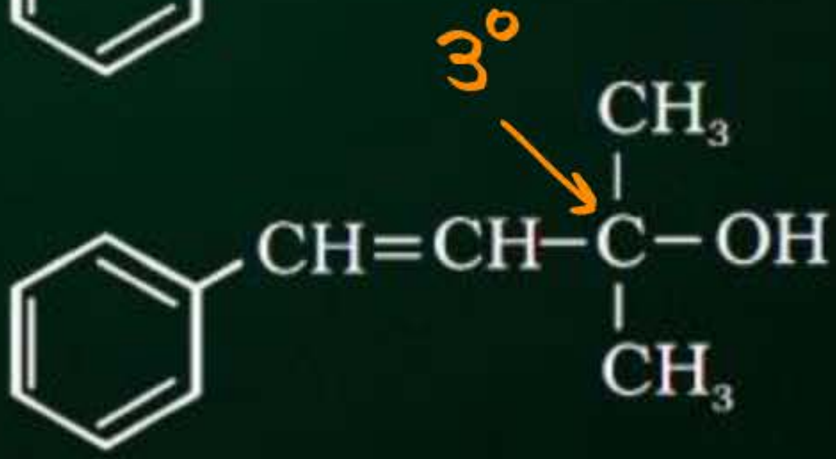
1°

(iv) 

2° →

(v) 

2°

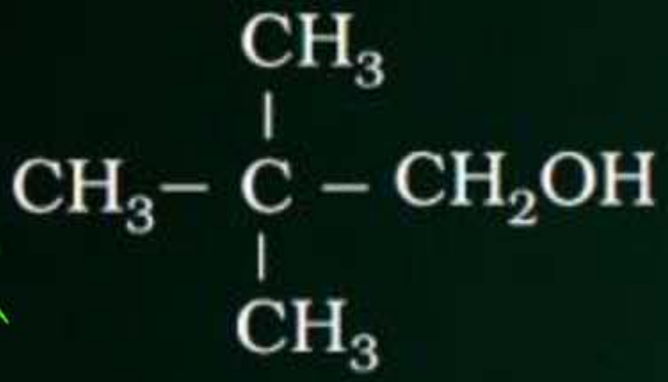
(vi) 

3°

QUESTION (NCERT Example)

Identify allylic alcohols in the given examples.

(i) ✗

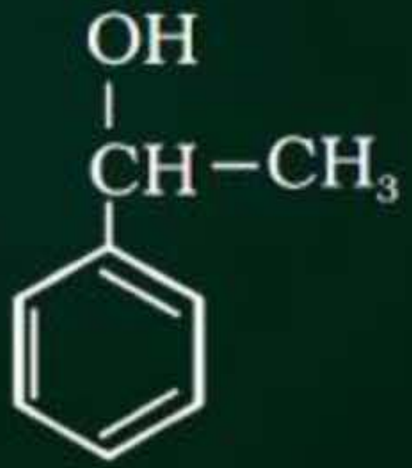


$CH_3-\underset{CH_3}{\overset{CH_3}{C}}-CH_2OH$

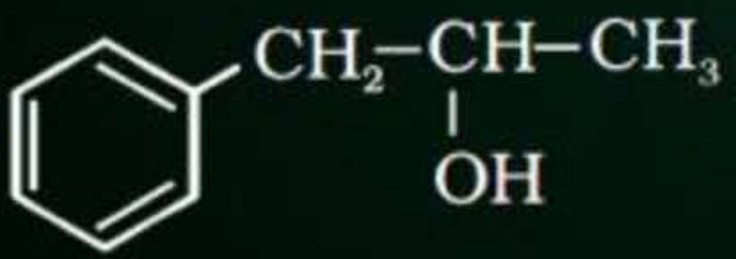
✓ (ii) $H_2C=CH-CH_2OH$

(iii) ✗ $CH_3-CH_2-CH_2-OH$

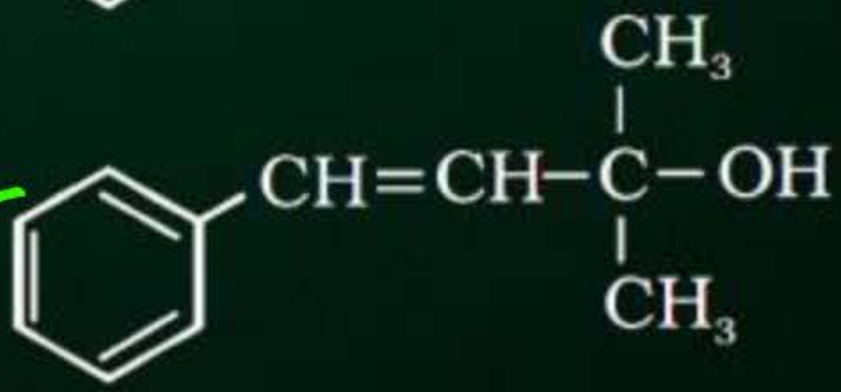
(iv)



(v) ✗



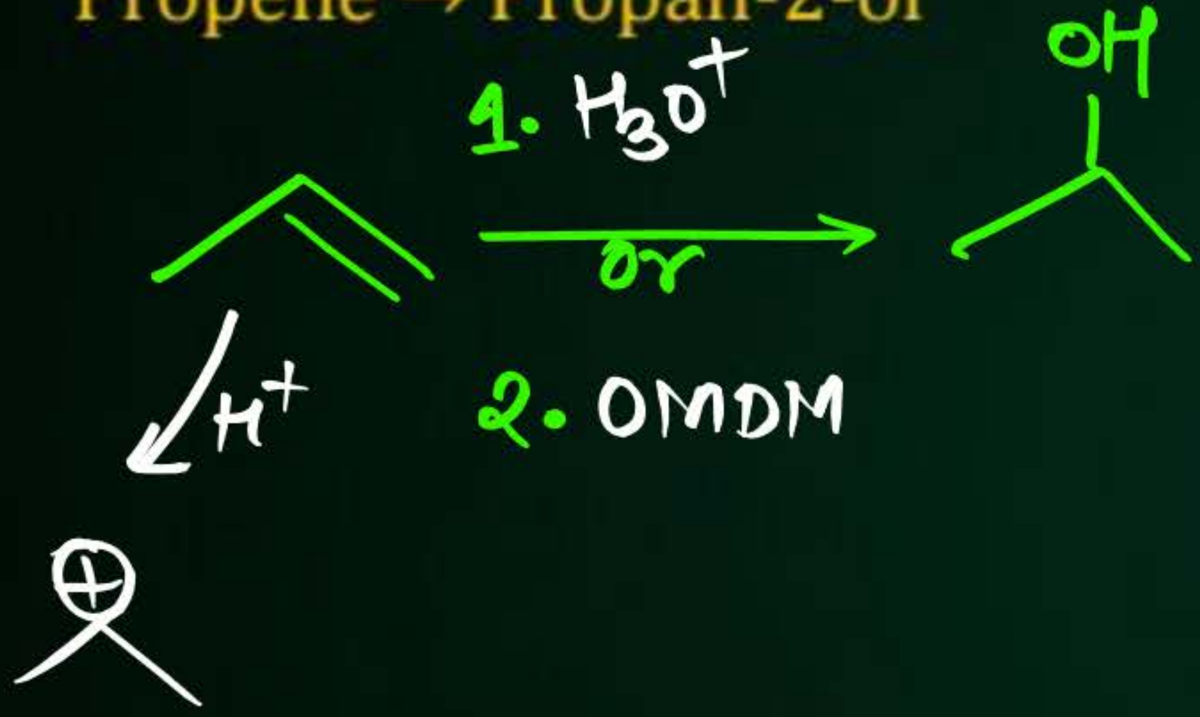
✓ (vi)



QUESTION (NCERT Exercise)

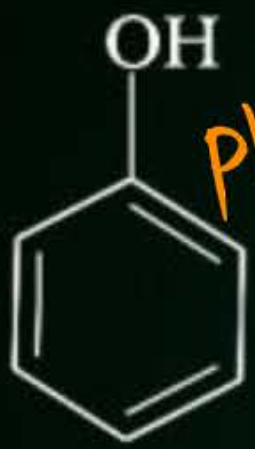
How are the following conversions carried out?

(i) Propene → Propan-2-ol


1. H_3O^+
or
2. OMDM
OH
H^+
⊕

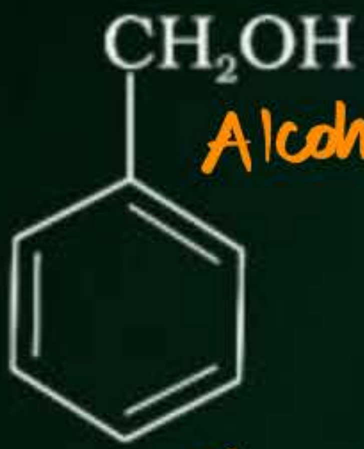
QUESTION (NCERT Exemplar)

Which of the following compounds is aromatic alcohol?



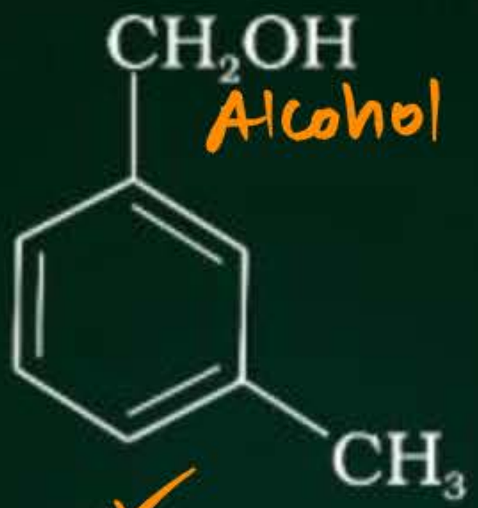
phenol

(A)



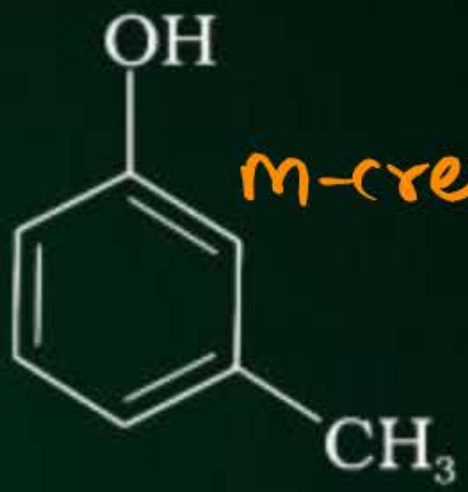
Alcohol

✓ (B)



Alcohol

✓ (C)



m-cresol

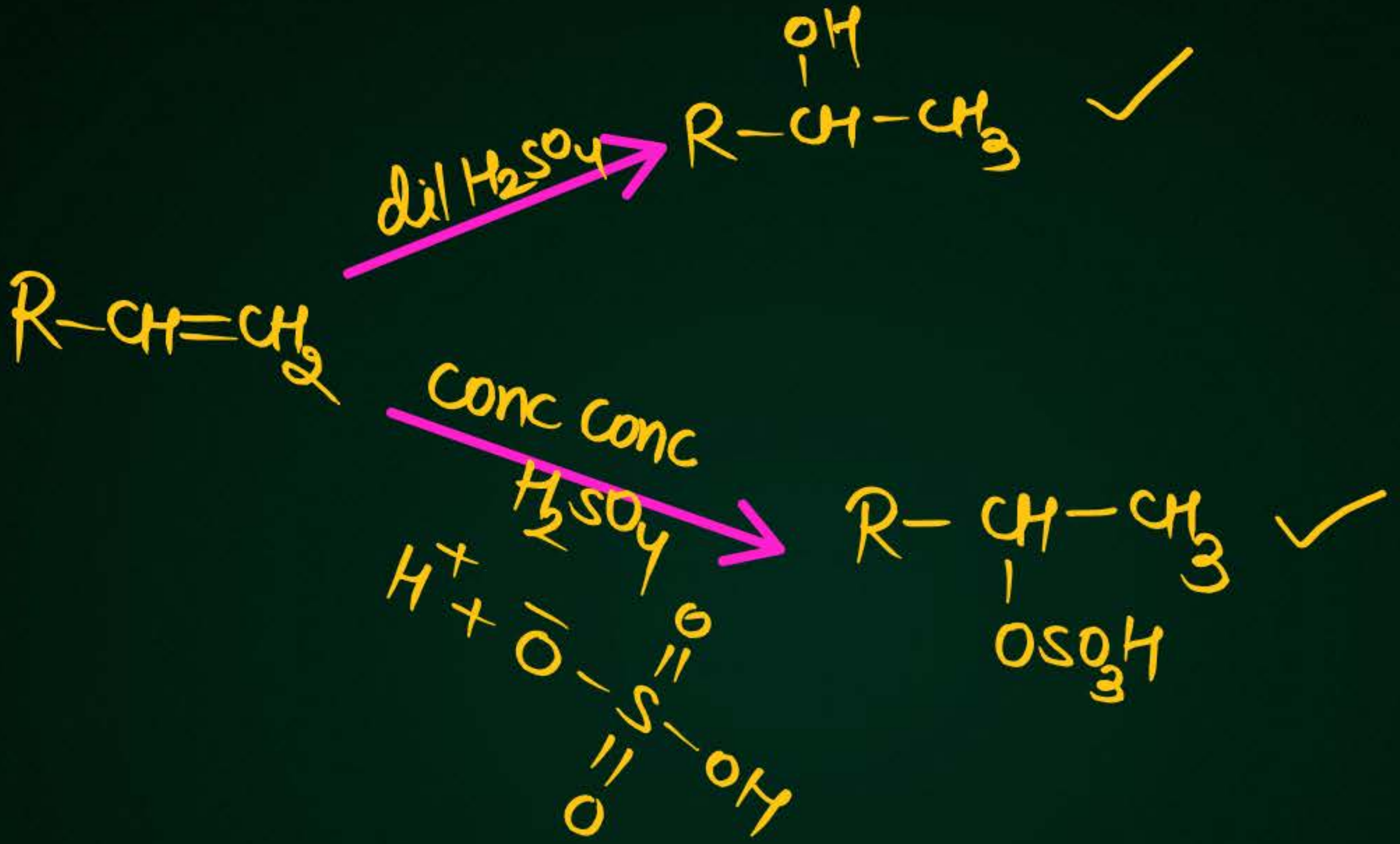
(D)

A A, B, C, D

B A, D

[✓ **C**] B, C

D A

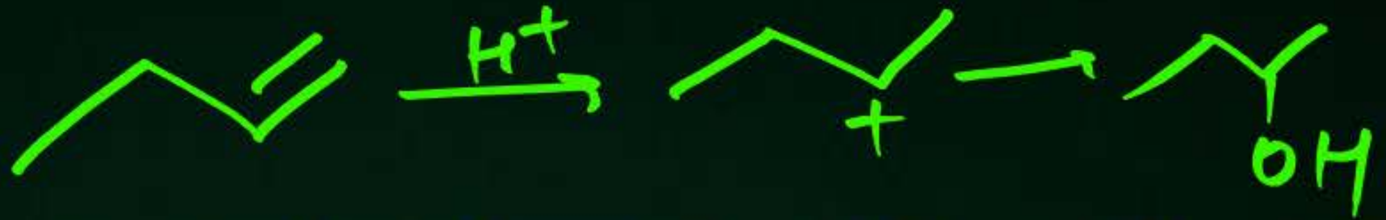


$R-CH=CH_2 \xrightarrow{\text{dil } H_2SO_4} R-\overset{OH}{\overset{|}{CH}}-CH_3$ ✓

$R-CH=CH_2 \xrightarrow[H_2SO_4]{\text{conc conc}} R-\underset{OSO_3H}{\underset{|}{CH}}-CH_3$ ✓

$H^+ + \overset{-}{O}-\underset{\underset{O}{||}}{\overset{\overset{O}{||}}{S}}-OH$

QUESTION (NCERT Exemplar)



Assertion: Addition reaction of water to but-1-ene in acidic medium yields butan-1-ol.

Reason: Addition of water in acidic medium proceeds through the formation of primary carbocation.

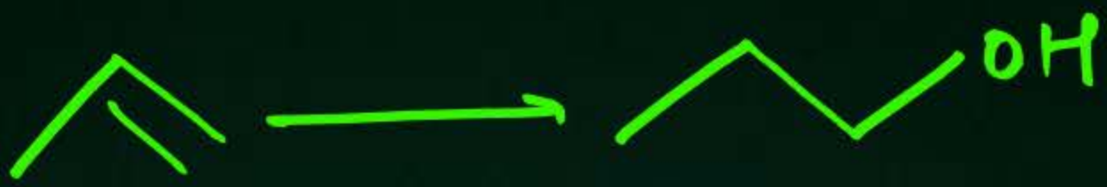
A Assertion and reason both are correct and reason is correct explanation of assertion.

[✓ B] Assertion and reason both are wrong statements.

C Assertion is correct statement but reason is wrong statement.

D Assertion is wrong statement but reason is correct statement.

QUESTION (AIIMS 2015)

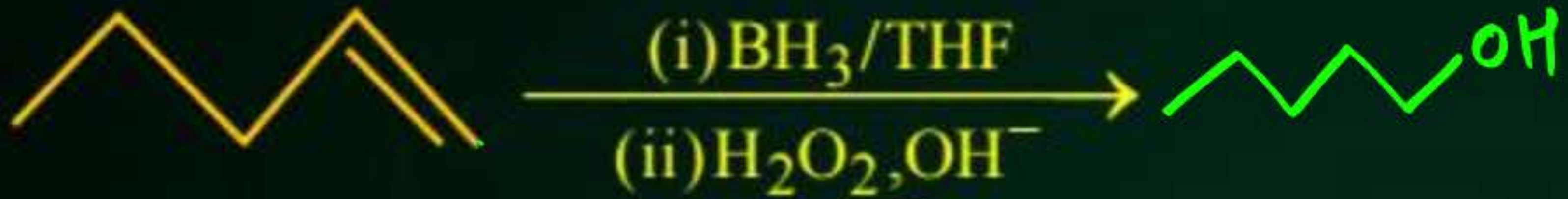


Which of the following reagents covert propene to 1-propanol?

- (A) H_2O, H_2SO_4
- (B) Aqueous KOH
- (C) $MgSO_4, NaBH_4/H_2O$
- [✓ (D)] B_2H_6, H_2O_2, OH^-

QUESTION (AIIMS 2013)

The product of the following reaction is:


(i) BH_3/THF
(ii) H_2O_2, OH^-
OH

H^+ $\bar{O}H$

Antimar

- [✓ A] 1-Pentanol
- B 2-Pentanol
- C Pentane
- D 1, 2-Pentanediol

QUESTION (AIIMS 2003)

Propan-1-ol can be prepared from propene by:

Ⓐ H_2O/H_2SO_4

Ⓑ $Hg(OAc)_2/H_2O$ followed by $NaBH_4$

[✓ Ⓒ] B_2H_6 followed by H_2O_2

Ⓓ CH_3CO_2H/H_2SO_4

QUESTION

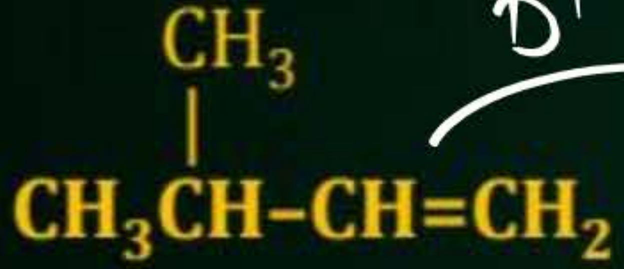
$$CH_3CH=CH_2 \xrightarrow{H^+} CH_3-\overset{+}{C}H-CH_3 \xrightarrow[-D^+]{D_2O} CH_3-\underset{\large OD}{\underset{|}{CH}}-CH_3$$

Complete the following equations:

(i) $CH_3CH=CH_2 \xrightarrow[\text{(ii) } D_2O]{\text{(i) } H^+} \text{(A)}$

$$CH_3CH=CH_2 \xrightarrow{D^+} CH_3-\overset{+}{C}H-CH_2-D \xrightarrow[-H^+]{H_2O} CH_3-\underset{\large OH}{\underset{|}{CH}}-CH_2-D$$

(ii) $CH_3CH=CH_2 \xrightarrow[\text{(ii) } H_2O]{\text{(i)} D^+} \text{(A)}$



(iii) $CH_3\overset{\large CH_3}{\overset{|}{C}H}-CH=CH_2 \xrightarrow[\text{(ii) } D_2O]{\text{(i) } D^+} \text{(A)}$

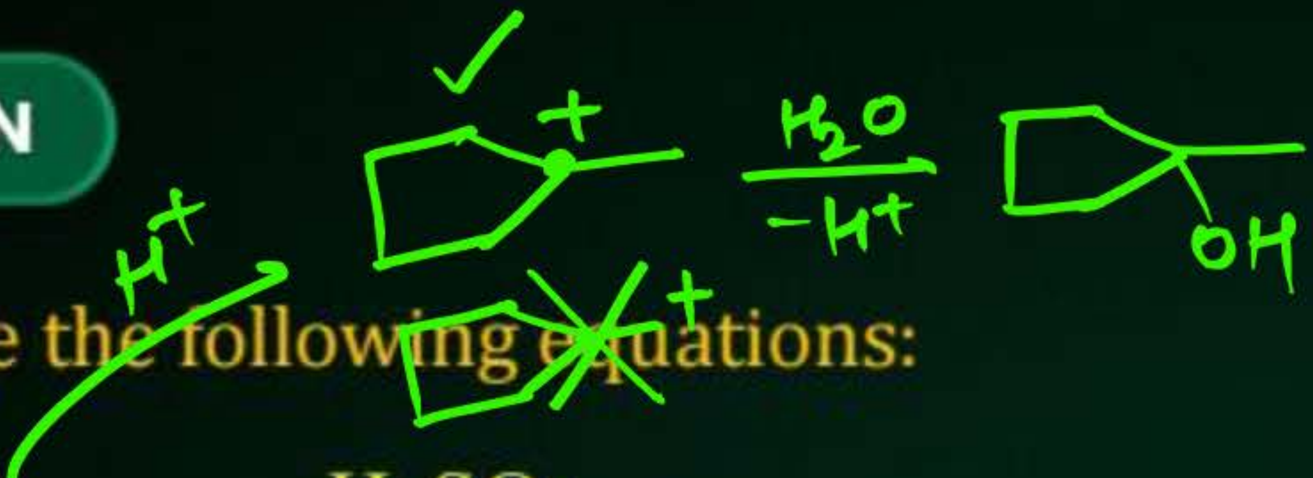
$$\xrightarrow{D^+} CH_3-\underset{\large H}{\underset{|}{\overset{\large CH_3}{\overset{|}{C}}}}-\overset{+}{C}H-CH_2-D \xrightarrow[\text{shift}]{H^{\ominus}} CH_3-\underset{\oplus}{\overset{\large CH_3}{\overset{|}{C}}}-CH_2-CH_2-D$$

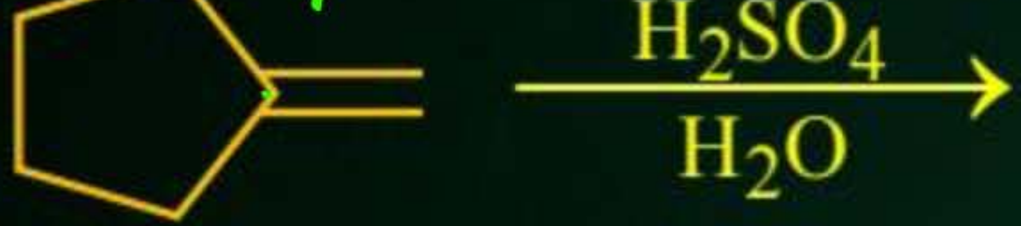
$$\Big\downarrow D_2O,\ -D^+$$

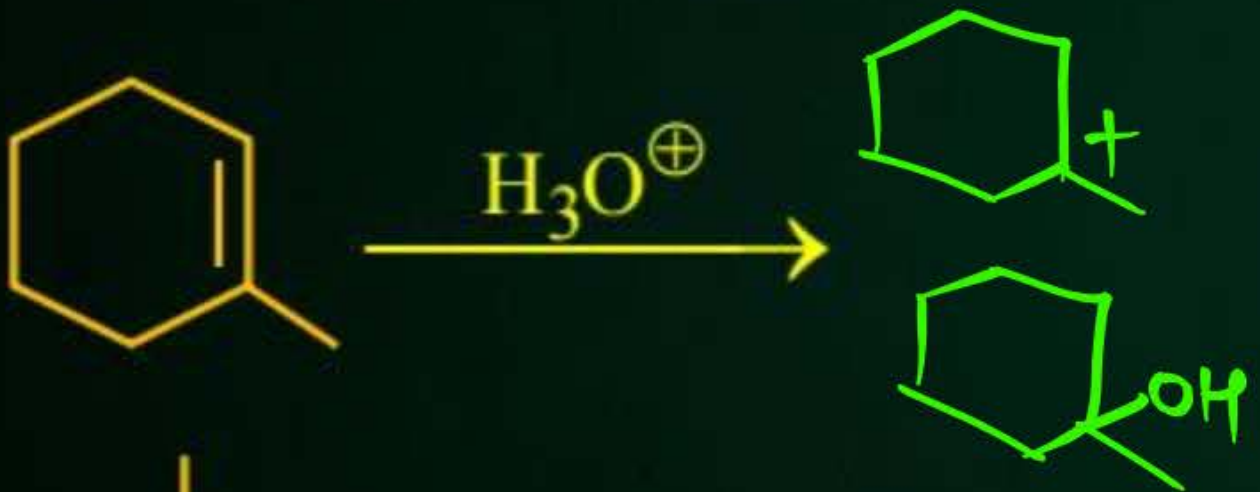
$$CH_3-\underset{\large OD}{\underset{|}{\overset{\large CH_3}{\overset{|}{C}}}}-CH_2-CH_2-D$$

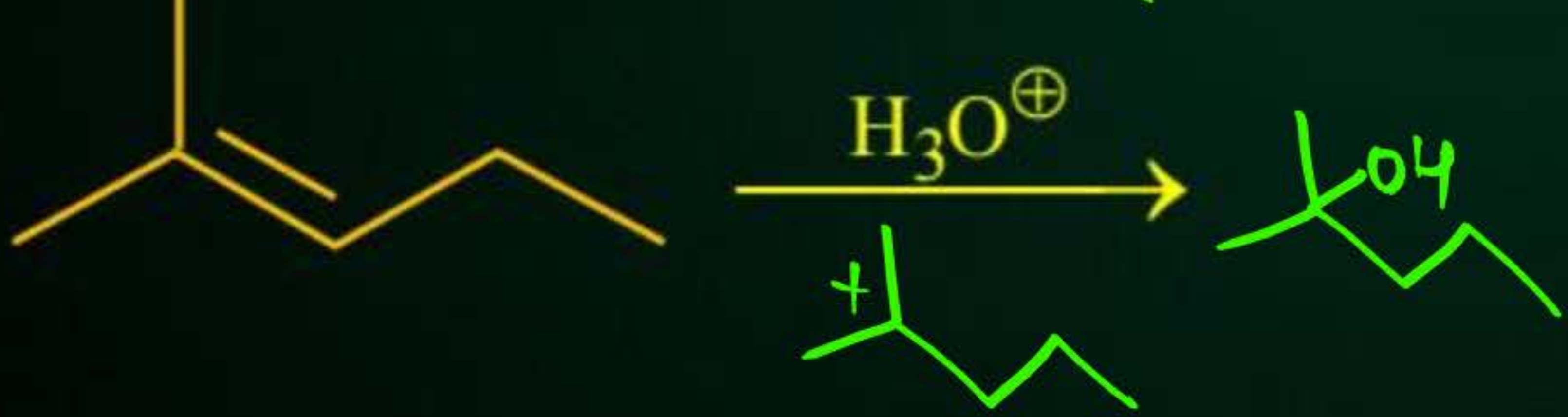
QUESTION

Complete the following equations:





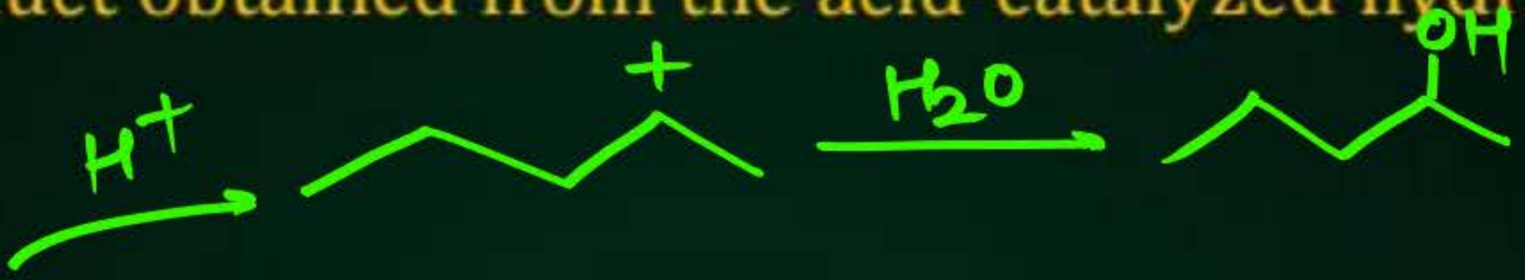




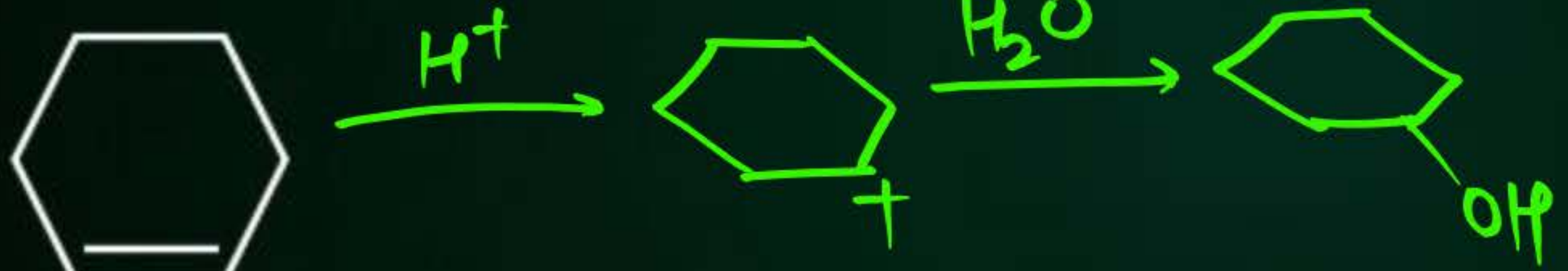
QUESTION

What is the major product obtained from the acid-catalyzed hydration of each of the following alkenes?

A $CH_3CH_2CH_2CH{=}CH_2$



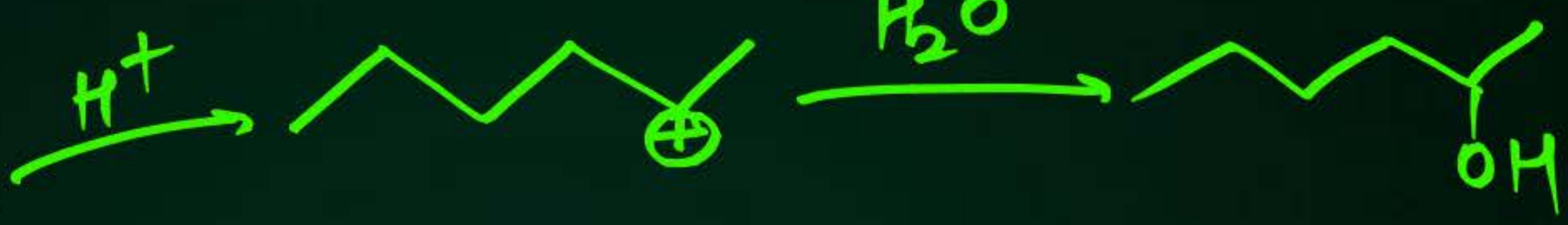
B



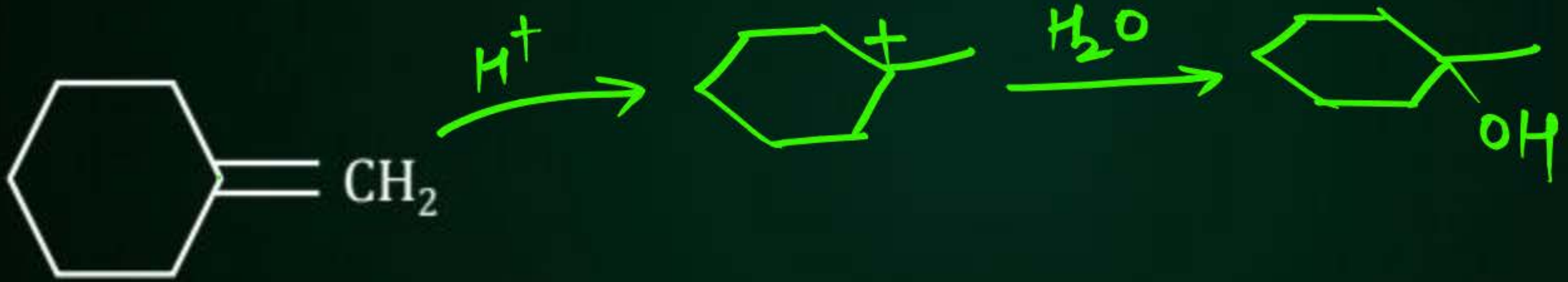
QUESTION

What is the major product obtained from the acid-catalyzed hydration of each of the following alkenes?

Ⓐ $CH_3CH_2CH_2CH{=}CHCH_3$



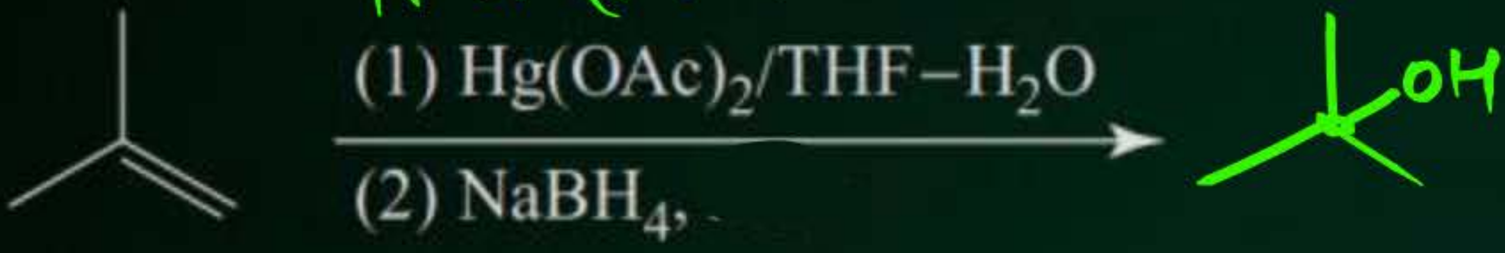
Ⓑ



QUESTION

Complete the following equations:

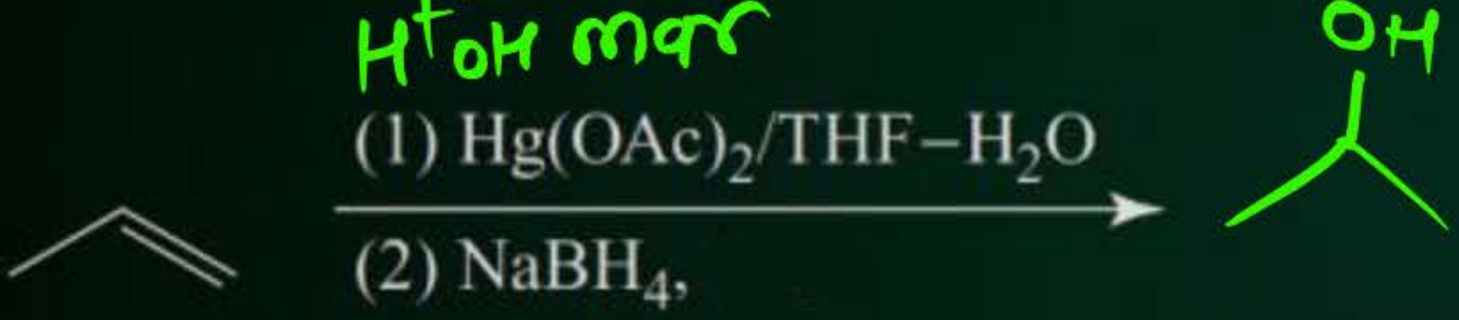
(a)



(1) Hg(OAc)$_2$/THF–H$_2$O
(2) NaBH$_4$,
OH

$H^+\bar{O}H$ (mar)

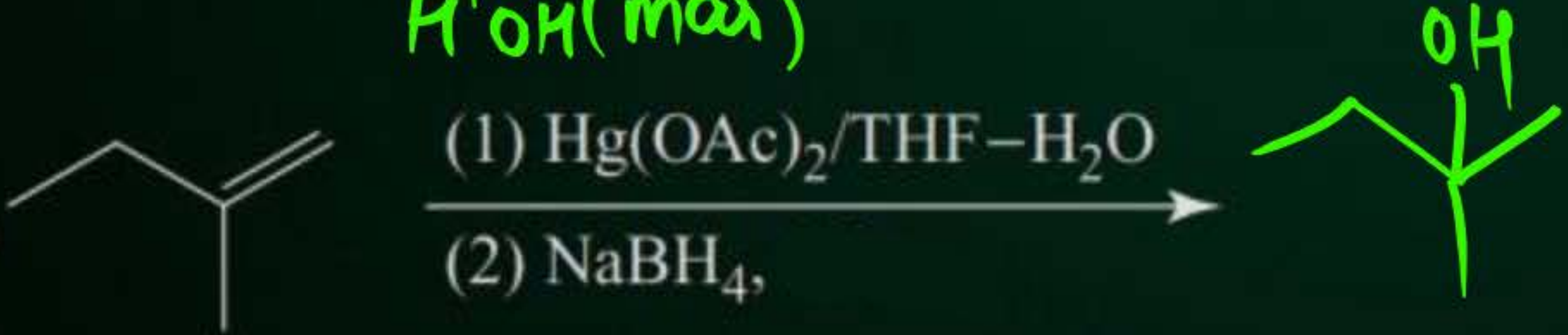
(b)



(1) Hg(OAc)$_2$/THF–H$_2$O
(2) NaBH$_4$,
OH

$H^+\bar{O}H$ mar

(c)

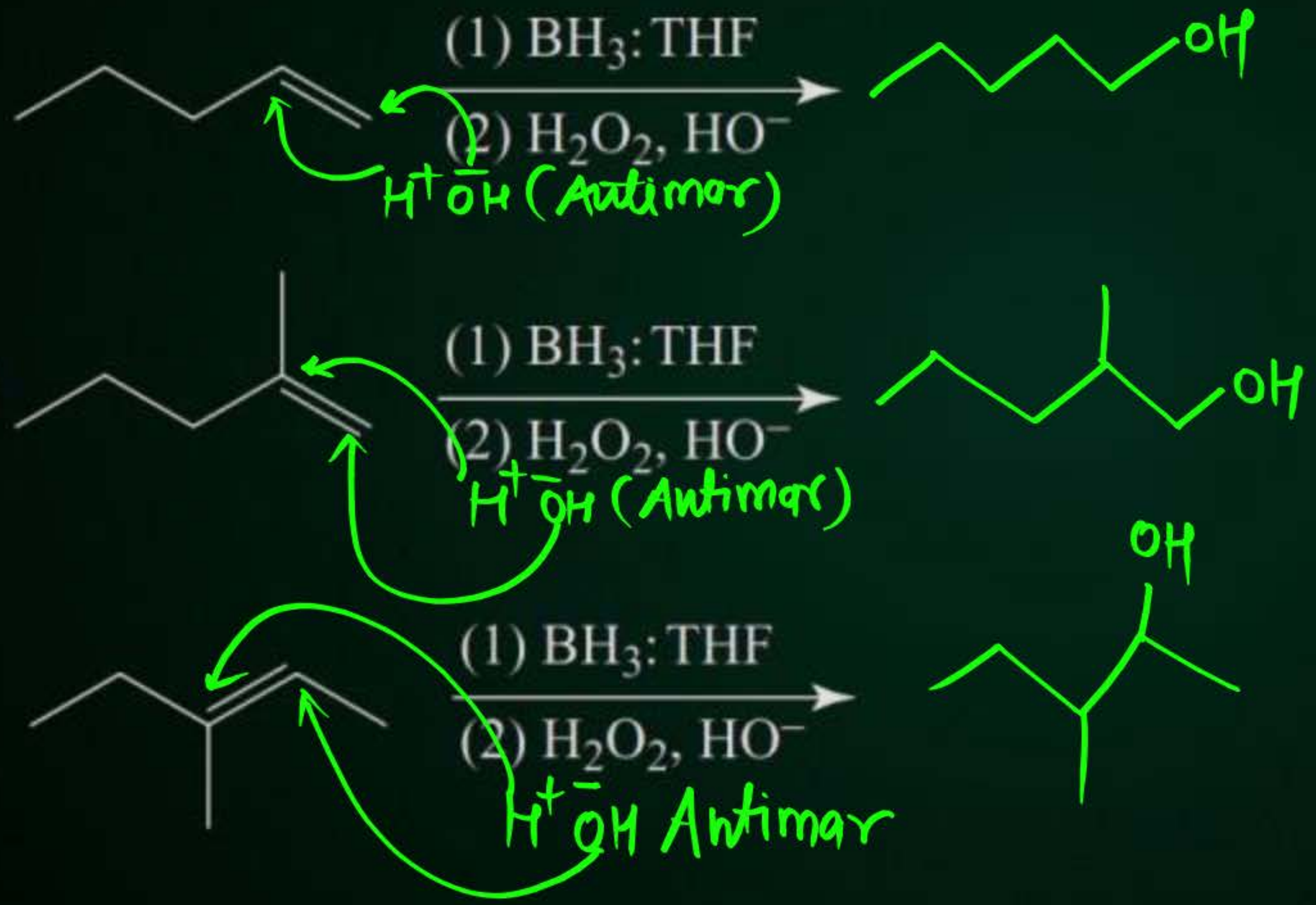


(1) Hg(OAc)$_2$/THF–H$_2$O
(2) NaBH$_4$,
OH

$H^+\bar{O}H$ (mar)

QUESTION

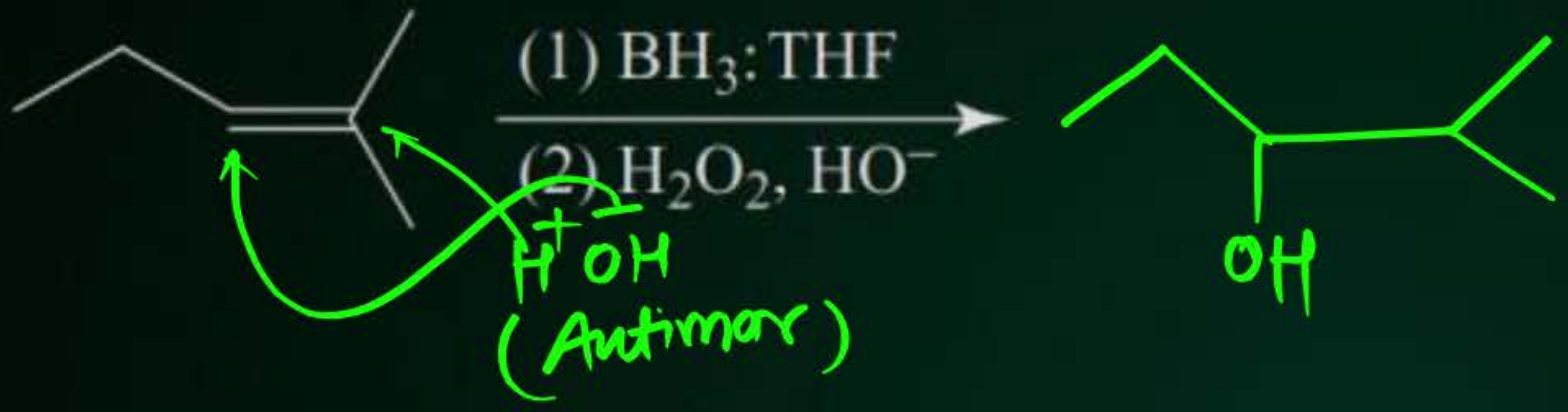
Complete the following equations:


(a)
(1) BH$_3$:THF
(2) H$_2$O$_2$, HO$^-$
OH
H$^+$ $\bar{O}$H (Antimar)
(b)
(1) BH$_3$:THF
(2) H$_2$O$_2$, HO$^-$
OH
H$^+$ $\bar{O}$H (Antimar)
(c)
(1) BH$_3$:THF
(2) H$_2$O$_2$, HO$^-$
OH
H$^+$ $\bar{O}$H Antimar

QUESTION

Complete the following equations:

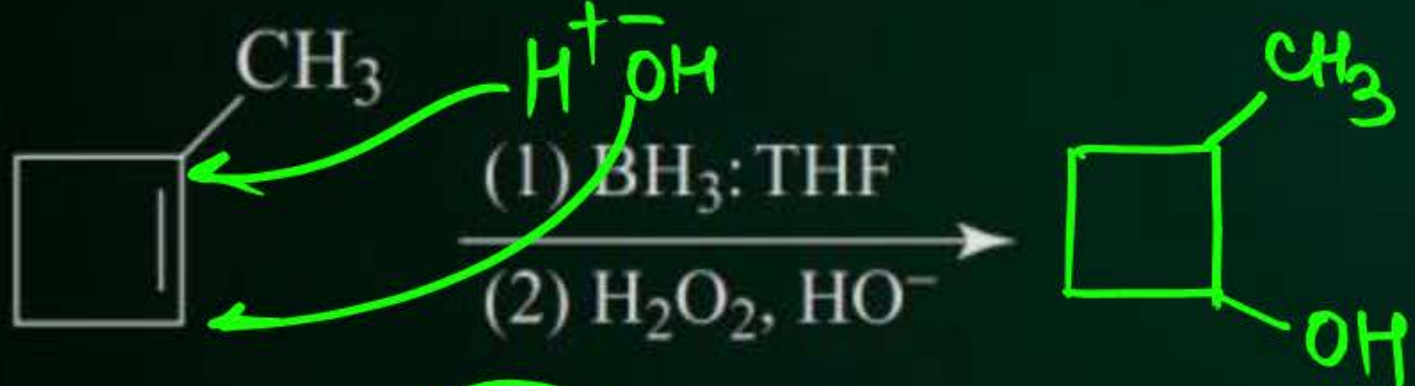
(d)



$\xrightarrow[\text{(2) } H_2O_2,\ HO^-]{\text{(1) } BH_3:THF}$

$\overset{+}{H}\ \overset{-}{OH}$
(Antimar)
OH

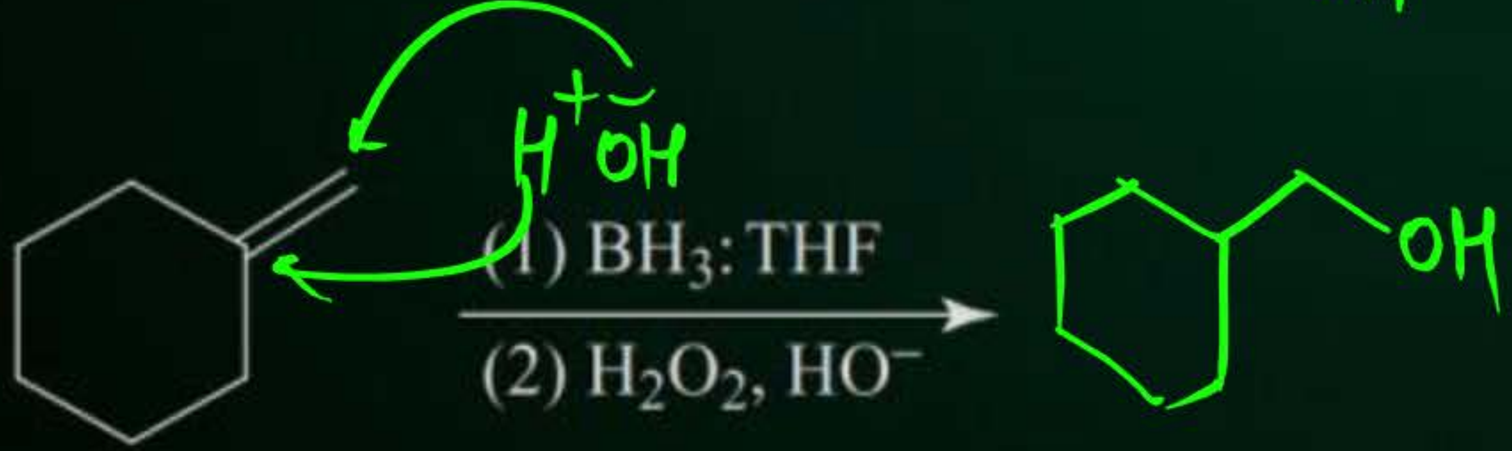
(e)



$\xrightarrow[\text{(2) } H_2O_2,\ HO^-]{\text{(1) } BH_3:THF}$

CH_3
$\overset{+}{H}\ \overset{-}{OH}$
CH_3
OH

(f)



$\xrightarrow[\text{(2) } H_2O_2,\ HO^-]{\text{(1) } BH_3:THF}$

$\overset{+}{H}\ \overset{-}{OH}$
OH

QUESTION

Reaction involving 'syn' addition is:

$\xrightarrow{H^+} CH_3-\overset{\oplus}{C}H_2$

(A) $CH_2=CH_2 \xrightarrow{H^+/H_2O}$ No Type of add

$\xrightarrow{H^+} CH_3-\overset{+}{C}H-CH_3$

(B) $CH_3CH=CH_2 \xrightarrow{HX}$ X

(C) $CH_3CH=CH_2 \xrightarrow[NaBH_4]{Hg(OAc)/H_2O}$

Antiadd

(D) ✓ $CH_2=CH_2 \xrightarrow[H_2O_2/OH^-]{B_2H_6/THF}$

Syn Add

QUESTION

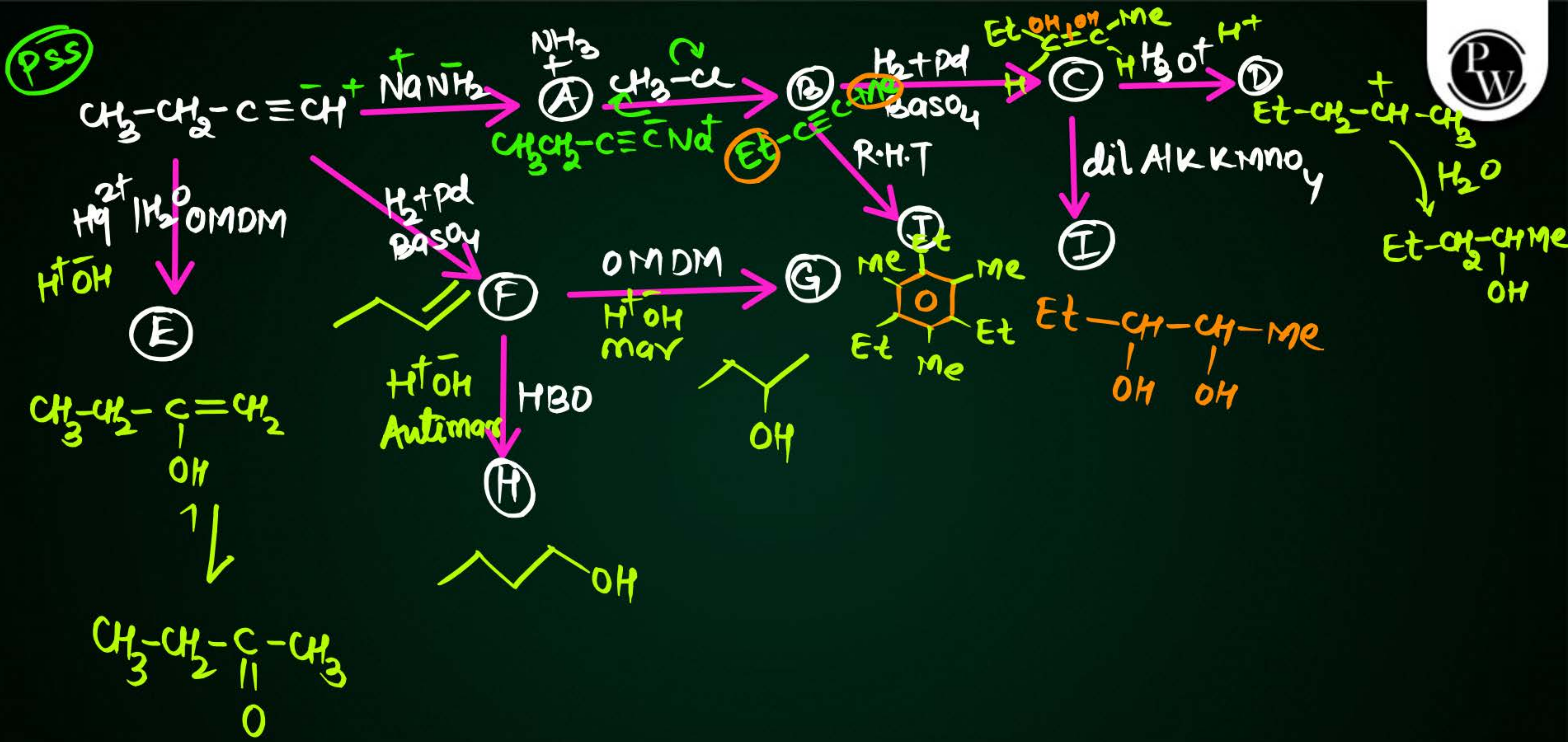
Reaction involving anti addition is:

Ⓐ $CH_2 = CH_2 \xrightarrow{H^+/H_2O}$

Ⓑ $CH_3CH = CH_2 \xrightarrow{HX}$

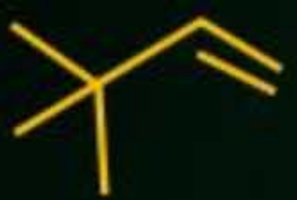
[✓ Ⓒ $CH_3CH = CH_2 \xrightarrow[NaBH_4]{Hg(OAc)_2/H_2O}$]

Ⓓ $CH_2 = CH_2 \xrightarrow[H_2O_2/OH^-]{B_2H_6/THF}$


PSS
CH3-CH2-C≡CH
NaNH2
NH3
A
CH3CH2-C≡C⁻Na⁺
CH3-Cl
B
Et-C≡C-Me
H2+Pd
BaSO4
C
Et-C(OH)=C(OH)-Me
H3O+
H+
D
Et-CH2-CH⁺-CH3
H2O
Et-CH2-CHMe
OH
R.H.T
I
Me Et Me Et Et Me
dil Alk KMnO4
I
Et-CH-CH-Me
OH OH
Hg2+ / H2O
OMDM
H+OH−
E
CH3-CH2-C=CH2
OH
CH3-CH2-C-CH3
O
H2+Pd
BaSO4
F
OMDM
H+OH−
mar
G
OH
H+OH−
Antimar
HBO
H
OH

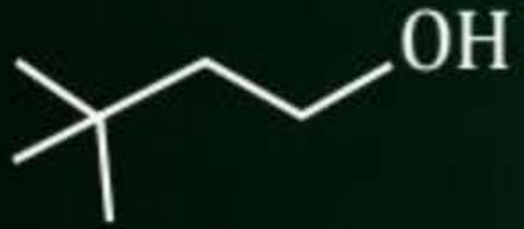
Home Work

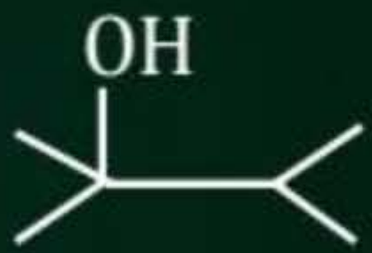
QUESTION 01

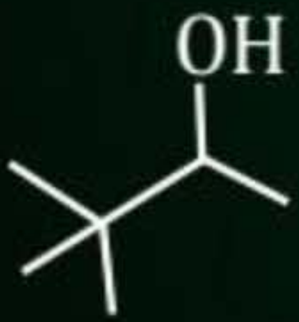


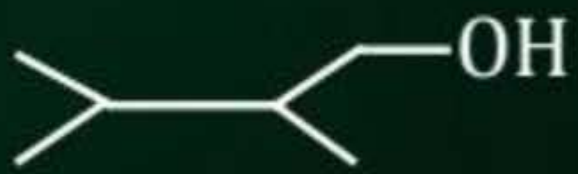
$\xrightarrow{H^+/H_2O}$ J (Major)

J is:

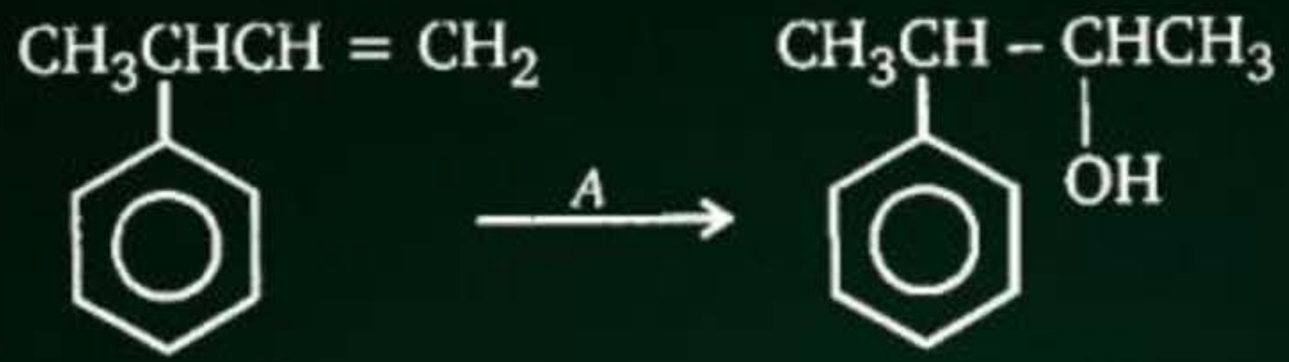
A 

B 

C 

D 

QUESTION


$CH_3CHCH=CH_2$
A
$CH_3CH-CHCH_3$
OH

Reagent A may be:

(A) H_2O/H^+

(B) $BH_3.THF/H_2O_2—OH^-$

(C) $Hg(OCOCH_3)_2.THF/NaBH_4$

(D) All are possible

QUESTION 03

Hydration of 3-phenyl but-1-ene in dil. H_2SO_4 will give mainly:

(A) 3-Phenyl butan-1-ol

(B) 3-Phenyl butan-2-ol

(C) 2-Phenyl butan-2-ol

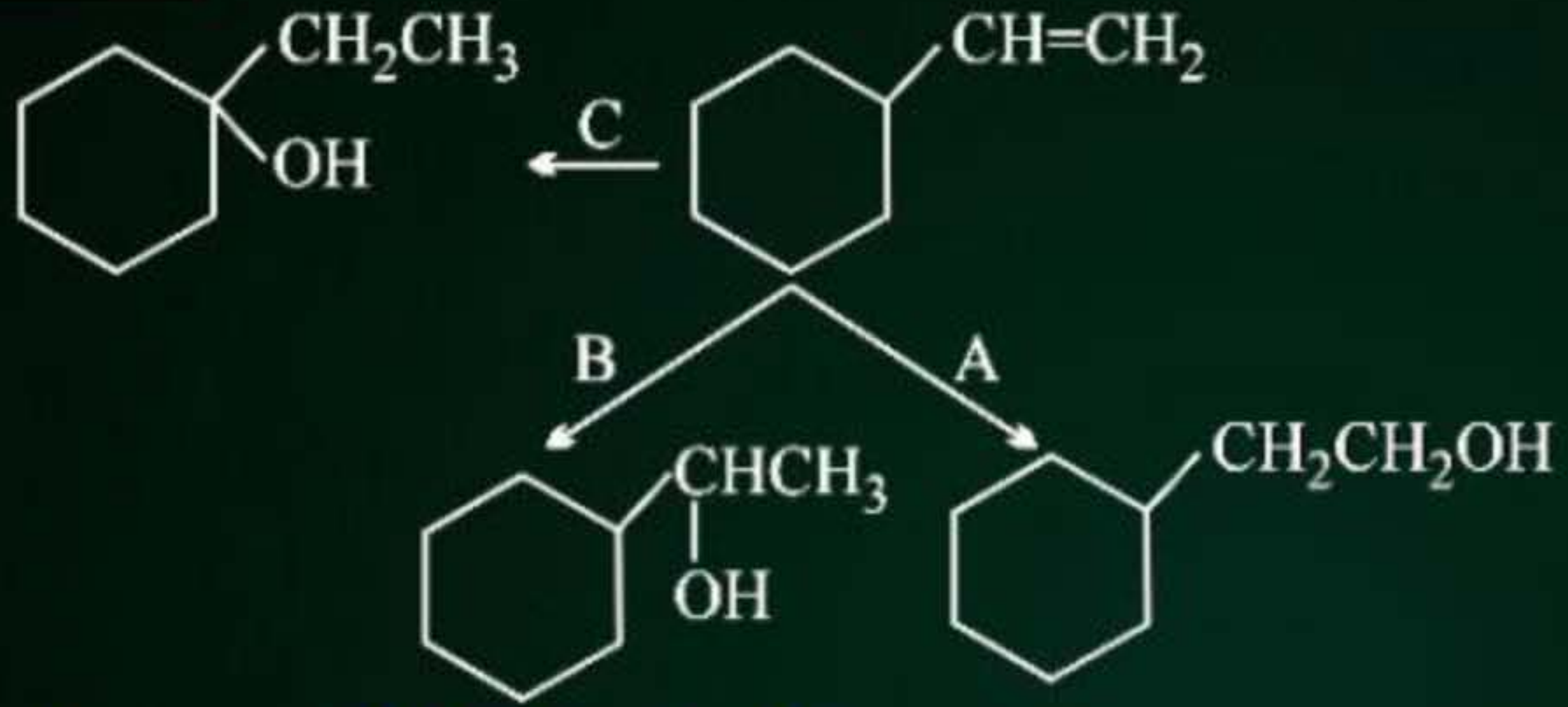
(D) 2-Phenyl butan-1-ol

QUESTION 04

Oxymercuration-demercuration of 3,3-dimethyl but-1-ene gives which alcohol?

- (A) 2,3-dimethyl butan-2-ol
- (B) 2,3-dimethyl butan-1-ol
- (C) 3,3-dimethyl butan-2-ol
- (D) 3,3-dimethyl butan-1-ol

QUESTION 05


CH2CH3
OH
C
CH=CH2
B
A
CHCH3
OH
CH2CH2OH

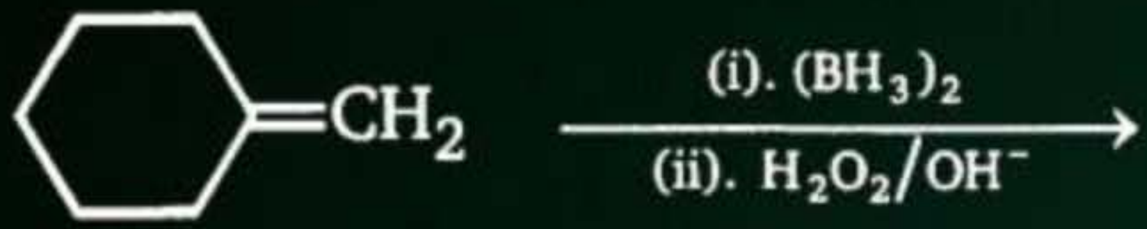
Select schemes A, B, C out of

I. acid catalysed hydration **II HBO**

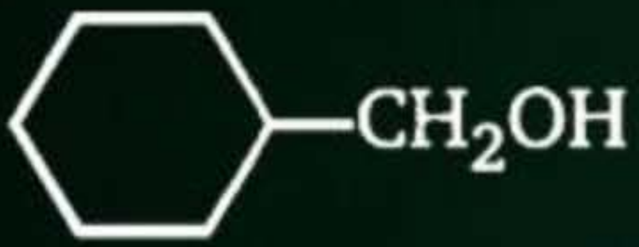
III oxymercuration-demercuration

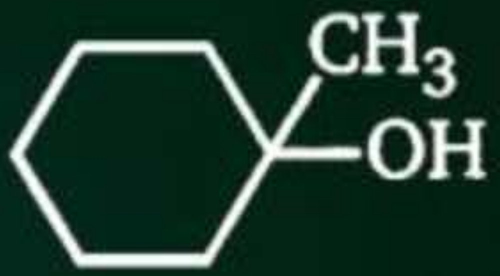
- **A** I in all cases
- **B** I, II, III
- **C** II, III, I
- **D** III, I, II

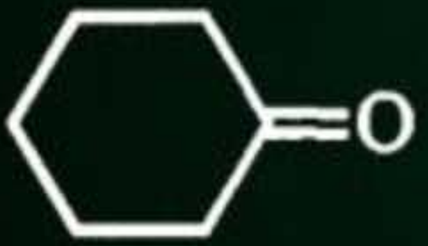
QUESTION 06

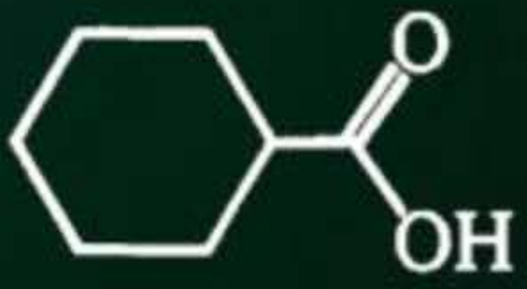

CH2
(i). (BH3)2
(ii). H2O2/OH⁻

(P). Product (P) in the reaction is:

A


B


C


D


QUESTION 07

Propene can be converted into propan-1-ol. Which of the reagents among the following is ideal to affect the conversion?

A Alkaline $KMnO_4$

B B_2H_6 and alkaline H_2O_2

C O_3/Zn

D OsO_4/CH_2Cl_2

QUESTION 08

Which of the following alkenes on acid-catalysed hydration gives a tertiary alcohol?

Ⓐ But-2-ene

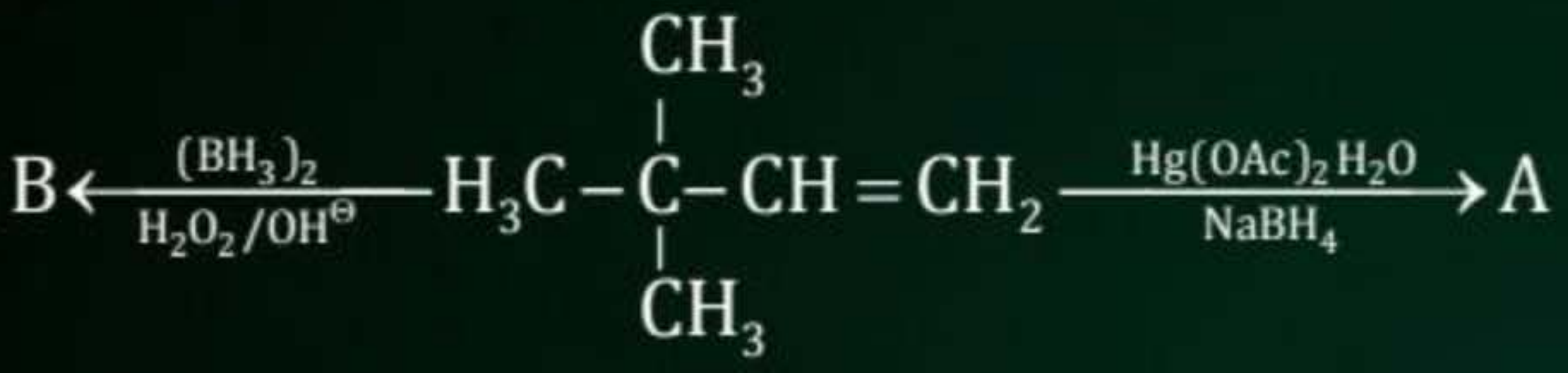
Ⓑ Propene

Ⓒ But-1-ene

Ⓓ 2-Methylpropene

QUESTION⑨

Choose the correct option for the following reactions.



$$B \xleftarrow[H_2O_2/OH^{\ominus}]{(BH_3)_2} H_3C-\overset{\overset{\large CH_3}{|}}{\underset{\underset{\large CH_3}{|}}{C}}-CH=CH_2 \xrightarrow[NaBH_4]{Hg(OAc)_2\,H_2O} A$$

A 'A' and 'B' are both Markovnikov addition products.

B 'A' is Markovnikov product and 'B' is anti-Markonikov Product.

C 'A' and 'B' are both anti-Markovnikov products.

D 'B' is Markovnikov and 'A' is anti-Markovnikov product.

QUESTION 10

Among the following alkenes, which one produces tertiary butyl alcohol on acidic hydrolysis?

(A) $CH_3CH_2CH = CH_2$

(B) $CH_3CH = CHCH_3$

(C) $(CH_3)_2C = CH_2$

(D) $CH_3CH = CH_2$

ANSWER KEY

1. B
2. C
3. C
4. C
5. C
6. A
7. B
8. D
9. B
10. C

Home Work From PW Module (Yakeen NEET)

Prarambh: Q 01, 02, 03, 04, 05, 34

Prabal: Q 12

Parikshit: Q 07

Thank you!!

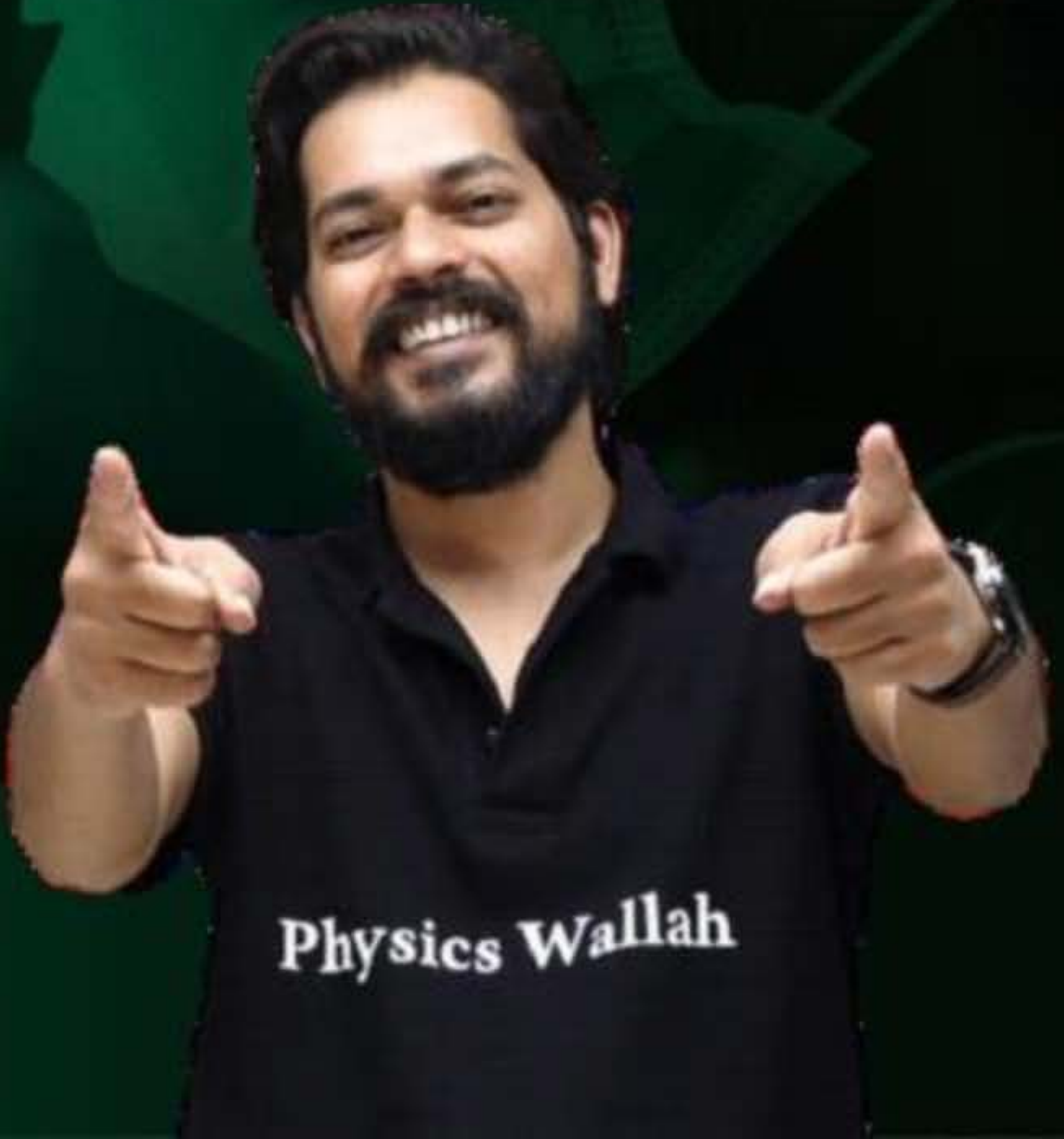
YAKEEN 2.0

FOR NEET 2025

Lecture- 02 | **Organic Chemistry**

Alcohols, Phenols and Ethers

By- Pankaj Sir(POPU MAMA)


Physics Wallah

Topics *to be covered*

1. Methods of Preparation of Alcohols Part 02
2. Practice

Reducing agent

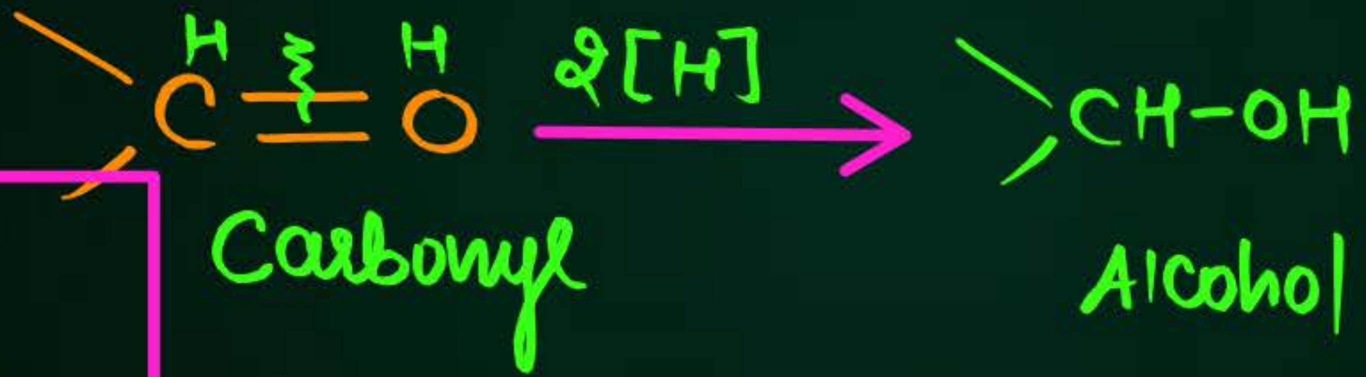
G.R

SBH → sodium borohydride LAH → Lithium aluminium hydride

Methods of Preparation of Alcohols

2. Reduction reactions:

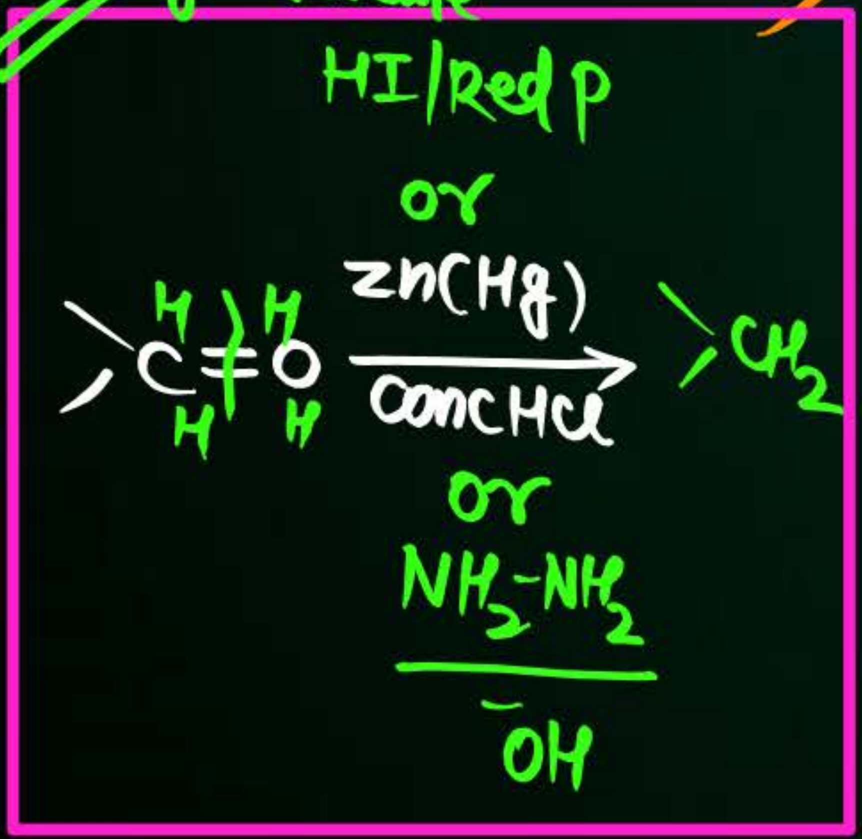
A. By reduction of carbonyl compounds:



H
H
2[H]
CH-OH
Carbonyl
Alcohol

Carbonyl to Alkane

D.M



HI/Red P
or
Zn(Hg)
conc HCl
or
NH_2-NH_2
$\bar{O}H$
H
H
H
H
CH_2

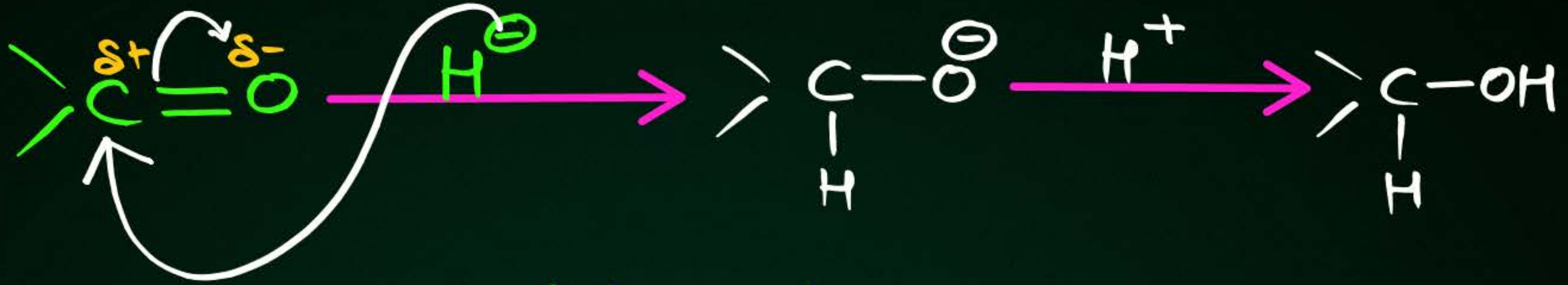
(LAH)

① $LiAlH_4^{\ominus}$ | H^+ from source $\overset{+}{H_2}O$, ROH^+, $RCOOH^+$

② $NaBH_4^{\ominus}$ | H^+ (SBH)

③ H_2/cat Ni, Pt, Pd (Hydrogenation)

Mechanism


δ+
δ-
C
O
H⊖
C—O⊖
H
H+
C—OH
H

$\overset{+}{Li}\overset{-}{AlH_4}$

$Li^+ + AlH_4^-$

$(AlH_3 + H^{\ominus})$

$\overset{+}{Na}\overset{-}{BH_4}$

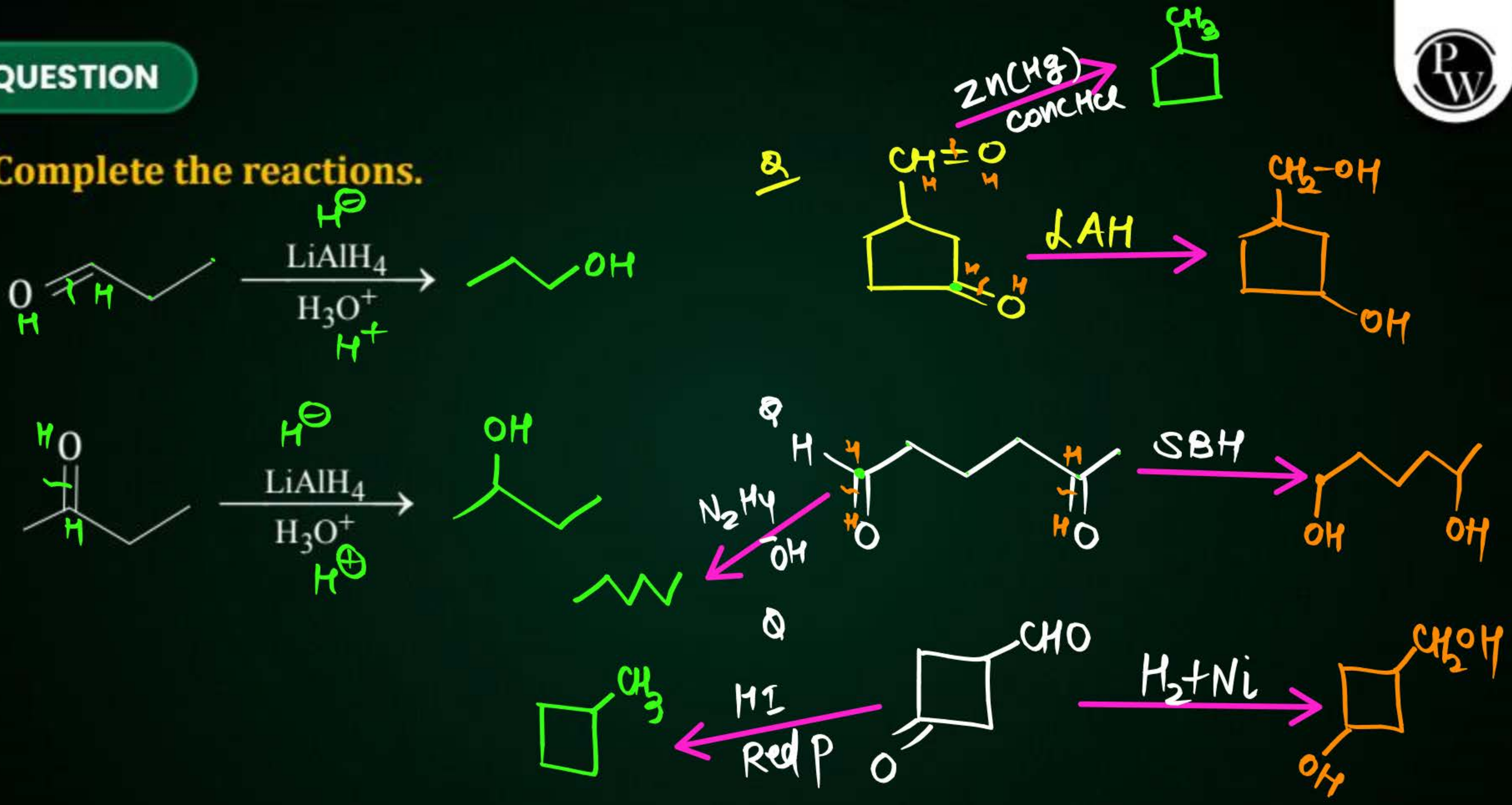
$Na^+ + BH_4^{\ominus}$

$(BH_3 + \ddot{H}^{\ominus})$

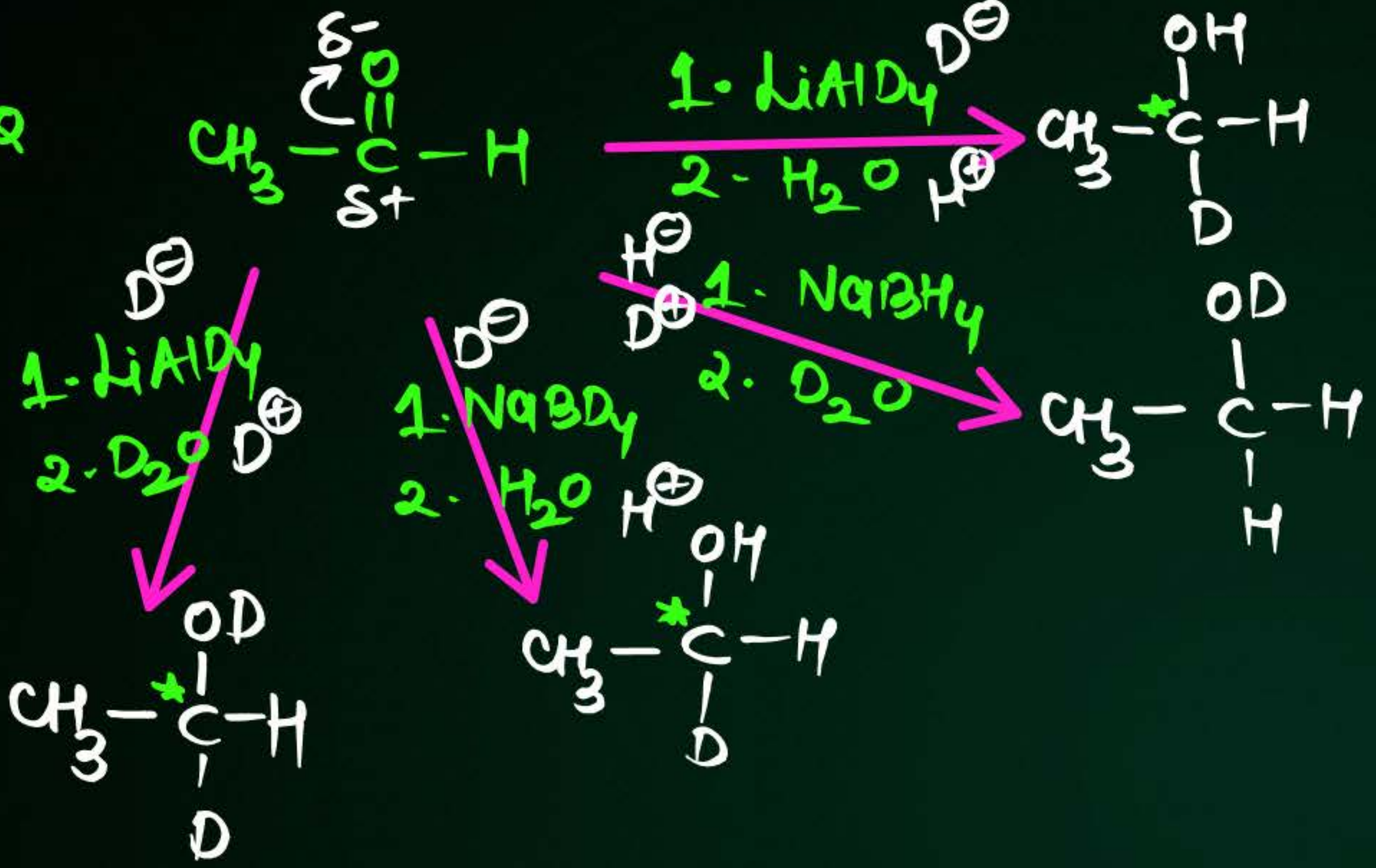
N.A.R (Nucleophilic addition Rxn)

QUESTION

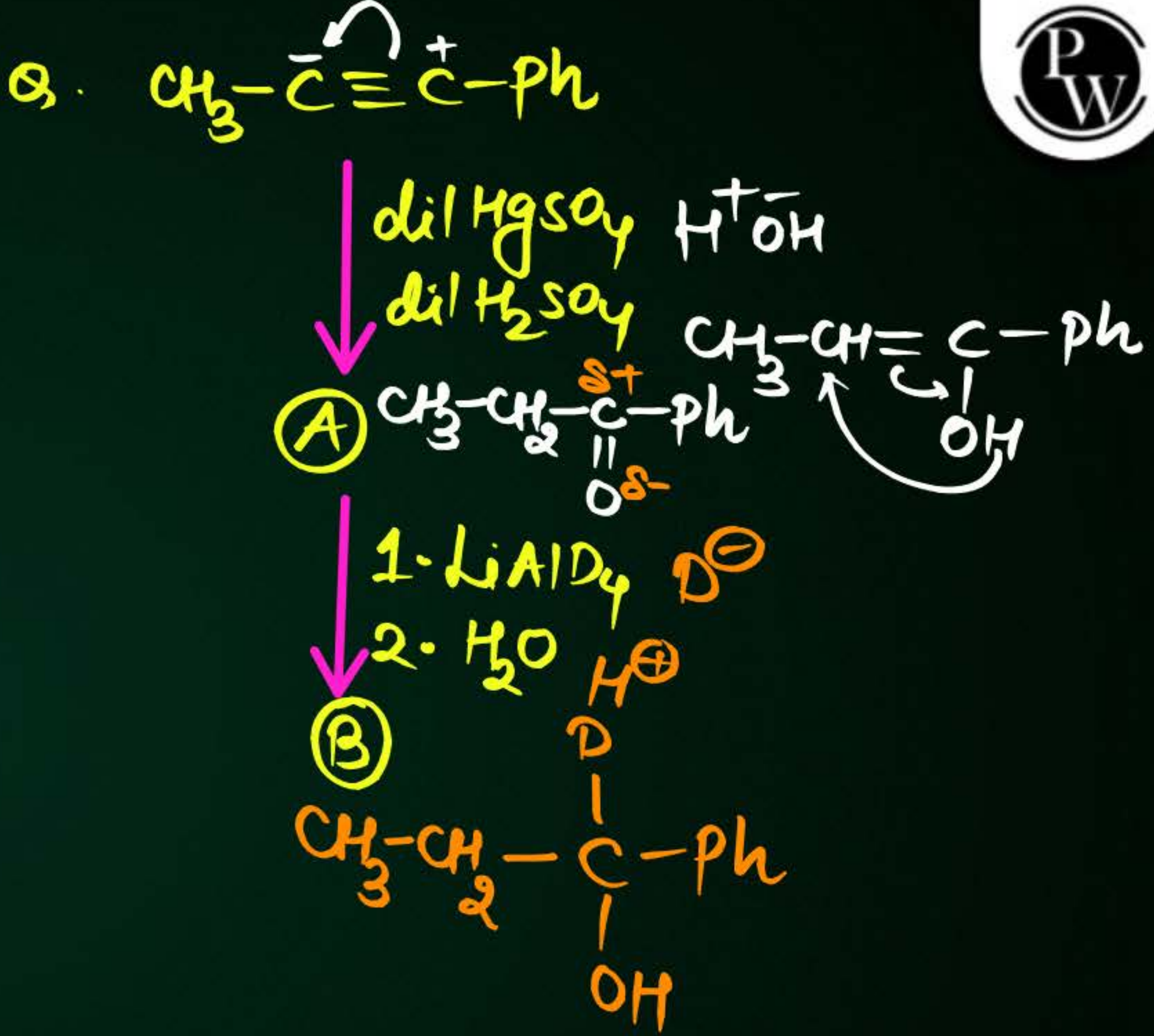
Complete the reactions.


H⊖
LiAlH4
H3O+
H+
OH
H⊖
LiAlH4
H3O+
H⊕
OH
Q
CH=O
Zn(Hg)
conc HCl
CH3
LAH
CH2-OH
OH
Q
H
SBH
OH
OH
N2H4
⁻OH
Q
CHO
O
H2+Ni
CH2OH
OH
HI
Red P
CH3

Q

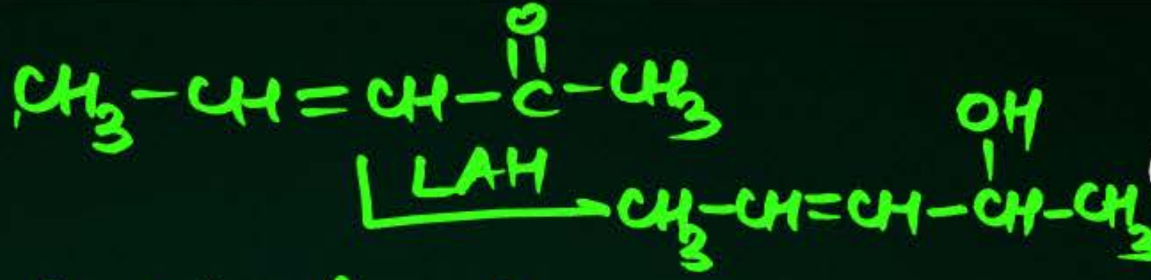

δ−
δ+
CH3–C(=O)–H
1. LiAlD4 D⊖
2. H2O H⊕
CH3–C*(OH)(H)–D
H⊖
D⊕
1. NaBH4
2. D2O
CH3–C(OD)(H)–H
D⊖
1. LiAlD4
2. D2O D⊕
CH3–C*(OD)(H)–D
D⊖
1. NaBD4
2. H2O H⊕
CH3–C*(OH)(H)–D

Q.

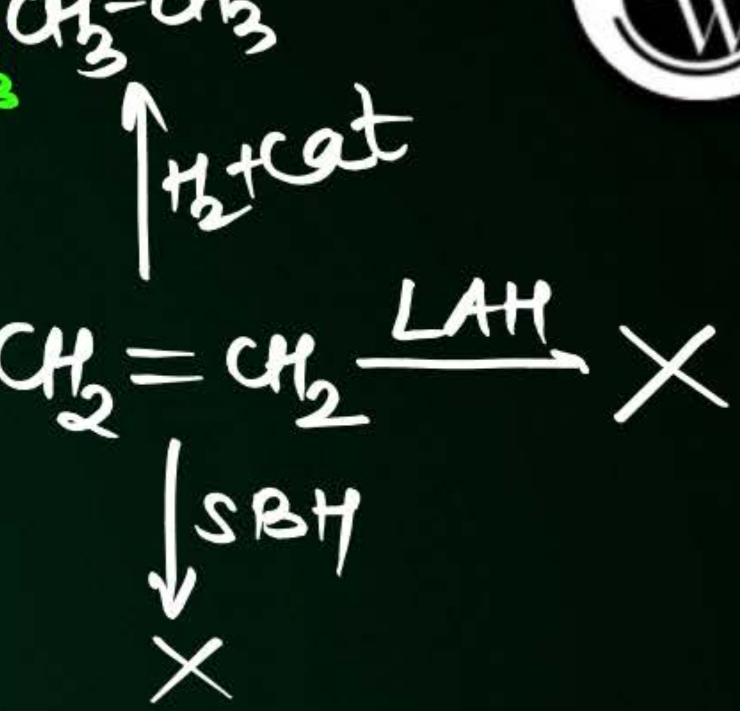

CH3–C≡C–Ph
dil HgSO4 H⁺ ⁻OH
dil H2SO4
CH3–CH=C(OH)–Ph
(A) CH3–CH2–C(=O)–Ph
δ+
δ−
1. LiAlD4 D⊖
2. H2O H⊕
(B)
CH3–CH2–C(D)(OH)–Ph

Only for L.A.H

Q



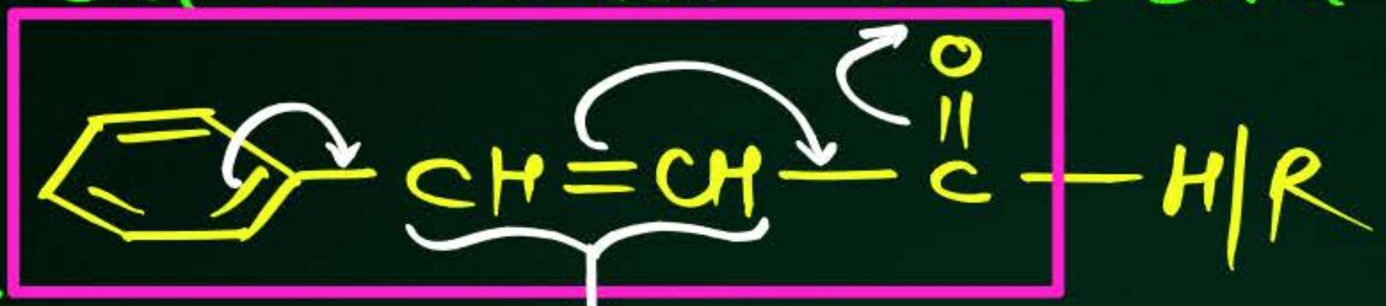
$$CH_3-CH=CH-\overset{\overset{O}{\|}}{C}-CH_3 \xrightarrow{LAH} CH_3-CH=CH-\overset{\overset{OH}{|}}{CH}-CH_3$$



CH_3-CH_3
H_2+cat
$CH_2=CH_2$
LAH
×
SBH
×

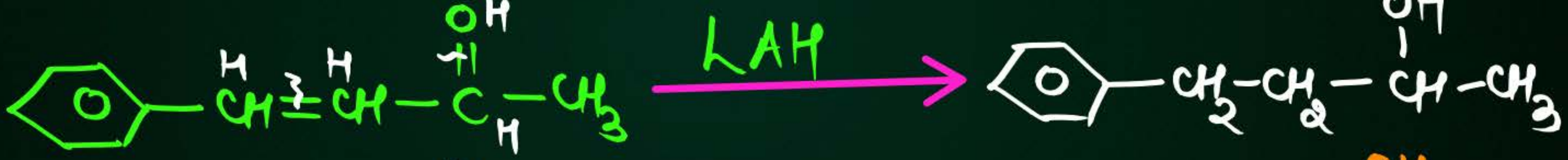
LAH can also reduce double bond.

Benzene & C=O ke beech alkene HO.



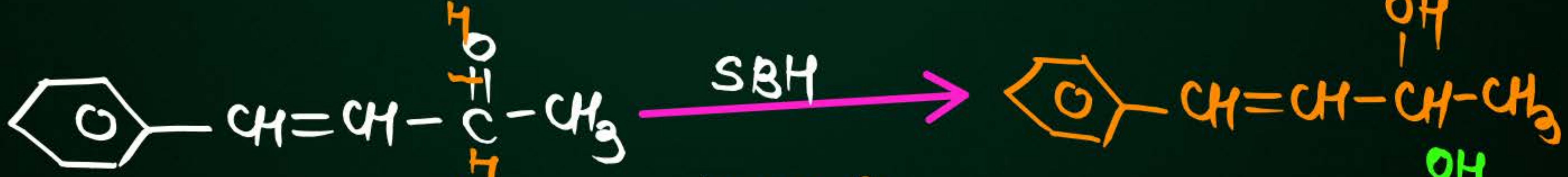
Active double bond

Q



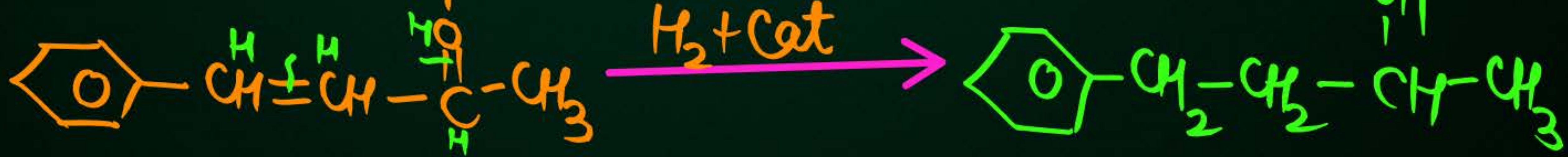
H
H
OH
CH=CH
C
H
CH_3
LAH
OH
$CH_2-CH_2-CH-CH_3$

q

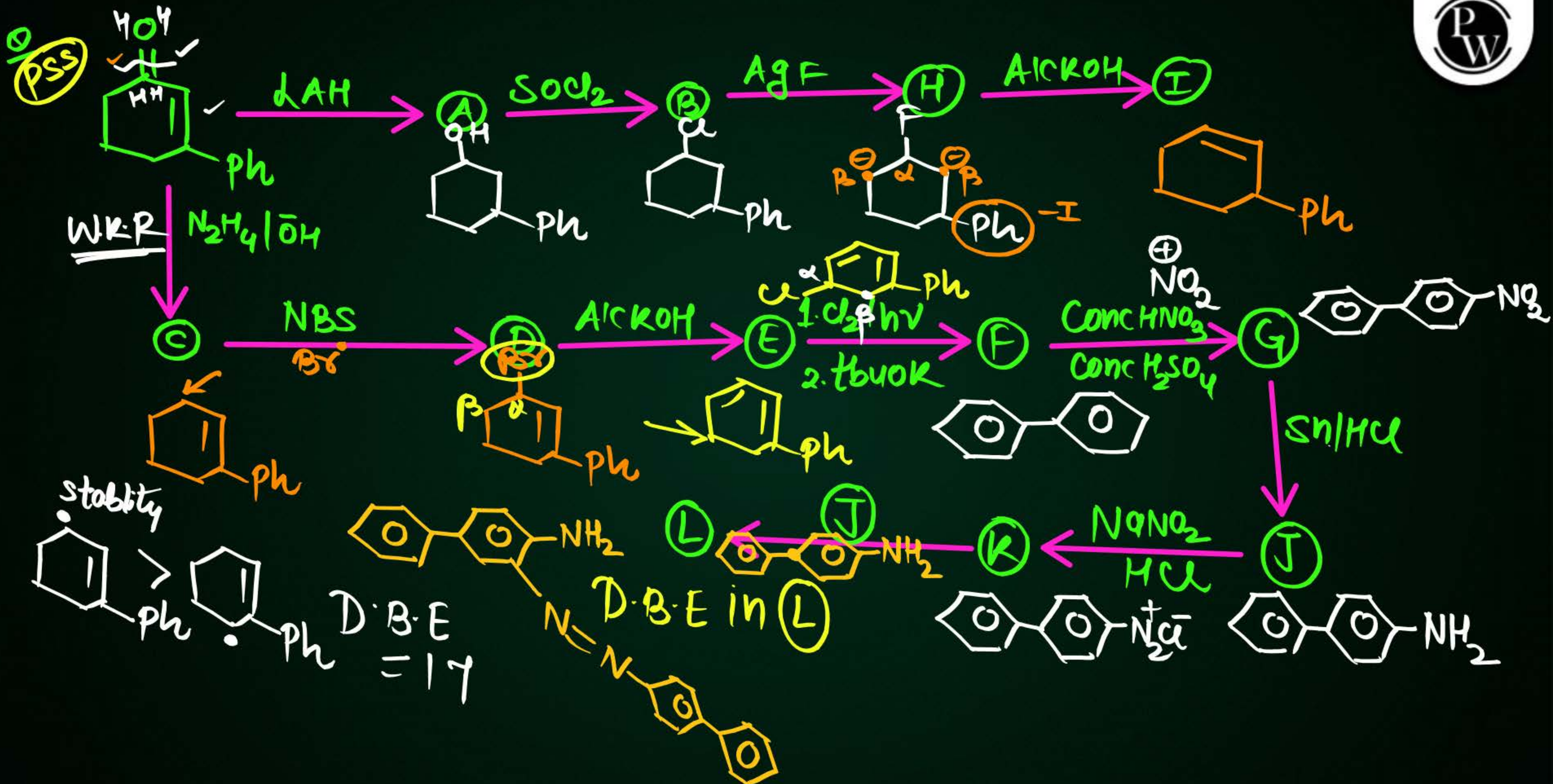


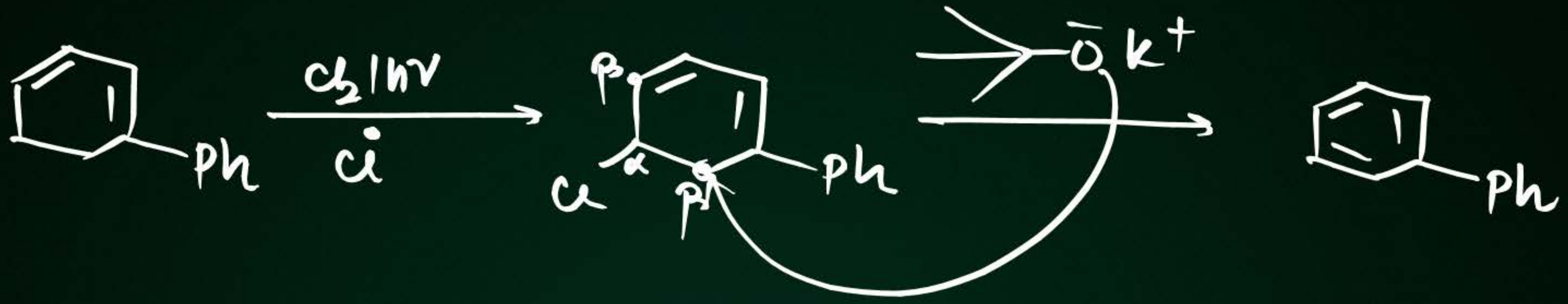
H
O
CH=CH
C
H
CH_3
SBH
OH
CH=CH-CH-CH_3

Q



H
H
HO
CH=CH
C
H
CH_3
H_2+Cat
OH
$CH_2-CH_2-CH-CH_3$


Q
PSS
H O H
H H
Ph
LAH
A
OH
Ph
SOCl2
B
Cl
Ph
AgF
H
F
β
α
β
Ph
-I
Alc KOH
I
Ph
W.K.R
N2H4 | OH⁻
C
NBS
Br•
D
Br
β
α
Ph
Alc KOH
E
α
Cl
α
β
Ph
Ph
1. Cl2, hν
2. tbuOK
F
⊕
NO2
Conc HNO3
Conc H2SO4
G
NO2
Sn/HCl
J
NH2
NaNO2
HCl
K
N2⁺Cl⁻
L
J
NH2
NH2
N=N
D.B.E in L
stability
Ph
Ph
D.B.E
= 17


Ph
Cl2/hν
Cl•
β
α
Cl
β
Ph
O⁻K⁺
Ph

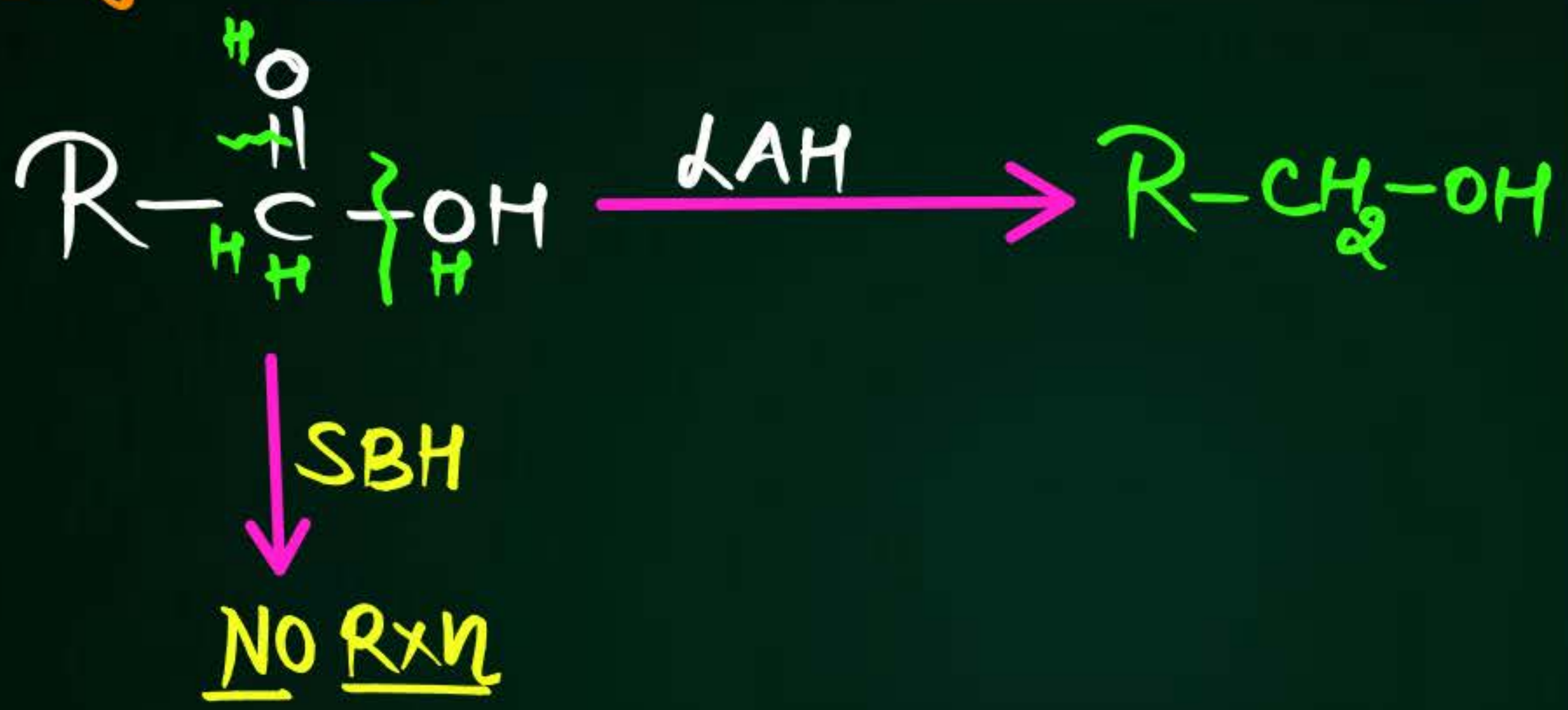
B. By reduction of carboxylic acid, ester and Acid chlorides:

Redⁿ of

① Carboxylic Acid

✓ Al—H

B—H

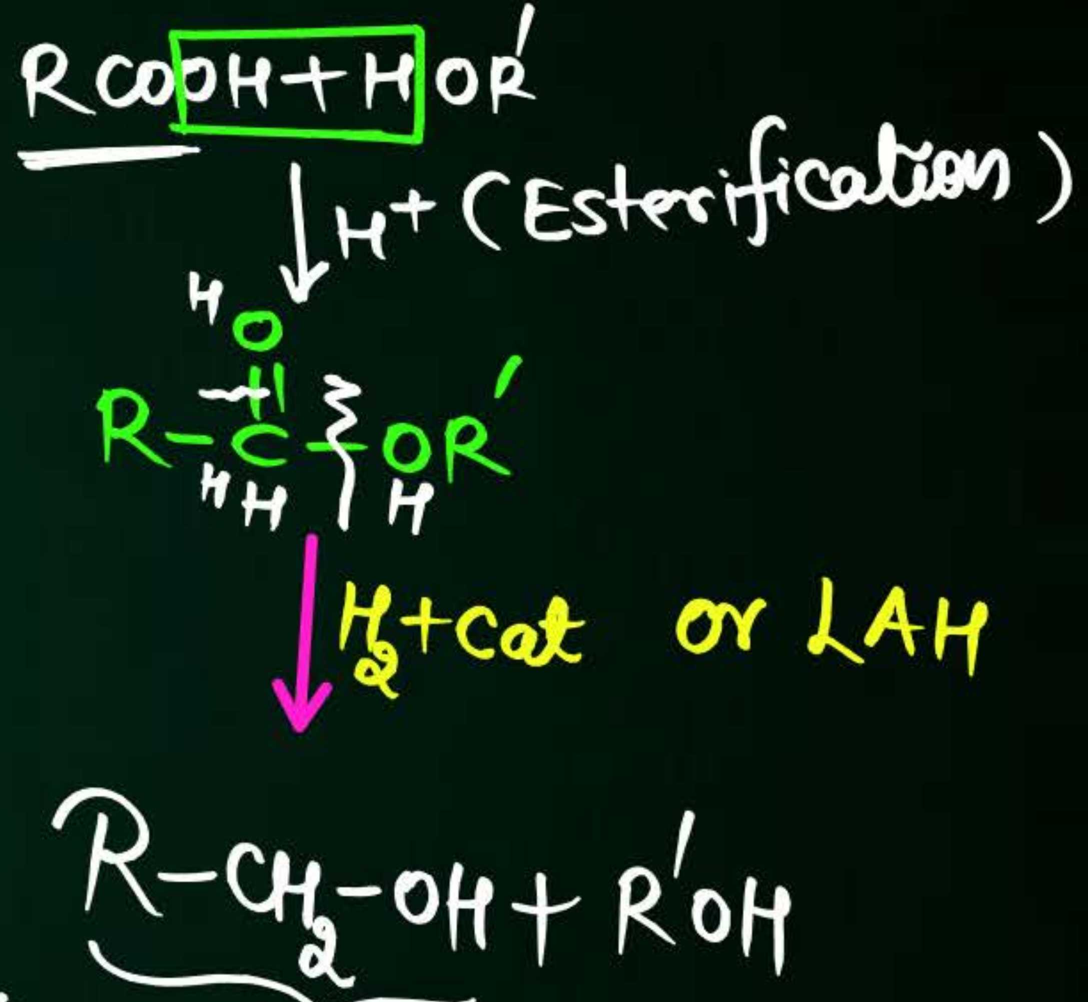


$$R-\overset{O}{\overset{\|}{C}}-OH \xrightarrow{LAH} R-CH_2-OH$$

$\downarrow$ SBH

NO Rxn

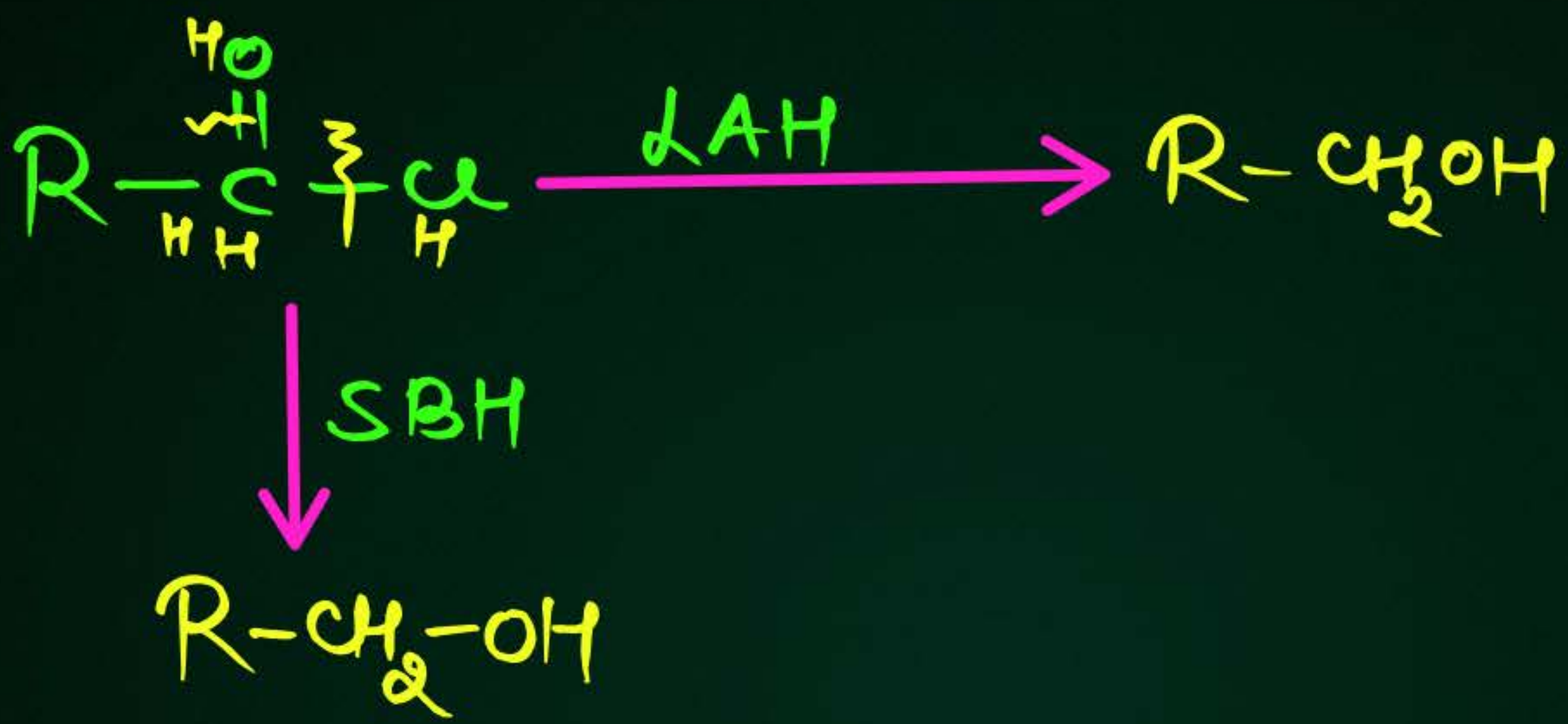
② Redⁿ of Ester



$$RCOOH + HOR' \xrightarrow{H^+\ (\text{Esterification})} R-\overset{O}{\overset{\|}{C}}-OR' \xrightarrow{H_2+\text{cat or } LAH} \underbrace{R-CH_2-OH}_{} + R'OH$$

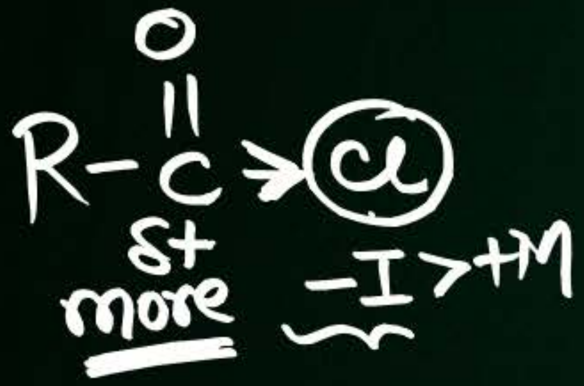
No Rxn with SBH

③ Redⁿ of Acid chloride



$$R-\overset{O}{\overset{\|}{C}}-Cl \xrightarrow{LAH} R-CH_2OH$$

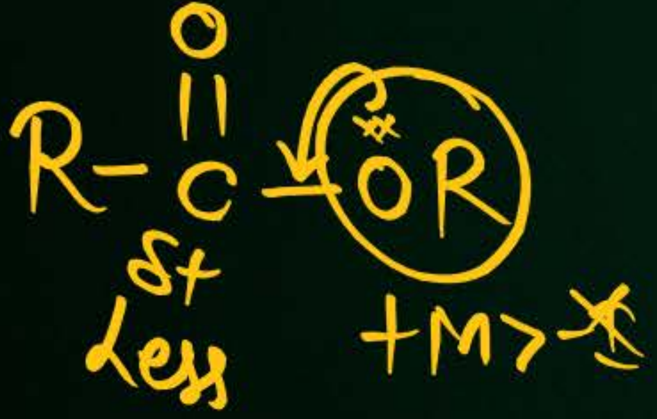
$$R-\overset{O}{\overset{\|}{C}}-Cl \xrightarrow{SBH} R-CH_2-OH$$



$$R-\overset{O}{\overset{\|}{\underset{\delta+}{C}}}\rightarrow Cl$$

more

$-I > +M$



$$R-\overset{O}{\overset{\|}{\underset{\delta+}{C}}}-\ddot{O}R$$

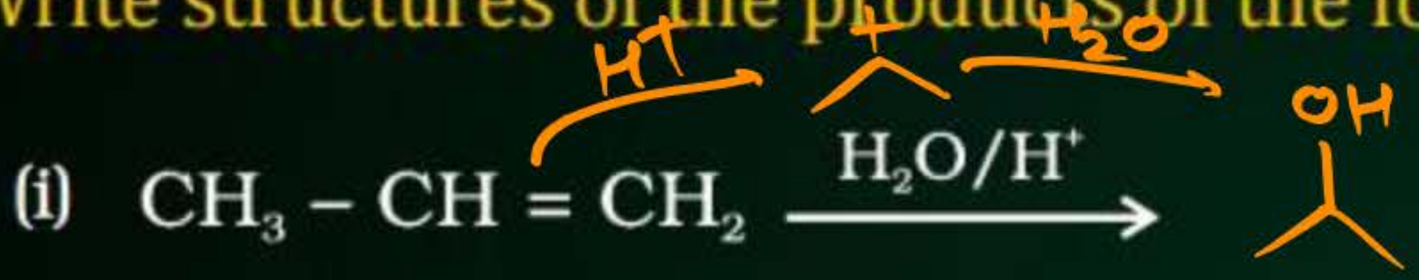
Less

$+M > -I$

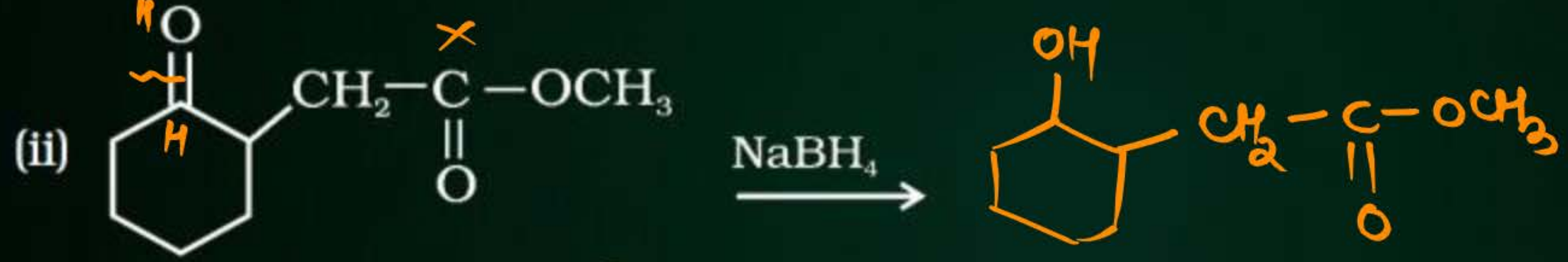
Reducing agent	Carbonyl comp	Carboxylic acid	Ester	Acid chloride
1. LAH*	$>C=O \rightarrow >CHOH$	$-COOH \rightarrow -CH_2OH$	$-COOR' \rightarrow -CH_2OH$ $+ R'OH$	$-COCl \rightarrow -CH_2OH$
2. SBH*	$>C=O \rightarrow >CH-OH$	×	×	$-COCl \rightarrow -CH_2OH$
3. H_2+Cat	$>C=O \rightarrow >CH-OH$	Nahi padte	$-COOR' \rightarrow -CH_2OH$ $+ R'OH$	Nahi padte
4. Zn(Hg) conc HCl	$>C=O \rightarrow >CH_2$	×	×	×
5. $N_2H_4 \vert \bar{O}H$	$>C=O \rightarrow >CH_2$	×	×	×
6. HI/Red P	$>C=O \rightarrow >CH_2$	$-COOH \rightarrow -CH_3$	×	×

QUESTION (NCERT Exercise)

Write structures of the products of the following reactions:

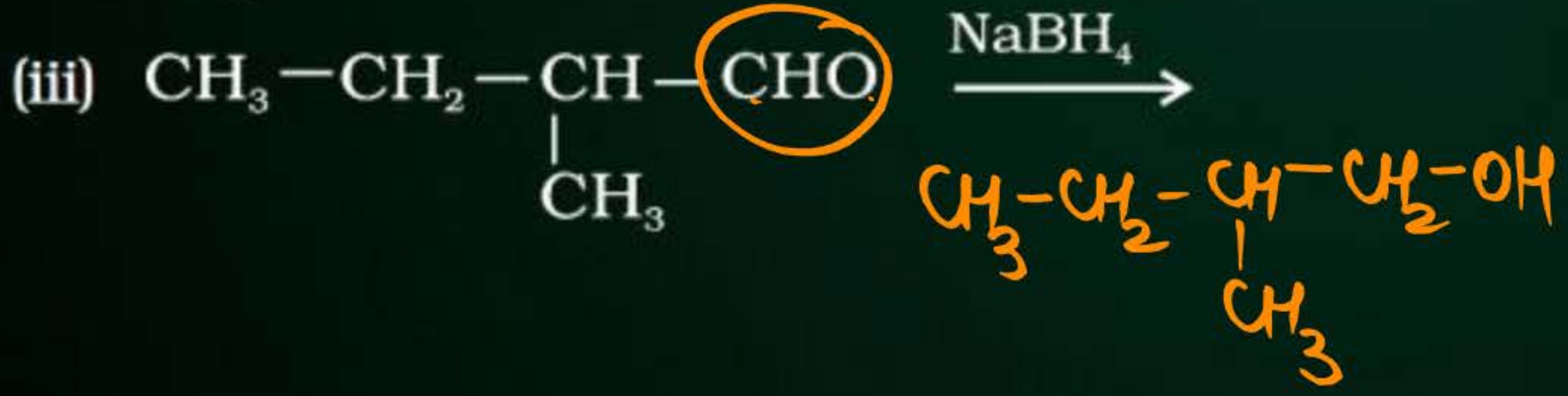


(i) $CH_3-CH=CH_2 \xrightarrow{H_2O/H^+}$



(ii)

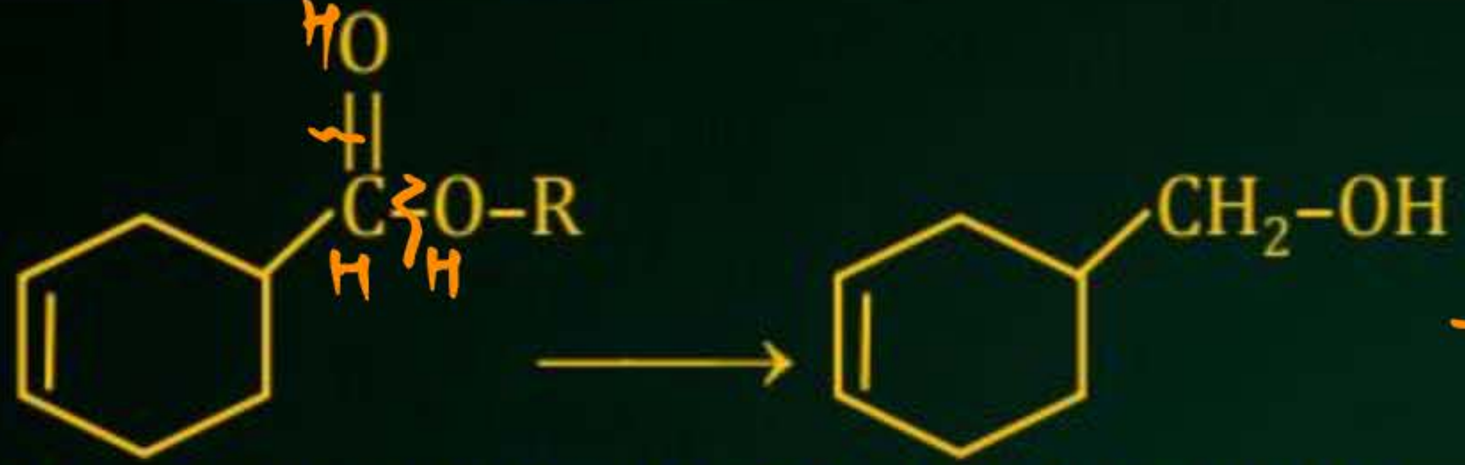
O
H
CH2—C—OCH3
O
NaBH4
OH
CH2—C—OCH3
O



(iii) $CH_3-CH_2-\underset{\underset{CH_3}{|}}{CH}-CHO \xrightarrow{NaBH_4}$

$CH_3-CH_2-\underset{\underset{CH_3}{|}}{CH}-CH_2-OH$

QUESTION (AIIMS 2018)


H O
H H
C–O–R
CH$_2$–OH

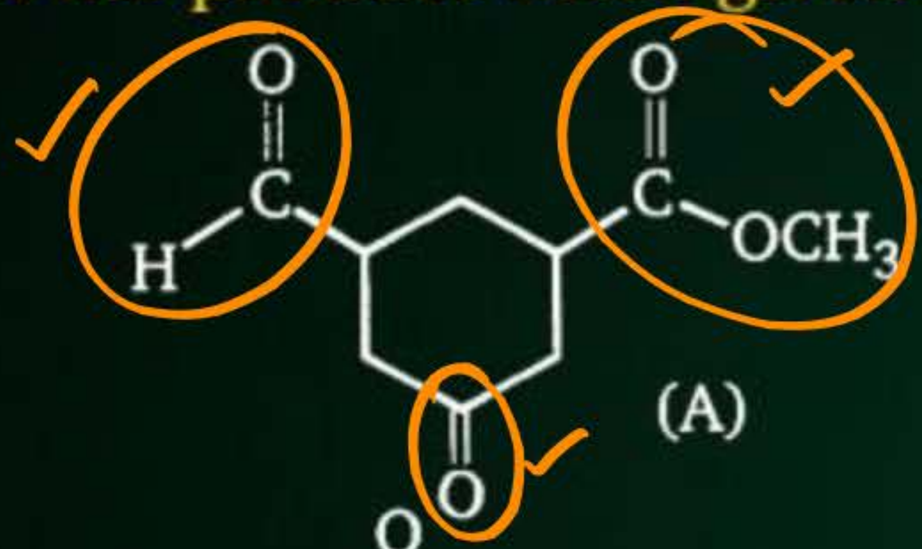
+ ROH

Which reagent is suitable for this conversion?

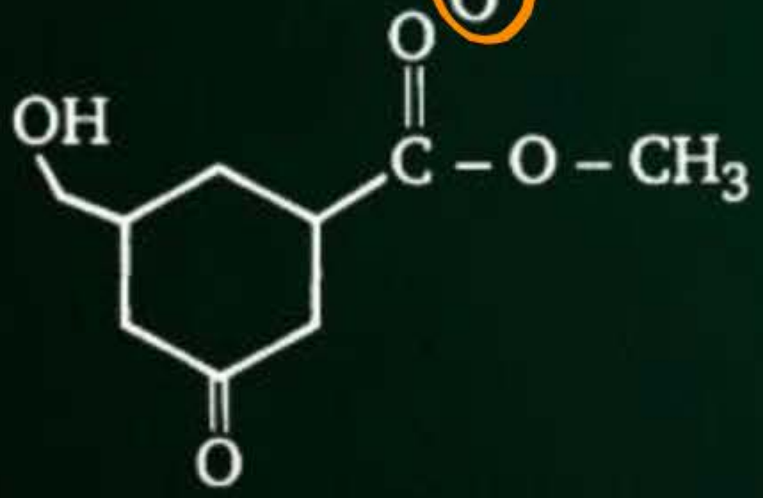
- **A** $Zn+Hg/HCl$ ✗
- **B** [✓ $LiAlH_4$]
- **C** $NH_2–NH_2/OH^-$ ✗
- **D** Red P + HI ✗

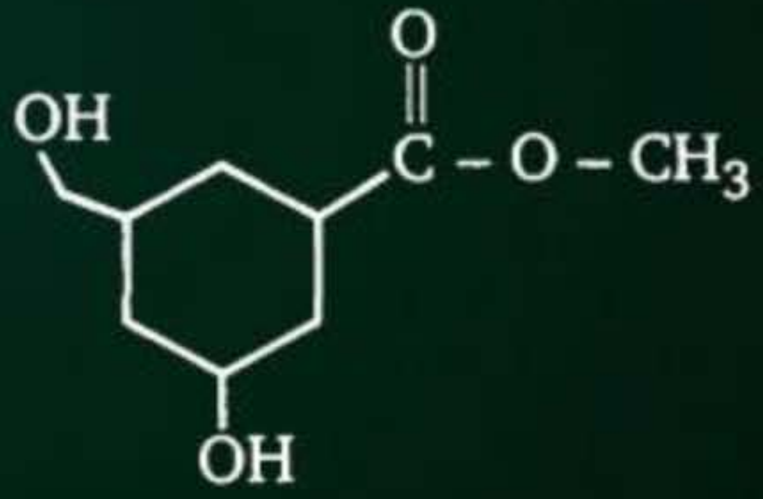
QUESTION

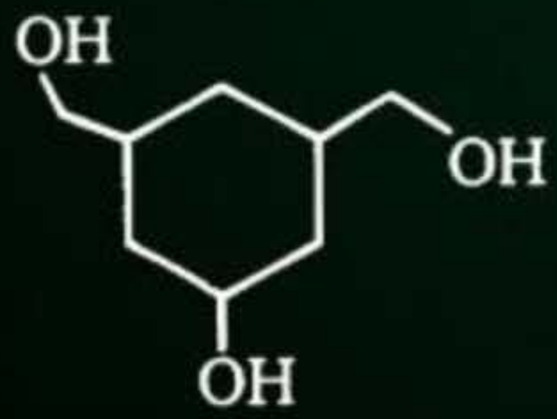
Predict the product when given compound reacts with $LiAlH_4$:

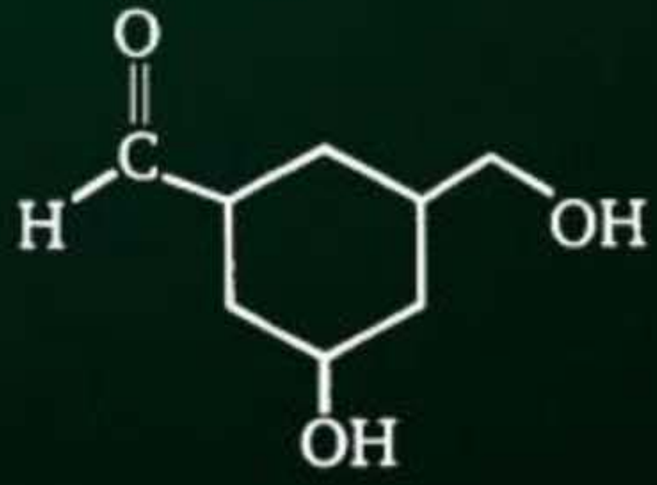


(A)

A


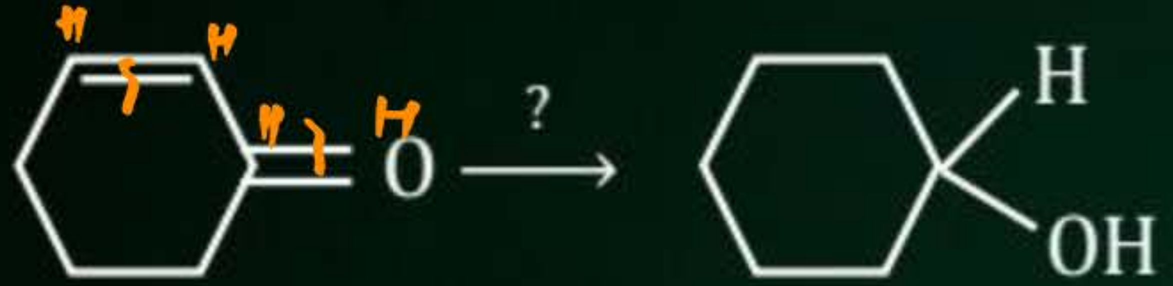
B


[✓ C]


D


QUESTION

Predict the nature of reducing agent in the following reaction.



A $LiAlH_4$ ✗

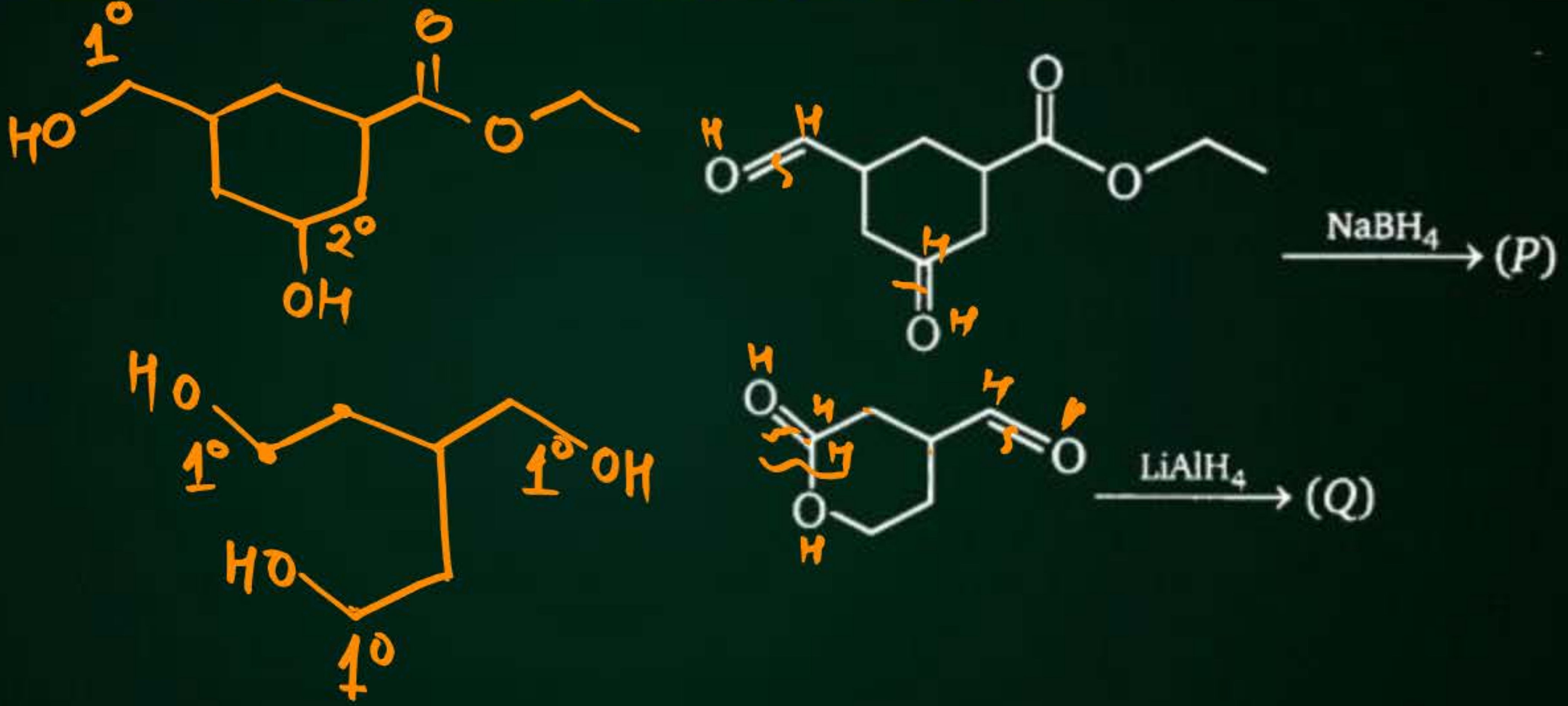
B $NaBH_4$ ✗

[✓ **C**] H_2 /Pt

D Both (A) and (C)

QUESTION

Sum of number of 1° alcoholic group in product (P) and (Q) is:



1°
HO
OH
2°
O
NaBH$_4$
(P)
1°
HO
1° OH
HO
1°
O
LiAlH$_4$
(Q)

A 1

B 2

C 3

D 4

QUESTION

$$R C\overset{o}{H} \cancel{=} \overset{o}{C}H_2 \xrightarrow[2.\ H_2O/Zn]{1.\ O_3} (A) \xrightarrow[2.\ H_3O^+]{1.\ LiAlH_4\ /\text{Dry ether}} (B)$$

B is here ÷ **Red** R–CH=O

H–C=O
H

(A) RCHO + HCHO

(B) RCHO + HCOOH

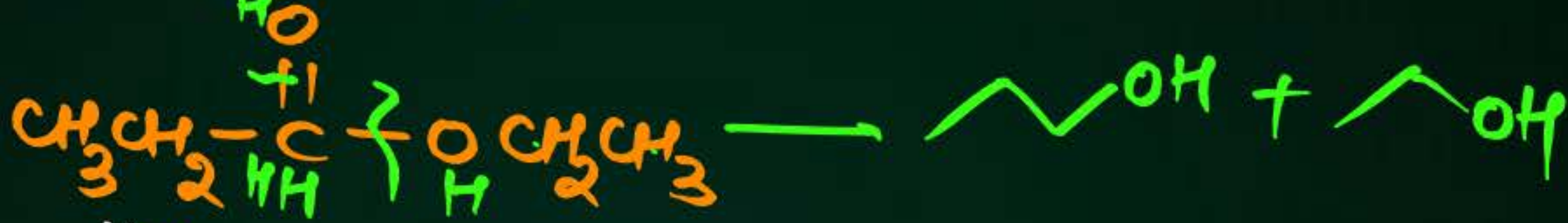
(C) RCOOH + HCOOH

(D) ✓ $RCH_2OH + CH_3OH$

QUESTION

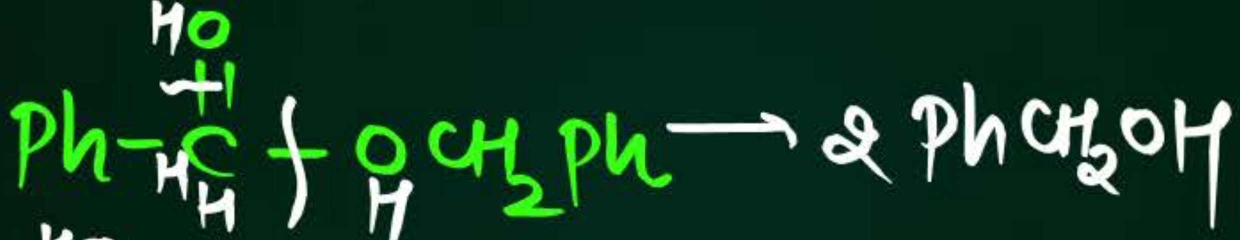
Which of the esters shown, after reduction with $LiAlH_4$ and aqueous H^+ workup, will yield two molecules of only a single alcohol?

A $CH_3CH_2CO_2CH_2CH_3$



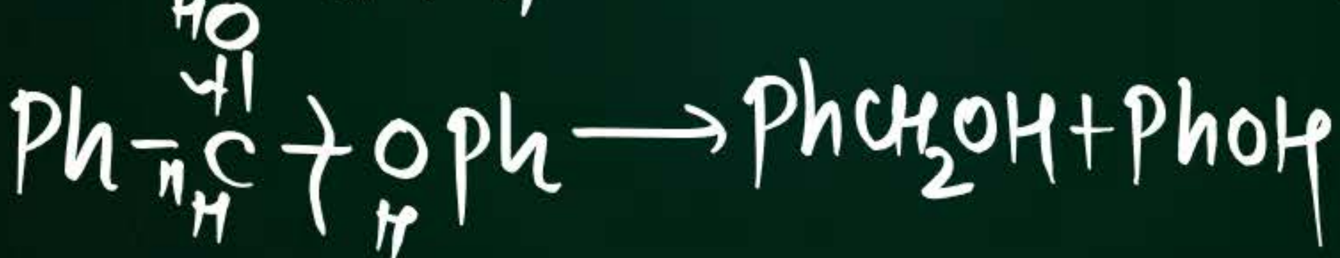
$$CH_3CH_2-\underset{HH}{\overset{HO}{C}}\}\underset{H}{O}CH_2CH_3 \longrightarrow$$

[✓ **B**] $C_6H_5CO_2CH_2C_6H_5$



$$Ph-\underset{HH}{\overset{HO}{C}}\}\underset{H}{O}CH_2Ph \longrightarrow 2\,PhCH_2OH$$

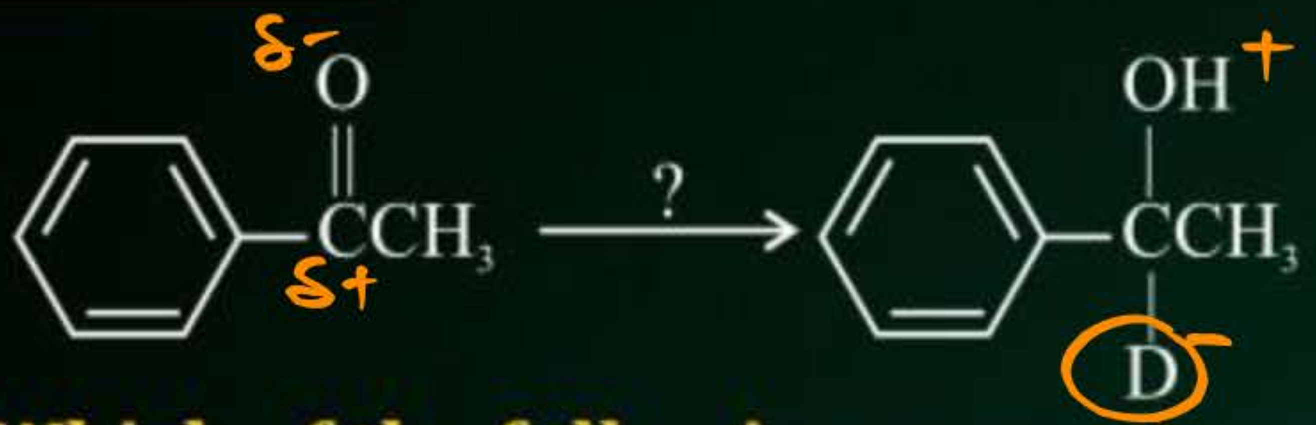
C $C_6H_5CO_2C_6H_5$



$$Ph-\underset{HH}{\overset{HO}{C}}\}\underset{H}{O}Ph \longrightarrow PhCH_2OH + PhOH$$

D None of these

QUESTION



Which of the following reagents would carry out the following transformation? ($D = {}^2H$)

$D^{\ominus}$ $H^{\oplus}$

[✓ A] $NaBD_4$ in CH_3OH

H^- D^+

B $LiAlH_4$ then D_2O

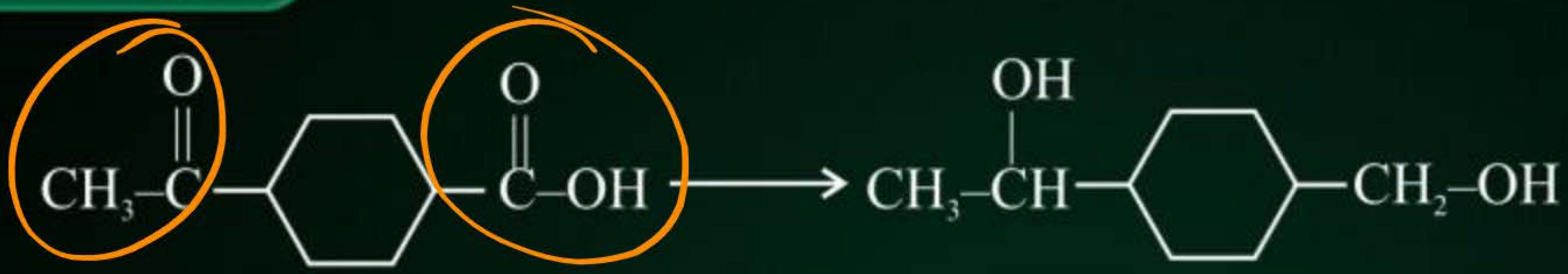
C $NaBD_4$ in CH_3OD

D^- D^+

D^- D^+

D $LiAlD_4$ then D_2O

QUESTION



Above conversion can be done by:

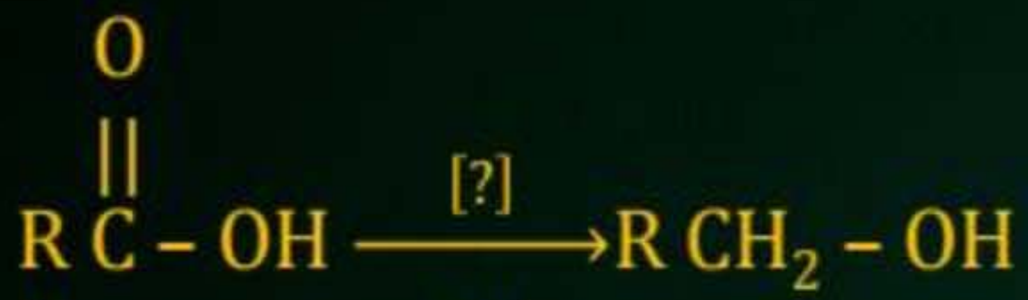
A $NaBH_4$

[✓ **B**] $LiAlH_4$

C ozonolysis

D $KMnO_4$

QUESTION



$$R\overset{\overset{O}{||}}{C}-OH \xrightarrow{[?]} RCH_2-OH$$

Here reagent is:

(A) [✓ $LiAlH_4$]

(B) $NaBH_4$ ×

(C) Both (A) & (B)

(D) Red P/HI $\boxed{RCH_3}$

Home Work

QUESTION 01

When acetaldehyde is reacted with $LiAlH_4$, the product formed is:

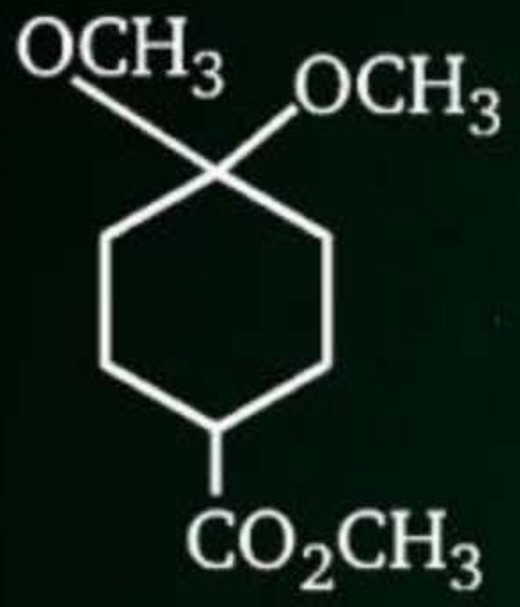
(A) CH_3COOH

(B) CH_3CH_2OH

(C) CH_3OH

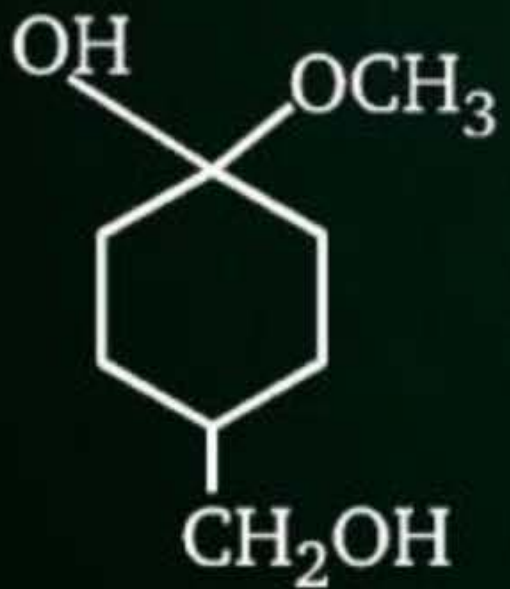
(D) $HCOOH$

QUESTION 02

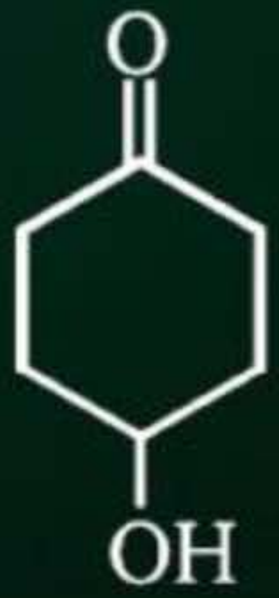

OCH3
OCH3
CO2CH3

$\xrightarrow{LiAlH_4}$ (A) Major: Product (A) is:

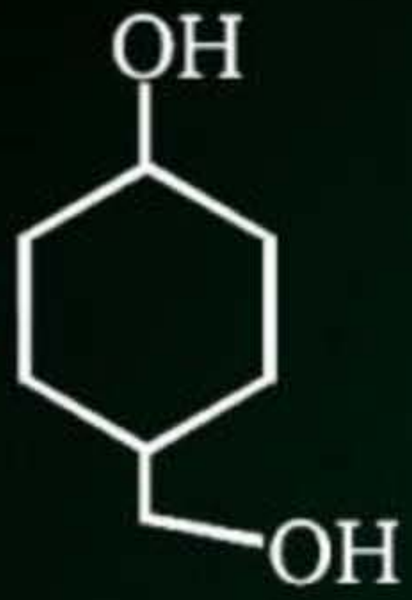
Ⓐ


OH
OCH3
CH2OH

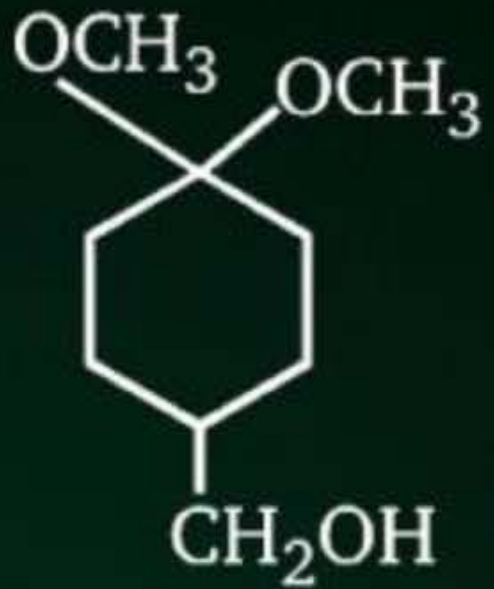
Ⓑ



C



D


OCH3
OCH3
CH2OH

QUESTION ③

The compound which on reduction with $LiAlH_4$ gives two alcohols:

(A) CH_3COOCH_3

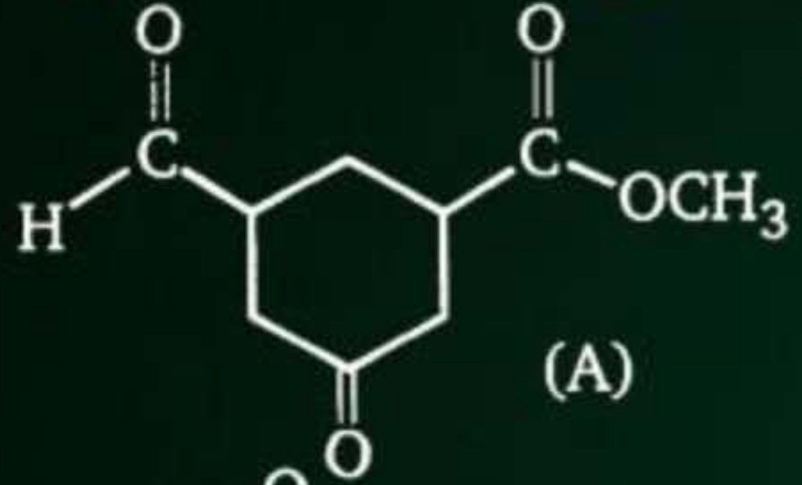
(B) $CH_3COOC_2H_5$

(C) CH_3COCH_3

(D) CH_3CHO

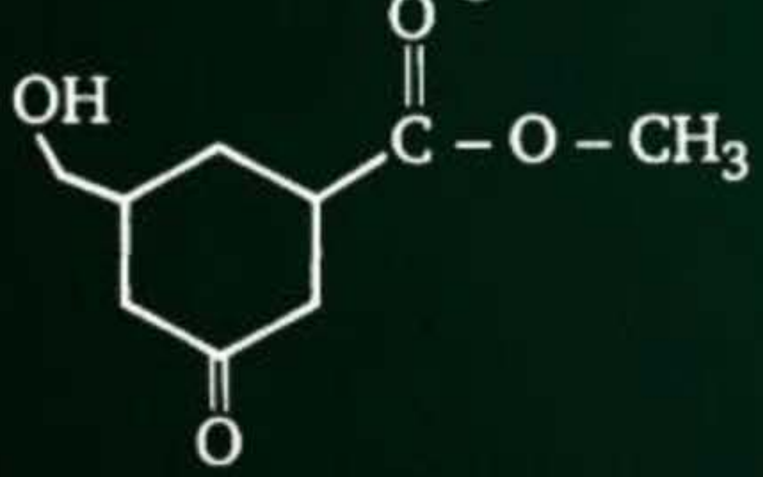
QUESTION ④

Predict the product when given compound reacts with $NaBH_4$:

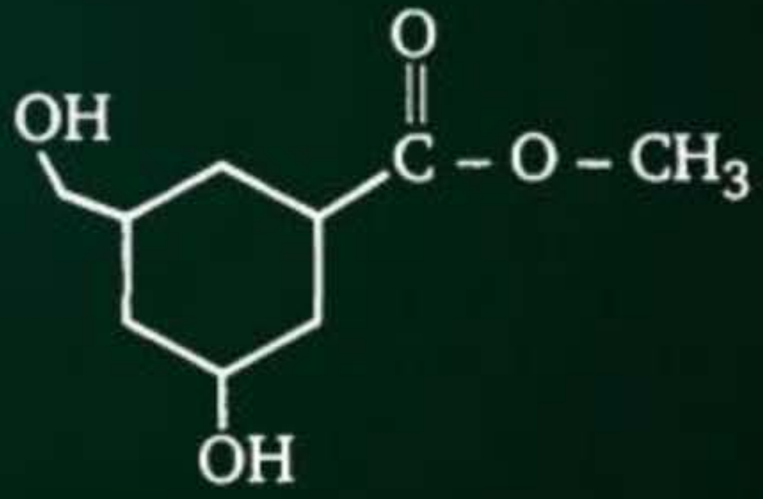


(A)

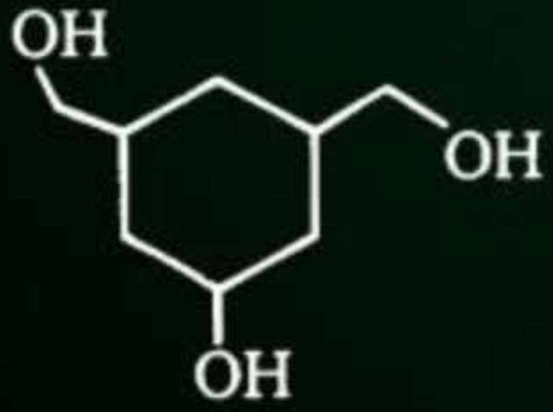
A



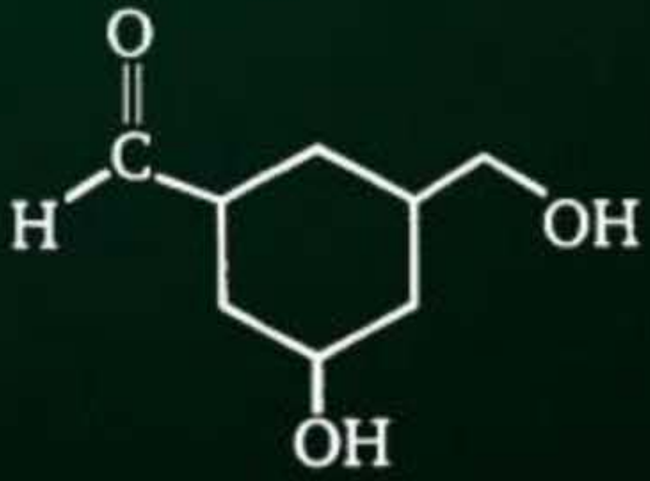
B



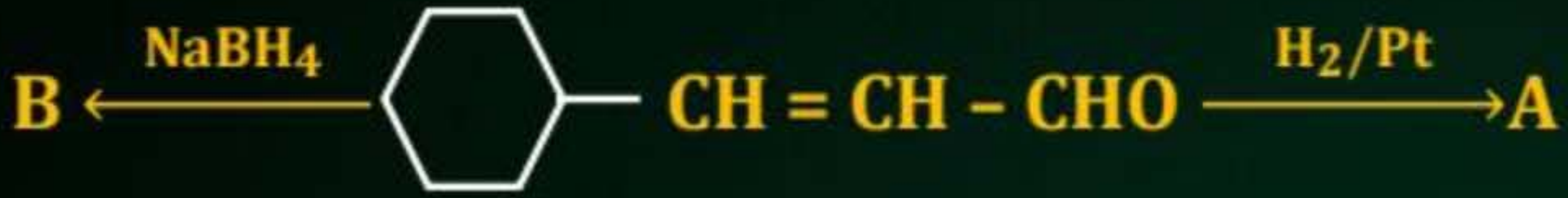
C



D

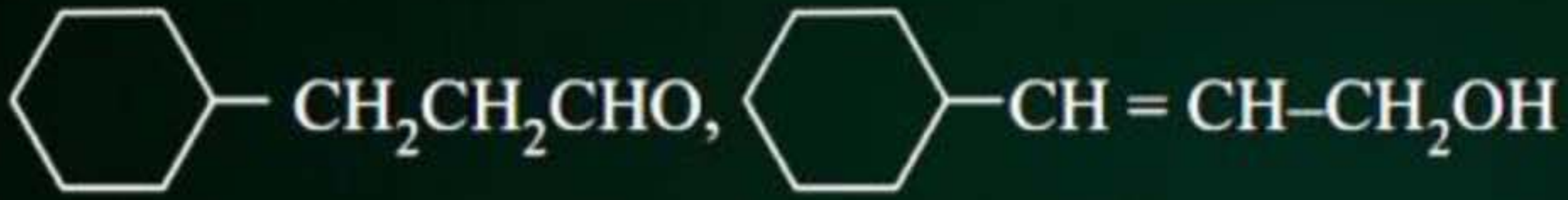


QUESTION ⑤

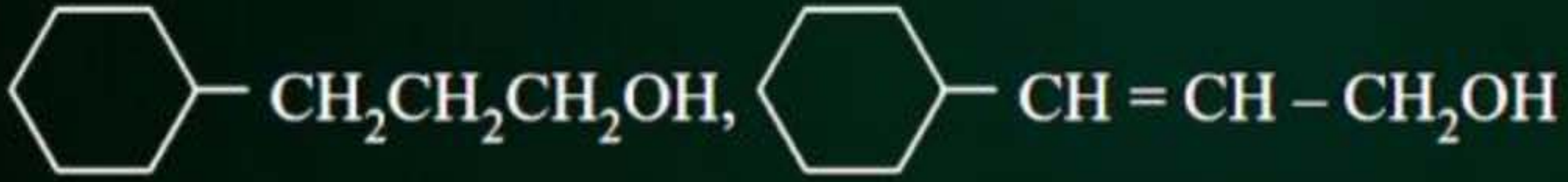

B
NaBH$_4$
CH = CH - CHO
H$_2$/Pt
A

A and B are:

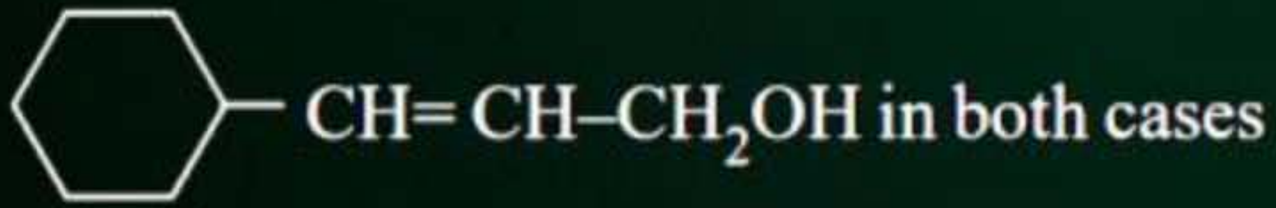
A


CH$_2$CH$_2$CHO,
CH = CH–CH$_2$OH

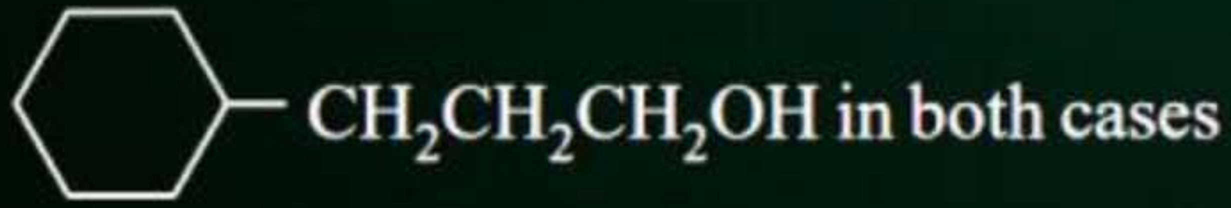
B


CH$_2$CH$_2$CH$_2$OH,
CH = CH – CH$_2$OH

C


CH= CH–CH$_2$OH in both cases

D


CH$_2$CH$_2$CH$_2$OH in both cases

QUESTION (NCERT Exemplar) ⑥

Which of the following are not used to convert RCHO into RCH_2OH?

- Ⓐ H_2/Pd
- Ⓑ $LiAlH_4$
- Ⓒ $NaBH_4$
- Ⓓ Reaction with RMgX followed by hydrolysis

ANSWER KEY

1. B
2. D
3. A
4. B
5. B
6. D

Home Work From PW Module (Yakeen NEET)

Prabal: Q 30, 32

Parikshit: Q 06

Thank you!!

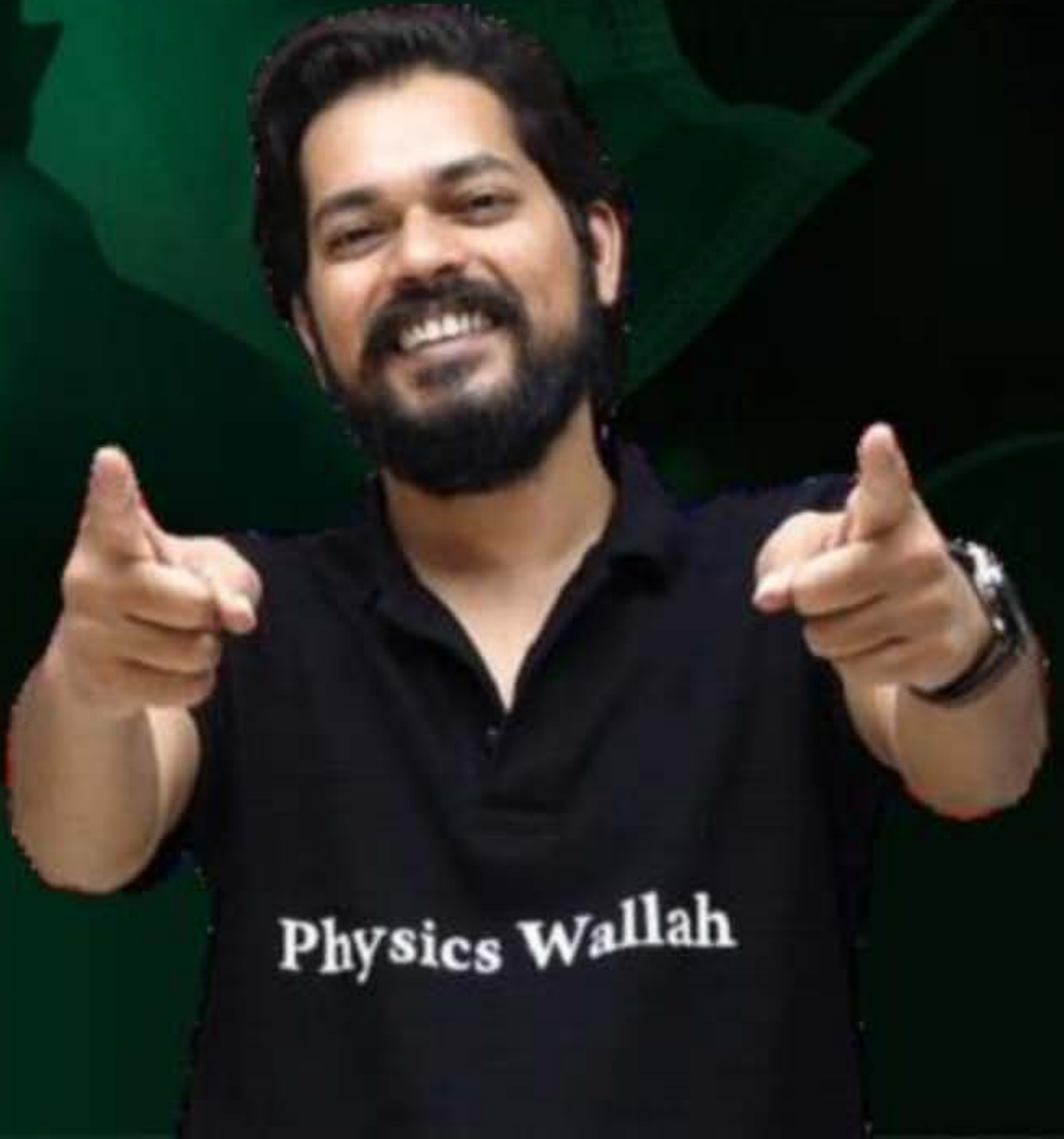
YAKEEN 2.0

FOR NEET 2025

Lecture- 03 Organic Chemistry

Alcohols, Phenols and Ethers

By- Pankaj Sir(POPU MAMA)


Physics Wallah

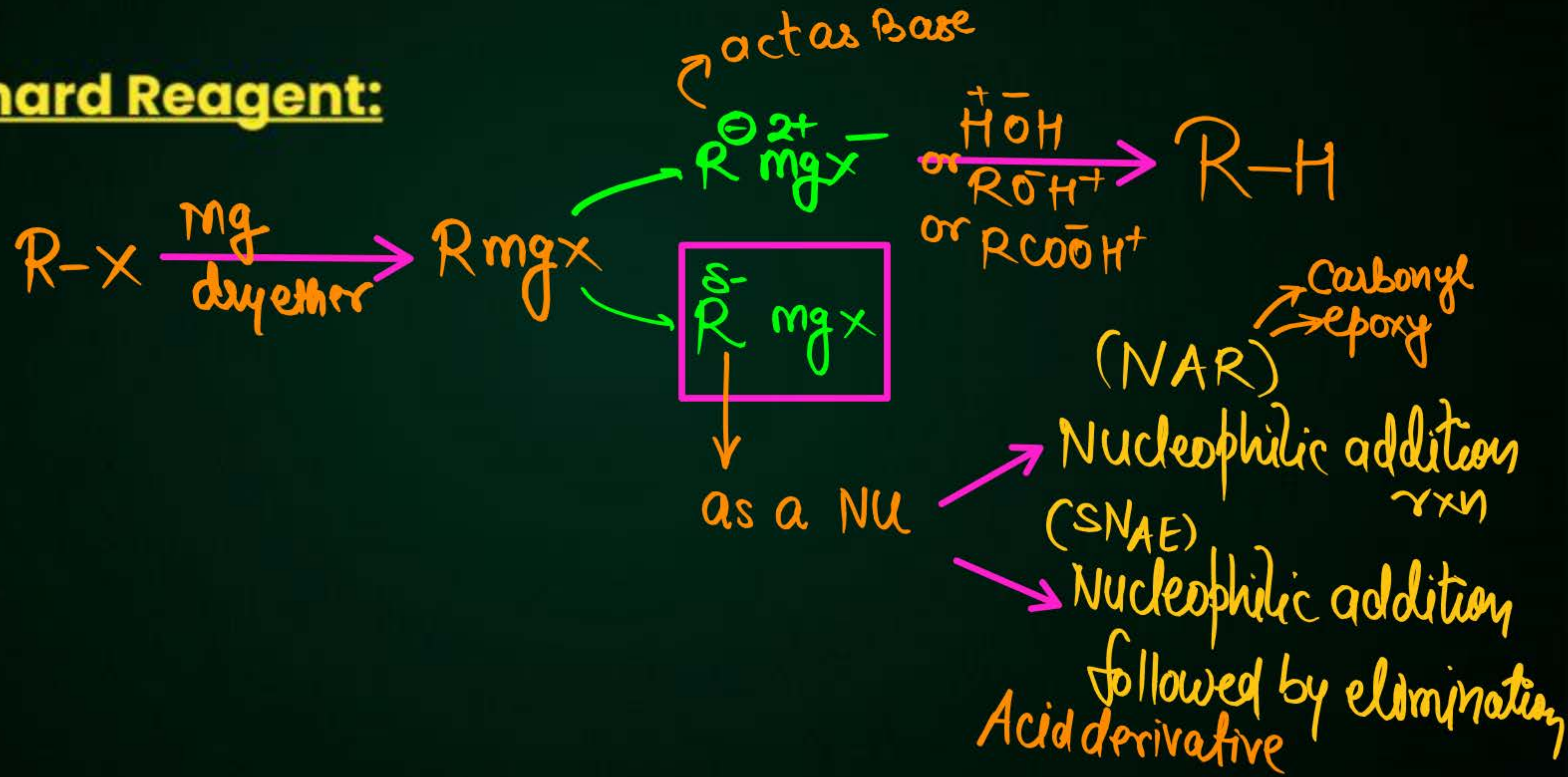
Topics *to be covered*

1. Methods of Preparation of Alcohols Part 03 ✓
2. Grignard Reagent ✓
3. Practice

Methods of Preparation of Alcohols

Acid Base rxns are fastest

3. By Grignard Reagent:



$R-X \xrightarrow[\text{dry ether}]{Mg} RMgX$

act as Base

$\overset{\ominus}{R}\overset{2+}{Mg}\overset{-}{X} \xrightarrow[\text{or } R\overset{-}{O}\overset{+}{H} \text{ or } RCO\overset{-}{O}\overset{+}{H}]{\overset{+}{H}\overset{-}{O}H} R-H$

$\boxed{\overset{\delta-}{R}MgX}$

$\downarrow$

as a NU

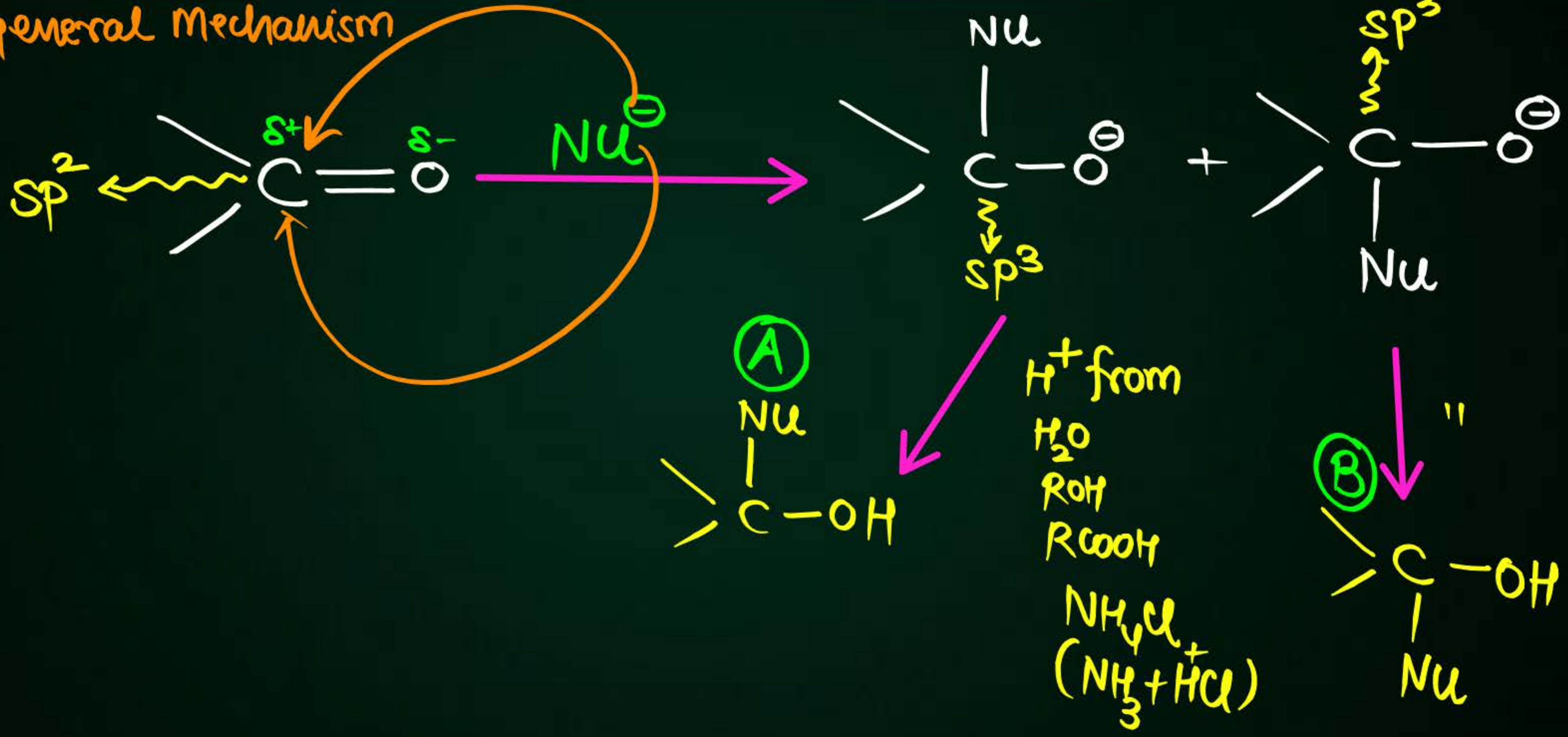
→ Nucleophilic addition rxn (NAR) → Carbonyl, → epoxy

→ Nucleophilic addition followed by elimination (SNAE)

Acid derivative

1. Mechanism of NAR in carbonyl comp.

General Mechanism



$\delta+$
$\delta-$
sp^2
$Nu^{\ominus}$
Nu
$O^{\ominus}$
sp^3
+
sp^3
$O^{\ominus}$
Nu
Ⓐ
Nu
C–OH
H^+ from
H_2O
ROH
RCOOH
NH_4Cl
$(NH_3 + HCl)$
"
Ⓑ
C–OH
Nu

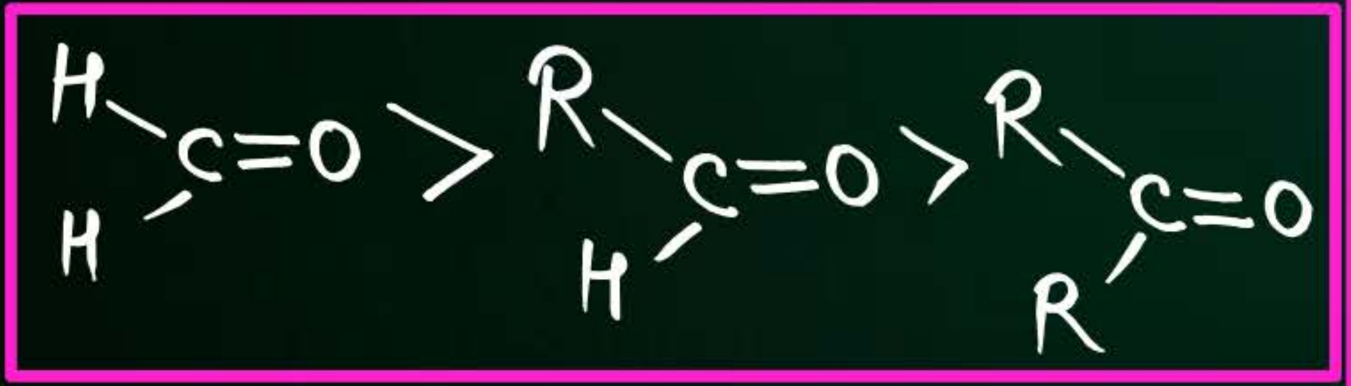
ROR of NAR

① Steric factor

$$R.O.R \propto \frac{1}{S.H}$$

S.H → steric hinderence

(Bulkness)


H
H
C=O
>
R
H
C=O
>
R
R
C=O

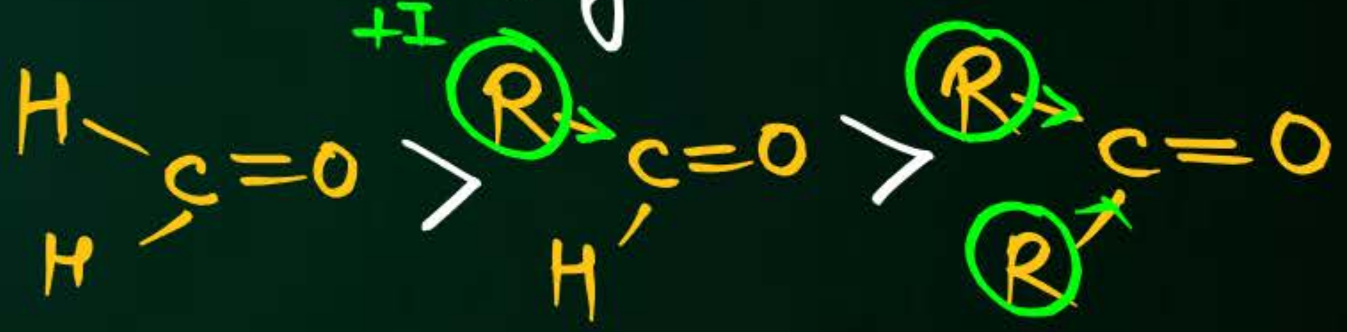
② Electronic factor

$e^{\ominus}$ paane ki chahat

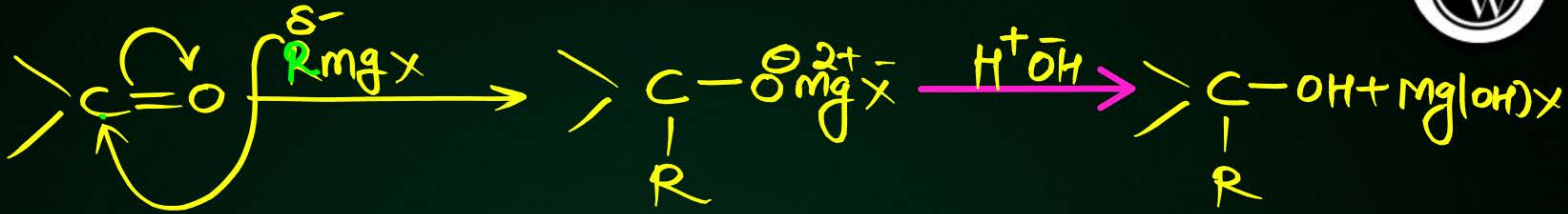
$$R.O.R \propto \text{Electrophilicity of carbonyl carbon}$$

$$\propto \text{ewg}$$

$$\propto \frac{1}{\text{edg}}$$


+I
H
H
C=O
>
R
H
C=O
>
R
R
C=O

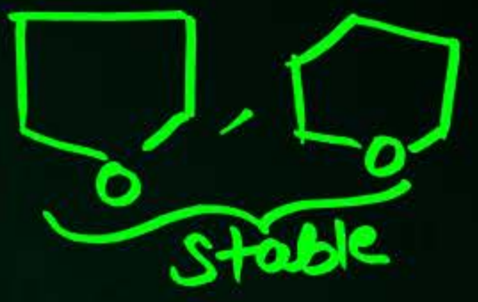
NAR in G.R

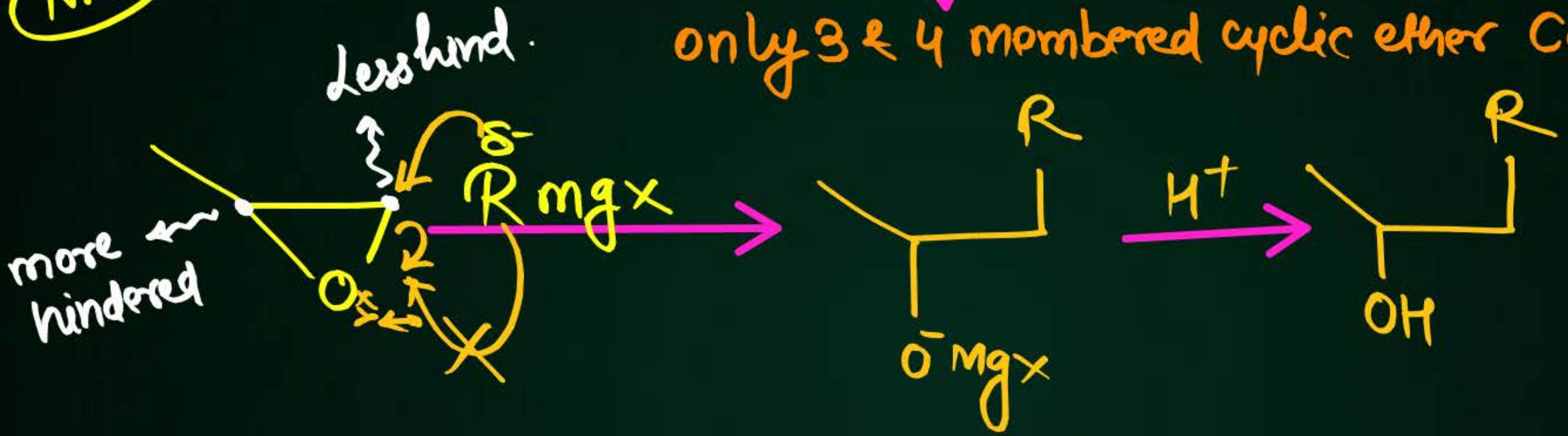

δ-
RMgX
C=O
C–O⊖ Mg2+ X-
R
H+ OH-
C–OH + Mg(OH)X
R

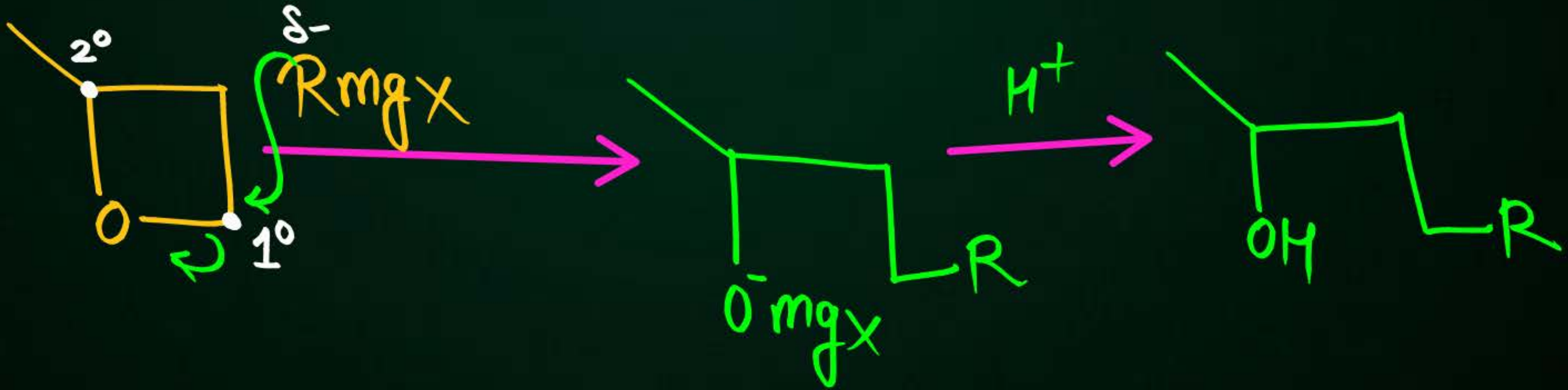
Reaction of G.R with cyclic ether

NAR

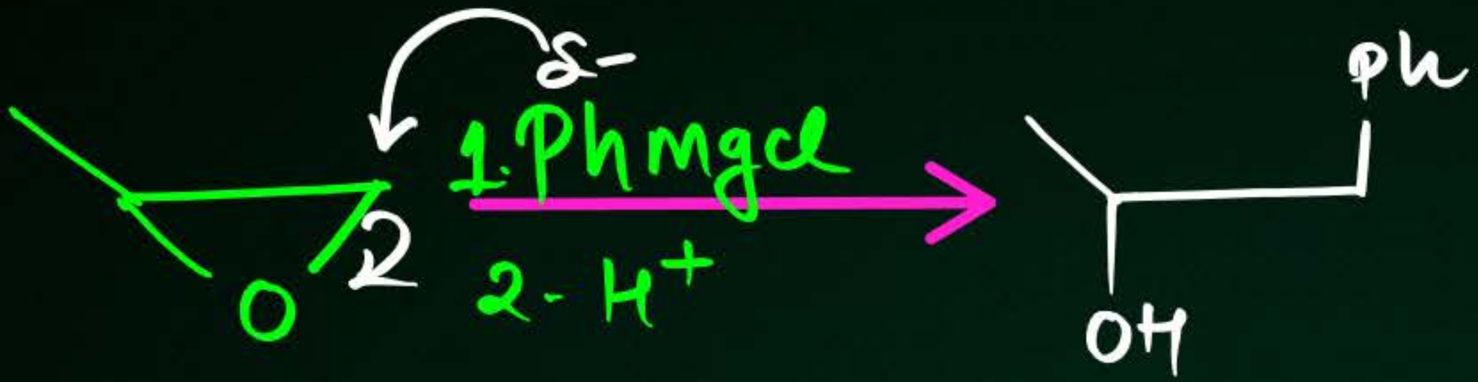
only 3 & 4 membered cyclic ether Can react with G.R



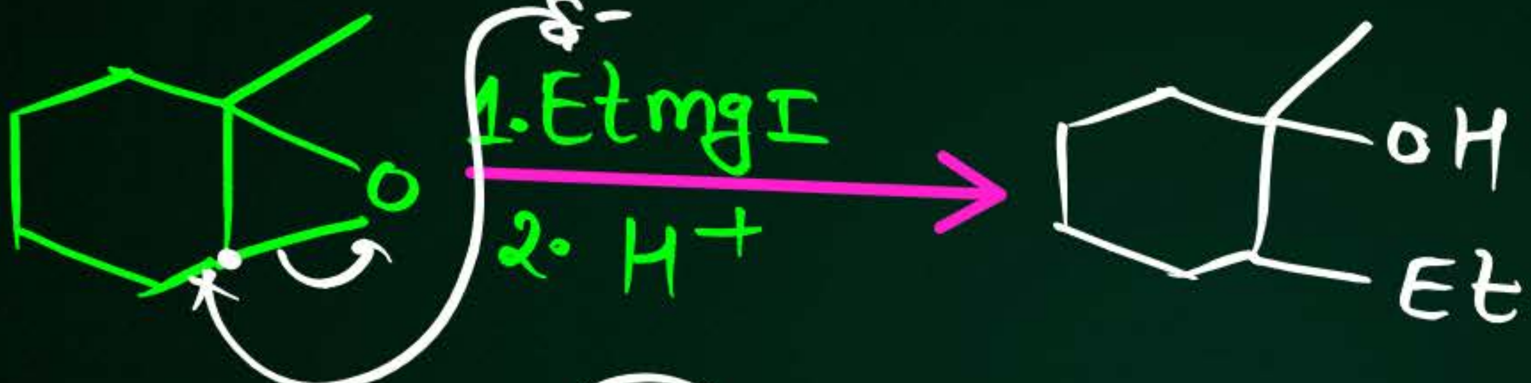

Less hind.
more hindered
O
δ-
δ-
R mgx
1
2
R
O⁻mgx
H+
R
OH


2°
1°
O
δ-
Rmgx
O⁻mgx
R
H+
OH
R

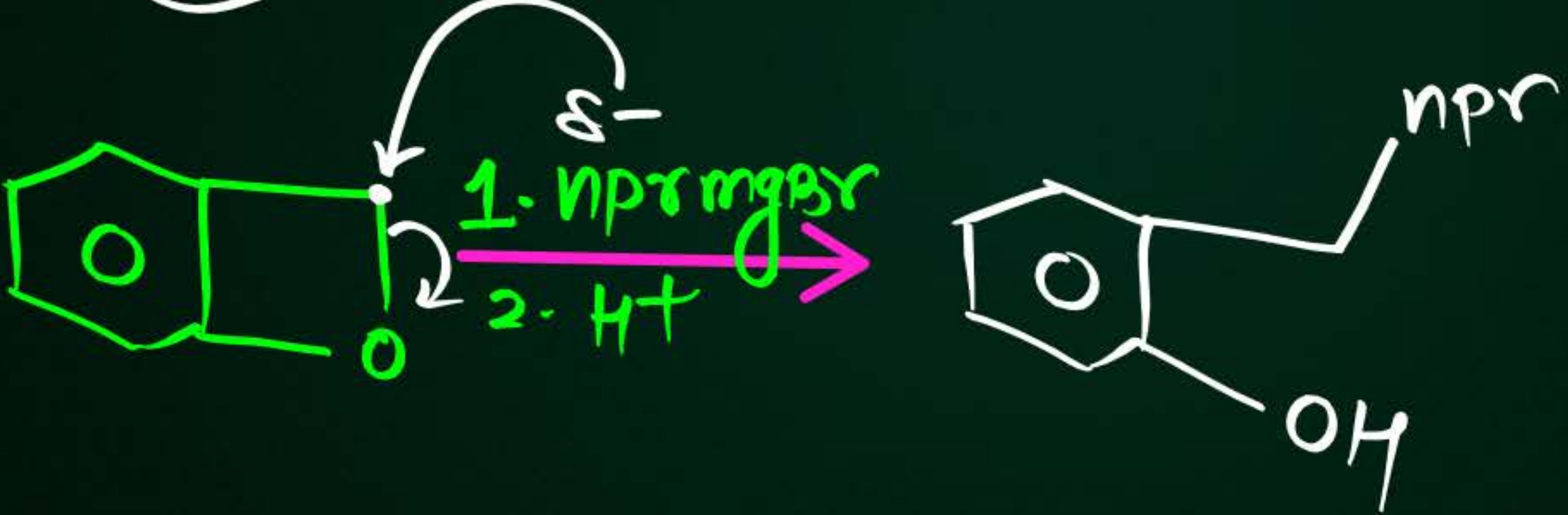
Q 1)


δ-
1. PhMgCl
2. H⁺
Ph
OH
O

2)

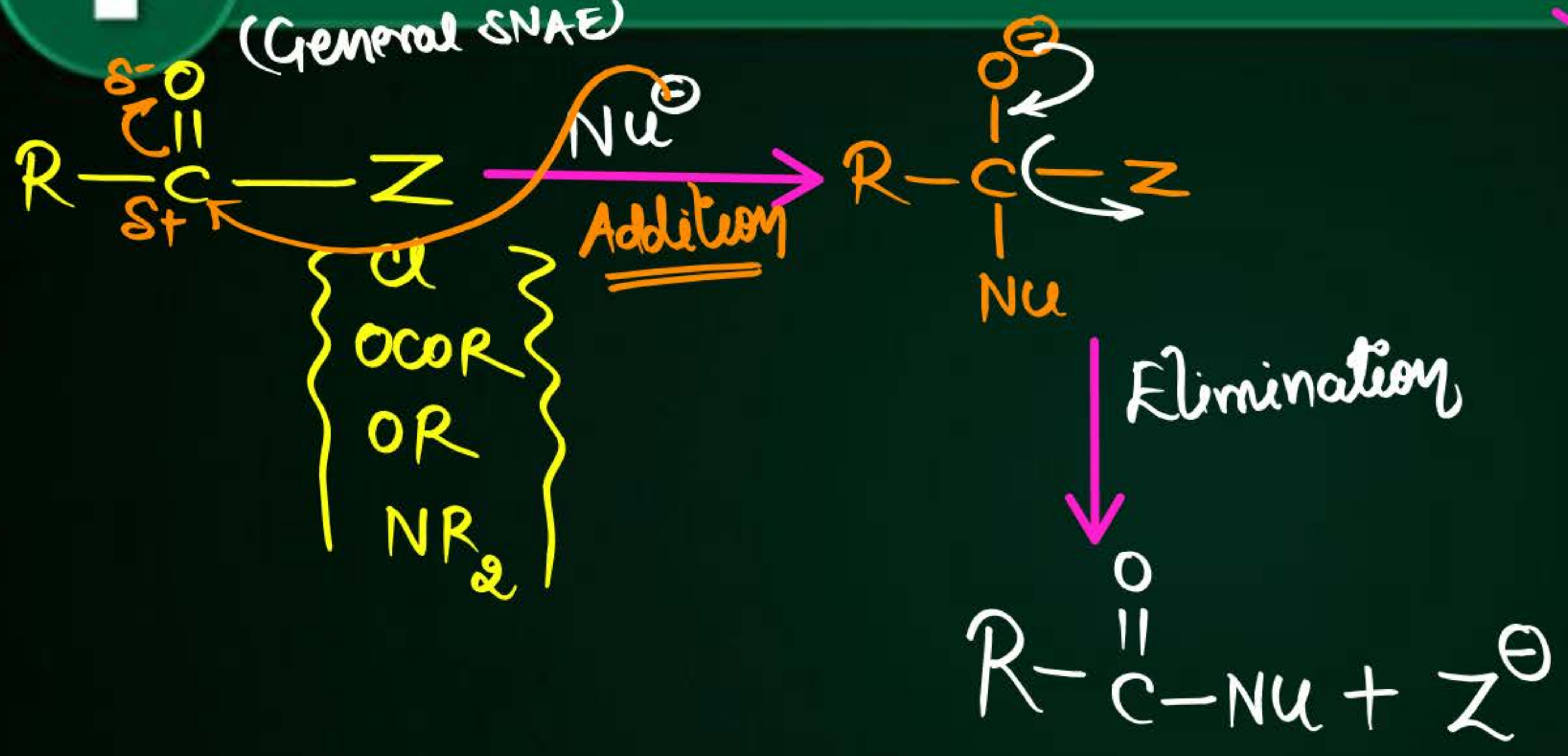

δ-
1. EtMgI
2. H⁺
O
OH
Et

3)

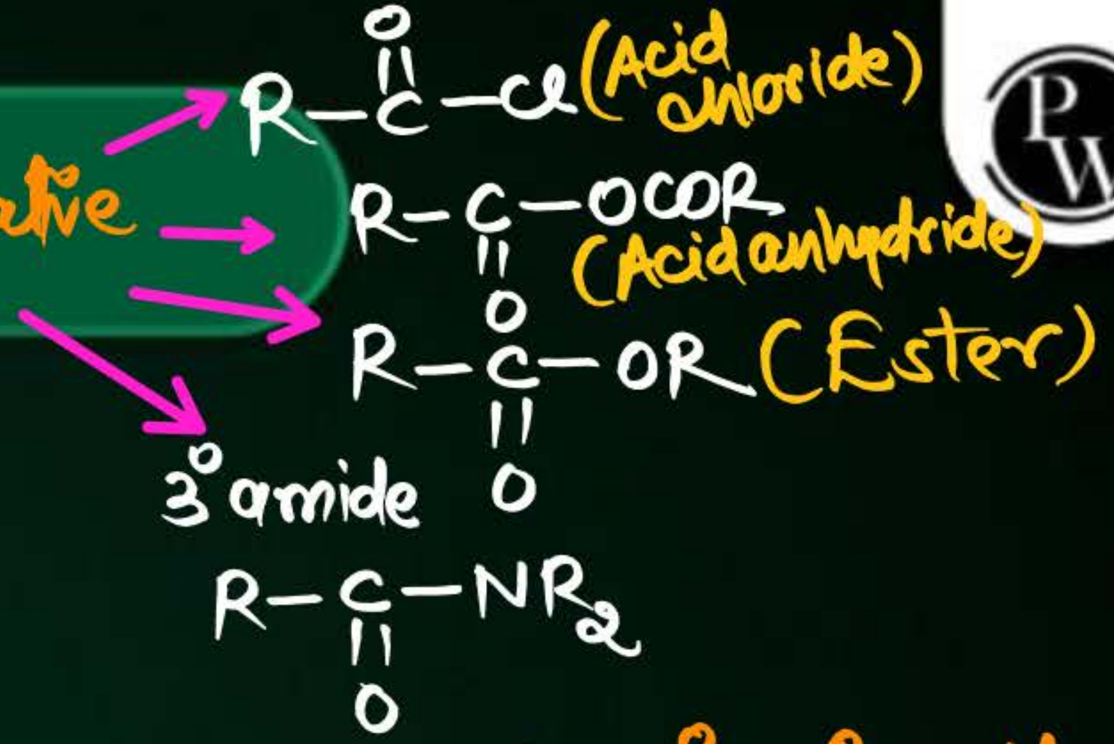

δ-
1. nPrMgBr
2. H⁺
O
npr
OH

2. Mechanism of SN^{AE} in Acid derivative

(General SNAE)

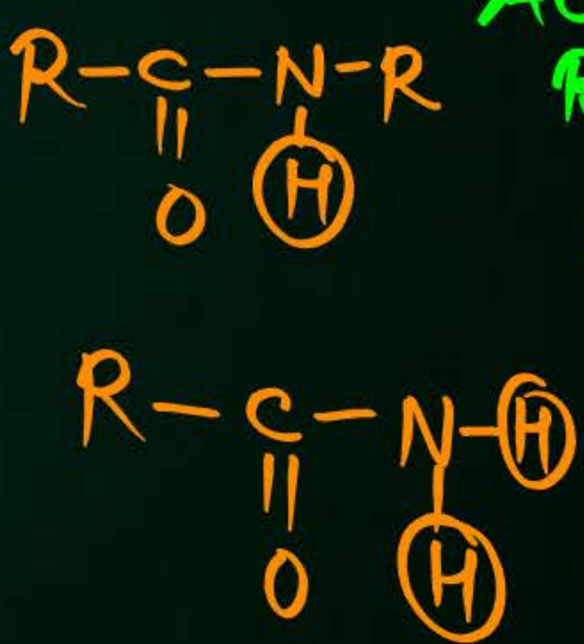


δ- O
δ+
R—C—Z
Nu⊖
Addition
Cl
OCOR
OR
NR2
O⊖
R—C—Z
Nu
Elimination
R—C(=O)—Nu + Z⊖



R—C(=O)—Cl (Acid chloride)
R—C(=O)—OCOR (Acid anhydride)
R—C(=O)—OR (Ester)
3° amide
R—C(=O)—NR2

In 1° & 2° amide Acid Base Ho Jati hai



R—C(=O)—N(H)—R
R—C(=O)—N(H)—H

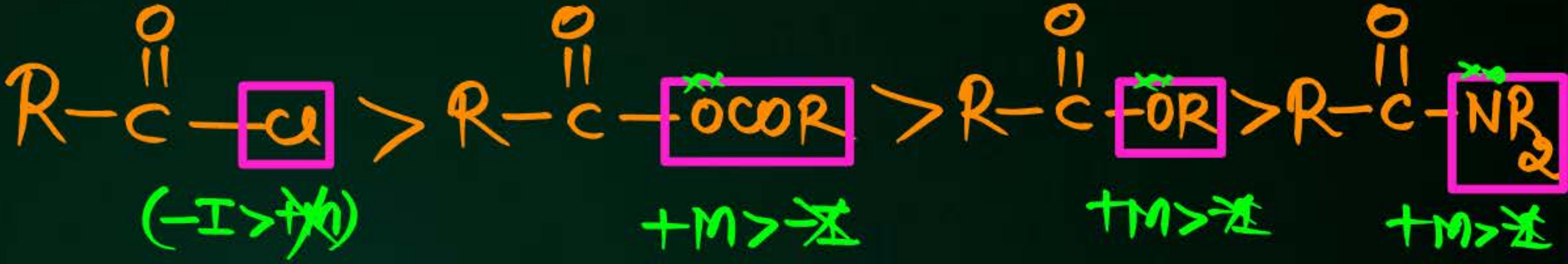
ROR of SN^{AE}

① Electronic factor

ROR $\propto$ electrophilicity

$\propto$ ewg

$\propto \frac{1}{\text{edg}}$



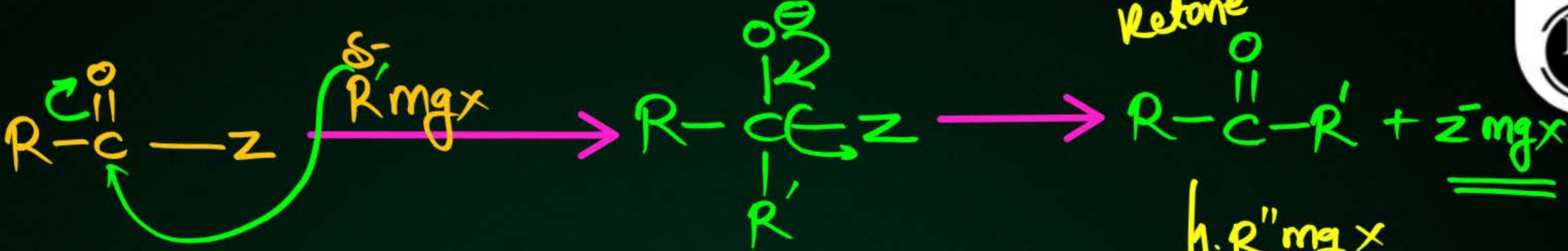
$$R-\overset{O}{\overset{\|}{C}}-\boxed{Cl} > R-\overset{O}{\overset{\|}{C}}-\boxed{\ddot{O}COR} > R-\overset{O}{\overset{\|}{C}}-\boxed{\ddot{O}R} > R-\overset{O}{\overset{\|}{C}}-\boxed{\ddot{N}R_2}$$

$(-I > \cancel{+M})$ $+M > \cancel{-I}$ $+M > \cancel{-I}$ $+M > \cancel{-I}$

+M power

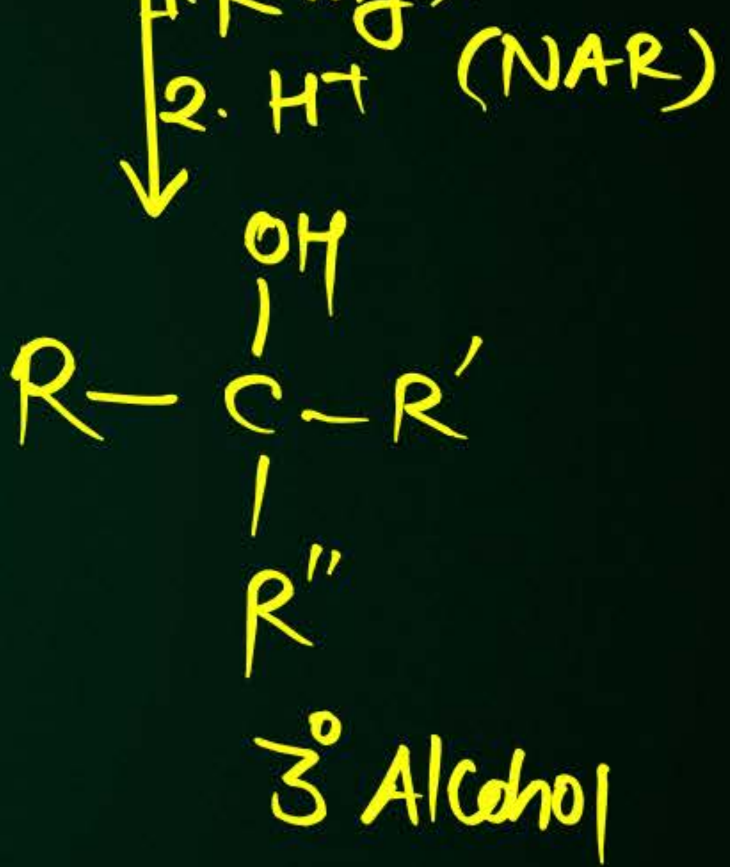
$$-\ddot{N}R_2 > -\ddot{O}R > -\ddot{O}-\underset{O}{\underset{\|}{C}}-R$$

SNAE in G.R



$$R-\overset{O}{\overset{\|}{C}}-Z \xrightarrow{\overset{\delta-}{R'}mgx} R-\underset{R'}{\underset{|}{\overset{O^{\ominus}}{\overset{|}{C}}}}-Z \longrightarrow R-\overset{O}{\overset{\|}{C}}-R' + \underline{\underline{Z^{-}mgx}}$$

$$\boxed{\text{Acid derivative} \xrightarrow{R'mgx} \text{Ketone} \xrightarrow{R''mgx} \overset{3^\circ}{\text{Alcohol}}}$$



$$\xrightarrow[\text{2. } H^+]{\text{1. } R''mgx} \quad (NAR)$$

$$R-\underset{R''}{\underset{|}{\overset{OH}{\overset{|}{C}}}}-R'$$

3° Alcohol

QUESTION

Assertion: Two moles of Grignard reagent is consumed in the formation of tertiary alcohol from ester followed by hydrolysis.

Reason: One mole of Grignard reagent converts ester into ketone and the second mole of Grignard reagent adds to ketone.

[✓ A] Both Assertion and Reason are correct and Reason is the correct explanation for Assertion.

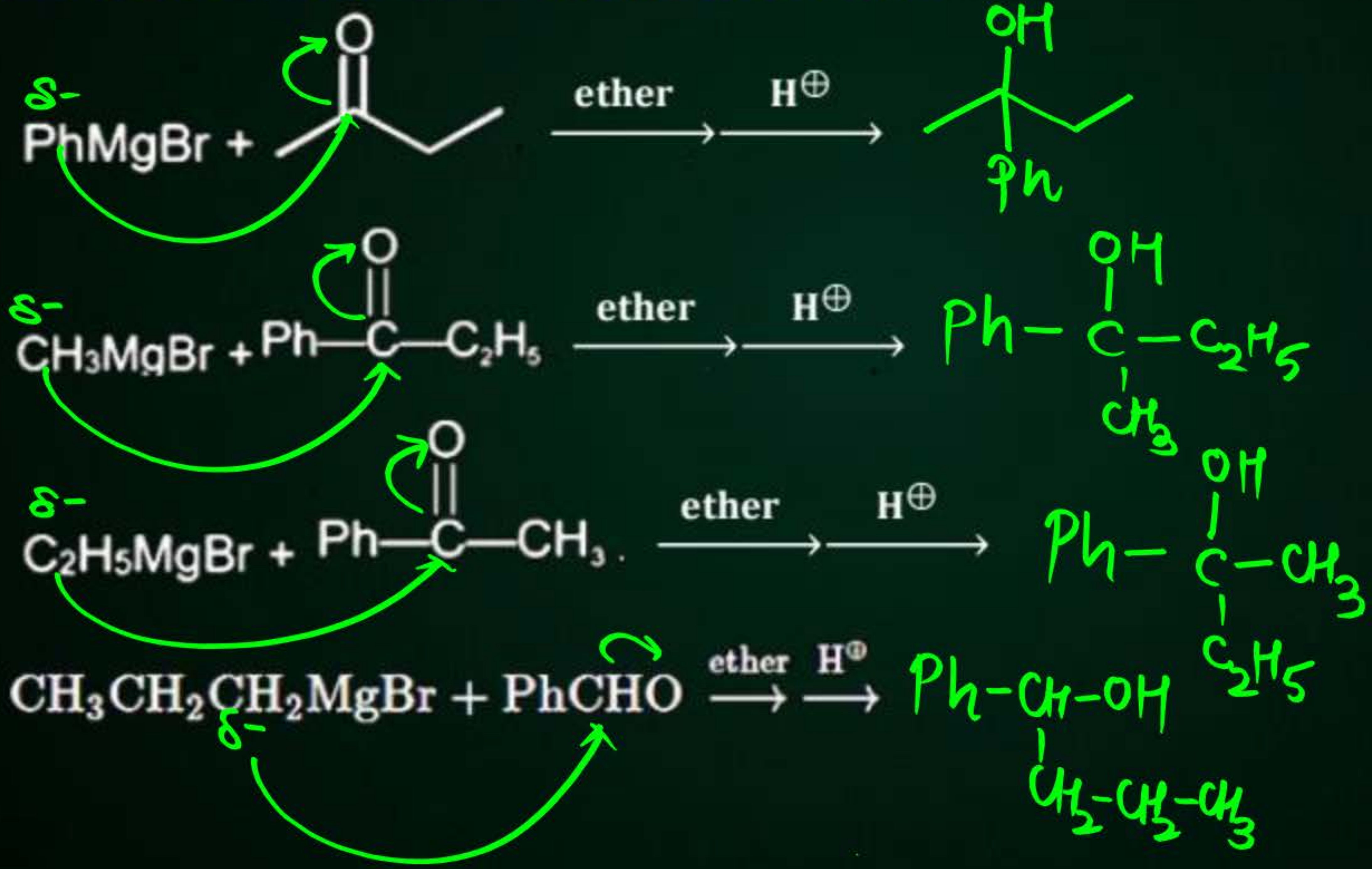
B Both Assertion and Reason are correct but Reason is not the correct explanation for Assertion.

C Assertion is correct but Reason is incorrect.

D Both Assertion and Reason are incorrect.

QUESTION

Write the product of these chemical reaction.



B $$\overset{\delta-}{CH_3}MgBr + Ph-\overset{\overset{O}{\|}}{C}-C_2H_5 \xrightarrow{\text{ether}} \xrightarrow{H^{\oplus}} Ph-\underset{\underset{CH_3}{|}}{\overset{\overset{OH}{|}}{C}}-C_2H_5$$

C $$\overset{\delta-}{C_2H_5}MgBr + Ph-\overset{\overset{O}{\|}}{C}-CH_3 \xrightarrow{\text{ether}} \xrightarrow{H^{\oplus}} Ph-\underset{\underset{C_2H_5}{|}}{\overset{\overset{OH}{|}}{C}}-CH_3$$

D $$CH_3CH_2\underset{\delta-}{CH_2}MgBr + PhCHO \xrightarrow{\text{ether}} \xrightarrow{H^{\oplus}} Ph-\underset{\underset{CH_2-CH_2-CH_3}{|}}{CH}-OH$$

QUESTION

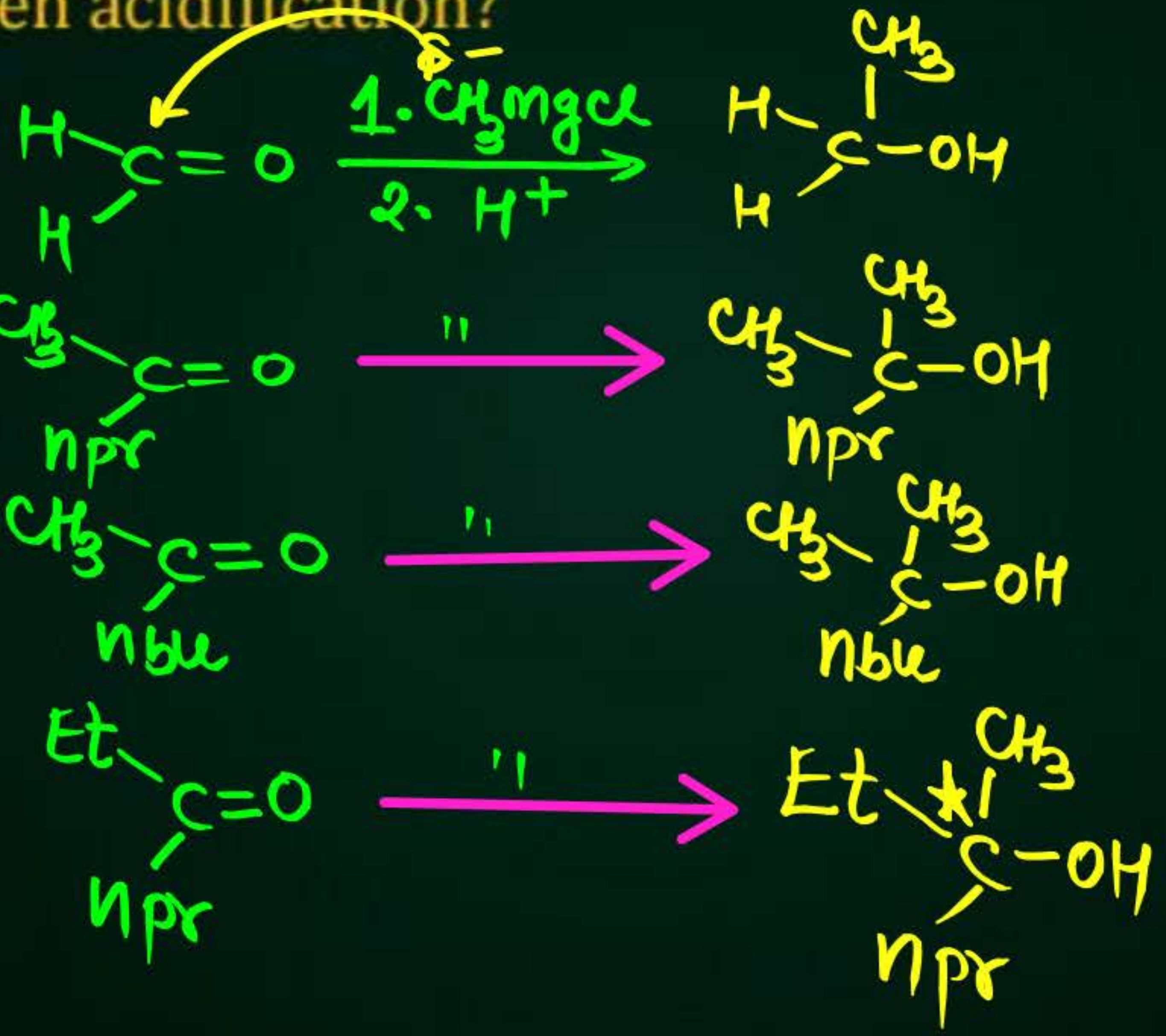
Which of the following compound can produce chiral compound upon treatment with CH_3MgCl and then acidification?

(A) Formaldehyde

(B) Pentanone-2

(C) 2-hexanone

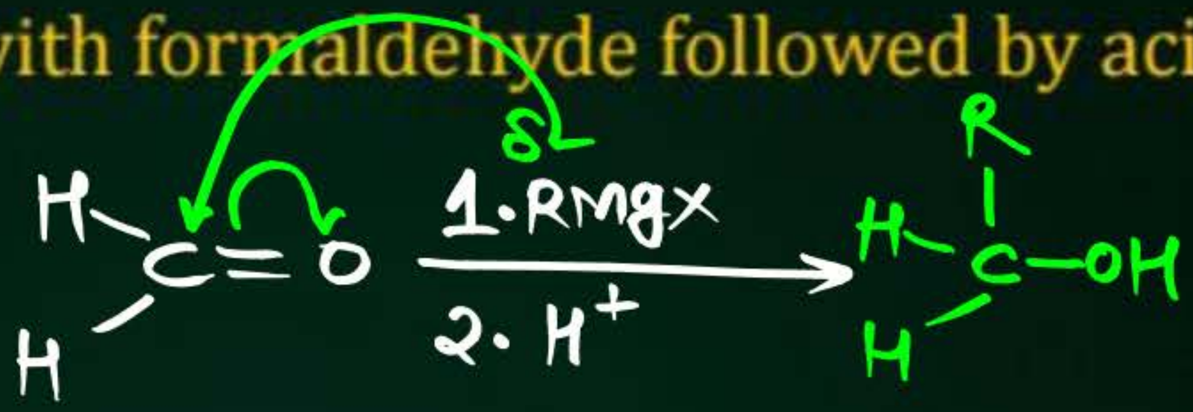
[✓ (D)] 3-hexanone



δ−
1. CH3MgCl
2. H+
H
C=O
H
CH3
H
C−OH
H
"
CH3
C=O
npr
CH3
CH3
C−OH
npr
"
CH3
C=O
nbu
CH3
CH3
C−OH
nbu
"
Et
C=O
npr
CH3
Et
*
C−OH
npr

QUESTION

The reaction of Grignard reagent with formaldehyde followed by acidification gives:


H
H
C=O
δ-
1. RMgX
2. H+
R
H
H
C—OH

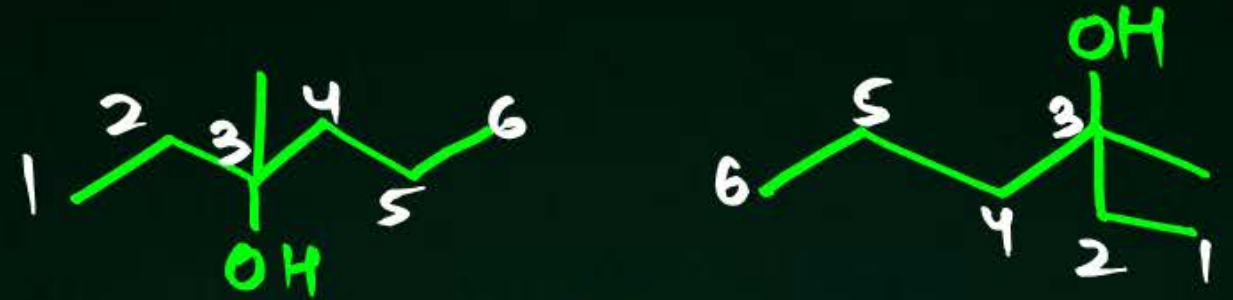
A An aldehyde

B A ketone

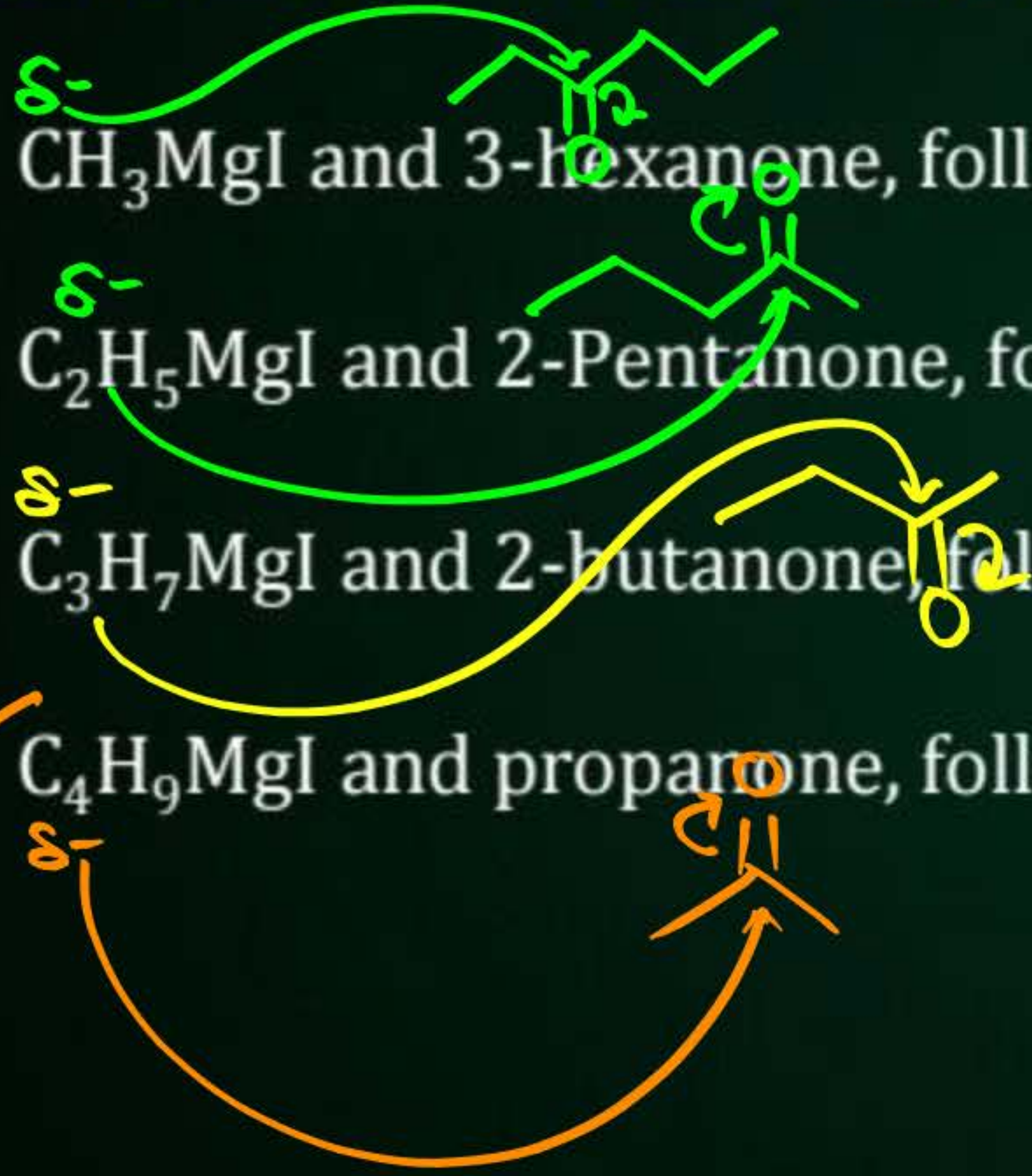
C A carboxylic acid

[✓ **D**] A primary alcohol

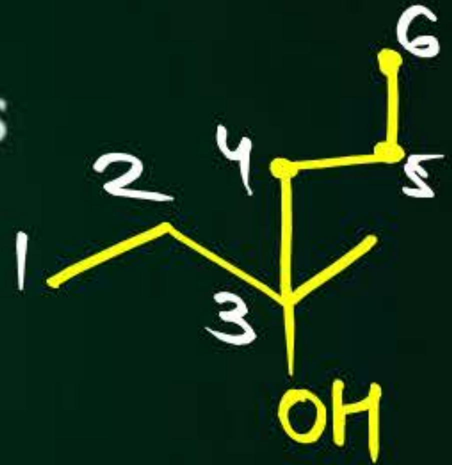
QUESTION

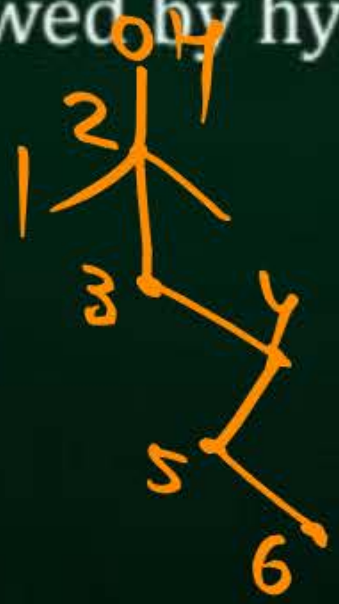

1
2
3
4
5
6
OH
6
5
4
3
2
1
OH

3-methyl-3-hexanol cannot be prepared by

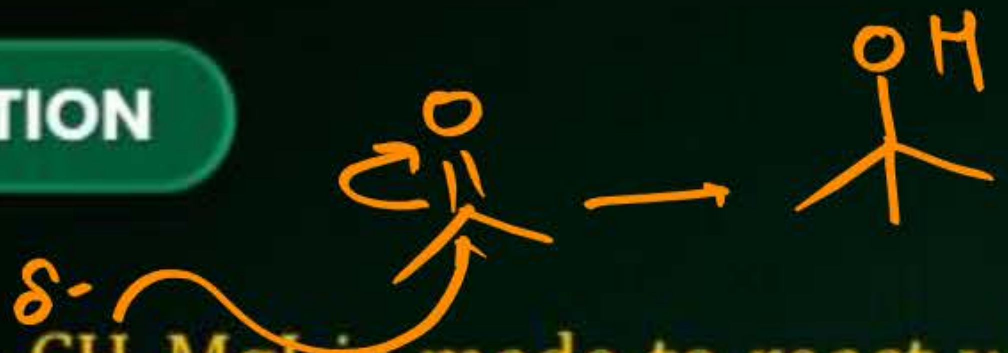

δ-
2
O
O
δ-
δ-
O
2
δ-
O

- (A) CH_3MgI and 3-hexanone, followed by hydrolysis
- (B) C_2H_5MgI and 2-Pentanone, followed by hydrolysis
- (C) C_3H_7MgI and 2-butanone, followed by hydrolysis
- [✓ (D)] C_4H_9MgI and propanone, followed by hydrolysis





QUESTION



When CH_3MgI is made to react with acetone and the addition product is hydrolysed, we get:

A primary alcohol

B secondary alcohol

[✓ **C**] tertiary alcohol

D an aldehyde

QUESTION

$\overset{\ominus}{Ph}MgBr \xrightarrow{CH_3\overset{-}{O}H^+} \boxed{Ph-H}$

Phenyl magnesium bromide reacts with methanol to give:

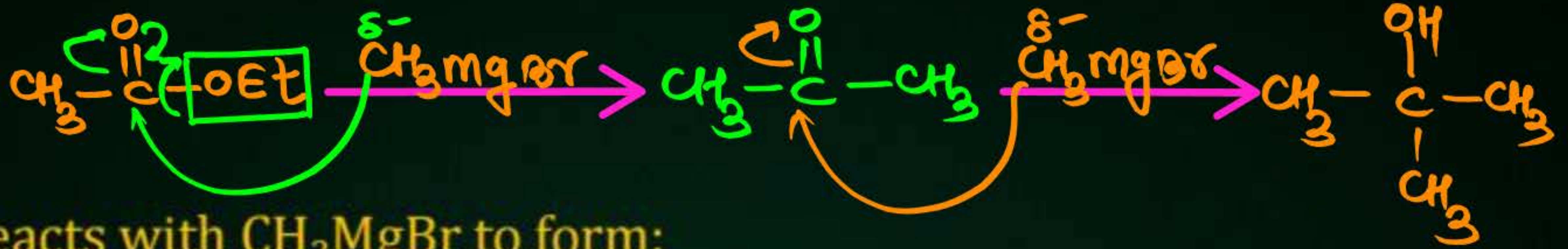
(A) a mixture of anisole and Mg(OH)Br

[✓ (B) a misture of benzene and Mg(OMe)Br]

(C) a mixture of toluene and Mg(OH)Br

(D) a mixture of phenol and Mg(Me)Br

QUESTION

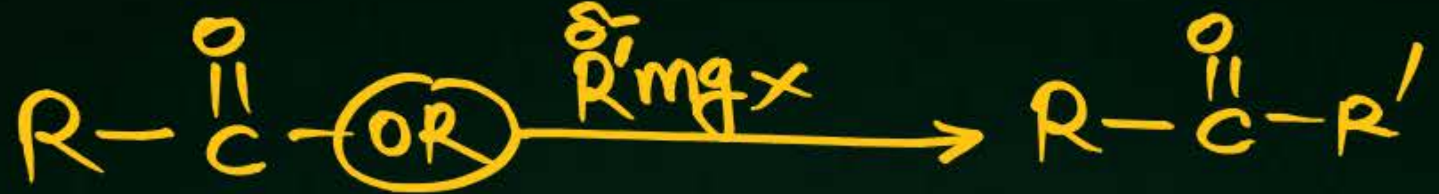


$$CH_3-\overset{O}{\overset{\|}{C}}-\boxed{OEt} \xrightarrow{\overset{\delta-}{CH_3}MgBr} CH_3-\overset{O}{\overset{\|}{C}}-CH_3 \xrightarrow{\overset{\delta-}{CH_3}MgBr} CH_3-\underset{CH_3}{\overset{OH}{C}}-CH_3$$

Ethyl acetate reacts with CH_3MgBr to form:

- (A) secondary alcohol
- [✓ (B)] tertiary alcohol
- (C) primary alcohol and an acid
- (D) an acid

QUESTION



$$R-\overset{O}{\overset{\|}{C}}-\boxed{OR}\xrightarrow{\overset{\delta^-}{R'}MgX}R-\overset{O}{\overset{\|}{C}}-R'$$

Reaction of esters with Grignard reagents give rise to:

A primary alcohols

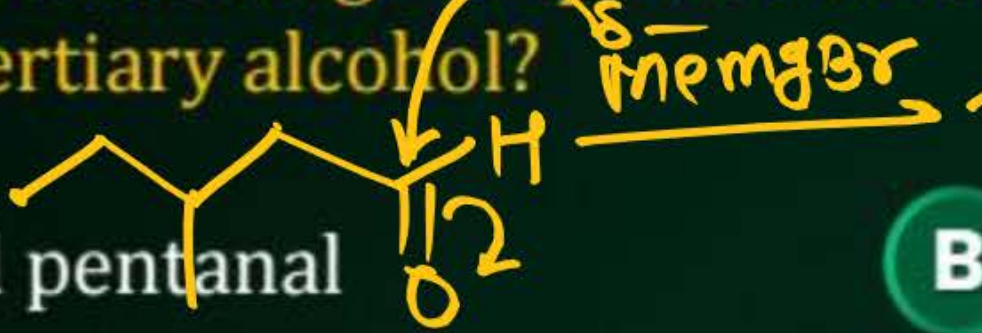
B secondary alcohols

C tertiary alcohols

[✓ **D**] ketones

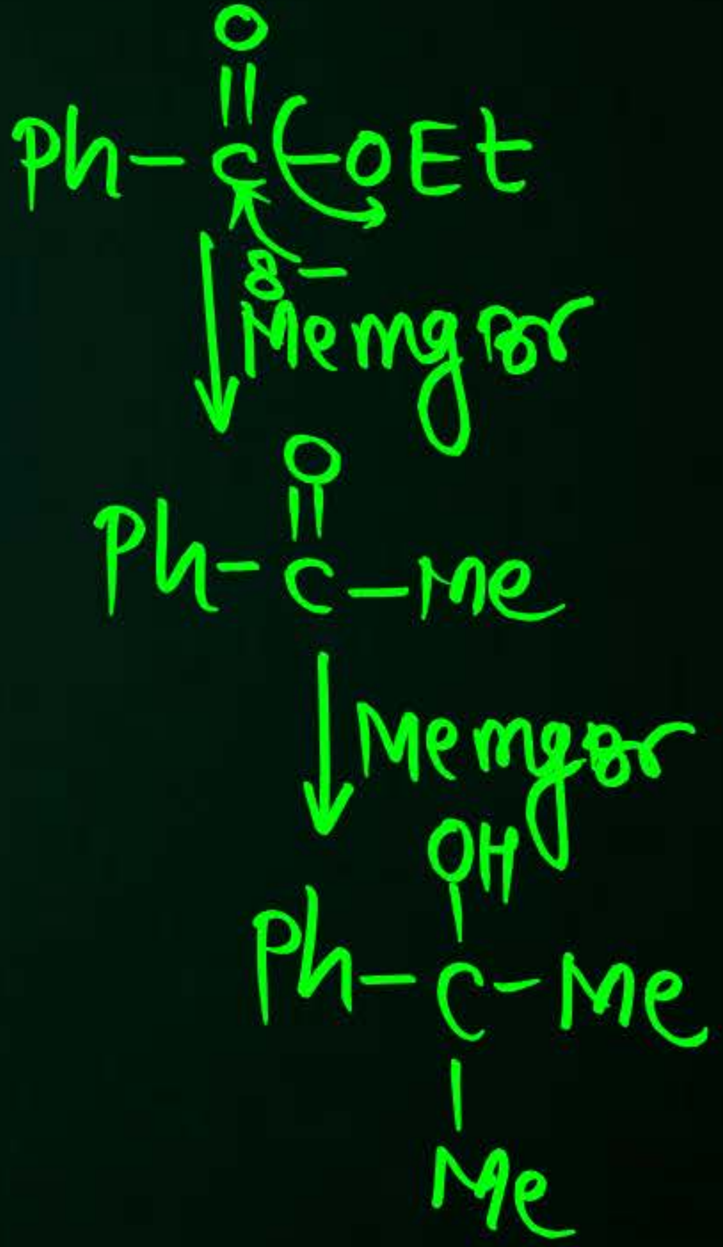
QUESTION

Which of the following compound does not react with methyl magnesium bromide to produce tertiary alcohol?

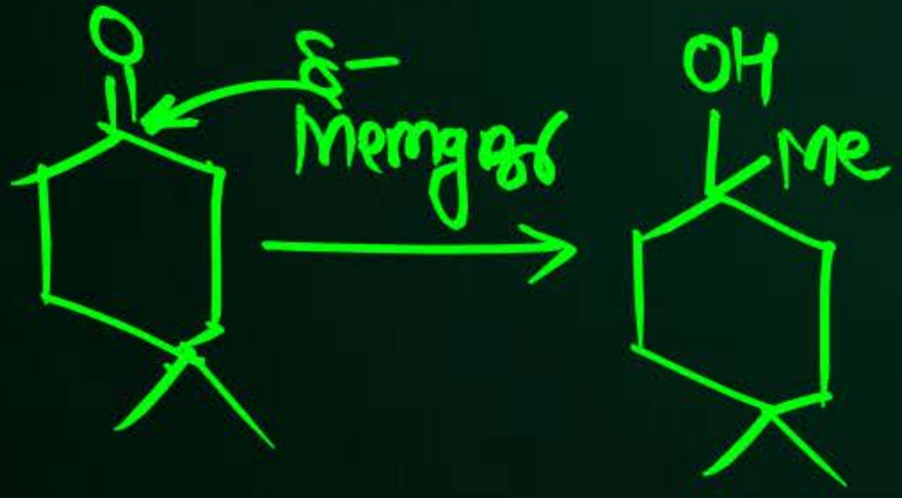

δ−
MeMgBr
H
2
O
2°
H
OH

[✓ **A**] 3-methyl pentanal

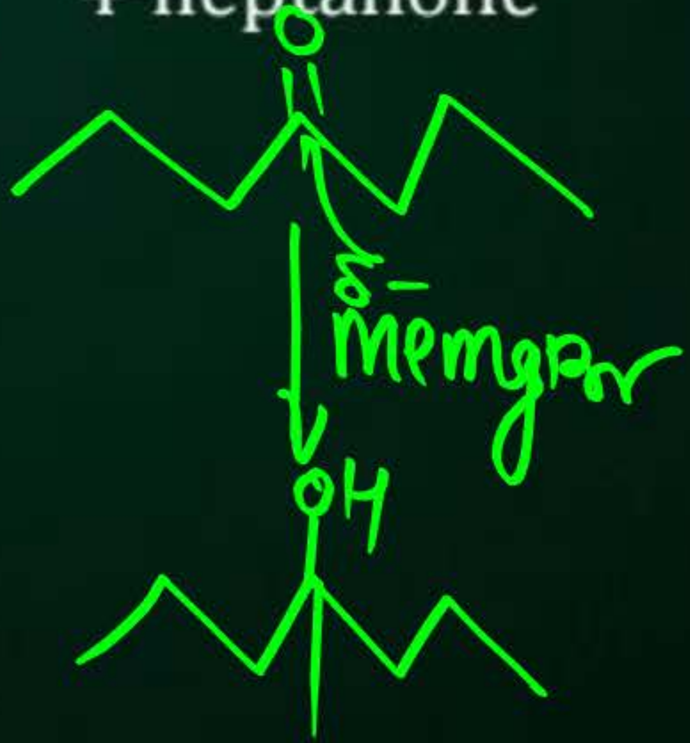
B Ethyl benzoate


Ph–C–OEt
O
δ−
MeMgBr
O
Ph–C–Me
MeMgBr
OH
Ph–C–Me
Me

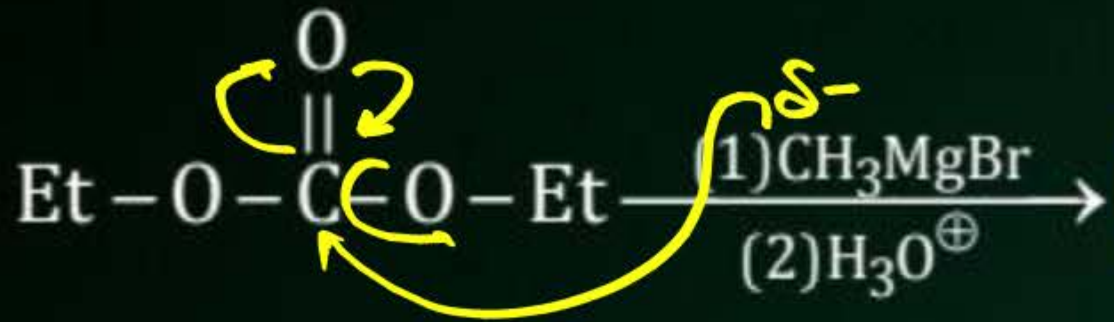
C 4, 4-dimethylcyclohexanone

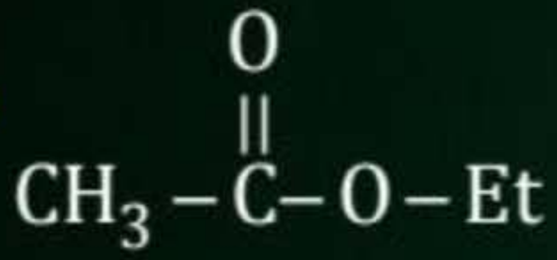

O
δ−
MeMgBr
OH
Me

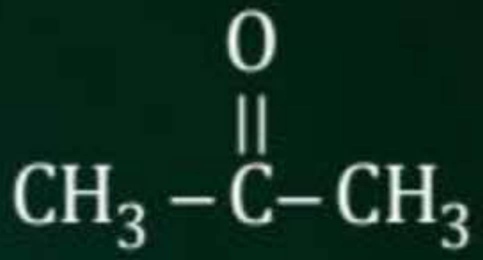
D 4-heptanone

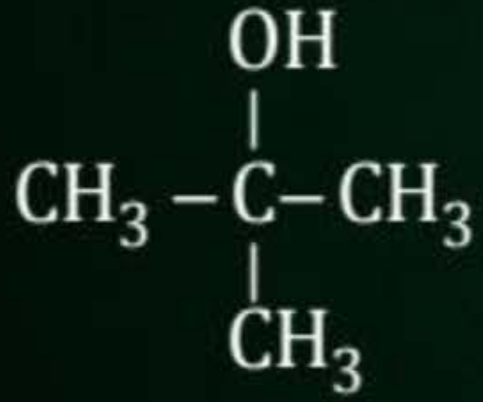

O
δ−
MeMgBr
OH

QUESTION


$Et-O-\overset{\overset{O}{\|}}{C}-O-Et \xrightarrow[(2)H_3O^{\oplus}]{(1)\overset{\delta-}{CH_3}MgBr}$ (A), Product (A) is:

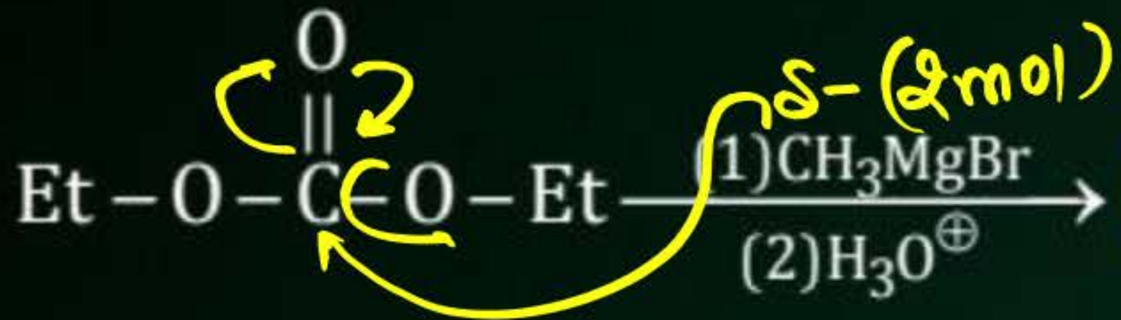
A ✓

$CH_3-\overset{\overset{O}{\|}}{C}-O-Et$

B

$CH_3-\overset{\overset{O}{\|}}{C}-CH_3$

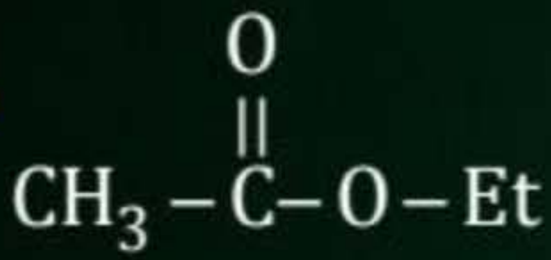
C

$CH_3-\underset{\underset{CH_3}{|}}{\overset{\overset{OH}{|}}{C}}-CH_3$

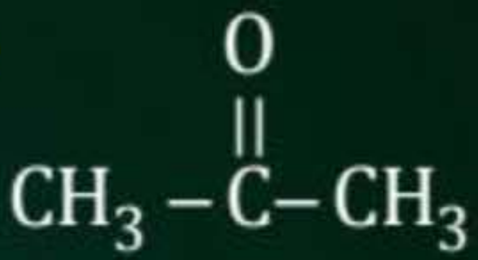
D $CH_3-CH_2-CH_3$

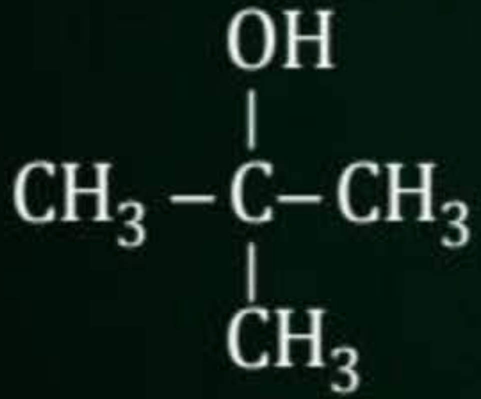
QUESTION



$\mathrm{Et-O-\overset{\overset{O}{\|}}{C}-O-Et \xrightarrow[(2)\,H_3O^{\oplus}]{(1)\,CH_3MgBr}}$ (A), Product (A) is:

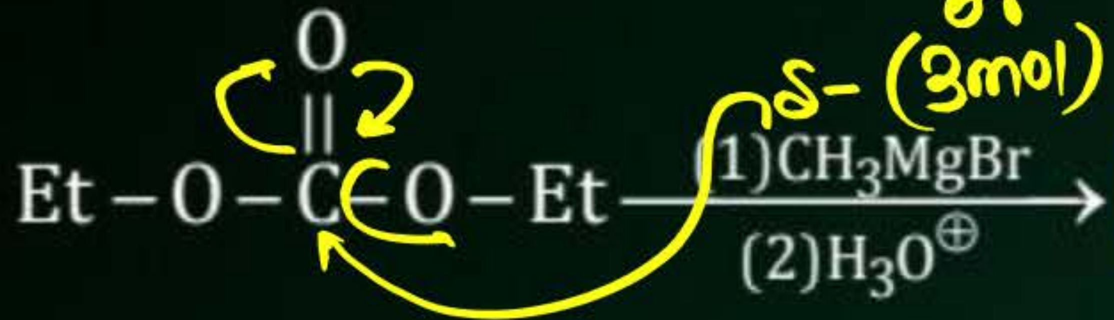
(A) 
$\mathrm{CH_3-\overset{\overset{O}{\|}}{C}-O-Et}$

[✓ (B)] 
$\mathrm{CH_3-\overset{\overset{O}{\|}}{C}-CH_3}$

(C) 
$\mathrm{CH_3-\overset{\overset{OH}{|}}{\underset{\underset{CH_3}{|}}{C}}-CH_3}$

(D) $\mathrm{CH_3-CH_2-CH_3}$

QUESTION

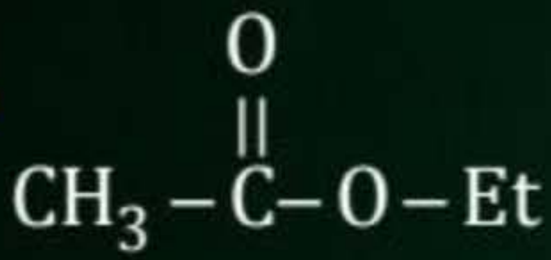


$$\mathrm{Et-O-\overset{\overset{O}{\|}}{C}-O-Et \xrightarrow[(2)\,H_3O^{\oplus}]{(1)\,CH_3MgBr}}$$ (A), Product (A) is:

Excess or (3mol)

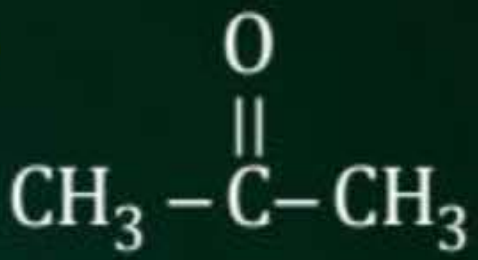
δ-

(A) ✗



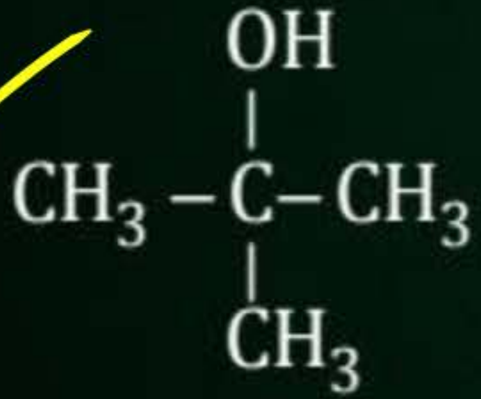
$$\mathrm{CH_3-\overset{\overset{O}{\|}}{C}-O-Et}$$

(B) ✗



$$\mathrm{CH_3-\overset{\overset{O}{\|}}{C}-CH_3}$$

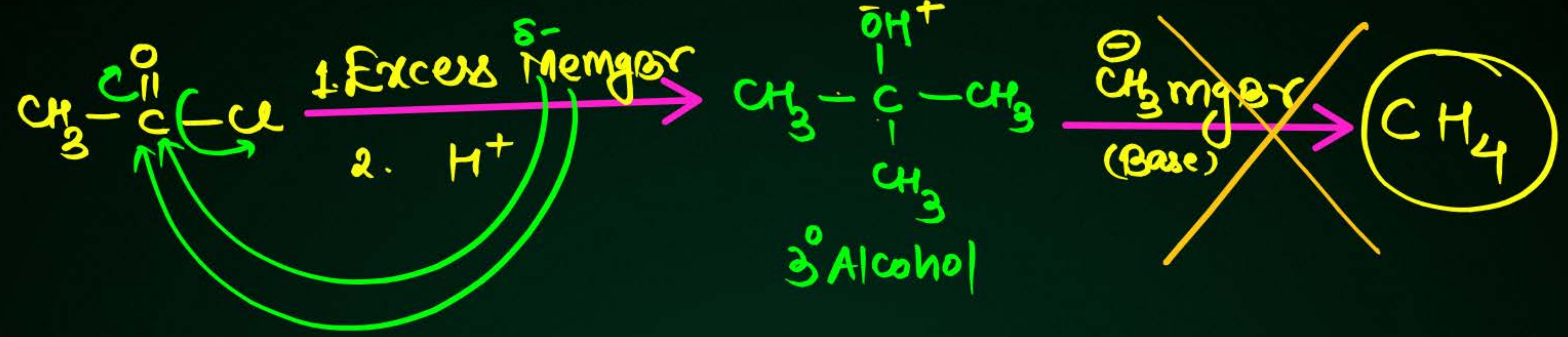
(C) ✓



$$\mathrm{CH_3-\underset{\underset{CH_3}{|}}{\overset{\overset{OH}{|}}{C}}-CH_3}$$

(D) $CH_3-CH_2-CH_3$

Q

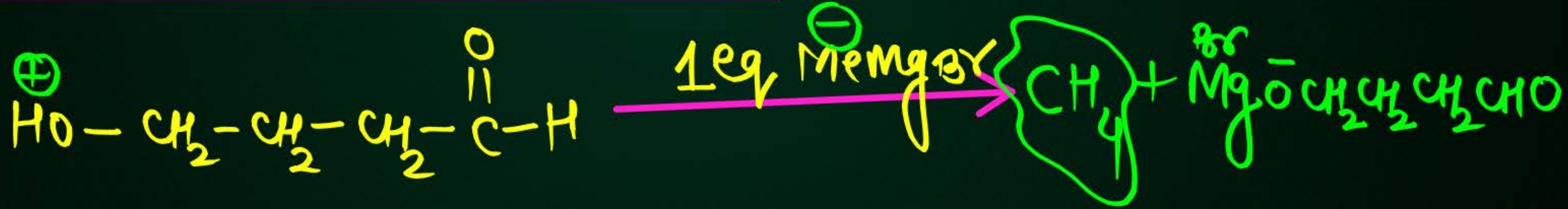


$$CH_3-\overset{O}{\overset{\|}{C}}-Cl \xrightarrow[2.\ H^+]{1.\ Excess\ \overset{\delta-}{Me}MgBr} CH_3-\underset{CH_3}{\overset{\overset{-}{O}H^+}{C}}-CH_3 \xcancel{\xrightarrow[(Base)]{\overset{\ominus}{CH_3}MgBr}} \boxed{CH_4}$$

3° Alcohol

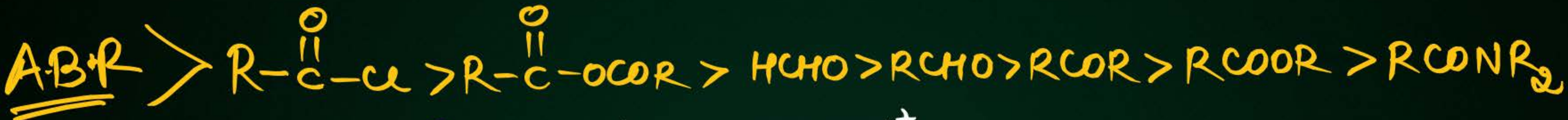
Acid - Base Rxn ko NAR & SNAE
ke baad nahi karate

Q



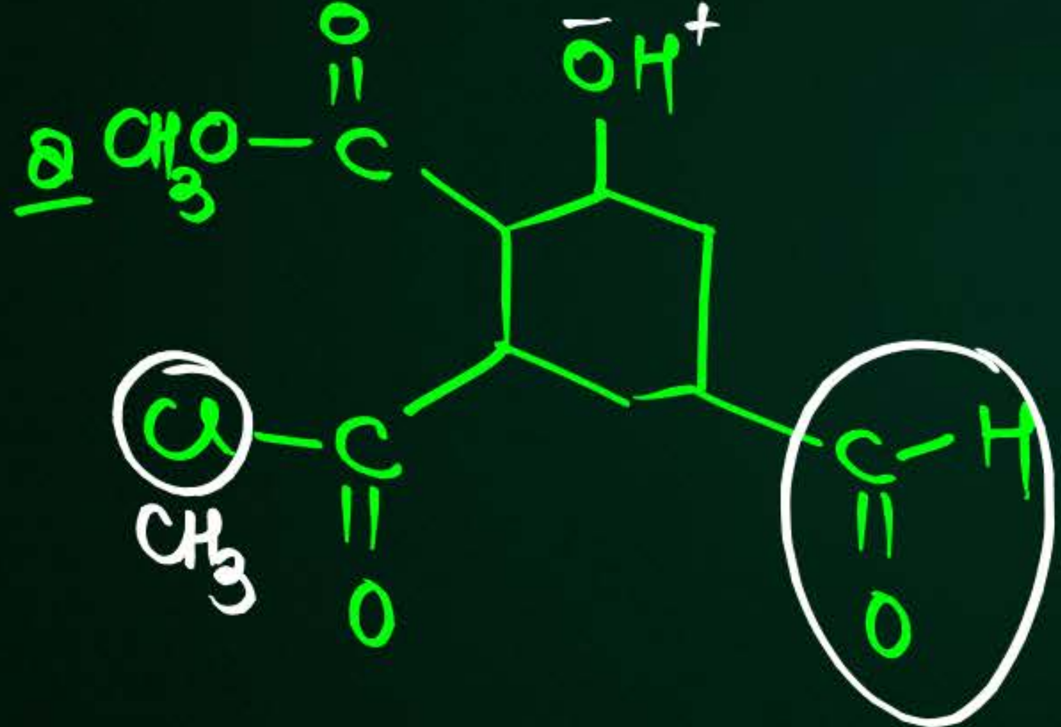
$$\overset{\oplus}{H}O-CH_2-CH_2-CH_2-\overset{O}{\overset{\|}{C}}-H \xrightarrow{1 eq\ \overset{\ominus}{Me}MgBr} CH_4 + \overset{Br}{Mg}\overset{-}{O}CH_2CH_2CH_2CHO$$

$\underbrace{\text{Acid/Base}}_{\text{fastest}}$ NAR SNAE



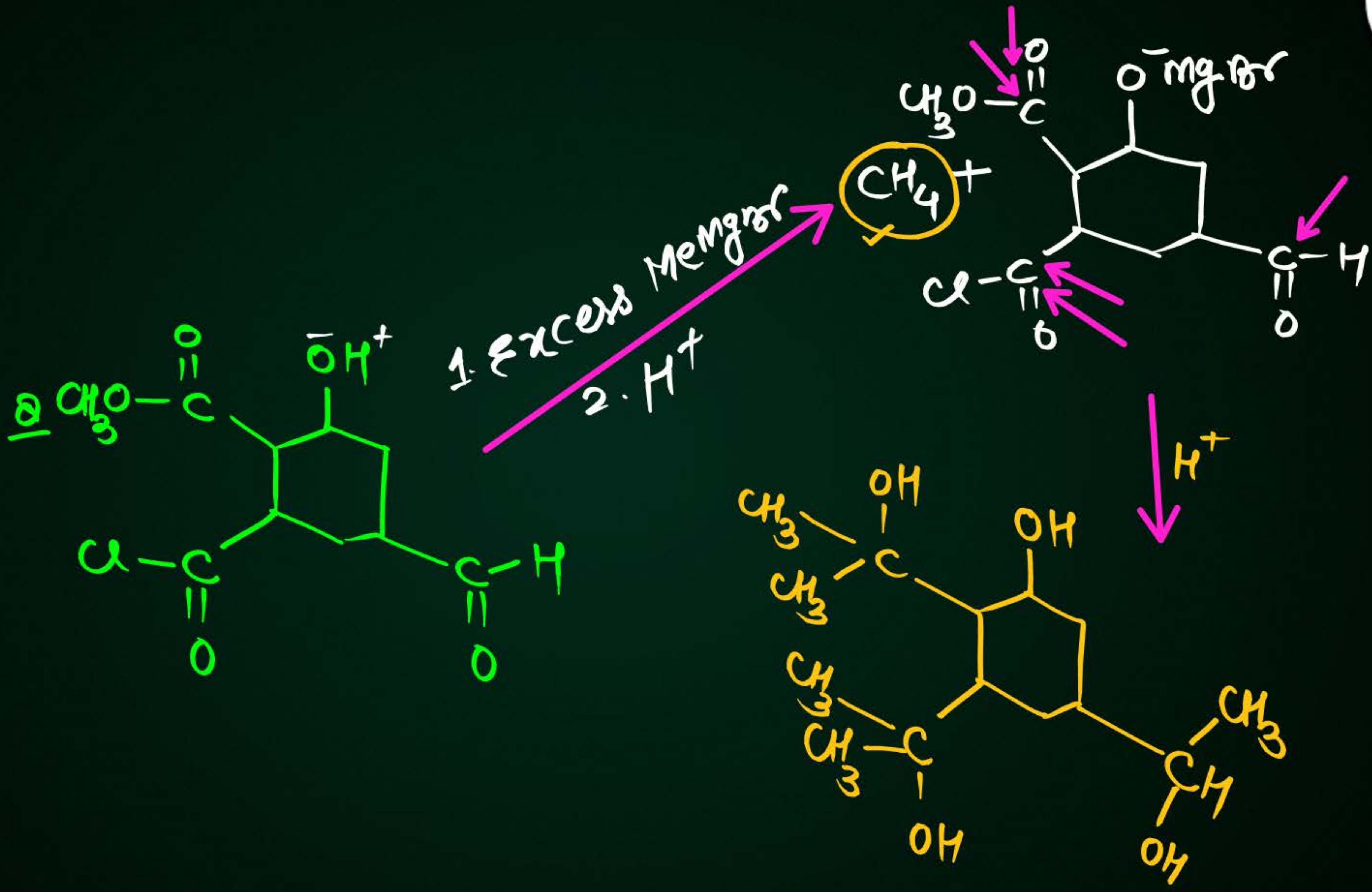
$$\text{A.B.R} > R-\overset{O}{\overset{\|}{C}}-Cl > R-\overset{O}{\overset{\|}{C}}-OCOR > HCHO > RCHO > RCOR > RCOOR > RCONR_2$$

Acid
Base
rxn

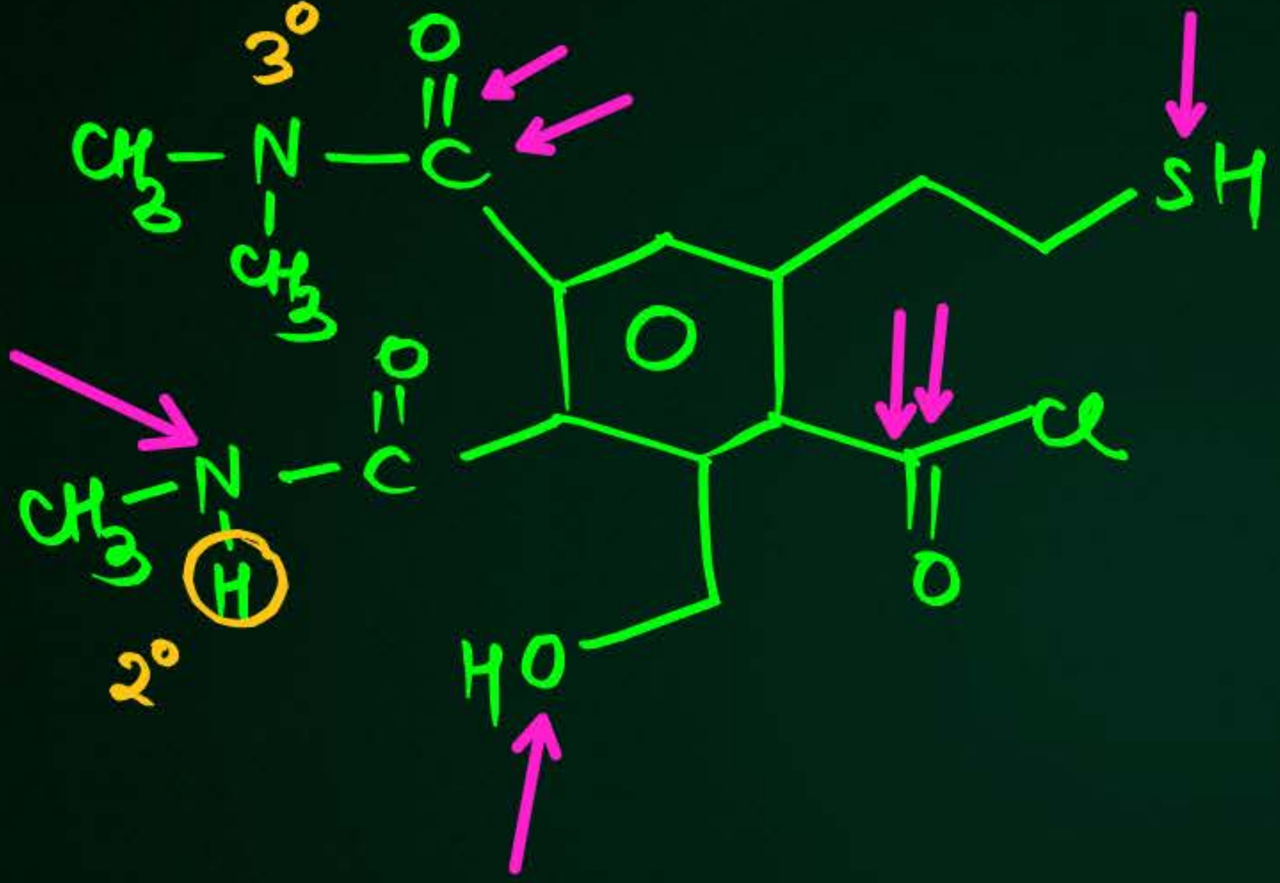


$\bar{O}H$
H^+
⊖
CH_3O
C
O
Cl
CH_3
C
O
C
H
O

1st mol	G.R	OH
2nd mol	G.R	COCl
3rd mol	G.R	CHO
4th mol	G.R	COCl → $COCH_3$
5th mol	G.R	COOR

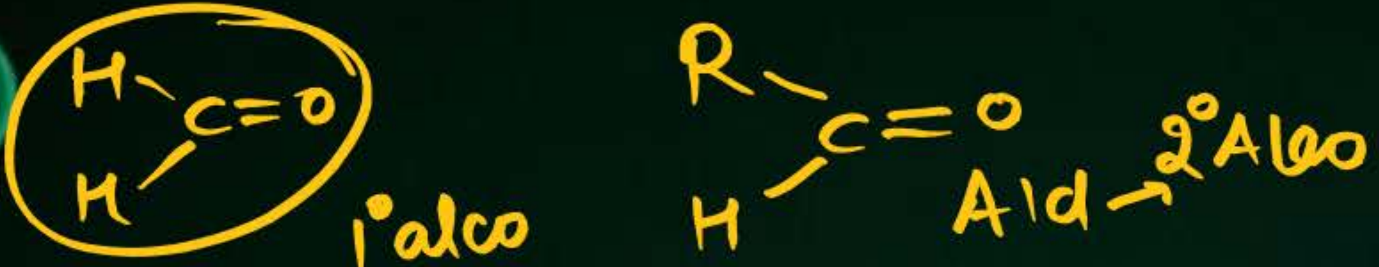
Q
CH3O–C=O
ŌH+
Cl–C=O
C–H=O
1. Excess MeMgBr
2. H+
CH4 +
CH3O–C=O
O⁻MgBr
Cl–C=O
C–H=O
H+
CH3
CH3
OH
OH
CH3
CH3
OH
CH3
CH
OH

Q Total no. of moles of G.R consumed ?
(Excess)


3°
O
CH3—N—C
CH3
SH
O
CH3—N—C
H
2°
Cl
O
HO

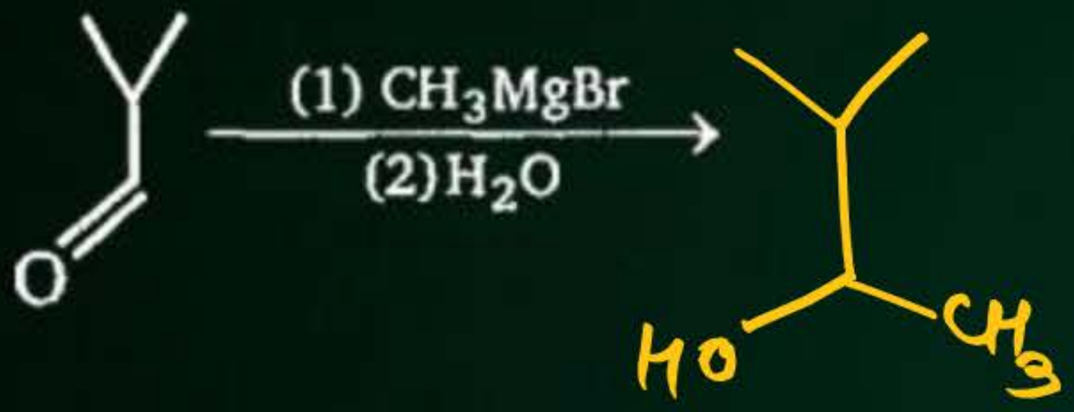
Ans ⑦ mol

QUESTION

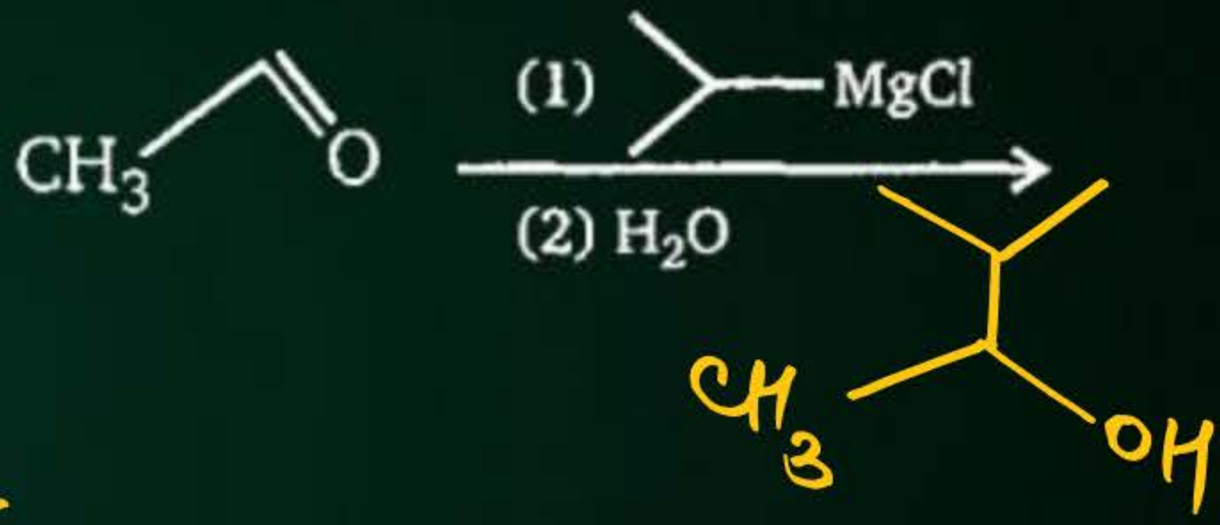

H
H
C=O
1°alco
R
H
C=O
Ald → 2° Alco

In which of the following reaction 2° alcohol is obtained as a product ?

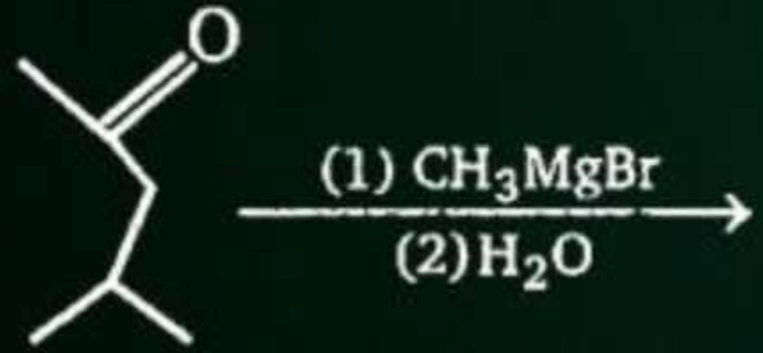
A


O
(1) CH_3MgBr
(2) H_2O
HO
CH_3

B


CH_3
O
(1)
MgCl
(2) H_2O
CH_3
OH

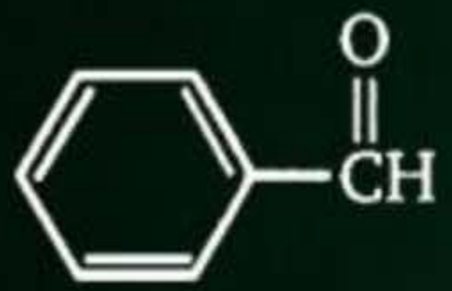
C

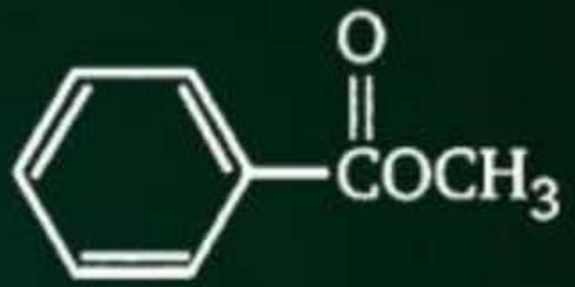

O
(1) CH_3MgBr
(2) H_2O

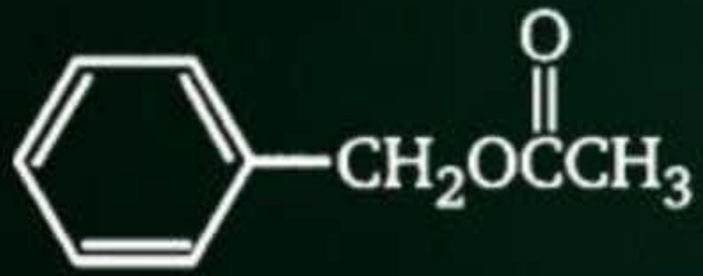
[✓ D] Both (A) and (B)

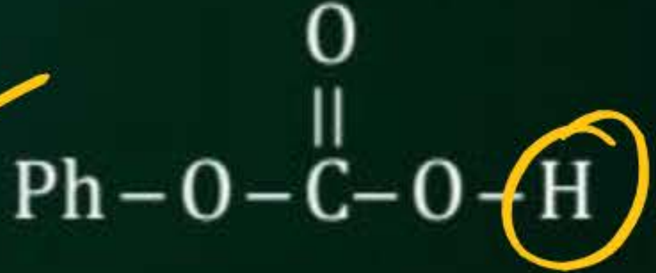
QUESTION

All of the following compound react with ethyl magnesium bromide. Alcohols are formed from three of the compounds. Which one does not give as alcohol ?

A


B


C


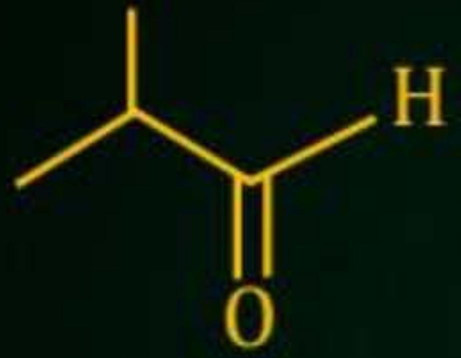
D ✓


$Ph-O-\overset{O}{\overset{\|}{C}}-O-H$

A.B.R

Home Work

QUESTION 01



$$+ CH_3MgBr \xrightarrow{Ether} \text{'A'} \xrightarrow{H_3O^+} \text{'B'}$$

(A) 3-methylbutan-2-ol

(B) 3-methylbutan-3-ol

(C) 2-methylbutan-2-ol

(D) pentan-2-ol

QUESTION 02

Acetone on reaction with methyl magnesium bromide followed by hydrolysis gives.

- (A) Secondary alcohol
- (B) Tertiary alcohol
- (C) Carboxylic acid
- (D) Alkane

QUESTION 03

Which of the following are the starting materials for the Grignard's synthesis of *tert.* butyl alcohol?

- A $CH_3MgI + CH_3COCH_3$
- B $CH_3MgI + CH_3CHOHCH_3$
- C $CH_3CH_2MgBr + CH_3COCH_3$
- D $CH_3CH_2MgBr + CH_3CHO$

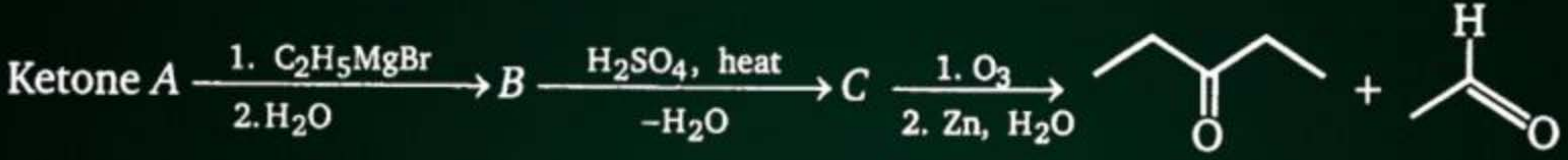
QUESTION 04

Isobutyl alcohol can be obtained by the reaction between:

- (A) C_2H_5MgBr and CH_3CHO
- (B) CH_3MgBr and CH_3CH_2CHO
- (C) $(CH_3)_2CHMgBr$ and $HCHO$
- (D) CH_3MgBr and CH_3COCH_3

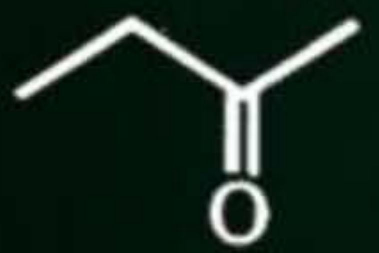
QUESTION 05

Consider the following sequence of reactions.

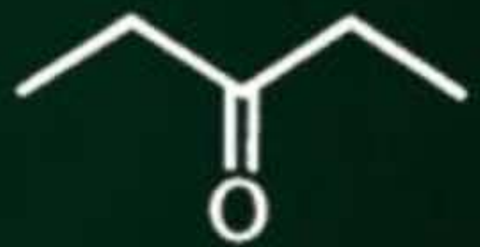

Ketone A
1. C_2H_5MgBr
2. H_2O
B
H_2SO_4, heat
$-H_2O$
C
1. O_3
2. Zn, H_2O
O
+
H
O

The ketone (A) is:

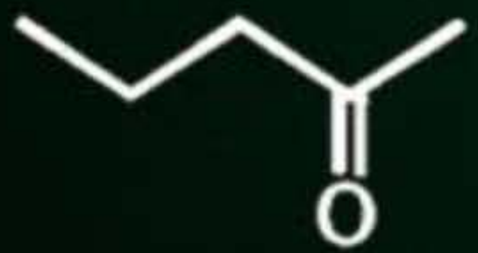
A



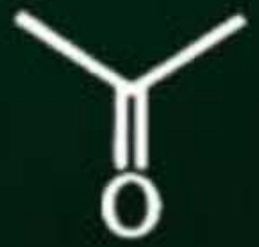
B



C



D



QUESTION 06

In the following sequence of reactins,

$$\mathrm{CH_3CH_2OH} \xrightarrow{P+I_2} \text{(a)} \xrightarrow[\text{ether}]{Mg} \text{(B)} \xrightarrow{HCHO} \text{(C)} \xrightarrow{H_2O} \text{(D)}$$

the compound D is:

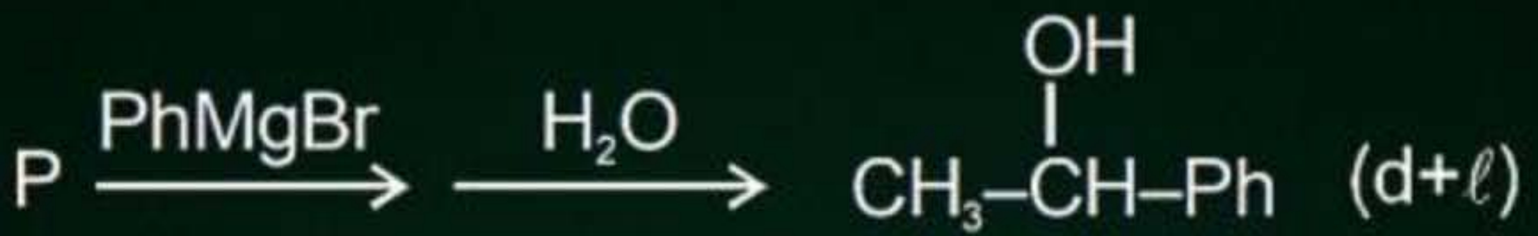
(A) propanal

(B) butanal

(C) *n*-butyl alcohol

(D) *n*-propyl alcohol

QUESTION 07



$$P \xrightarrow{PhMgBr} \xrightarrow{H_2O} CH_3-\overset{\overset{\displaystyle OH}{|}}{C}H-Ph \quad (d+\ell)$$

P can be:

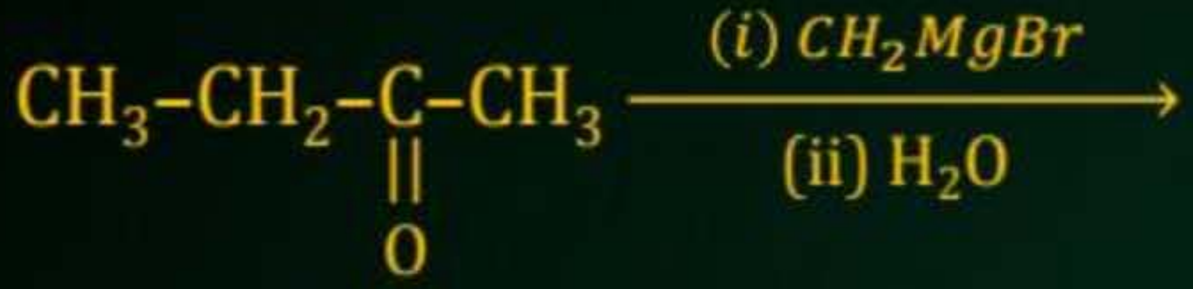
- (A) CH_3COOH
- (B) $HCOOCH_3$
- (C) CH_3COCl
- (D) CH_3CHO

QUESTION 08

Formaldehyde forms an addition product with CH_3MgI which on hydrolysis gives:

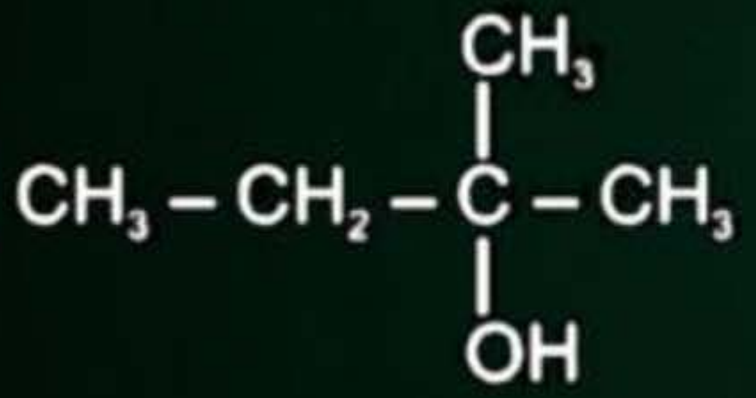
- (A) ethyl iodide
- (B) ethyl alcohol
- (C) methyl alcohol
- (D) methyl iodide

QUESTION 09

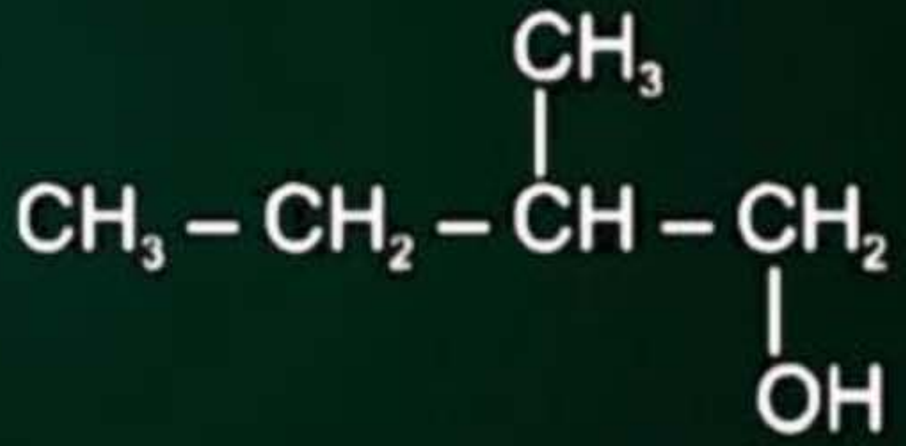


$$CH_3-CH_2-\underset{\underset{O}{\|}}{C}-CH_3 \xrightarrow[\text{(ii) } H_2O]{(i)\ CH_2MgBr}$$

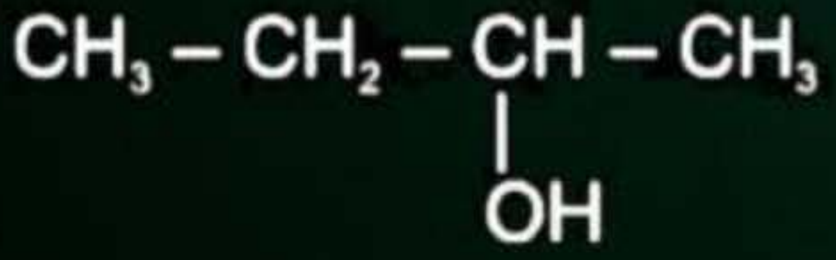
Product is:

A 

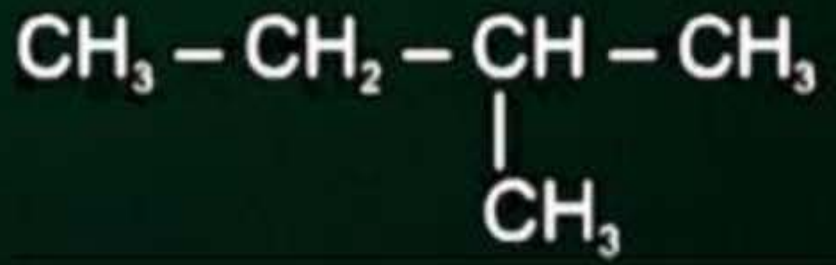
$$CH_3-CH_2-\overset{\overset{CH_3}{|}}{\underset{\underset{OH}{|}}{C}}-CH_3$$

B 

$$CH_3-CH_2-\overset{\overset{CH_3}{|}}{CH}-\underset{\underset{OH}{|}}{CH_2}$$

C 

$$CH_3-CH_2-\underset{\underset{OH}{|}}{CH}-CH_3$$

D 

$$CH_3-CH_2-\underset{\underset{CH_3}{|}}{CH}-CH_3$$

QUESTION 10

From which of the following tertiary butyl alcohol is obtained by the action of methyl magnesium iodide?

Ⓐ HCHO

Ⓑ CH_3CHO

Ⓒ CH_3COCH_3

Ⓓ CO_2

ANSWER KEY

1. A
2. B
3. A
4. C
5. B
6. D
7. D
8. B
9. A
10. C

Home Work From PW Module (Yakeen NEET)

Prabal: Q 30, 32

Parikshit: Q 06

Thank you!!

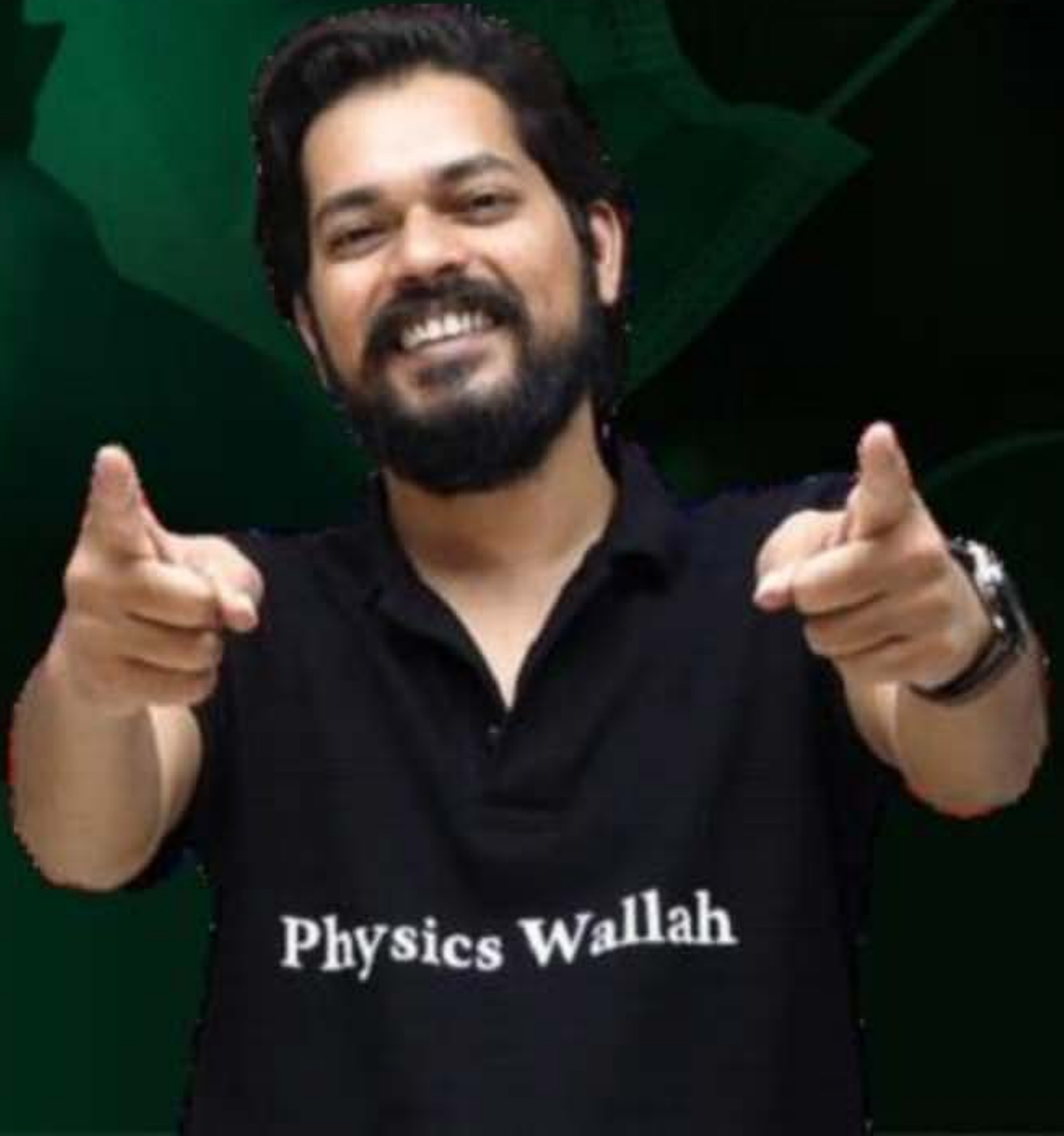
YAKEEN 2.0

FOR NEET 2025

Lecture- 04 | **Organic Chemistry**

Alcohols, Phenols and Ethers

By- Pankaj Sir(POPU MAMA)


Physics Wallah

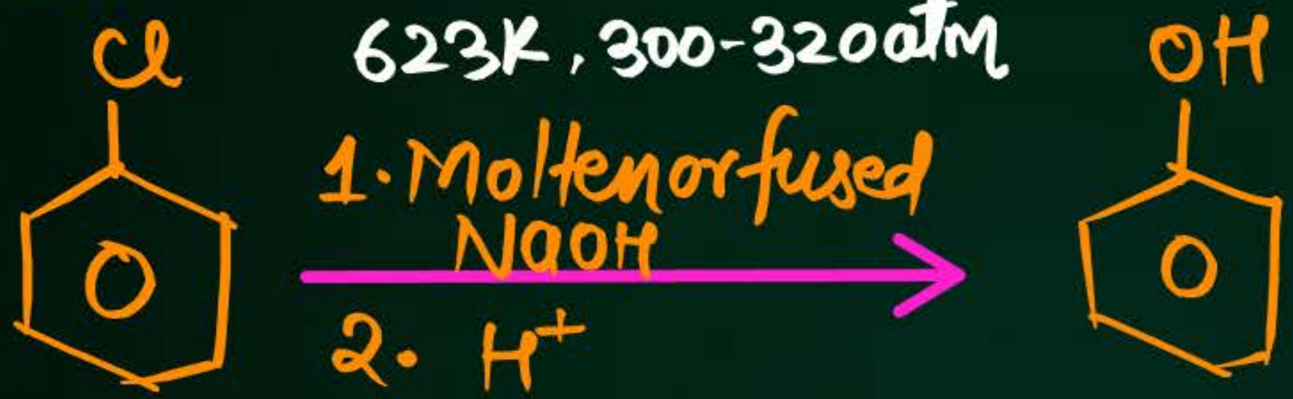
Topics *to be covered*

1. Methods of Preparation of Phenols ✓
2. Practice

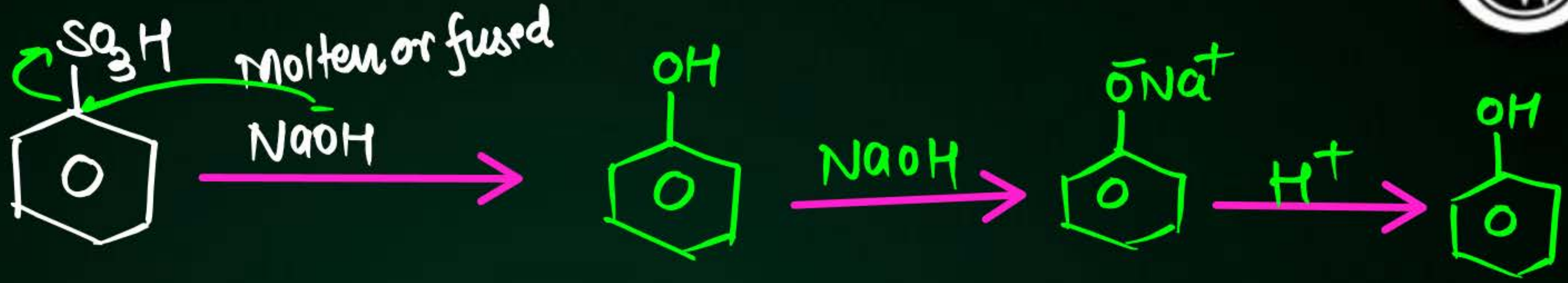
Methods of Preparation of Phenols

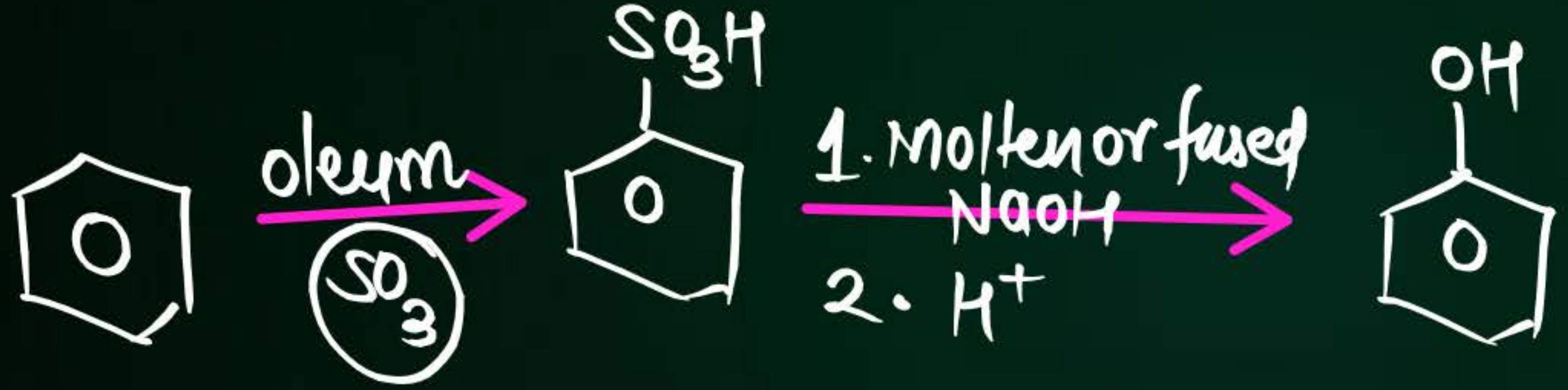
$PhCl \xrightarrow{NaOH} PhOH \xrightarrow{NaOH} Ph\bar{O}\overset{+}{Na} \xrightarrow{H^+} PhOH$

1. Dows Process:

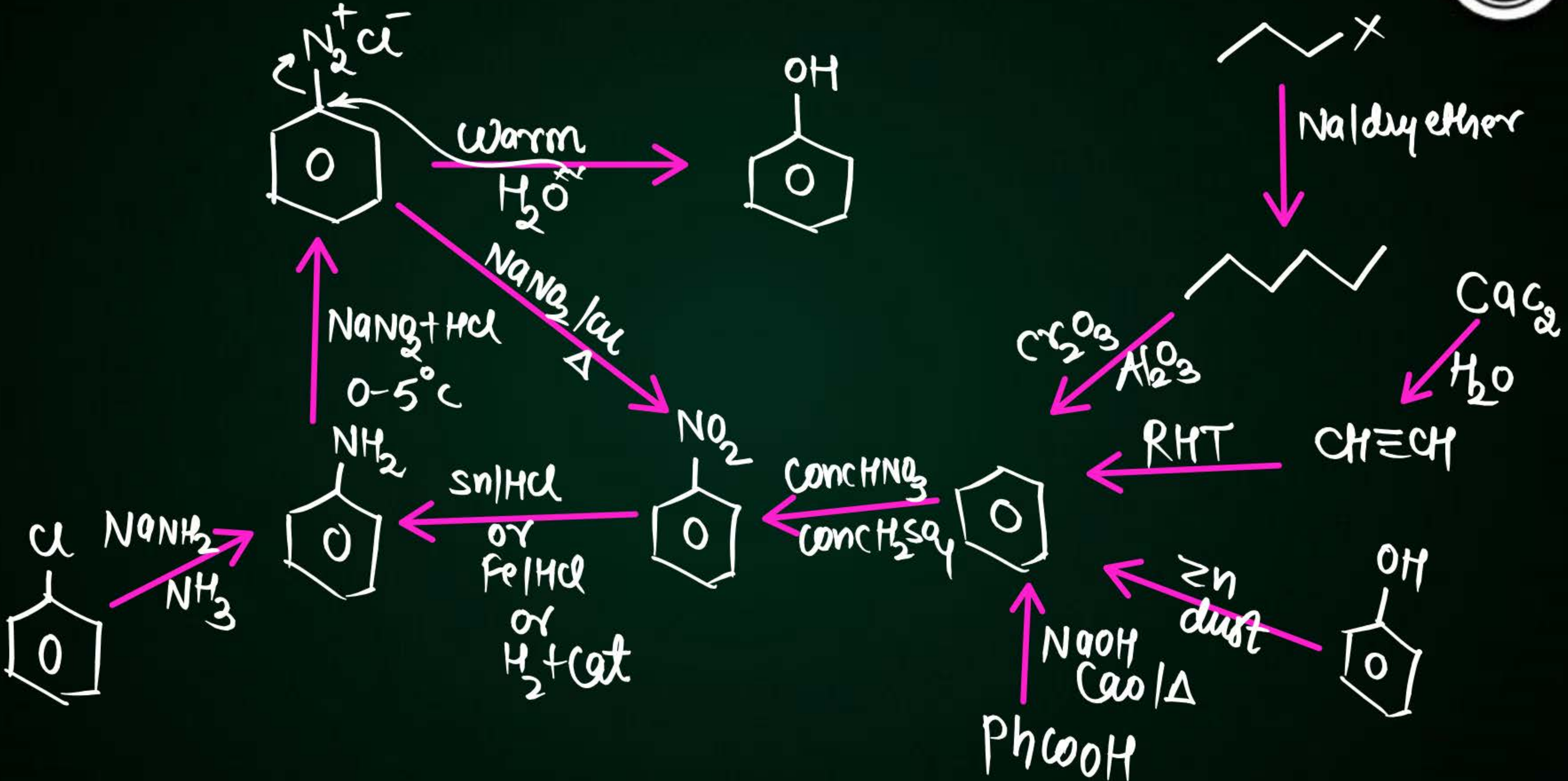

Cl
623K, 300-320atm
1. Molten or fused NaOH
2. H+
OH

2. From Benzene Sulphonic Acid:


SO3H
Molten or fused
NaOH
OH
NaOH
ŌNa+
H+
OH

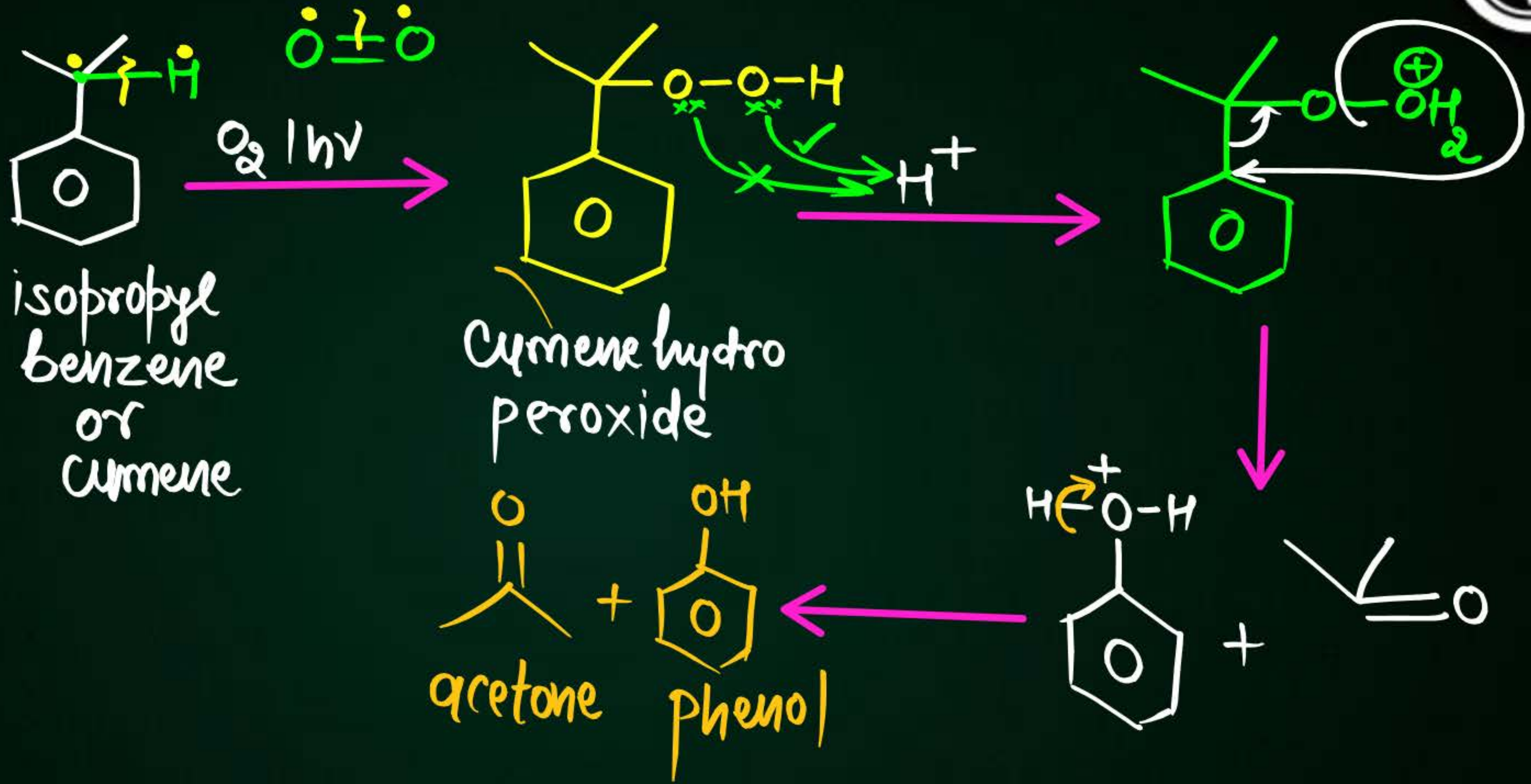

oleum
SO3
SO3H
1. Molten or fused NaOH
2. H+
OH

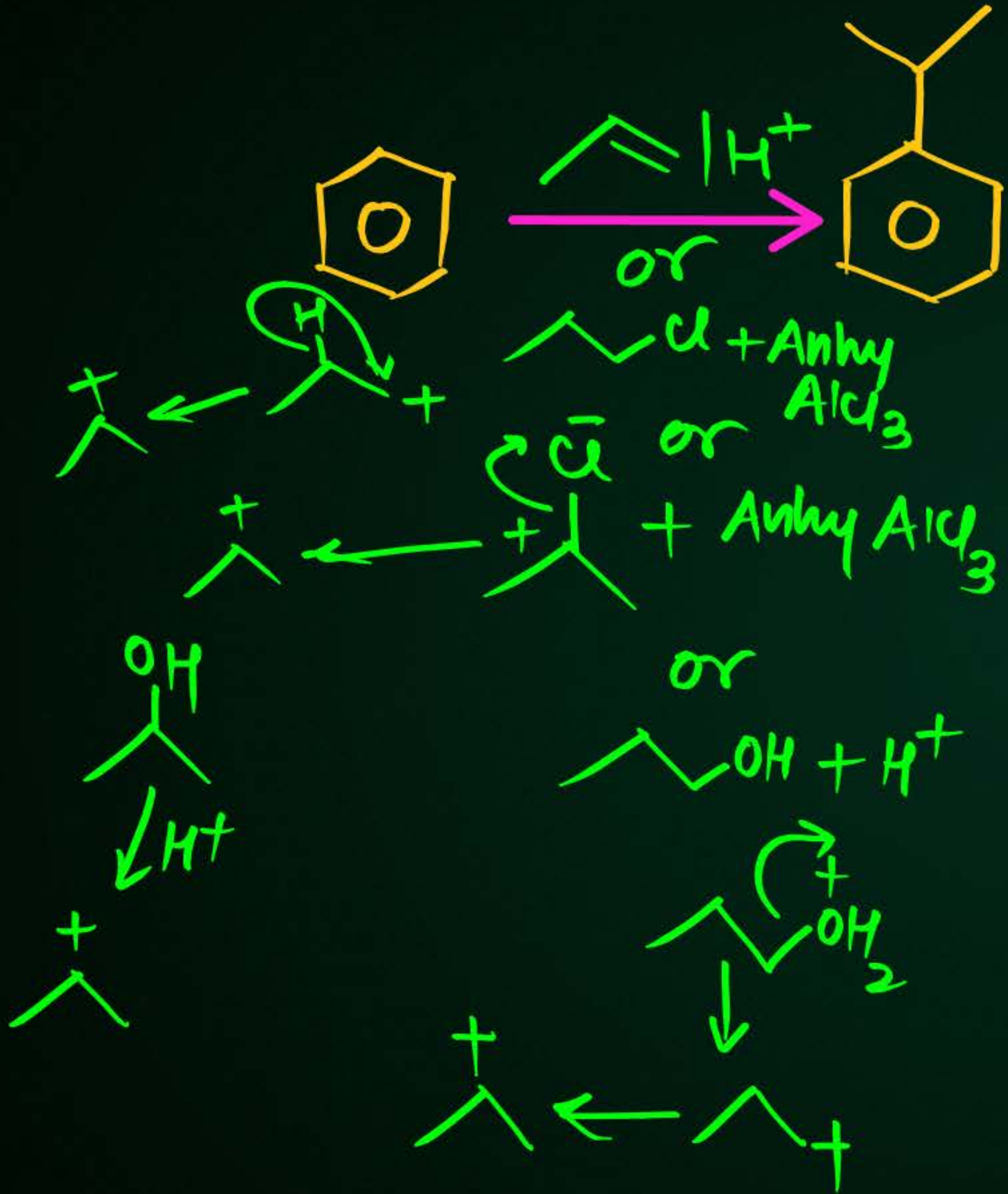
3. From Diazonium salt:

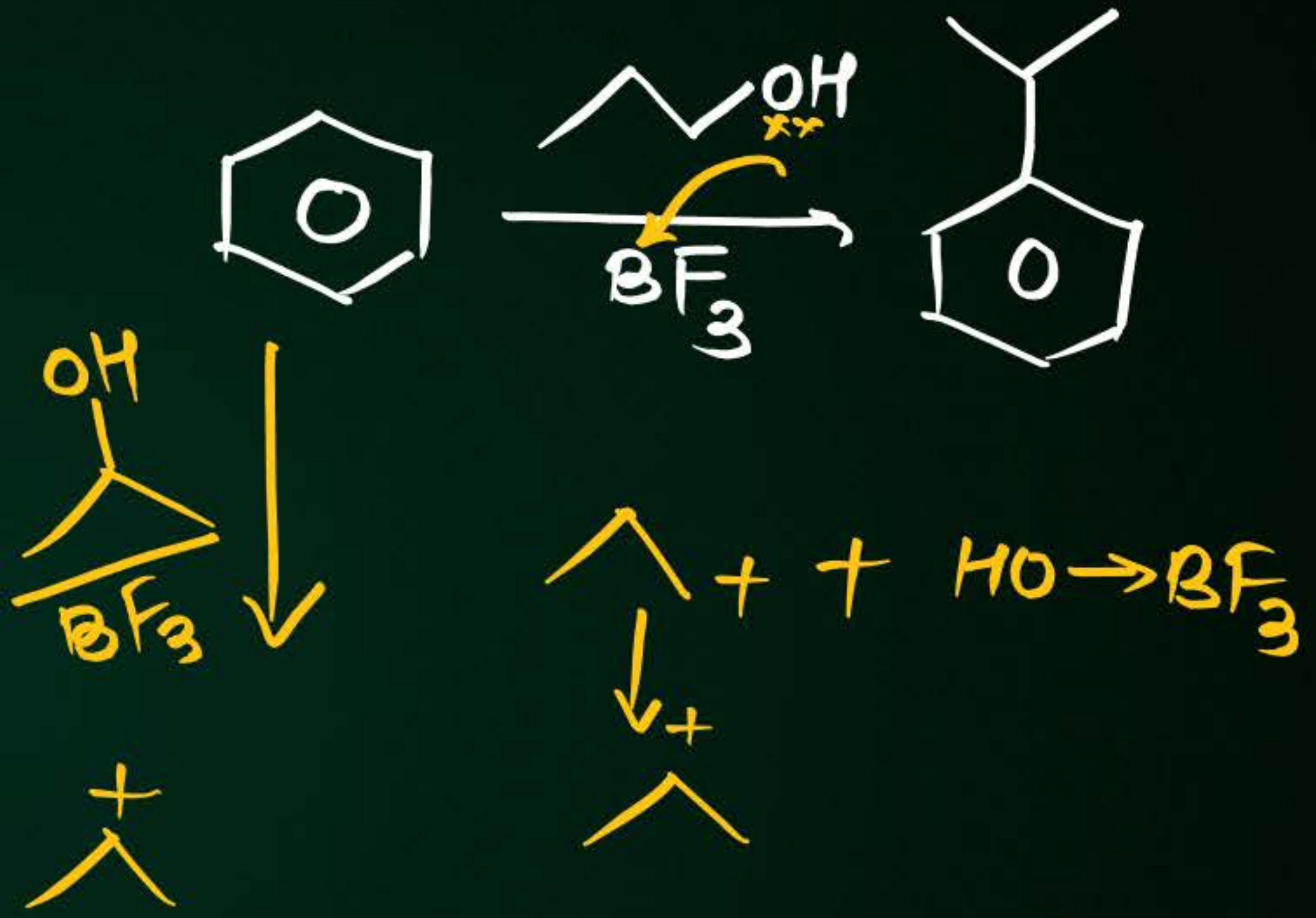


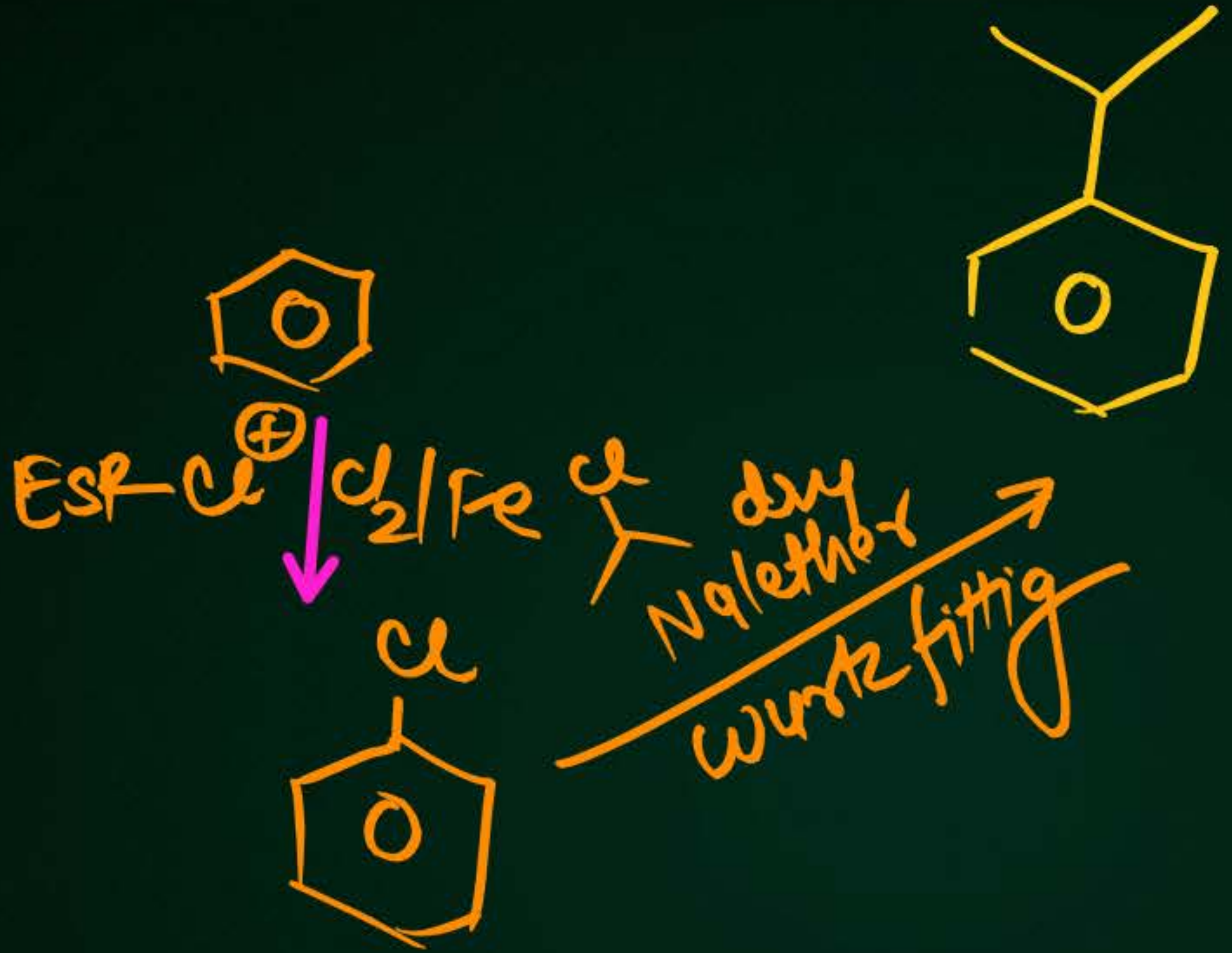
N2+ Cl−
Warm
H2O+
OH
X
Na/dry ether
NaNO2+HCl
0-5°C
NaNO2/Cu
Δ
Cr2O3
Al2O3
CaC2
H2O
NO2
NH2
RHT
CH≡CH
Cl
NaNH2
NH3
Sn/HCl
or
Fe/HCl
or
H2+cat
Conc HNO3
Conc H2SO4
Zn dust
OH
NaOH
CaO/Δ
PhCOOH

4. From cumene:


O–O
O2 | hν
H+
isopropyl benzene or cumene
Cumene hydro peroxide
O–O–H
OH2
H–O–H
O
OH
acetone
phenol

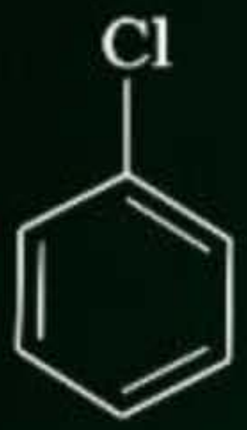

H+
or
Cl + Anhy AlCl3
H
+
Cl
or
+ Anhy AlCl3
+
OH
H+
+
or
OH + H+
+
OH2
+
+


OH
BF3
OH
BF3
+
+ + HO→BF3
+

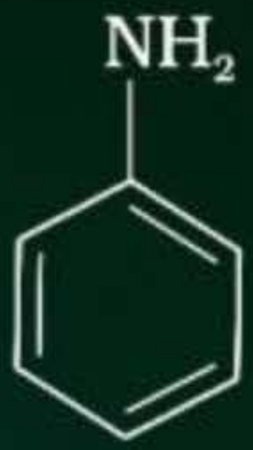

ESR-Cl⊕
Cl2/Fe
Cl
Cl
dry
Na/ether
wurtz fittig

QUESTION (NCERT Exemplar)

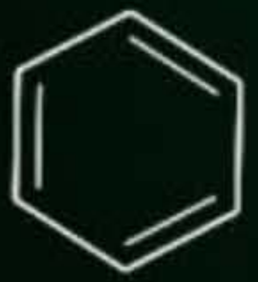
Which of the following reactions will not yield phenol?

Ⓐ 

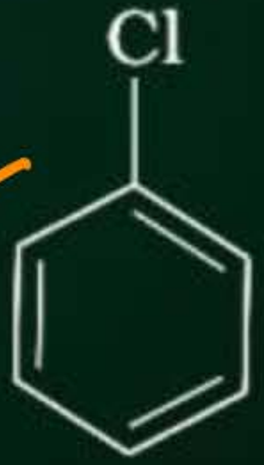
$\xrightarrow[\text{(ii) } H_2O/H^+]{\text{fusion with NaOH at 300 atm}}$ PhOH

Ⓑ 

$\xrightarrow[\text{(ii) } \underbrace{H_2O}\text{ (Warming)}]{\overset{PhN_2^+Cl^-}{\text{(i) } NaNO_2/HCl}}$ PhOH

Ⓒ 

$\xrightarrow[\text{(ii) NaOH, (Heating) (iii) } H^+]{\overset{PhSO_3H}{\text{(i) Oleum}}}$ PhOH

✓ Ⓓ 

$\xrightarrow[\text{(ii) HCl}]{\text{(i) NaOH (aq.), } \boxed{298k/1atm}}$ ✗

QUESTION

The product 'B' in the below mentioned reaction is:

$$C_6H_5Cl \xrightarrow[\text{300 atm, 623 K, HCl}]{\text{NaOH(aq)}} B$$

[✓ A] Phenol

B Benzol

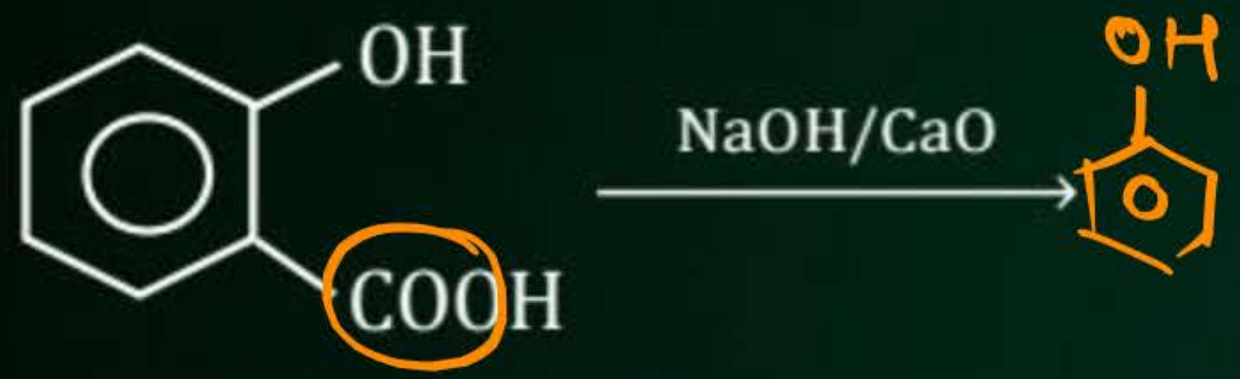
C Benzal

D Sodium benzoate

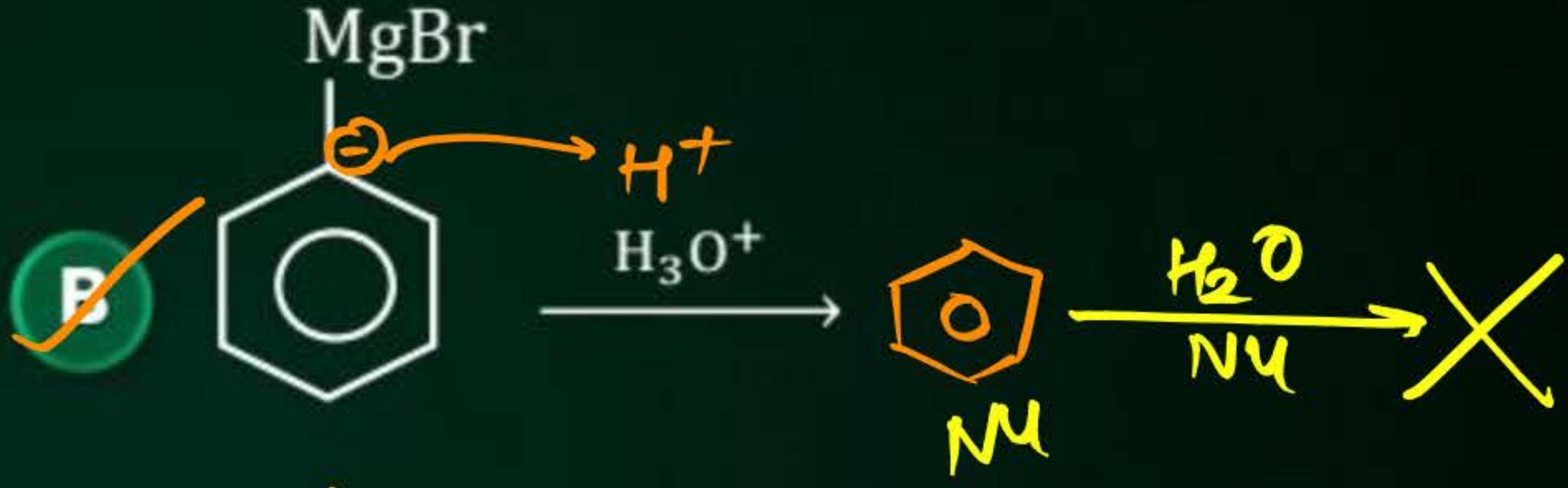
QUESTION

In which of the following reactions phenol is not obtained?

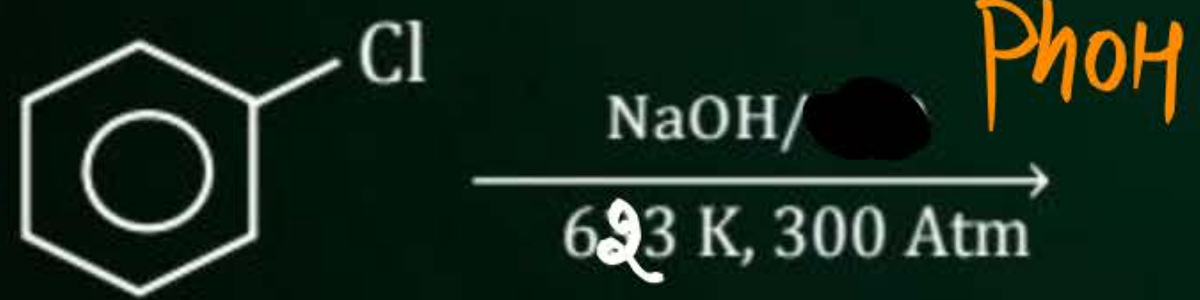
A


OH
COOH
NaOH/CaO
OH

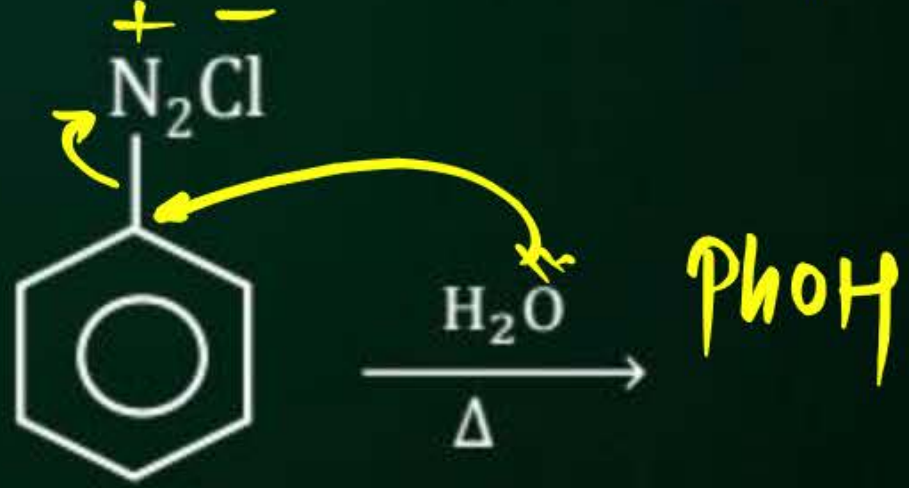
B


MgBr
H+
H_3O^+
Nu
H_2O
Nu

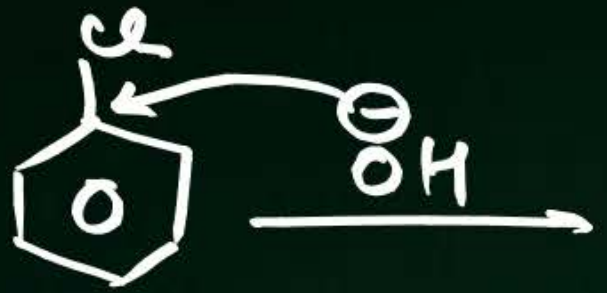
C


Cl
NaOH/[redacted]
623 K, 300 Atm
PhOH

D


$\overset{+}{N}_2\overset{-}{Cl}$
H_2O
Δ
PhOH

QUESTION



Conversion of chloro benzene into phenol by Dows process is an example of

A free radical substitution

[✓ B] nucleophilic substitution

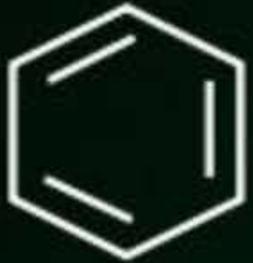
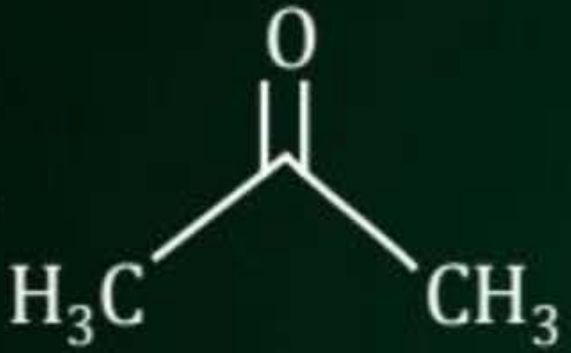
C electrophilic substitution

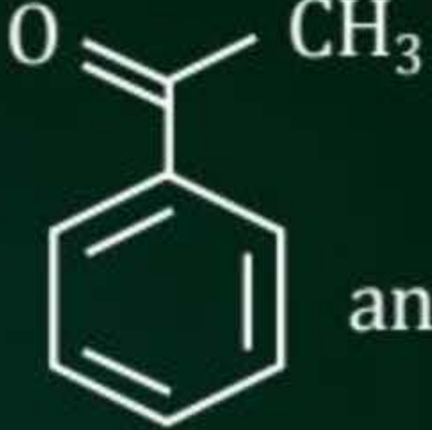
D Rearrangement

QUESTION

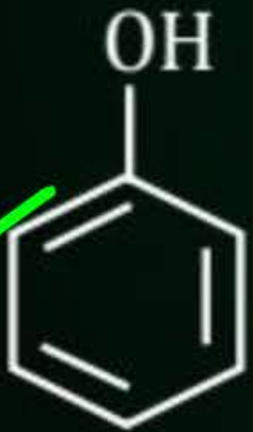
C A P

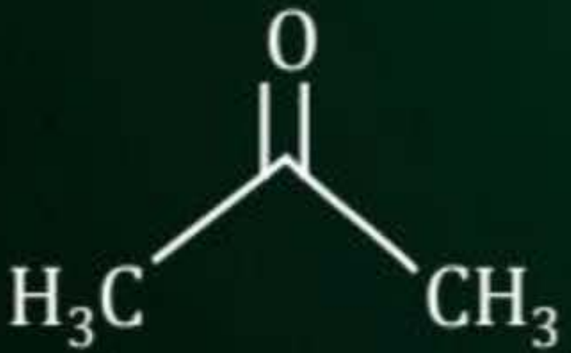
The products formed in the reaction of cumene with O_2 followed by treatment with dil. HCl are:

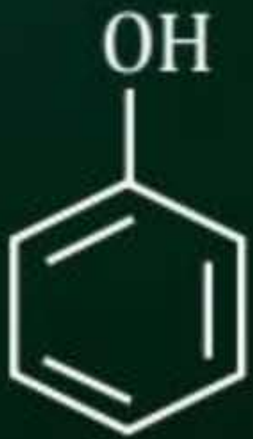
A  and 

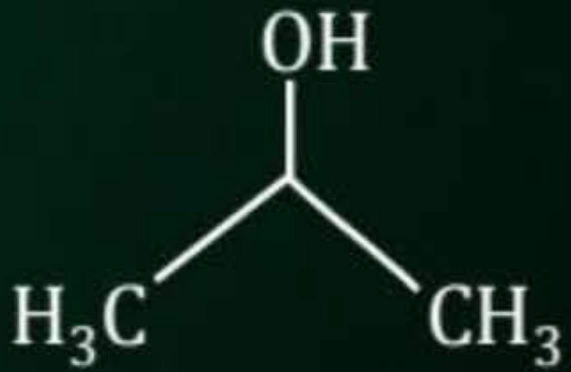
B 

and CH_3-OH

[✓ C] 

and 

D 

and 

QUESTION

Isopropylbenzene on air oxidation in presence of dilute acid gives:

- (A) C_6H_5COOH
- (B) C_6H_5CHO
- (C) $C_6H_5COCH_3$
- [✓ (D) C_6H_5OH]

QUESTION

Cumene is the compound used for commercial preparation of phenol. Chemically, cumene is:

[✓ A] isopropyl benzene

B ethyl benzene

C n-propyl benzene

D None of these

QUESTION

Reaction of aqueous sodium hydroxide and chlorobenzene gives which of the following products?

Ⓐ o-chlorophenol

Ⓑ m-chlorophenol

[✓ Ⓒ phenol]

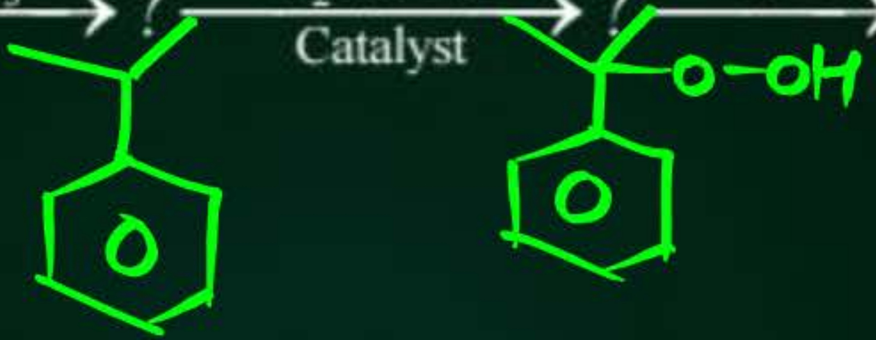
Ⓓ no reaction

QUESTION

$CH_3-\overset{\oplus}{C}H-CH_2-\overset{-}{Al}Cl_3$

What are the final products of the following sequence of reactions?

$$C_6H_6 + CH_3\overset{+}{C}H = CH_2 \xrightarrow{\text{Anhy. AlCl}_3} ? \xrightarrow[\text{Catalyst}]{O_2/130^\circ C} ? \xrightarrow{H^+} \underbrace{\text{PhOH} + \text{>=O}}$$



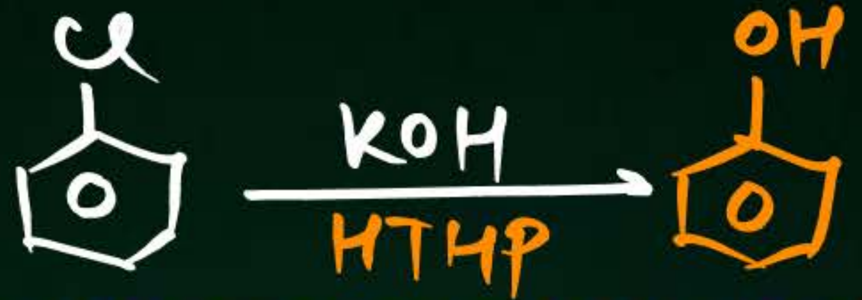
A Cumene and phenol

B [✓ Phenol and acetone]

C Cumene and acetone

D Benzoic acid and ethane

QUESTION


Cl
KOH
HTHP
OH

Phenol can be prepared by

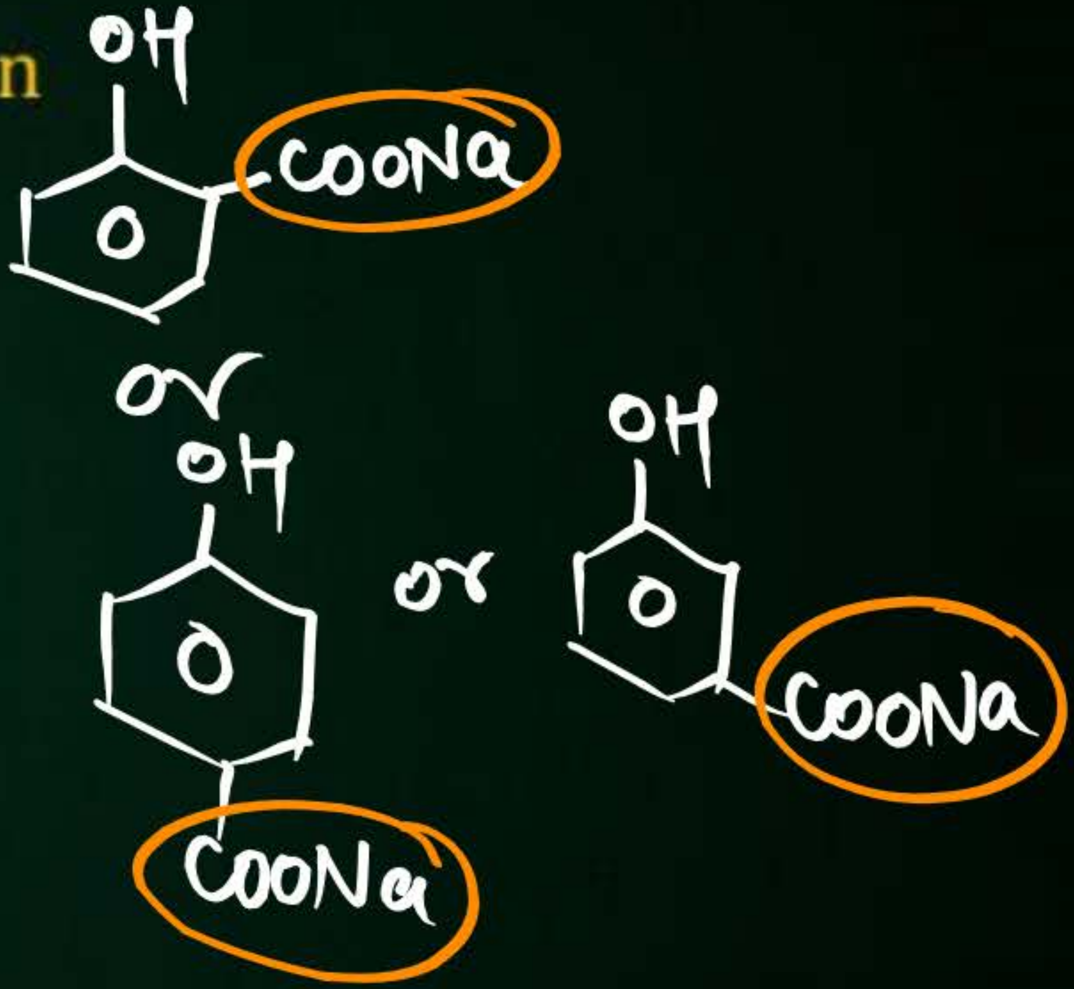
(1) Hydrolysis of chlorobenzene with aqueous KOH solution

(2) Heating Sodium salicylate with NaOH + CaO

(3) Reacting cumene hydroperoxide with dil. H_2SO_4 PhOH =O

(4) Heating benzene diazonium chloride with dil. H_2SO_4

$PhN_2^+Cl^- \xrightarrow{dil\ H^+} PhOH$


OH
COONa
or
OH
COONa
or
OH
COONa

A 1, 2, 3

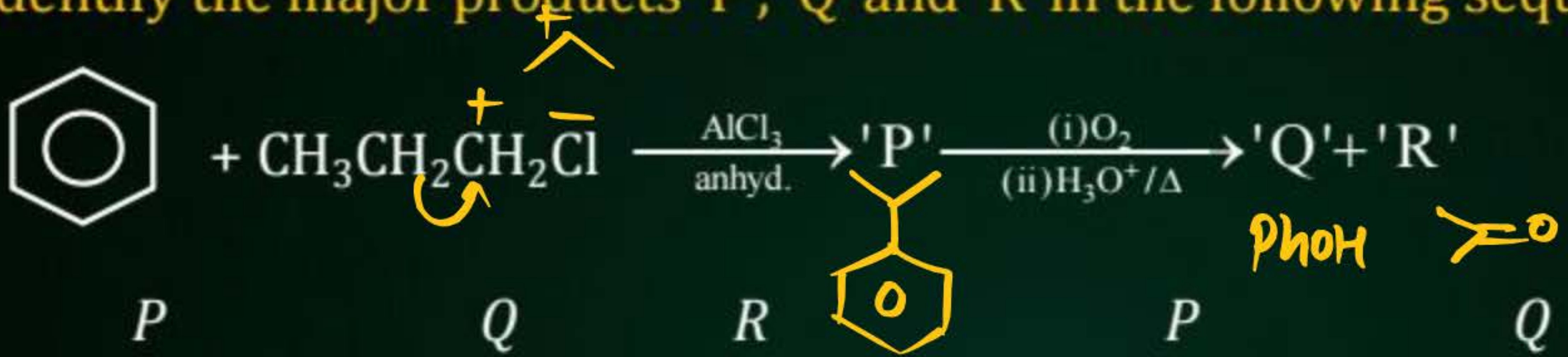
B 1, 2, 3, 4

C 3, 4

D 1, 3, 4

QUESTION

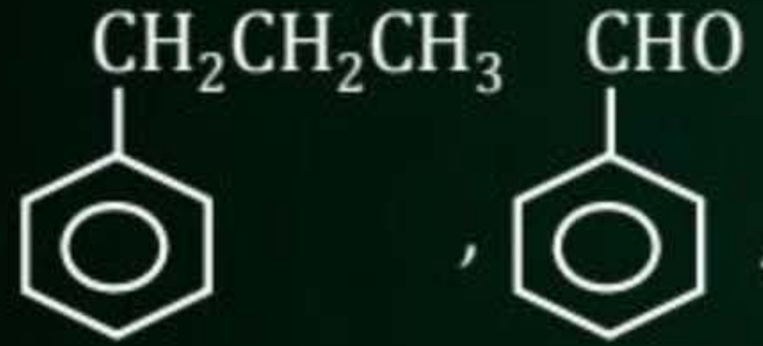
Identify the major products 'P', 'Q' and 'R' in the following sequence of reactions:



$+ CH_3CH_2CH_2Cl$
$AlCl_3$
anhyd.
'P'
(i)O_2
(ii)H_3O^+/Δ
'Q'+'R'
PhOH

P *Q* *R* *P* *Q* *R*

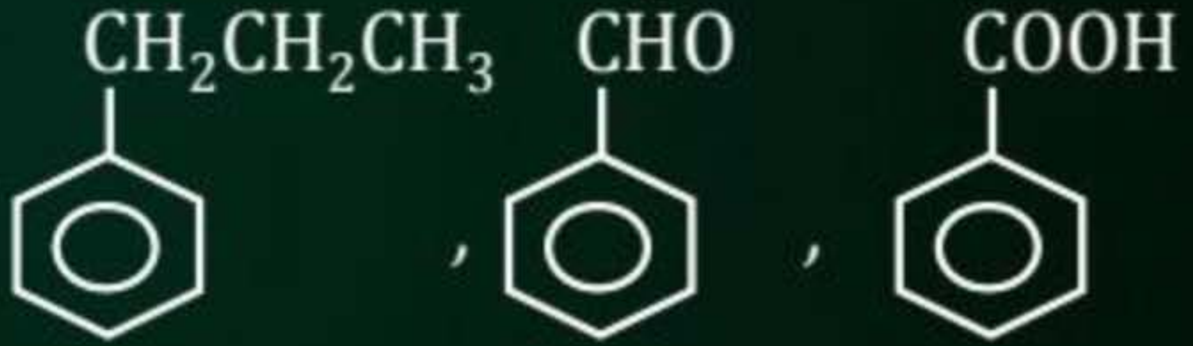
A



$CH_2CH_2CH_3$
CHO

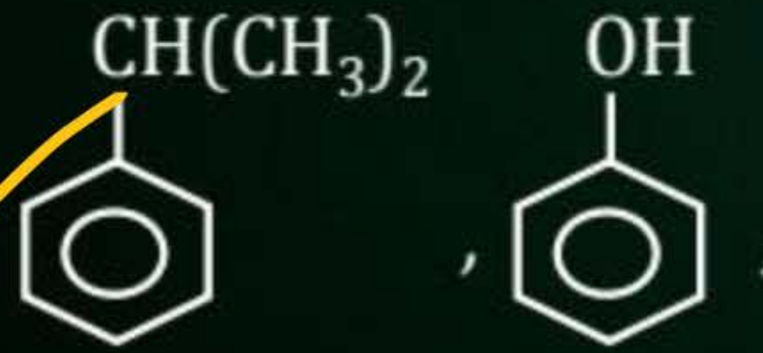
, CH_3CH_2OH

B



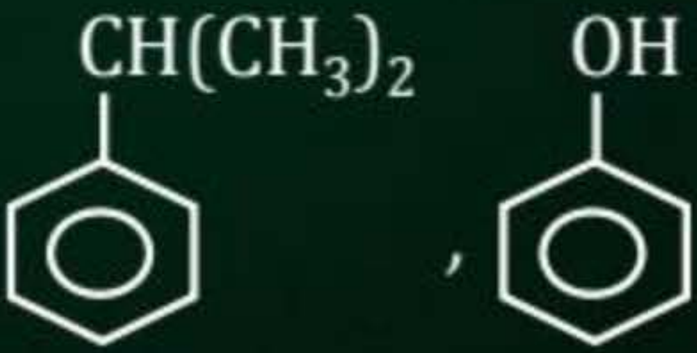
$CH_2CH_2CH_3$
CHO
$COOH$

C



, CH_3COCH_3

D



, $CH_3CH(OH)CH_3$

QUESTION

Benzene diazonium chloride when treated with dil. H_2SO_4 produces

A Benzene

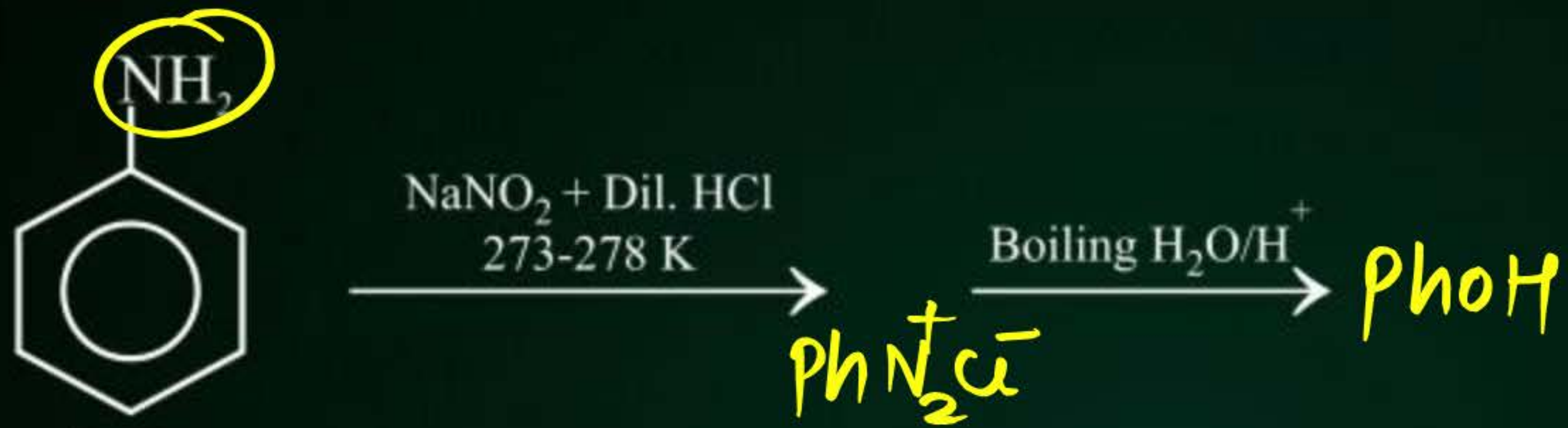
B Benzoic acid

C Toluene

[✓ D Phenol]

eq, electro
ISO, GOC, Hydro
+ 10+
AITS-2
+
AITS-1 30%.

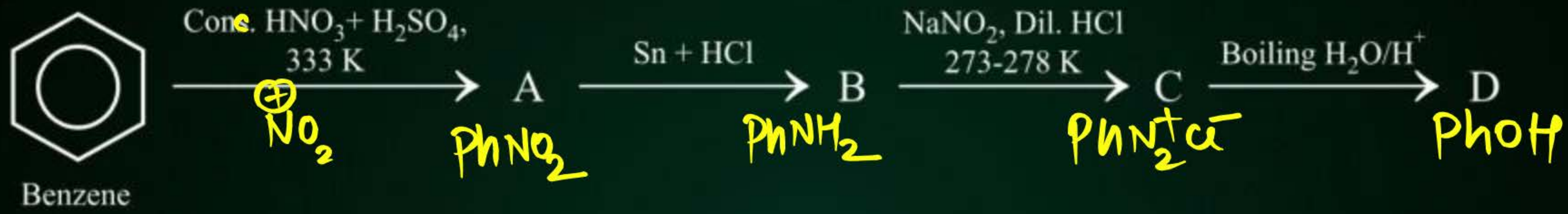
QUESTION



Aniline

$$\xrightarrow[273\text{-}278\ K]{NaNO_2 + \text{Dil. } HCl} PhN_2^+Cl^- \xrightarrow{\text{Boiling } H_2O/H^+} PhOH$$

QUESTION



$$\text{Benzene} \xrightarrow{\substack{\text{Conc. } HNO_3 + H_2SO_4, \\ 333\ K}} A \xrightarrow{Sn + HCl} B \xrightarrow{\substack{NaNO_2,\ \text{Dil. } HCl \\ 273\text{-}278\ K}} C \xrightarrow{\text{Boiling } H_2O/H^+} D$$

$\overset{\oplus}{N}O_2$

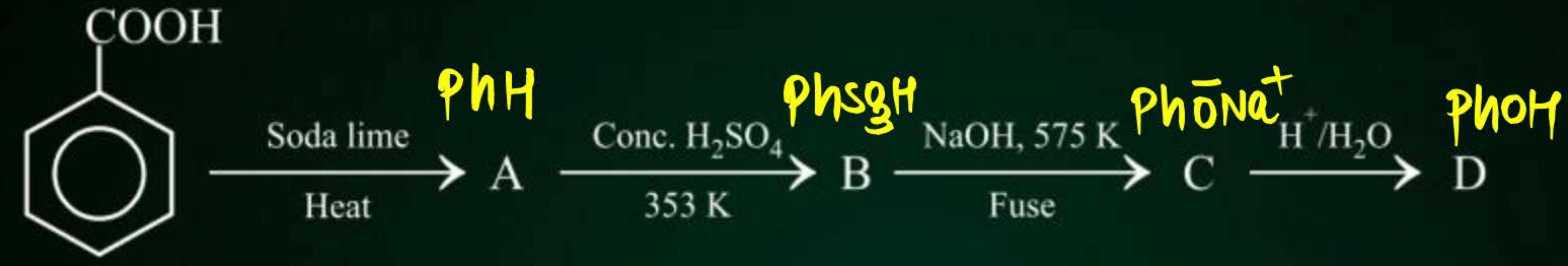
A: $PhNO_2$

B: $PhNH_2$

C: $Ph\overset{+}{N_2}\overset{-}{Cl}$

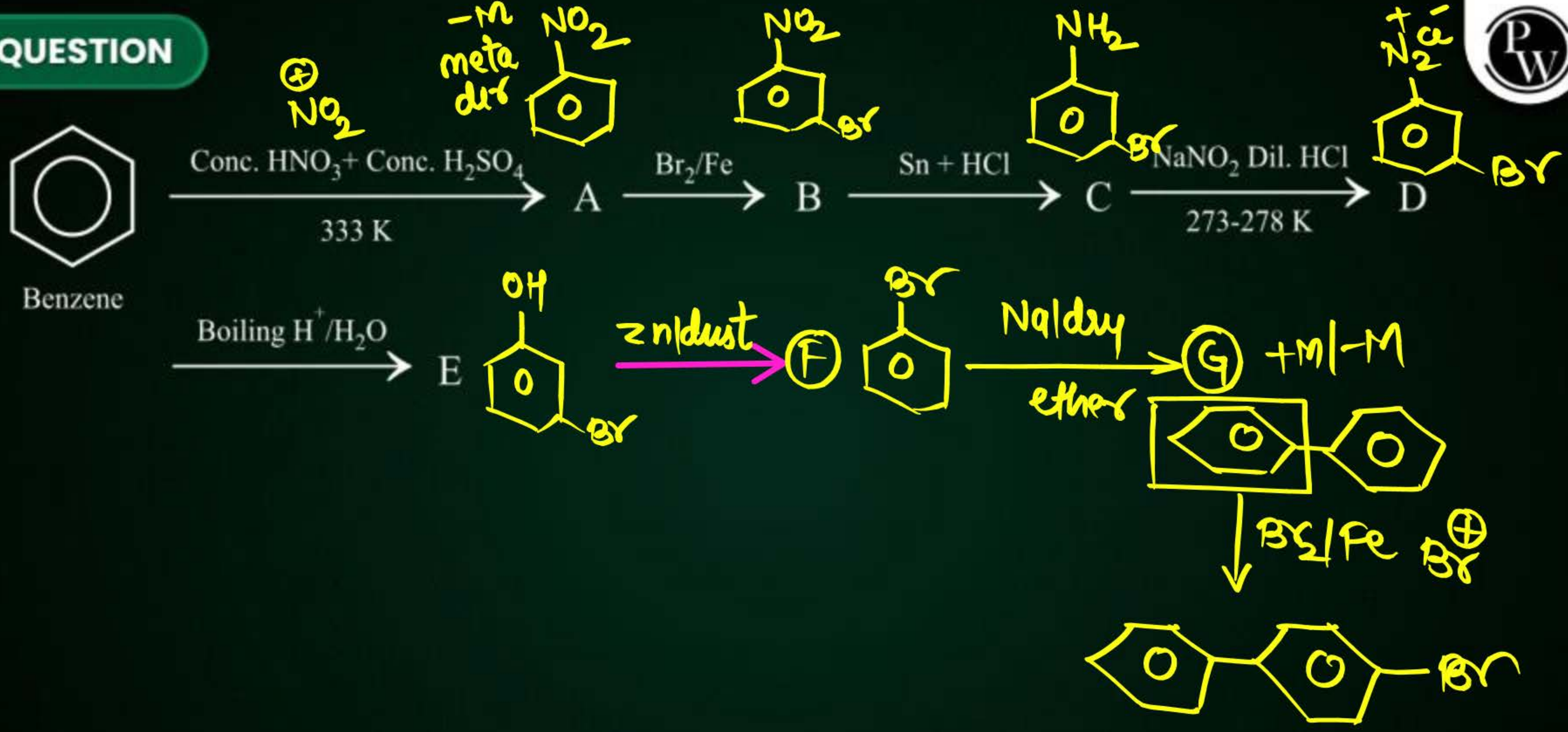
D: $PhOH$

QUESTION


Benzoic acid

$$\text{COOH-C}_6\text{H}_5 \xrightarrow[\text{Heat}]{\text{Soda lime}} \overset{\text{PhH}}{\text{A}} \xrightarrow[\text{353 K}]{\text{Conc. }H_2SO_4} \overset{\text{PhSO}_3\text{H}}{\text{B}} \xrightarrow[\text{Fuse}]{\text{NaOH, 575 K}} \overset{\text{Ph}\bar{\text{O}}\text{Na}^+}{\text{C}} \xrightarrow{H^+/H_2O} \overset{\text{PhOH}}{\text{D}}$$

QUESTION

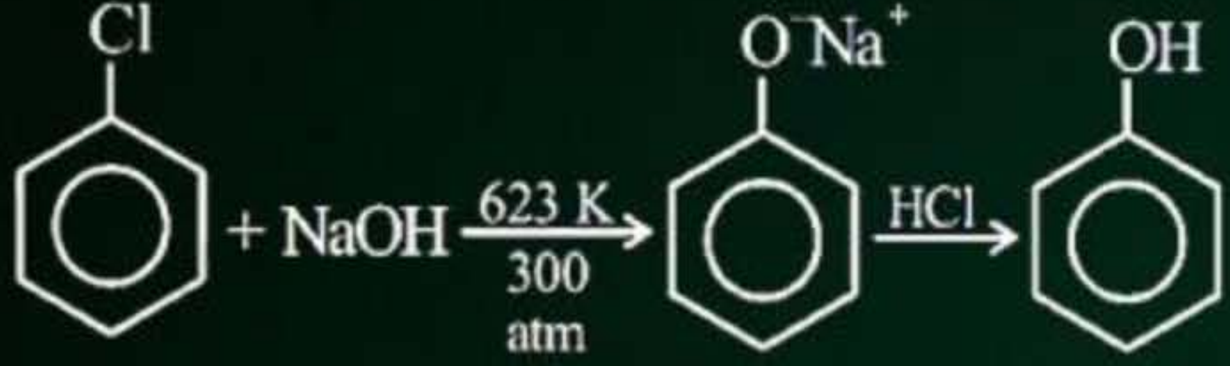

Benzene
Conc. HNO$_3$+ Conc. H$_2$SO$_4$
333 K
A
Br$_2$/Fe
B
Sn + HCl
C
NaNO$_2$ Dil. HCl
273-278 K
D
Boiling H$^+$/H$_2$O
E
⊕ NO$_2$
-M
meta dir
NO$_2$
NO$_2$
Br
NH$_2$
Br
N$_2^+$Cl$^-$
Br
OH
Br
Zn/dust
F
Br
Na/dry
ether
G
+M/-M
Br$_2$/Fe
Br$^{\oplus}$
Br

Home Work

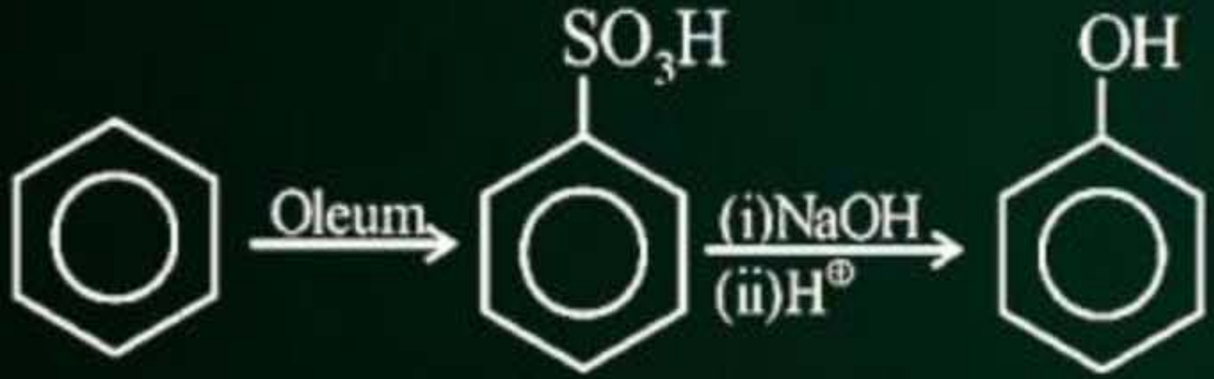
QUESTION 01

Identify which is/are the correct method(s) to synthesis the phenol?

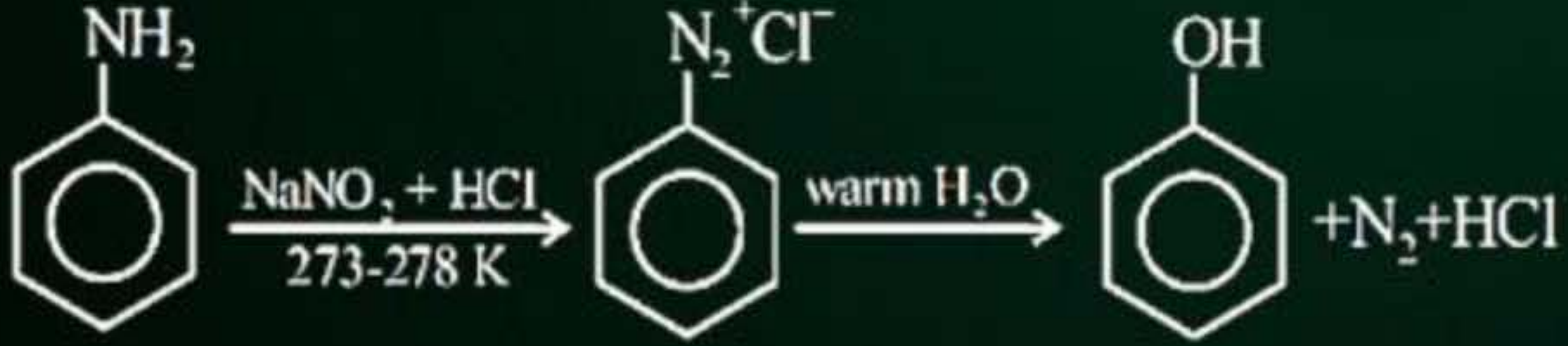
A


Cl
+ NaOH
623 K
300 atm
O⁻Na⁺
HCl
OH

B


Oleum
SO₃H
(i)NaOH
(ii)H⊕
OH

C


NH₂
NaNO₂ + HCl
273-278 K
N₂⁺Cl⁻
warm H₂O
OH
+N₂+HCl

D All of the above

QUESTION 02

When sodium benzene sulphonate is fused with sodium hydroxide (solid), the product formed is:

(A) benzene

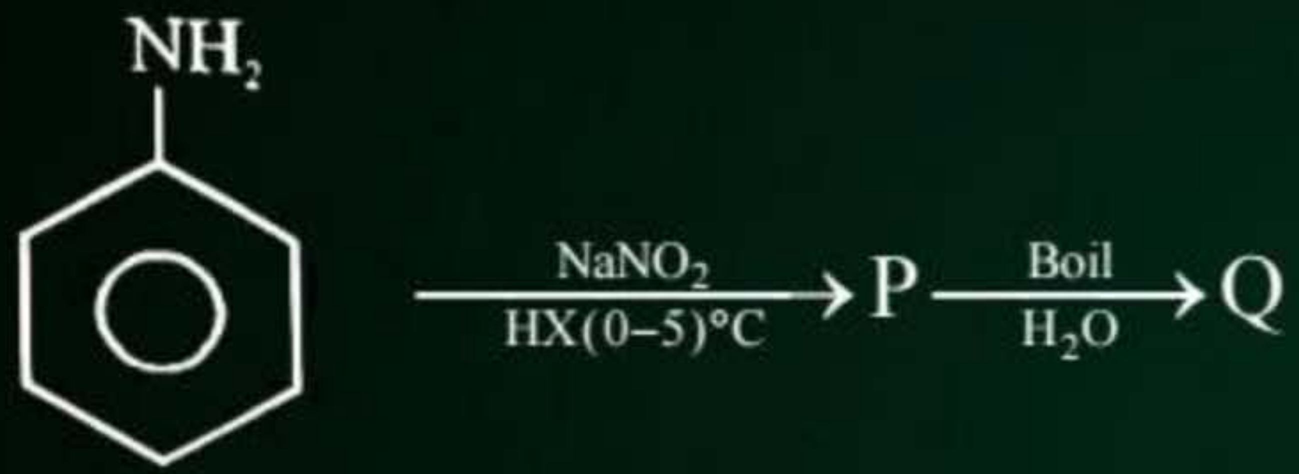
(B) phenol

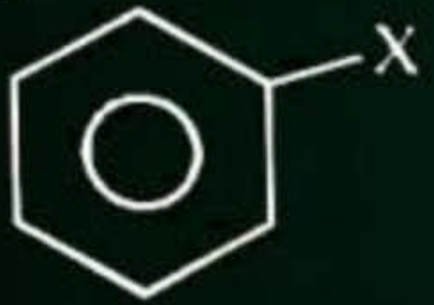
(C) benzene triphenol

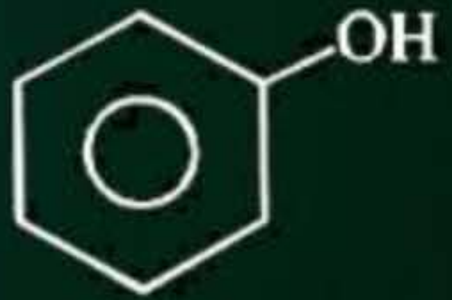
(D) none of these

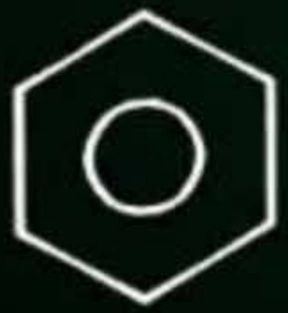
QUESTION 03

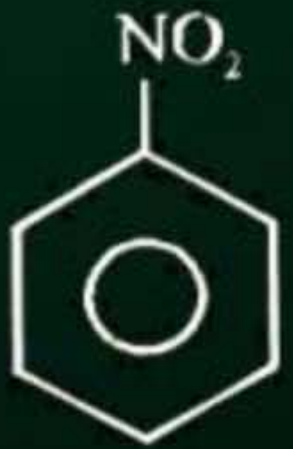
The product Q in the following reaction sequence is:


NH_2
$NaNO_2$
HX(0–5)°C
P
Boil
H_2O
Q

A


B


C


D


QUESTION 04

Benzene diazonium chloride on hydrolysis gives:

Ⓐ benzene

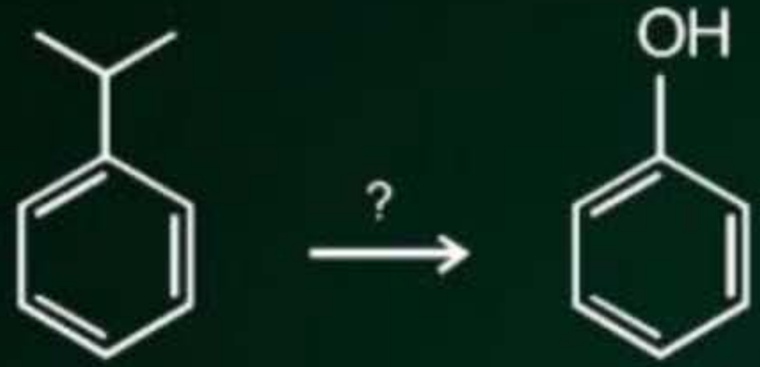
Ⓑ benzyl alcohol

Ⓒ phenol

Ⓓ chlorobenzene

QUESTION 05

Reagents required to perform the given transformation is:



A (i) O_2 oxidation (ii) H_3O^+

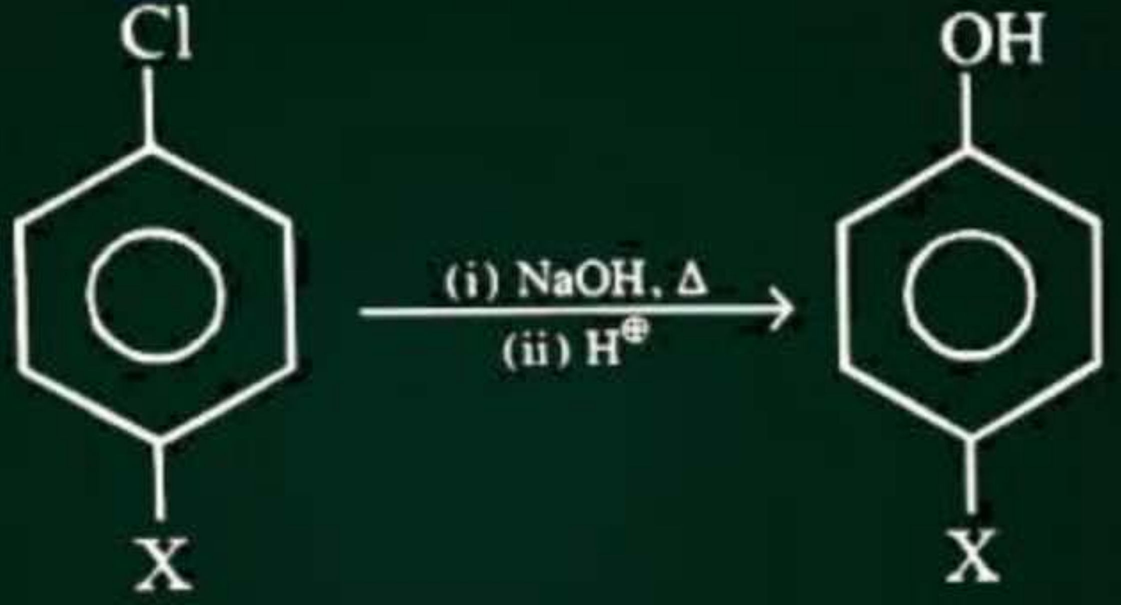
B (i) $KMnO_4$, hot (ii) $LiAlH_4$ (iii) H_3O^+

C (i) Hot $KMnO_4$ (ii) $NaBH_4$ (iii) H_3O^+

D (i) H_2CrO_4 (ii) $CaO + NaOH, \Delta$ (iii) $NaOH$

QUESTION 06

For the following reaction, best possible X is:


Cl
X
(i) NaOH, Δ
(ii) H⊕
OH
X

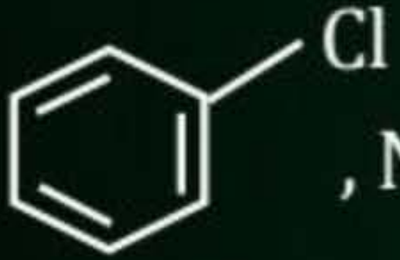
- **A** CH_3
- **B** OCH_3
- **C** H
- **D** NO_2

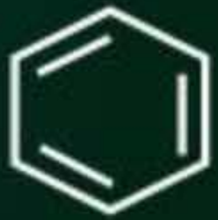
QUESTION 07

Which one of the following reaction sequence is incorrect method to prepare phenol?

(A) Aniline, $NaNO_2 + HCl$, H_2O heating

(B) Cumene, O_2, H_3O^+

(C)  , NaOH STP condition

(D)  , oleum, NaOH, H_3O^+

QUESTION 08

Cumene $\xrightarrow[\text{(ii) } H_2O,\ H^+]{\text{(i)} O_2}$ (X) and (Y);

(X) and (Y) respectively are:

Ⓐ toluene, propene

Ⓑ toluene, propyl chloride

Ⓒ phenol, acetone

Ⓓ phenol, acetaldehyde

ANSWER KEY

1. D
2. B
3. B
4. C
5. A
6. D
7. C
8. C

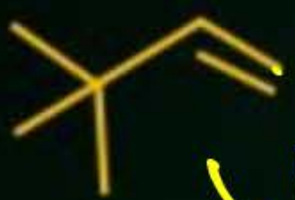
Home Work From PW Module (Yakeen NEET)

Prarambh: Q 25, 27, 31

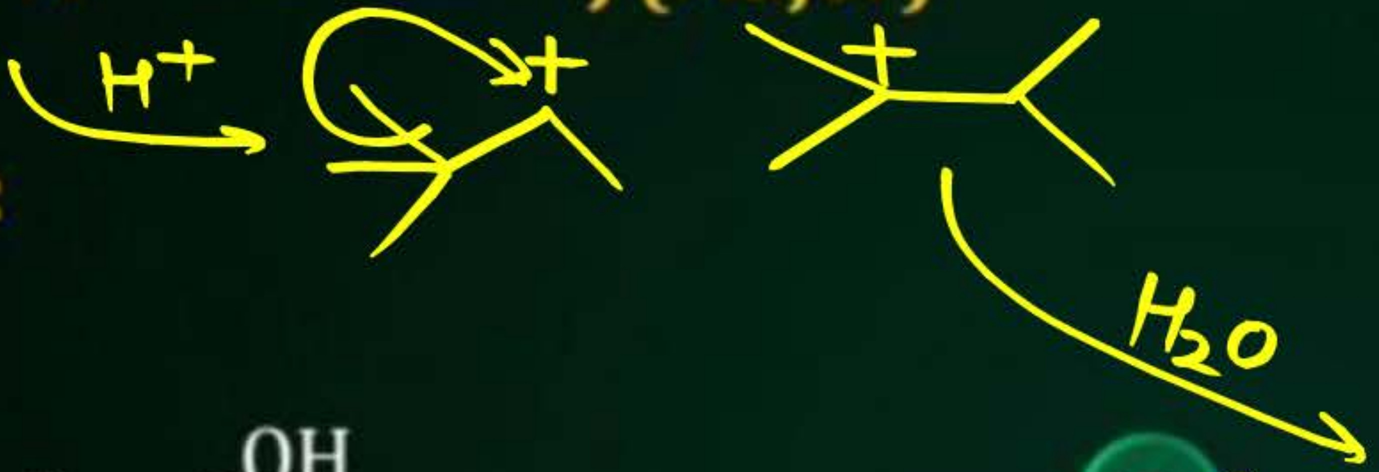
Home Work

Discussion of L-01

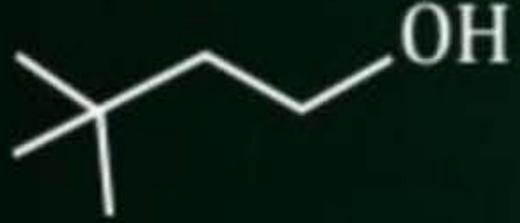
QUESTION 01

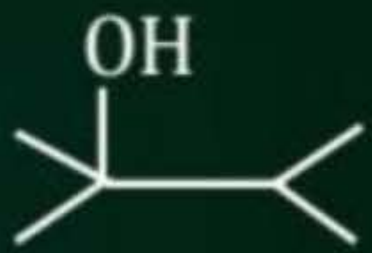


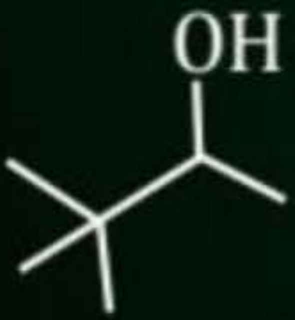
$\xrightarrow{H^+/H_2O}$ J (Major)

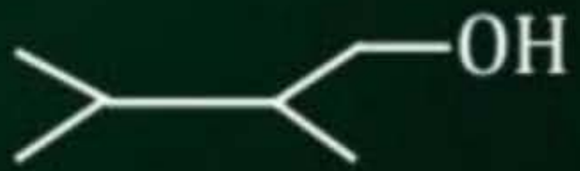


J is:

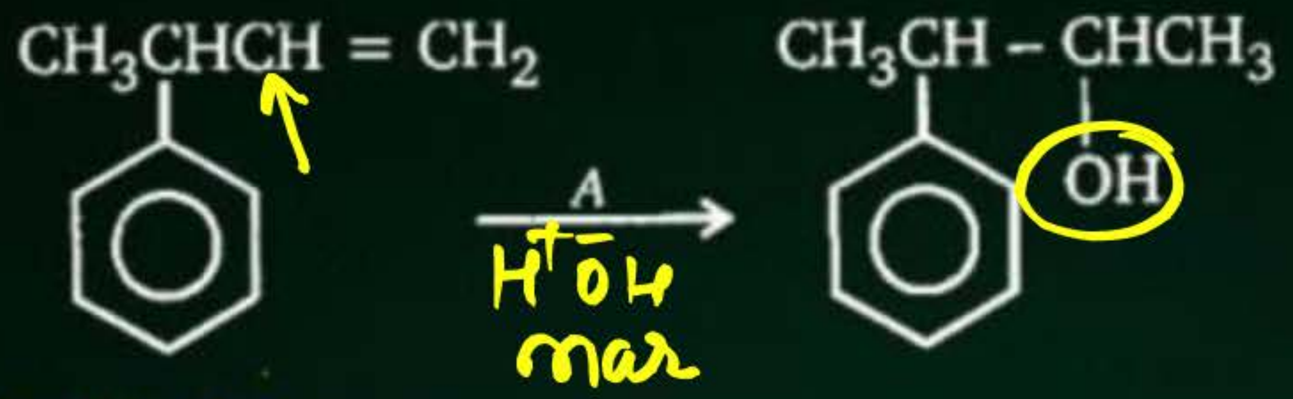
(A) 

(B) ✓ 

(C) 

(D) 

QUESTION 2


CH3CHCH = CH2
A
H+ OH-
mar
CH3CH - CHCH3
OH

Reagent A may be:

(A) H_2O/H^+

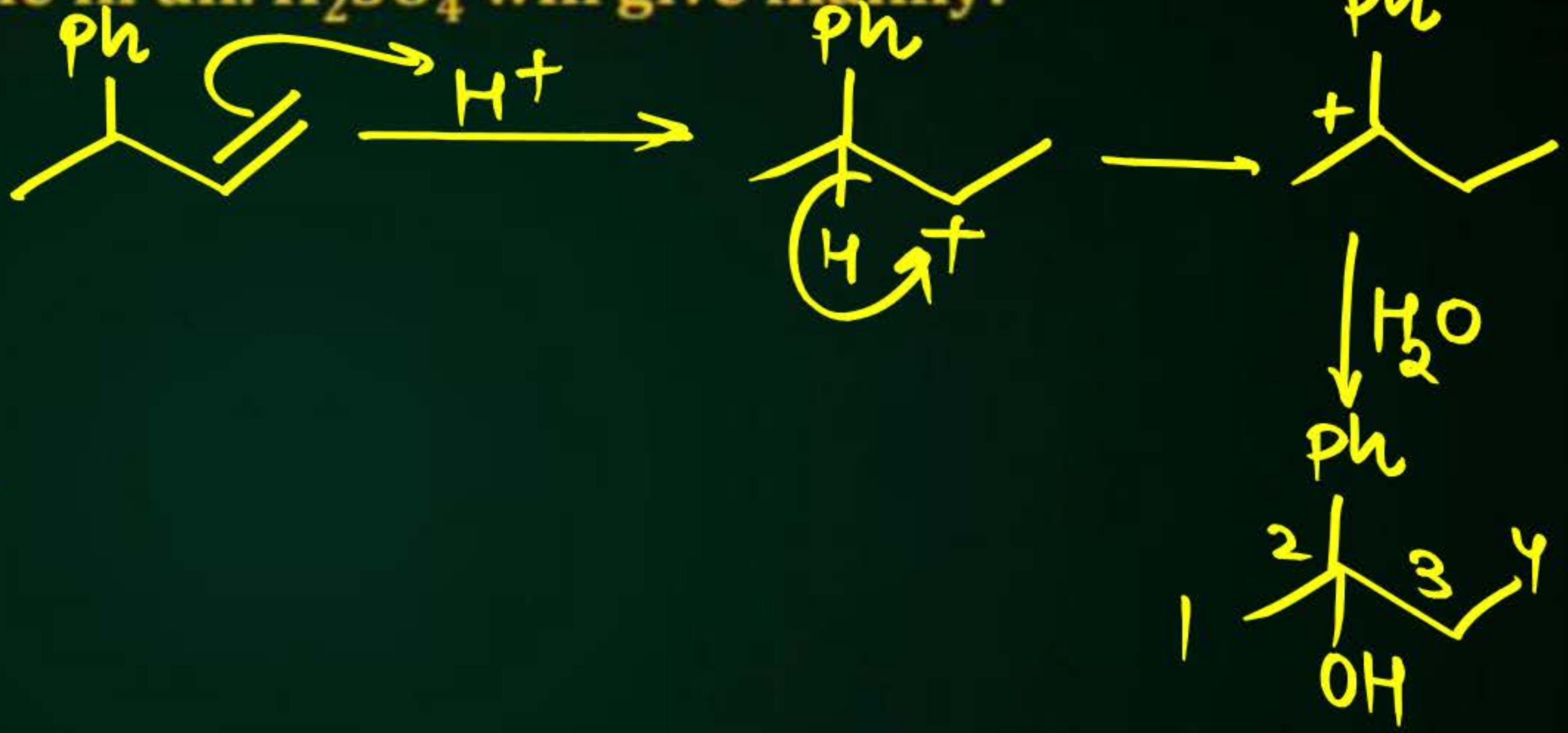
(B) $BH_3.THF/H_2O_2—OH^-$

[✓ (C)] $Hg(OCOCH_3)_2.THF/NaBH_4$

(D) All are possible

QUESTION 03

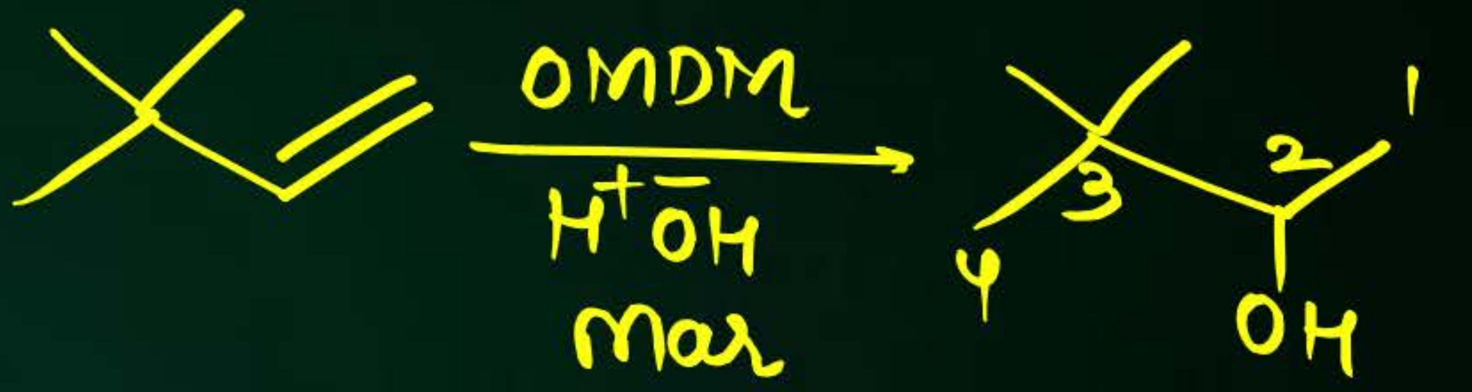
Hydration of 3-phenyl but-1-ene in dil. H_2SO_4 will give mainly:


Ph
H^+
Ph
H
+
Ph
+
H_2O
Ph
1
2
3
4
OH

- A 3-Phenyl butan-1-ol
- B 3-Phenyl butan-2-ol
- [✓ C] 2-Phenyl butan-2-ol
- D 2-Phenyl butan-1-ol

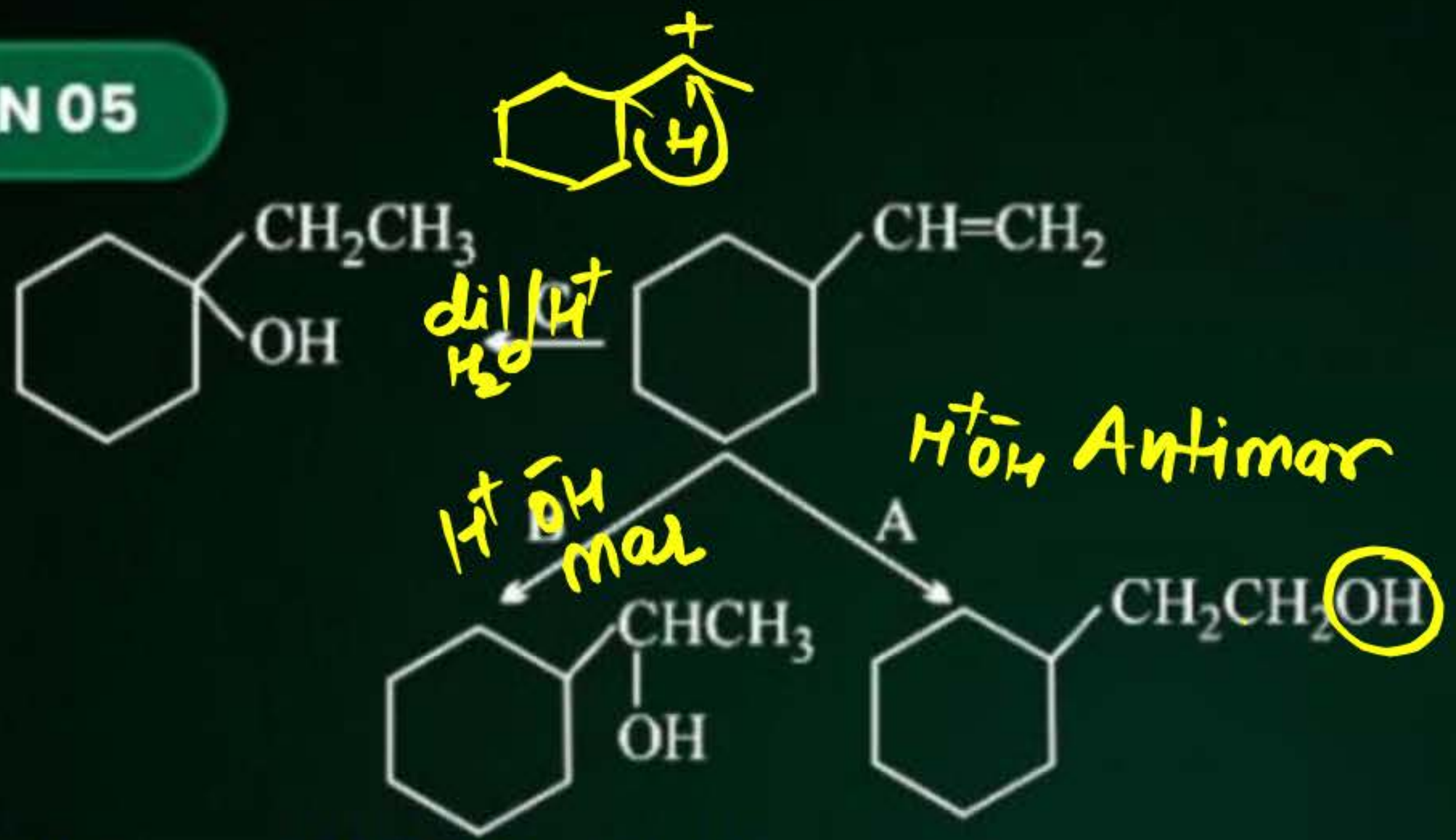
QUESTION 04

Oxymercuration-demercuration of 3,3-dimethyl but-1-ene gives which alcohol?



- A 2,3-dimethyl butan-2-ol
- B 2,3-dimethyl butan-1-ol
- [✓ C] 3,3-dimethyl butan-2-ol
- D 3,3-dimethyl butan-1-ol

QUESTION 05


CH$_2$CH$_3$
OH
dil H$^+$
H$_2$O
CH=CH$_2$
H$^+$ $\bar{O}H$ Antimar
H$^+$ $\bar{O}H$
mar
B
A
CHCH$_3$
OH
CH$_2$CH$_2$OH

Select schemes A, B, C out of

I. acid catalysed hydration II HBO

III oxymercuration-demercuration

(A) I in all cases

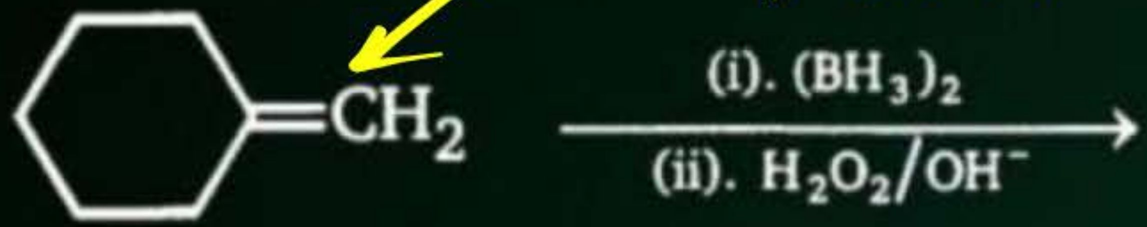
(B) I, II, III

[✓ (C)] II, III, I

(D) III, I, II

QUESTION 06

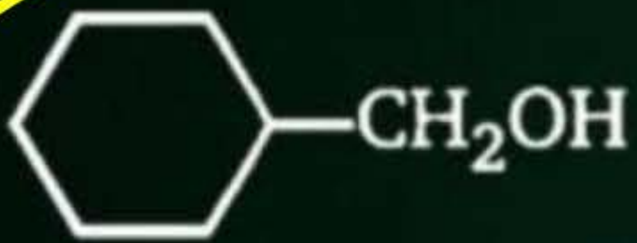
$H^+ \overline{OH}$ Antimar



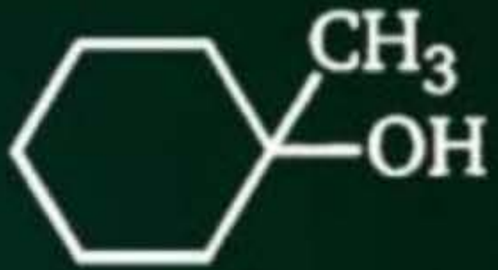
$=CH_2$
(i). $(BH_3)_2$
(ii). H_2O_2/OH^-

(P). Product (P) in the reaction is:

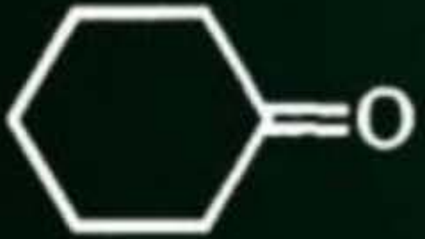
[✓ A]



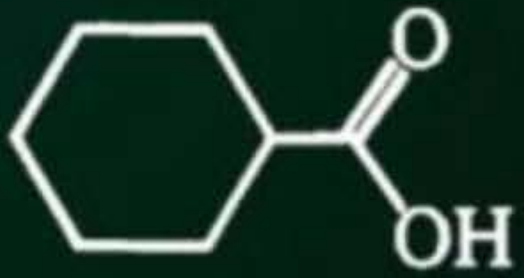
B



C

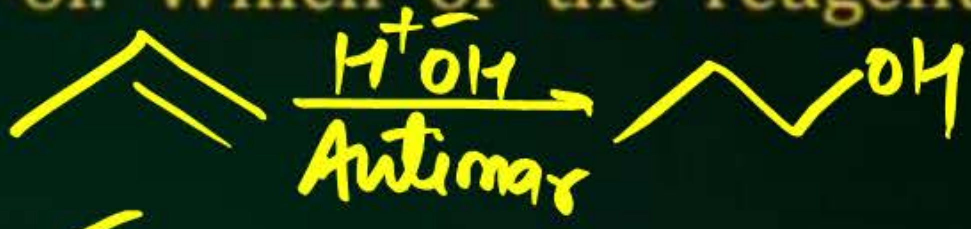


D



QUESTION 07

Propene can be converted into propan-1-ol. Which of the reagents among the following is ideal to affect the conversion?



A Alkaline $KMnO_4$

[✓ B] B_2H_6 and alkaline H_2O_2

C O_3/Zn

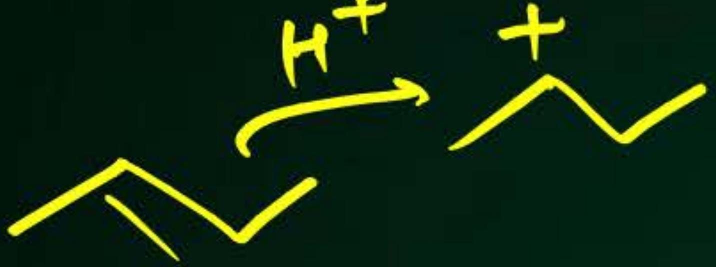
D OsO_4/CH_2Cl_2

QUESTION 08

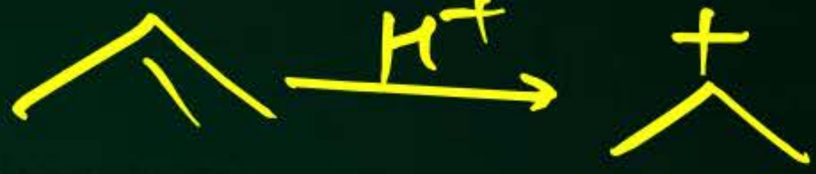
C^+ Mech

Which of the following alkenes on acid-catalysed hydration gives a tertiary alcohol?

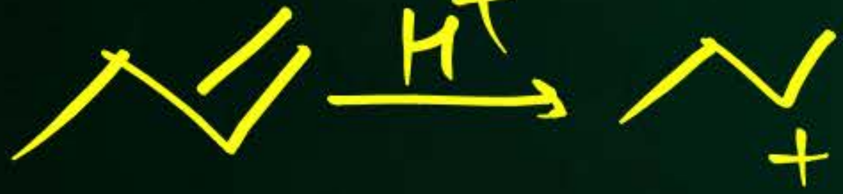
Ⓐ But-2-ene



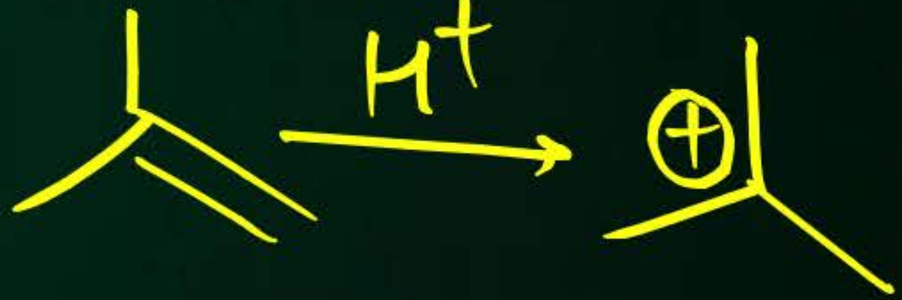
Ⓑ Propene



Ⓒ But-1-ene

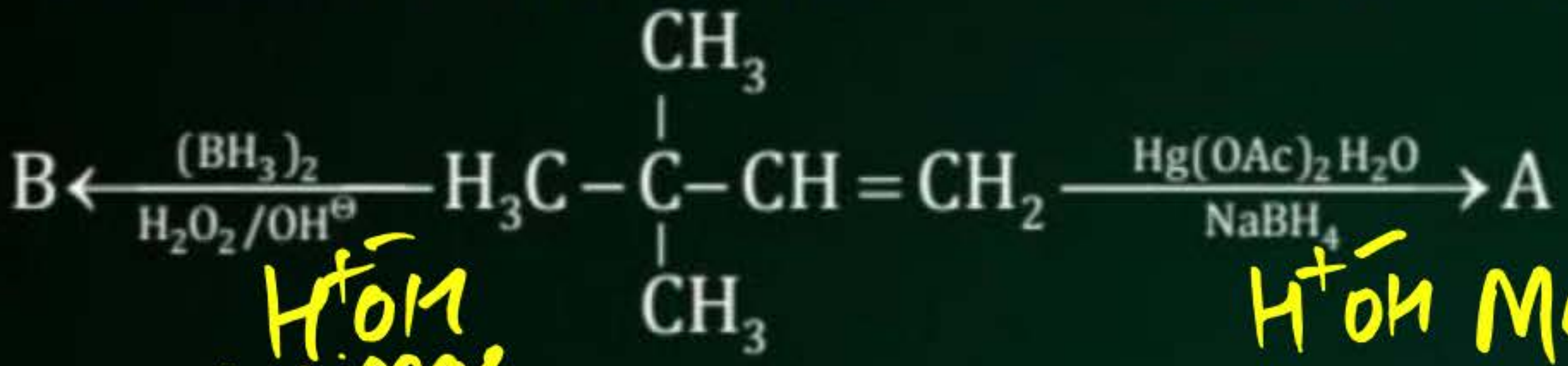


[✓ Ⓓ] 2-Methylpropene



QUESTION ⑨

Choose the correct option for the following reactions.



$$B \xleftarrow[H_2O_2/OH^{\ominus}]{(BH_3)_2} H_3C-\overset{\displaystyle CH_3}{\underset{\displaystyle CH_3}{\overset{|}{\underset{|}{C}}}}-CH=CH_2 \xrightarrow[NaBH_4]{Hg(OAc)_2\,H_2O} A$$

$H^+\overline{O}H$ Antimar

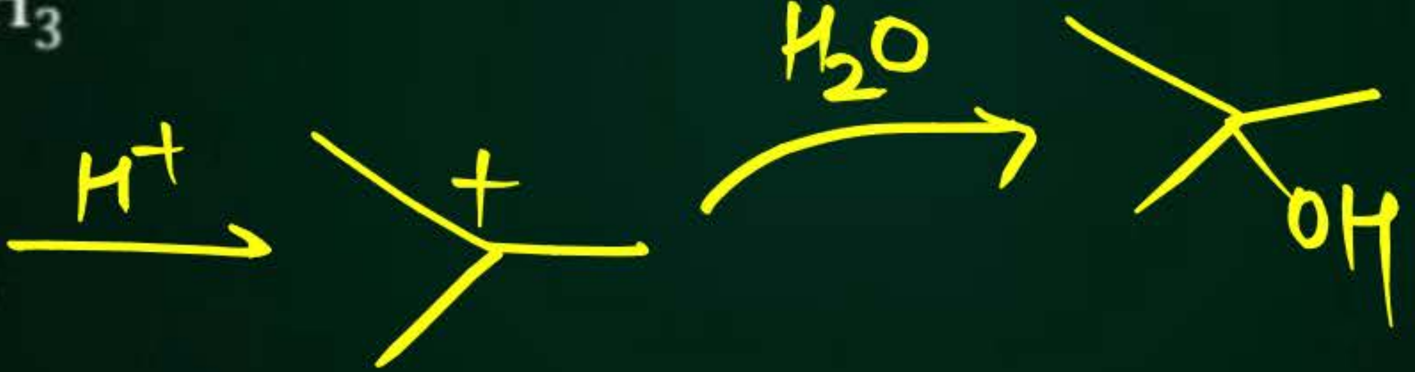
$H^+\overline{O}H$ Mar

- Ⓐ 'A' and 'B' are both Markovnikov addition products.
- [✓ Ⓑ] 'A' is Markovnikov product and 'B' is anti-Markonikov Product.
- Ⓒ 'A' and 'B' are both anti-Markovnikov products.
- Ⓓ 'B' is Markovnikov and 'A' is anti-Markovnikov product.

QUESTION 10

Among the following alkenes, which one produces tertiary butyl alcohol on acidic hydrolysis?

- A $CH_3CH_2CH = CH_2$
- B $CH_3CH = CHCH_3$
- [✓ C] $(CH_3)_2C = CH_2$
- D $CH_3CH = CH_2$



ANSWER KEY

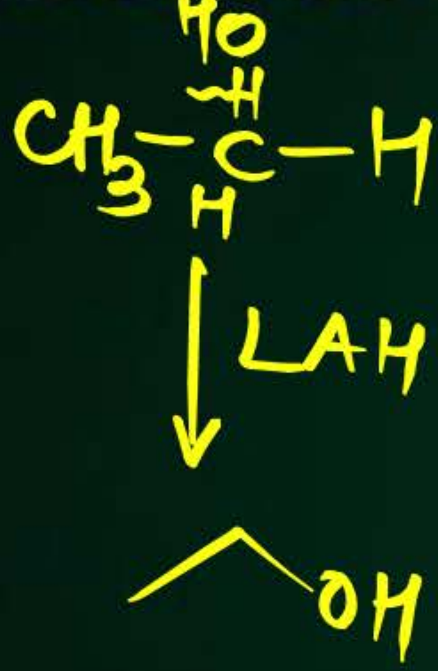
1.B
2.C
3.C
4.C
5.C
6.A
7.B
8.D
9.B
10.C

Home Work

Discussion of L-02

QUESTION 01

When acetaldehyde is reacted with $LiAlH_4$, the product formed is:


HO
H
CH_3
C
H
H
LAH
OH

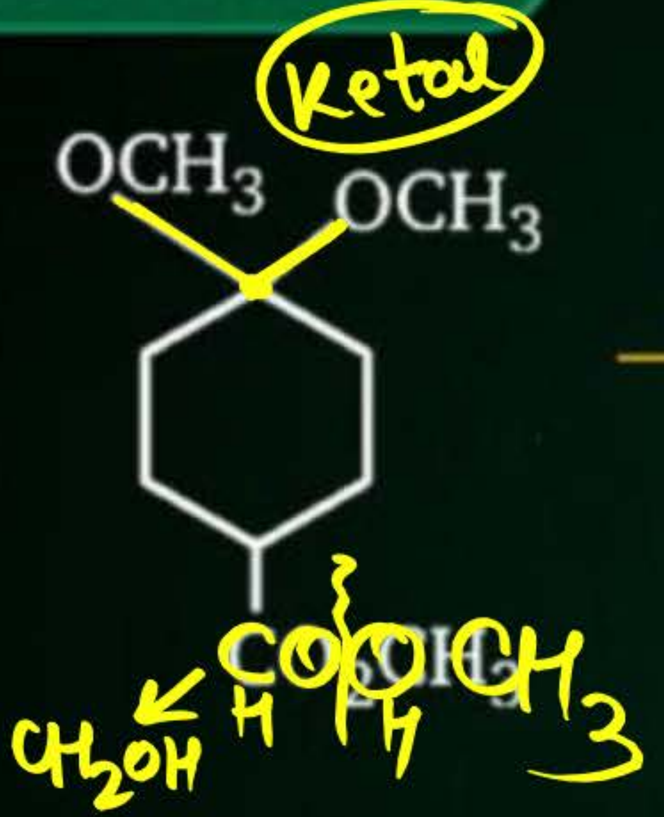
(A) CH_3COOH

[✓ (B)] CH_3CH_2OH

(C) CH_3OH

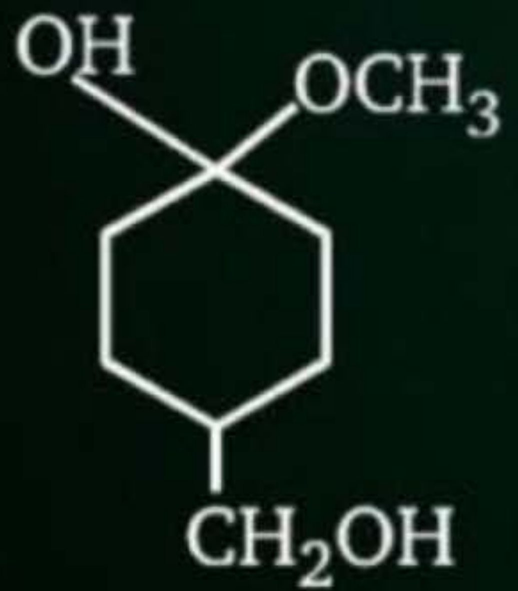
(D) HCOOH

QUESTION 02

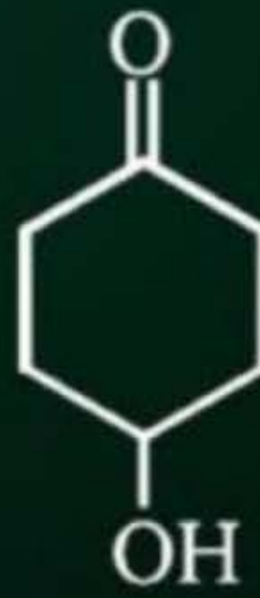

Ketal
OCH3
OCH3
COOCH3
H
H
CH2OH

$\xrightarrow{LiAlH_4}$ (A) Major: Product (A) is:

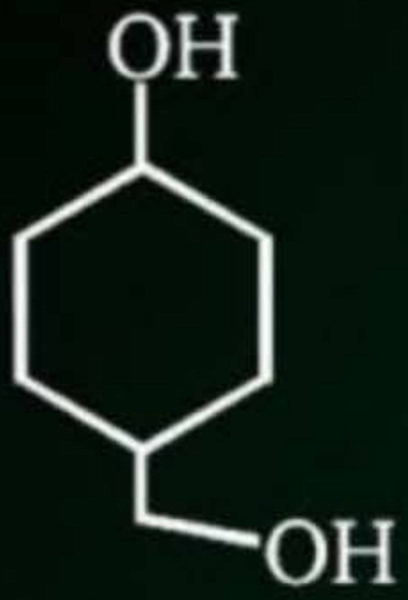
A


OH
OCH3
CH2OH

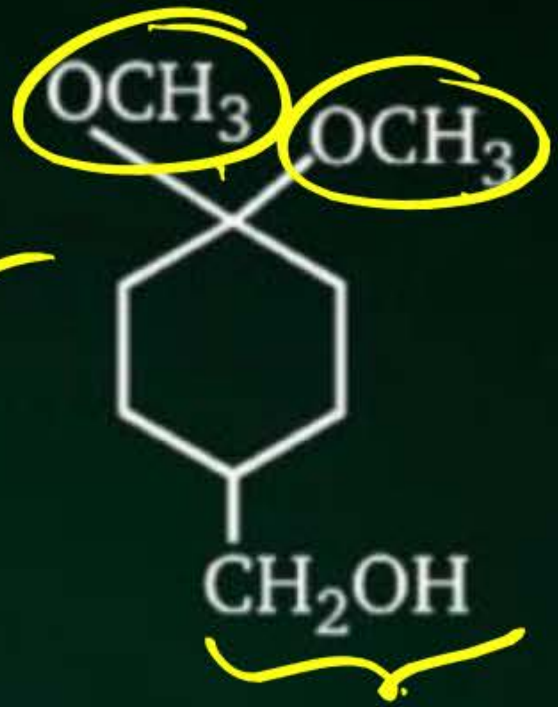
B



Ⓒ

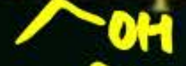

OH
OH

✓ Ⓓ


OCH3
OCH3
CH2OH

QUESTION ③

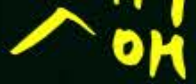
The compound which on reduction with $LiAlH_4$ gives two alcohols:

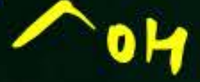


CH_3OH

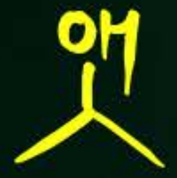
✓ (A) CH_3COOCH_3 H H

(B) $CH_3COOC_2H_5$ H H





(C) CH_3COCH_3

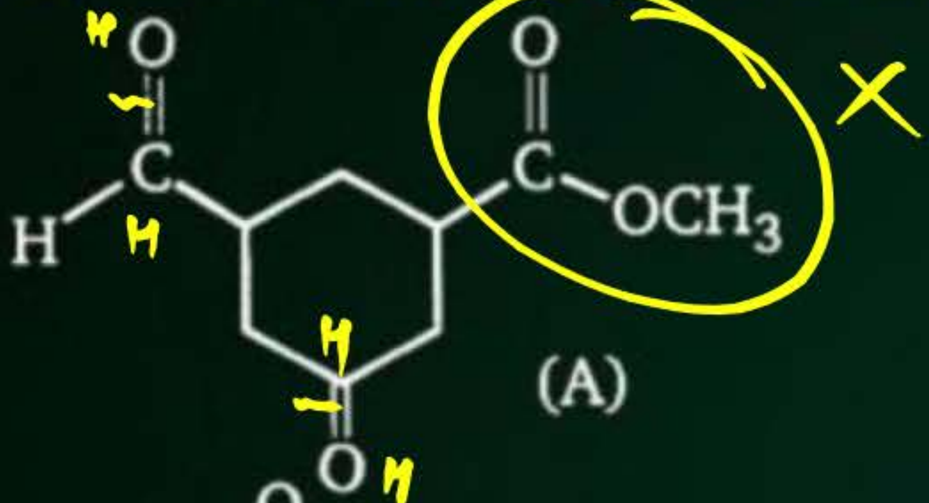


(D) CH_3CHO

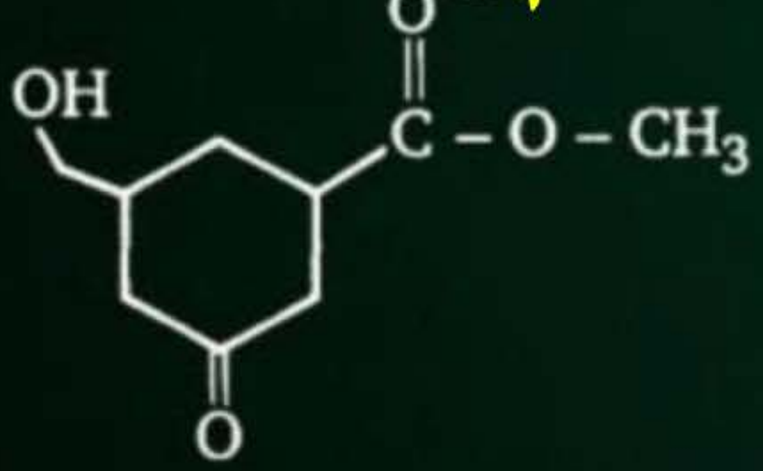
CH_3CH_2OH

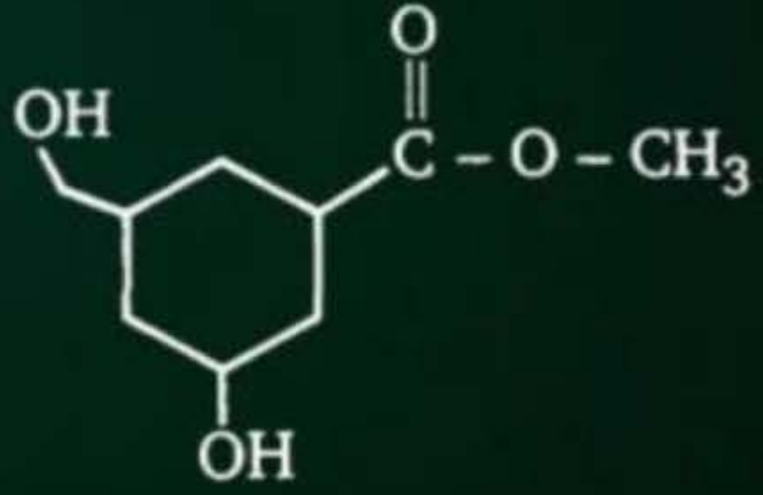
QUESTION ④

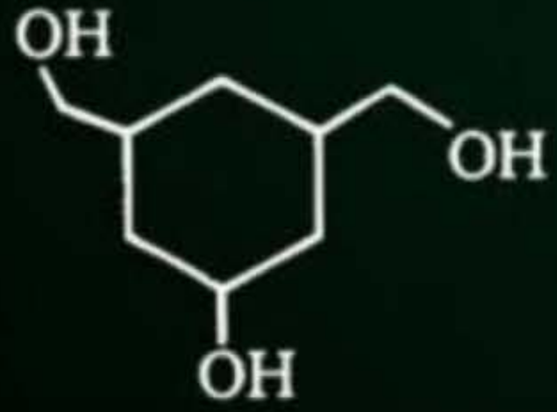
Predict the product when given compound reacts with NaBH$_4$:

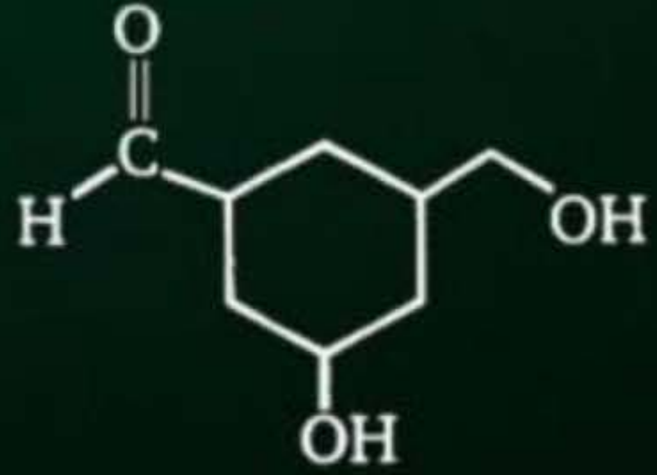

H
O
H
C
H
O
C
OCH$_3$
H
O
H
×

(A)

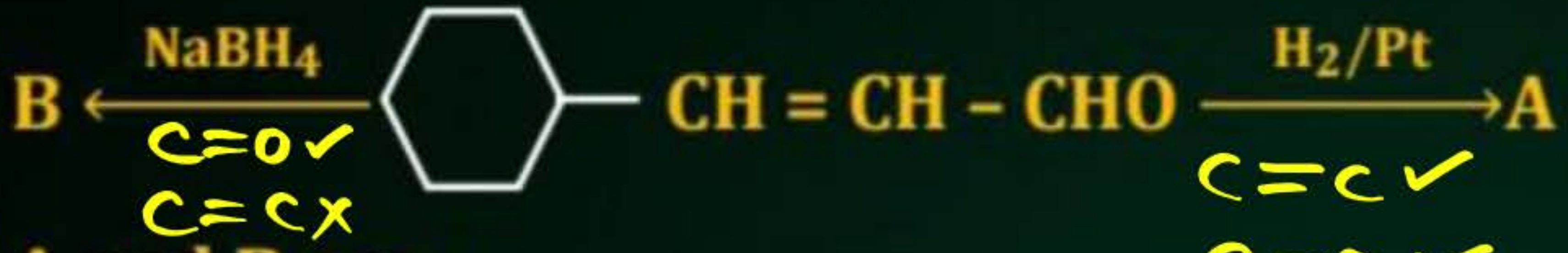
Ⓐ


✓ Ⓑ

OH
O
C – O – CH$_3$
OH

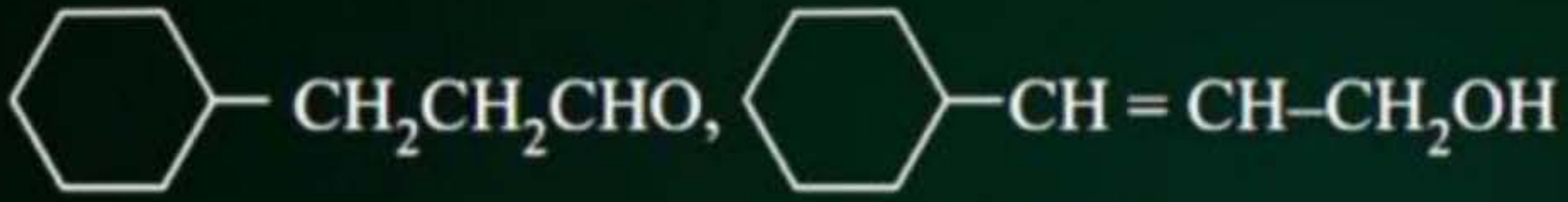
Ⓒ


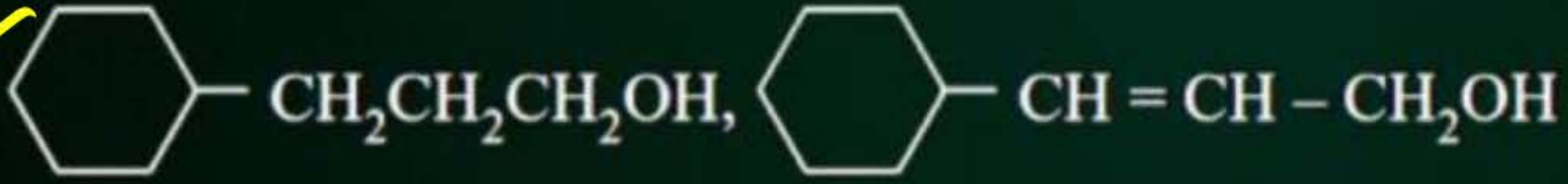
Ⓓ


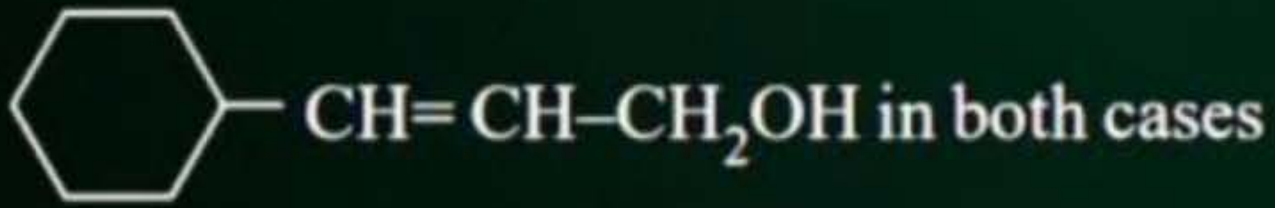
QUESTION ⑤

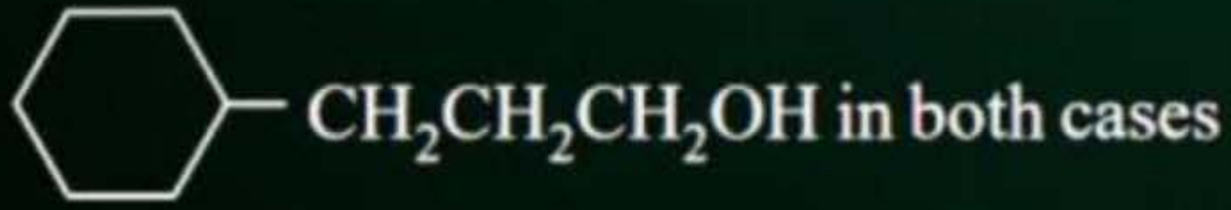

B
NaBH4
C=O ✓
C=C ✗
CH = CH - CHO
H2/Pt
C=C ✓
C=O ✓
A

A and B are:

A

CH2CH2CHO,
CH = CH–CH2OH

B ✓

CH2CH2CH2OH,
CH = CH – CH2OH

C

CH= CH–CH2OH in both cases

D

CH2CH2CH2OH in both cases

QUESTION (NCERT Exemplar) ⑥

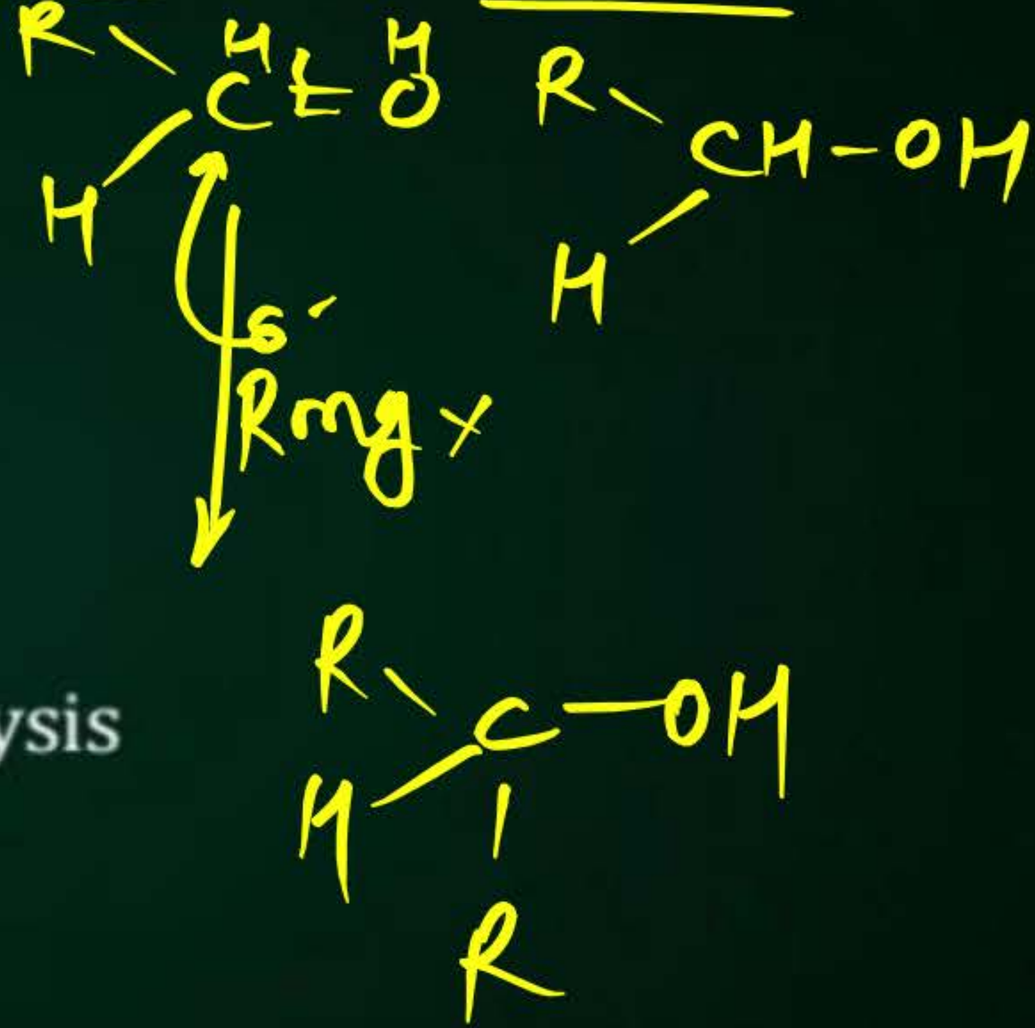
Which of the following are not used to convert RCHO into RCH_2OH?

A H_2/Pd

B $LiAlH_4$

C $NaBH_4$

[✓ D] Reaction with RMgX followed by hydrolysis


R
H
C = O
H
δ-
RMgX
R
CH–OH
H
R
C–OH
H
R

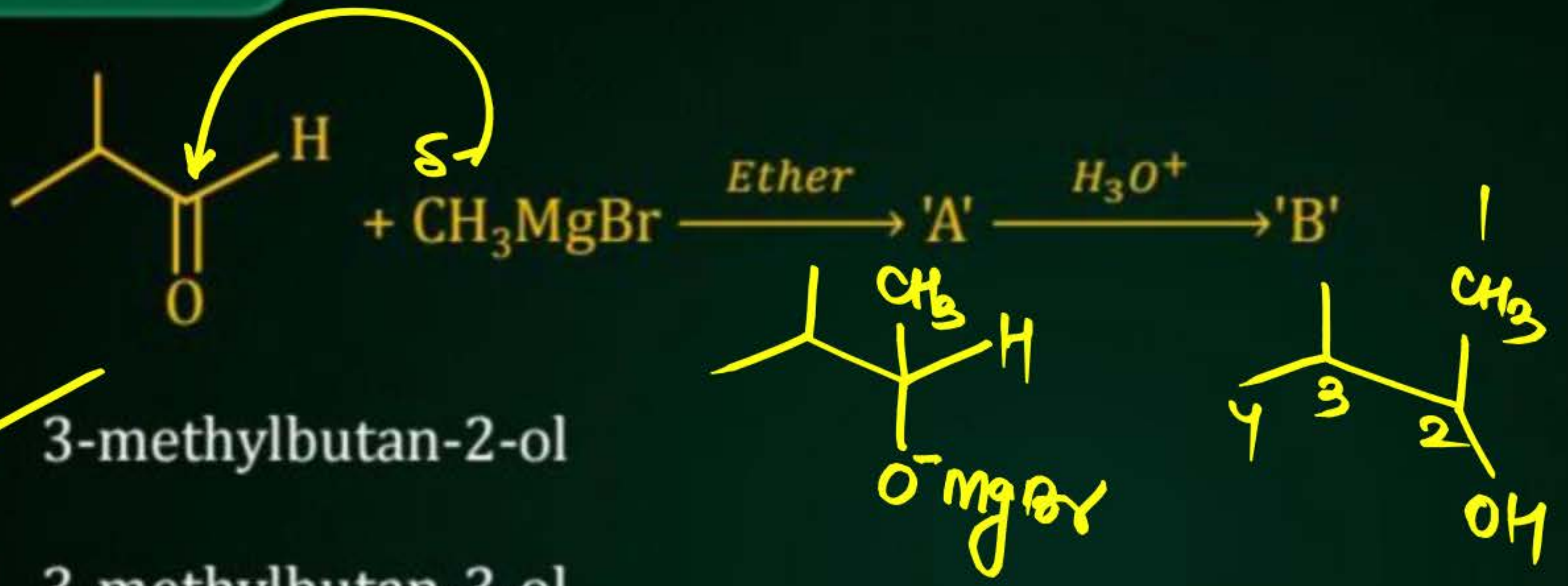
ANSWER KEY

1. B
2. D
3. A
4. B
5. B
6. D

Home Work

Discussion of L-03

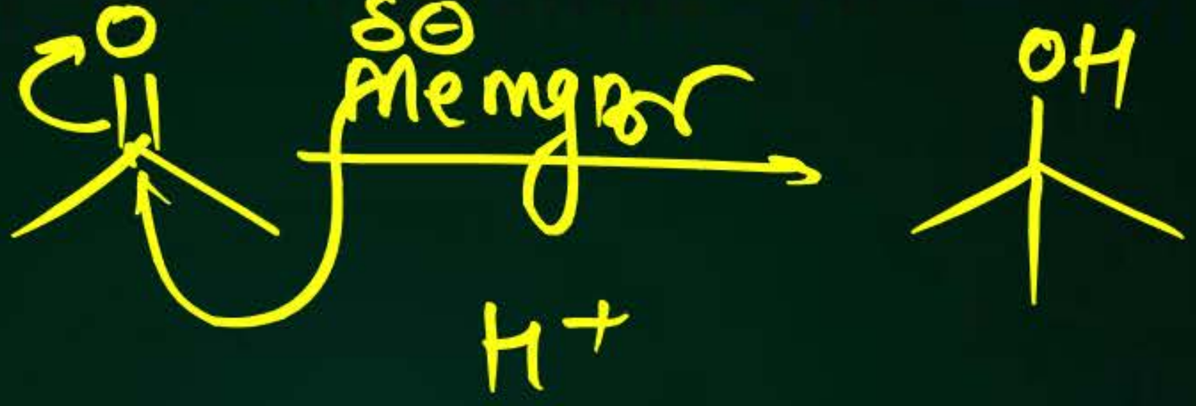
QUESTION 01


H
O
δ-
+ CH_3MgBr
Ether
'A'
H_3O^+
'B'
CH_3
H
O^-MgBr
CH_3
4
3
2
OH

- [✓ A] 3-methylbutan-2-ol
- B 3-methylbutan-3-ol
- C 2-methylbutan-2-ol
- D pentan-2-ol

QUESTION 02

Acetone on reaction with methyl magnesium bromide followed by hydrolysis gives.



A Secondary alcohol

B Tertiary alcohol ✓

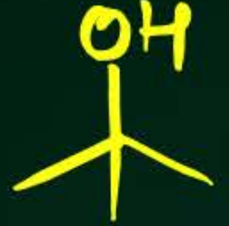
C Carboxylic acid

D Alkane

QUESTION 03

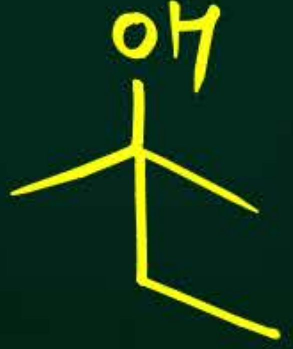
Which of the following are the starting materials for the Grignard's synthesis of *tert.* butyl alcohol?

(A) $\overset{\delta-}{C}H_3MgI + CH_3COCH_3 \longrightarrow$

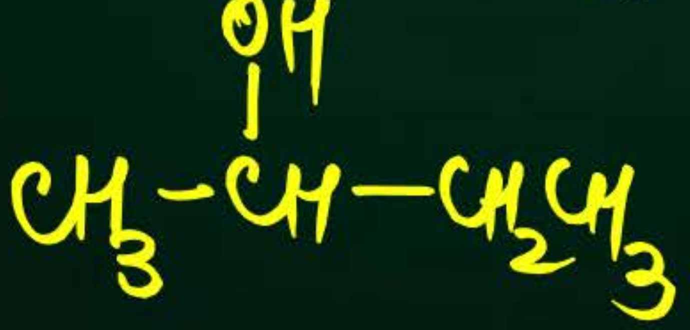


(B) $\overset{\ominus}{C}H_3MgI + CH_3CHO\overset{\oplus}{H}CH_3 \longrightarrow CH_4$

(C) $CH_3\overset{\delta-}{C}H_2MgBr + CH_3COCH_3 \longrightarrow$



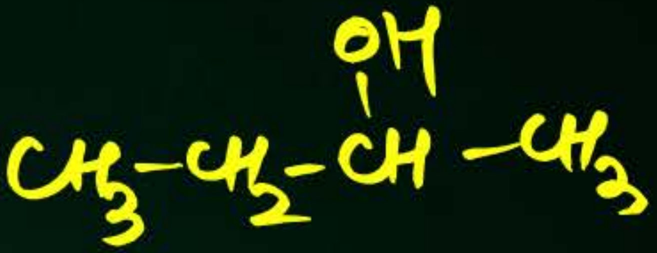
(D) $CH_3\overset{\delta-}{C}H_2MgBr + CH_3CHO$



$CH_3-\overset{\overset{OH}{|}}{C}H-CH_2CH_3$

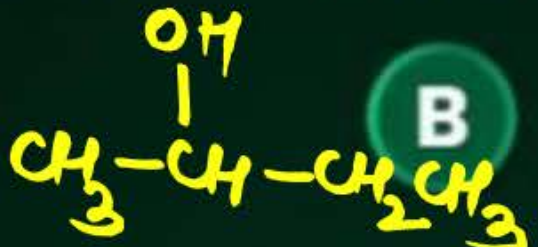
QUESTION 04

Isobutyl alcohol can be obtained by the reaction between:



$CH_3-CH_2-CH(OH)-CH_3$

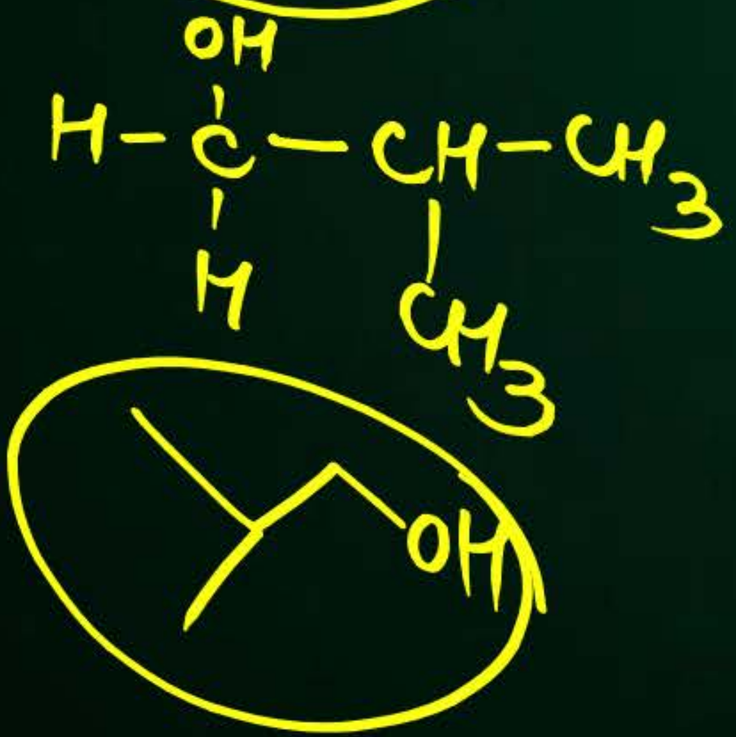
A ✗ $\overset{\delta-}{C_2}H_5MgBr$ and CH_3CHO



$CH_3-CH(OH)-CH_2CH_3$

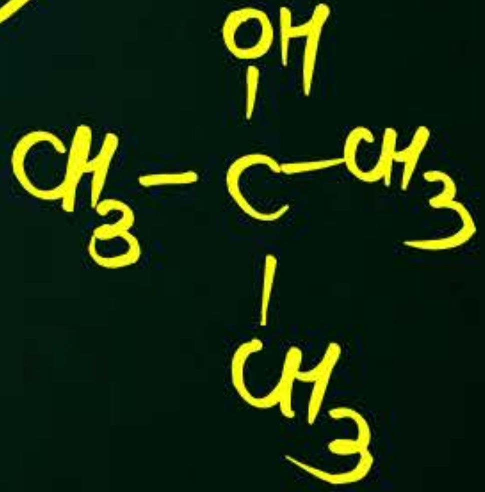
B $\overset{\delta-}{C}H_3MgBr$ and CH_3CH_2CHO

C ✓ $(CH_3)_2\overset{\delta-}{C}HMgBr$ and $HCHO$



$H-C(OH)(H)-CH(CH_3)-CH_3$

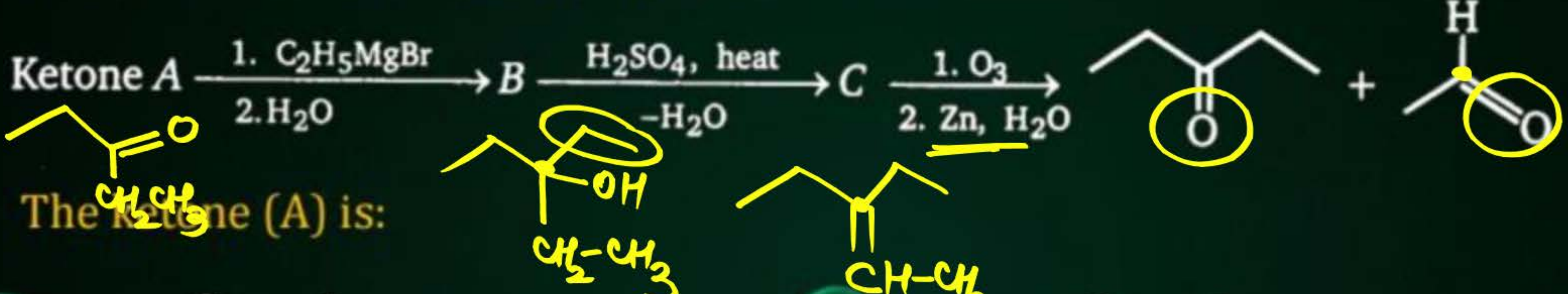
D $\overset{\delta-}{C}H_3MgBr$ and CH_3COCH_3



$CH_3-C(OH)(CH_3)-CH_3$

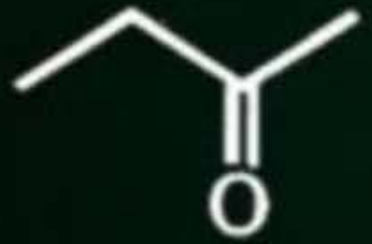
QUESTION 05

Consider the following sequence of reactions.

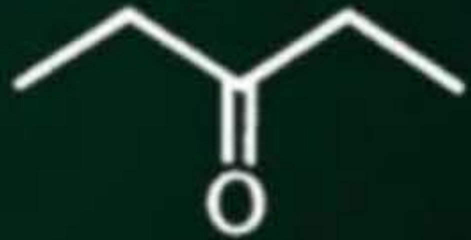

Ketone A
1. C2H5MgBr
2. H2O
B
H2SO4, heat
−H2O
C
1. O3
2. Zn, H2O
+
H
O
O
CH2CH3
OH
CH2-CH3
CH-CH3

The Ketone (A) is:

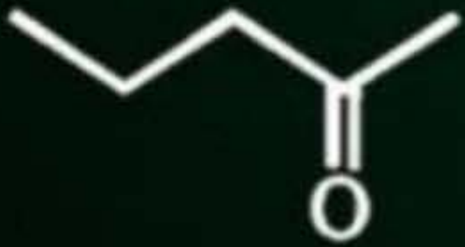
A



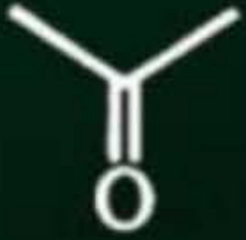
B



C

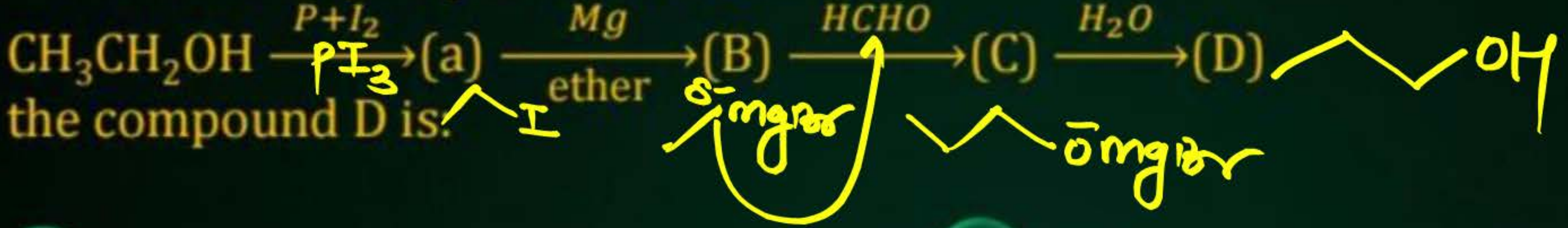


D



QUESTION 06

In the following sequence of reactins,



$CH_3CH_2OH \xrightarrow[PI_3]{P+I_2} (a) \xrightarrow[ether]{Mg} (B) \xrightarrow{HCHO} (C) \xrightarrow{H_2O} (D)$

the compound D is:

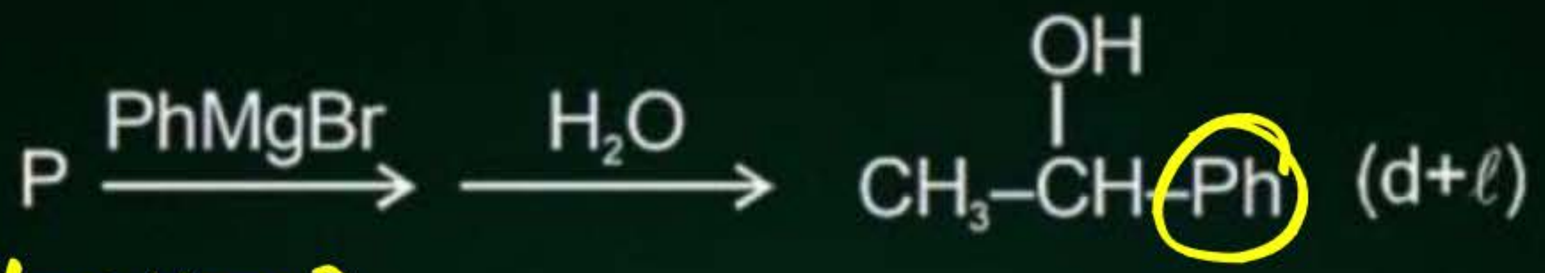
(A) propanal

(B) butanal

(C) *n*-butyl alcohol

[✓ (D)] *n*-propyl alcohol

QUESTION 07



$$P \xrightarrow{PhMgBr} \xrightarrow{H_2O} CH_3-\overset{\displaystyle OH}{\overset{|}{C}}H-Ph \quad (d+\ell)$$

P can be: $CH_3-CH=O$

A CH_3COOH

B $HCOOCH_3$

C CH_3COCl

[✓ D] CH_3CHO

QUESTION 08

$$\overset{\delta-}{CH_3}MgI \xrightarrow[H^+]{H-\overset{O}{\overset{\|}{C}}-H} CH_3CH_2OH$$

Formaldehyde forms an addition product with CH_3MgI which on hydrolysis gives:

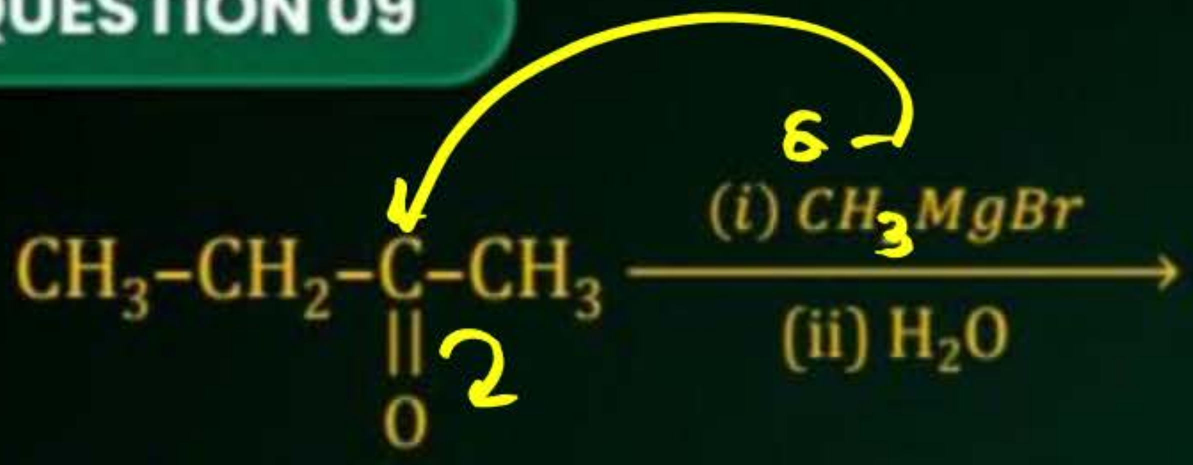
Ⓐ ethyl iodide

[✓ Ⓑ] ethyl alcohol

Ⓒ methyl alcohol

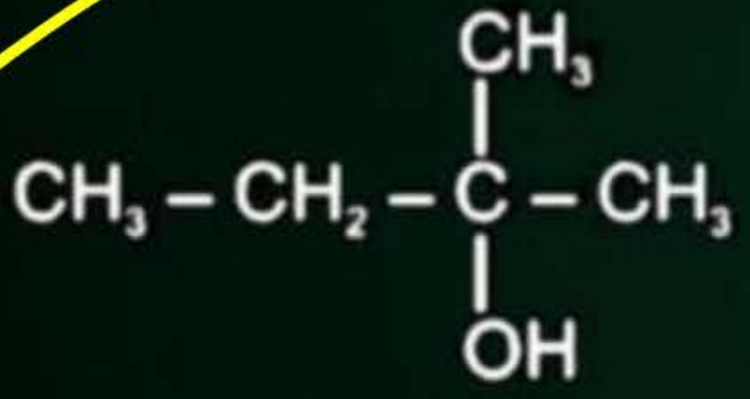
Ⓓ methyl iodide

QUESTION 09

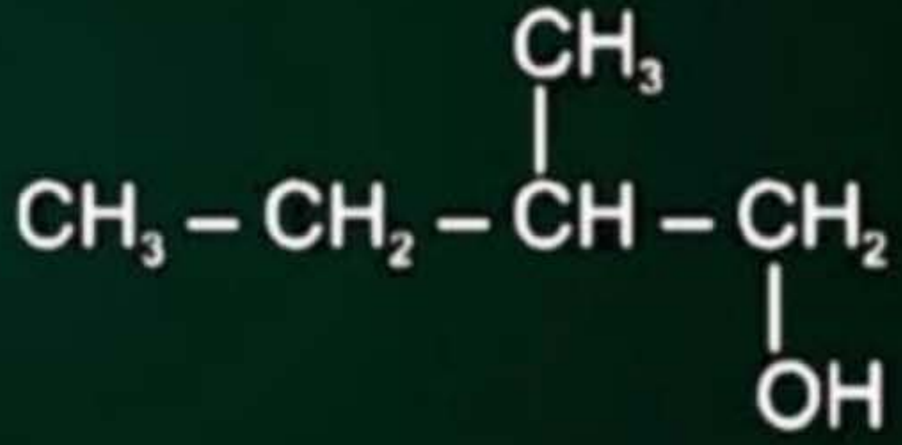


$CH_3-CH_2-\underset{\underset{O}{\|}}{C}-CH_3 \xrightarrow[(ii)\ H_2O]{(i)\ \overset{\delta-}{CH_3}MgBr}$

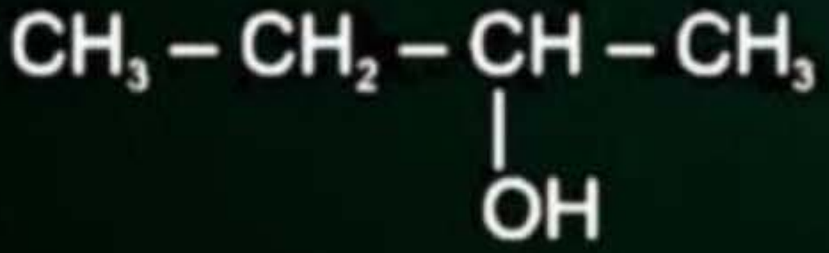
Product is:

[✓ A] 

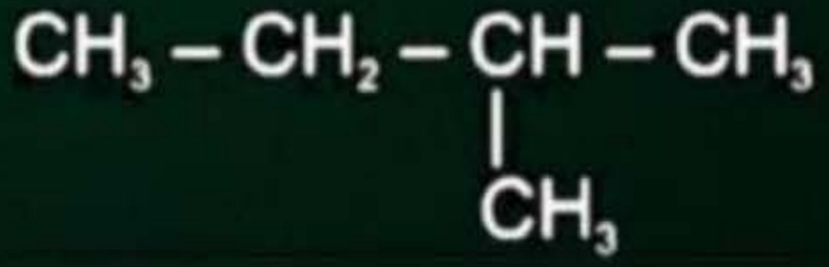
$CH_3-CH_2-\underset{\underset{OH}{|}}{\overset{\overset{CH_3}{|}}{C}}-CH_3$

(B) 

$CH_3-CH_2-\overset{\overset{CH_3}{|}}{CH}-\underset{\underset{OH}{|}}{CH_2}$

(C) 

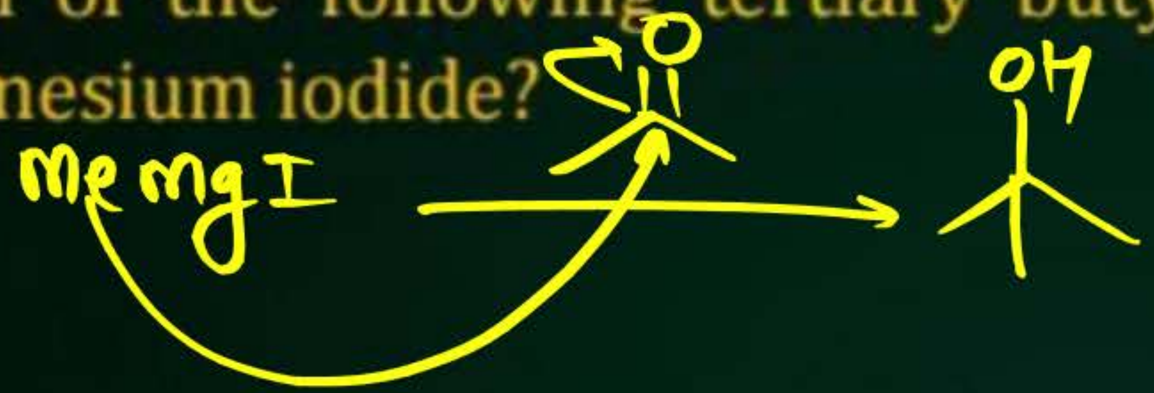
$CH_3-CH_2-\underset{\underset{OH}{|}}{CH}-CH_3$

(D) 

$CH_3-CH_2-\underset{\underset{CH_3}{|}}{CH}-CH_3$

QUESTION 10

From which of the following tertiary butyl alcohol is obtained by the action of methyl magnesium iodide?



- A HCHO
- B CH_3CHO
- [✓ C] CH_3COCH_3
- D CO_2

ANSWER KEY

1. A
2. B
3. A
4. C
5. B
6. D
7. D
8. B
9. A
10. C

Thank you!!

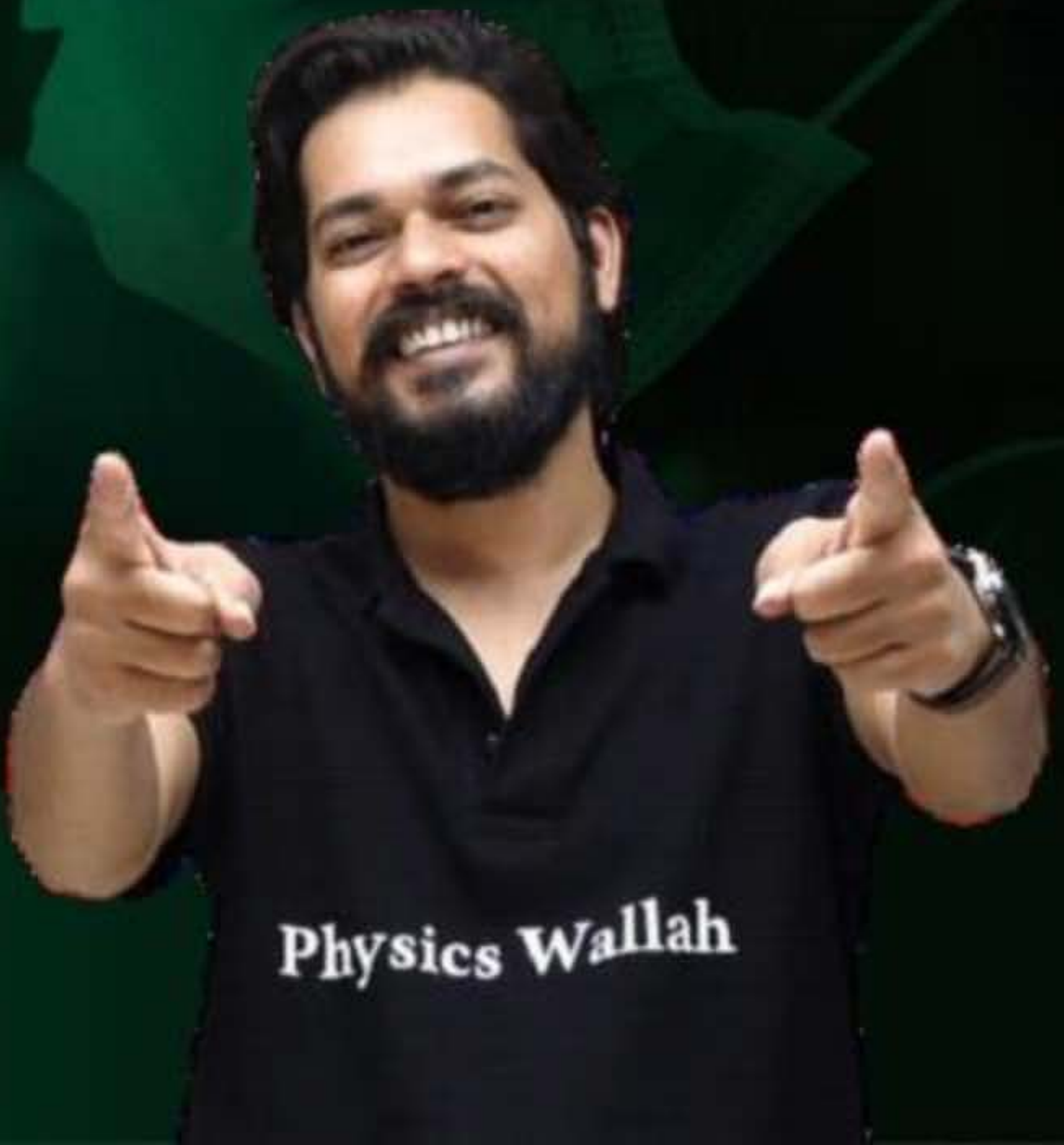
YAKEEN 2.0

FOR NEET 2025

Lecture- 05 | Organic Chemistry

Alcohols, Phenols and Ethers

By- Pankaj Sir(POPU MAMA)


Physics Wallah

Topics *to be covered*

1. Methods of Preparation of Ethers ✓
2. Practice

QUESTION

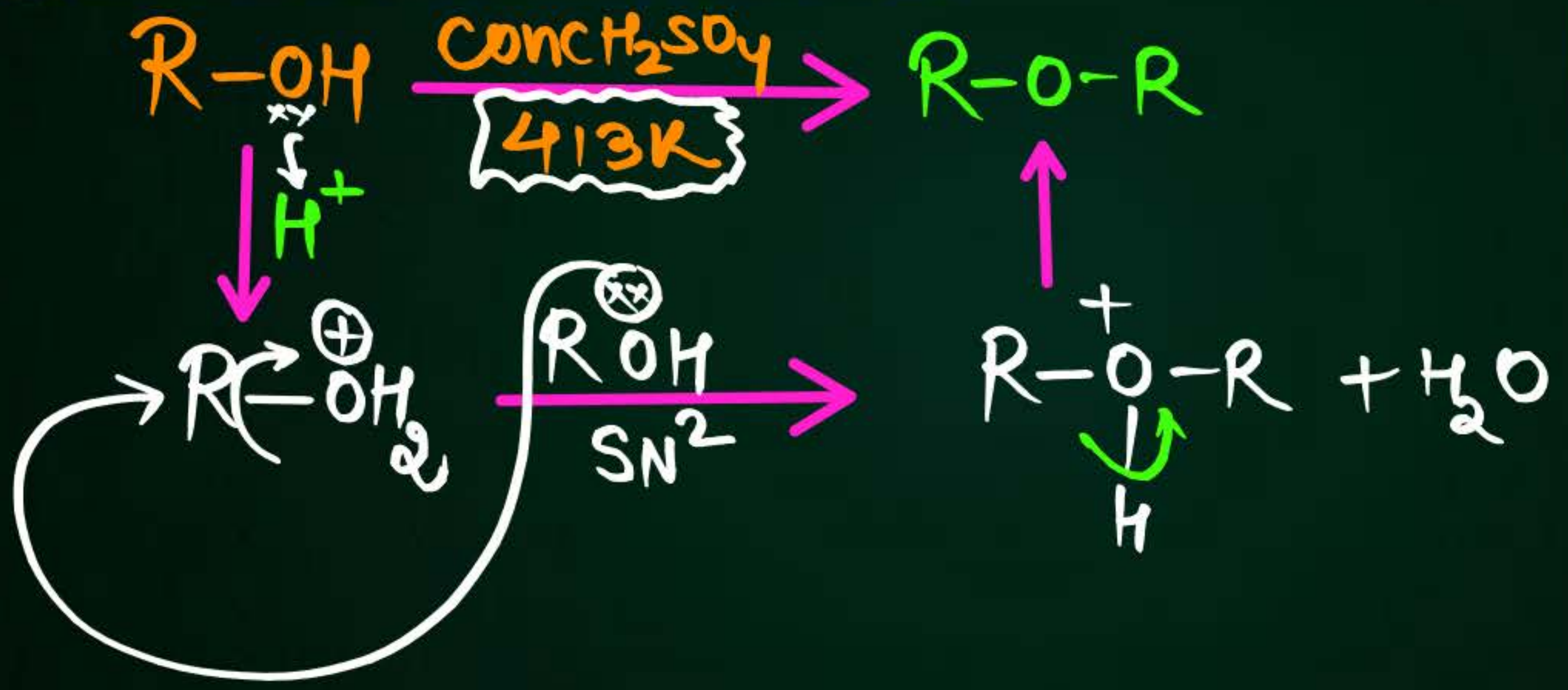
Reaction of aqueous sodium hydroxide and chlorobenzene gives which of the following products?

- (A) o-chlorophenol
- (B) m-chlorophenol
- (C) phenol
- [✓ (D) no reaction]

Methods of Preparation of Ethers

$R\boxed{OH+H}OR \longrightarrow R\text{-}OR$

1. By Dehydration of Alcohols:



$R-OH \xrightarrow[413K]{conc\,H_2SO_4} R-O-R$

$\downarrow H^+$

$R-\overset{\oplus}{O}H_2 \xrightarrow[SN^2]{R\overset{\cdot\cdot}{O}H} R-\underset{H}{\overset{+}{O}}-R + H_2O$

at 443K (E^1)

$R-OH \xrightarrow{H^+} R-\overset{+}{O}H_2$

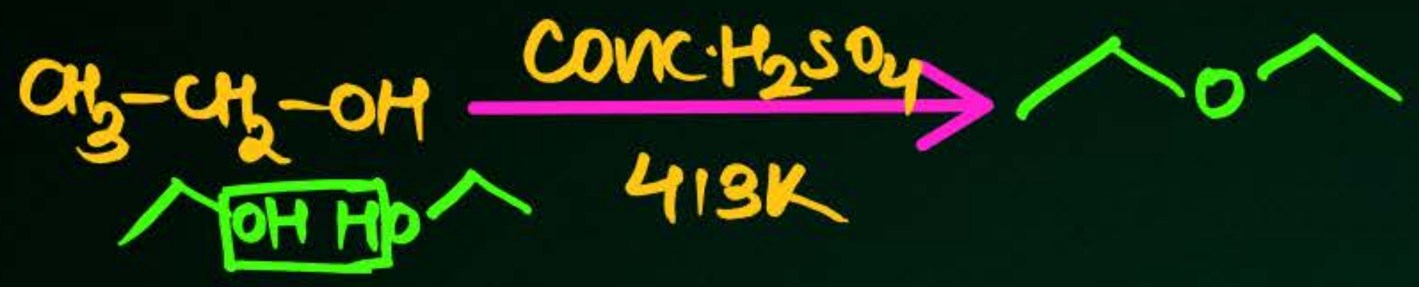
$\downarrow$

$R^{\oplus}$ (Rearrange if pos)

$\downarrow \Delta$

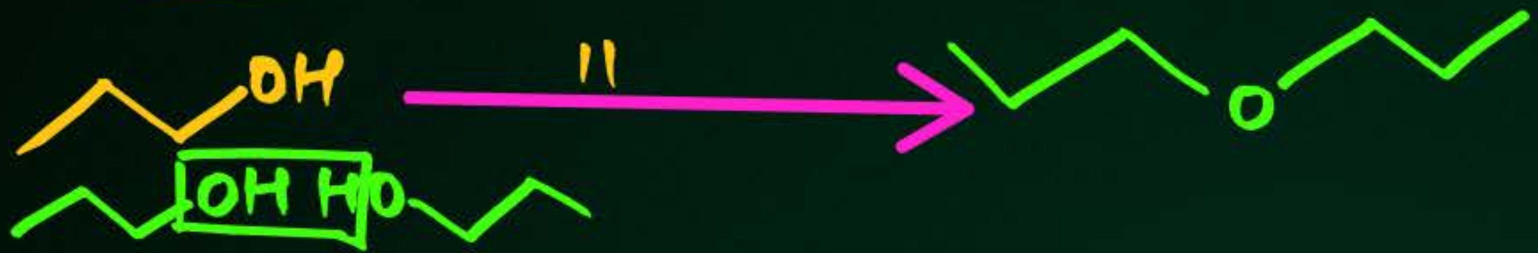
Alkene

Q ①

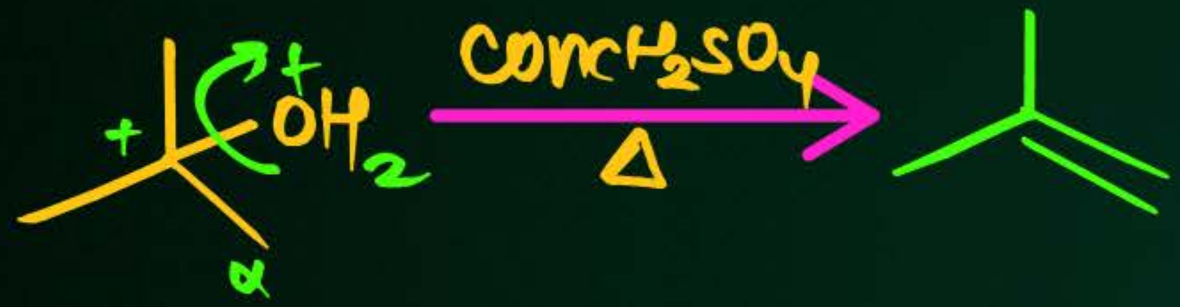


$CH_3-CH_2-OH \xrightarrow[413K]{Conc.H_2SO_4}$

②

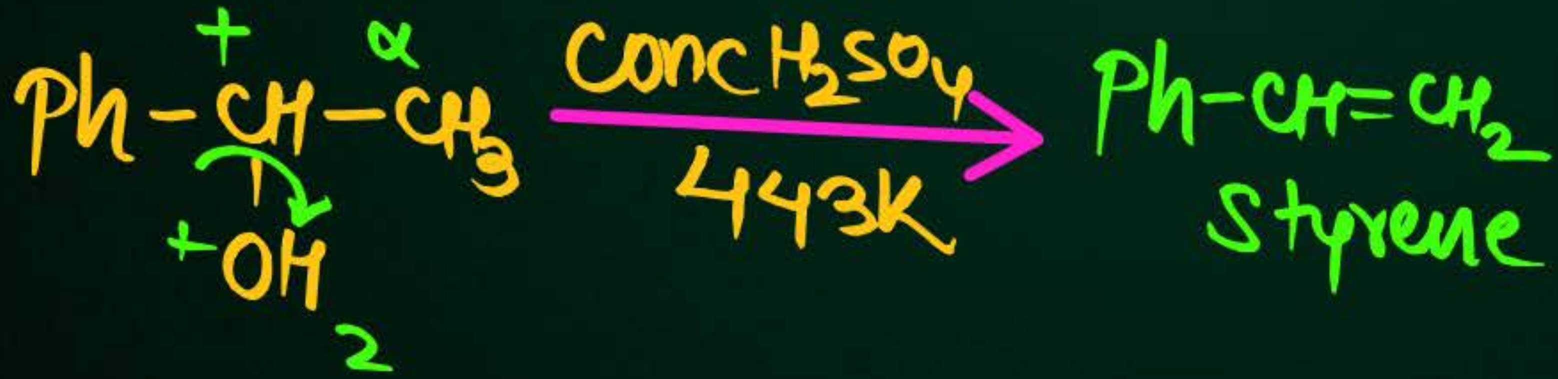


③



+
$\overset{+}{O}H_2$
conc H_2SO_4
Δ
α

④



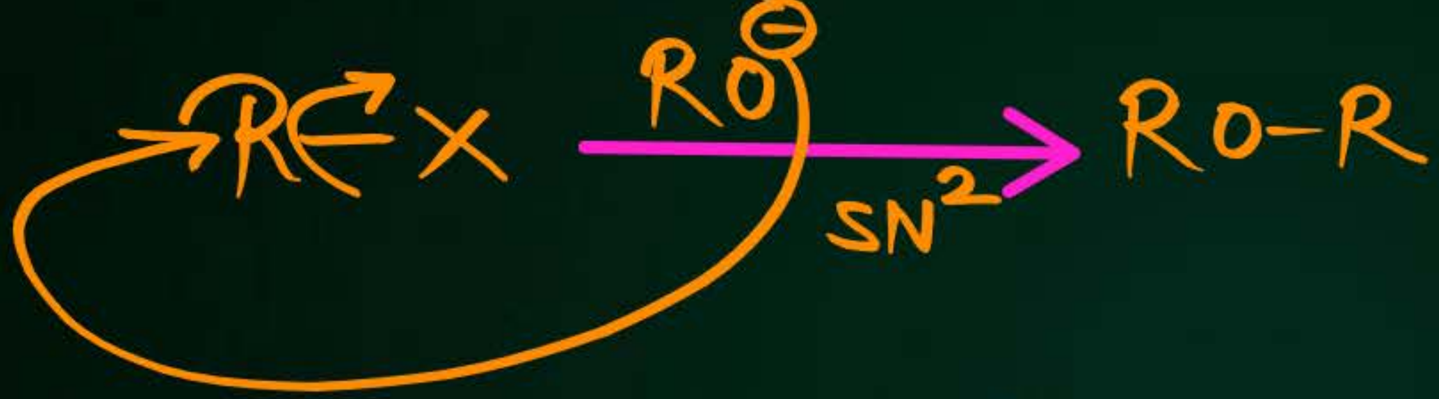
$Ph-\underset{^{+}OH_2}{\overset{+}{C}H}-\overset{\alpha}{C}H_3 \xrightarrow[443K]{Conc\,H_2SO_4} Ph-CH=CH_2$

Styrene

2. Williamson-Ether Synthesis: (SN^2)

1° Alkyl Halide + Alkoxide

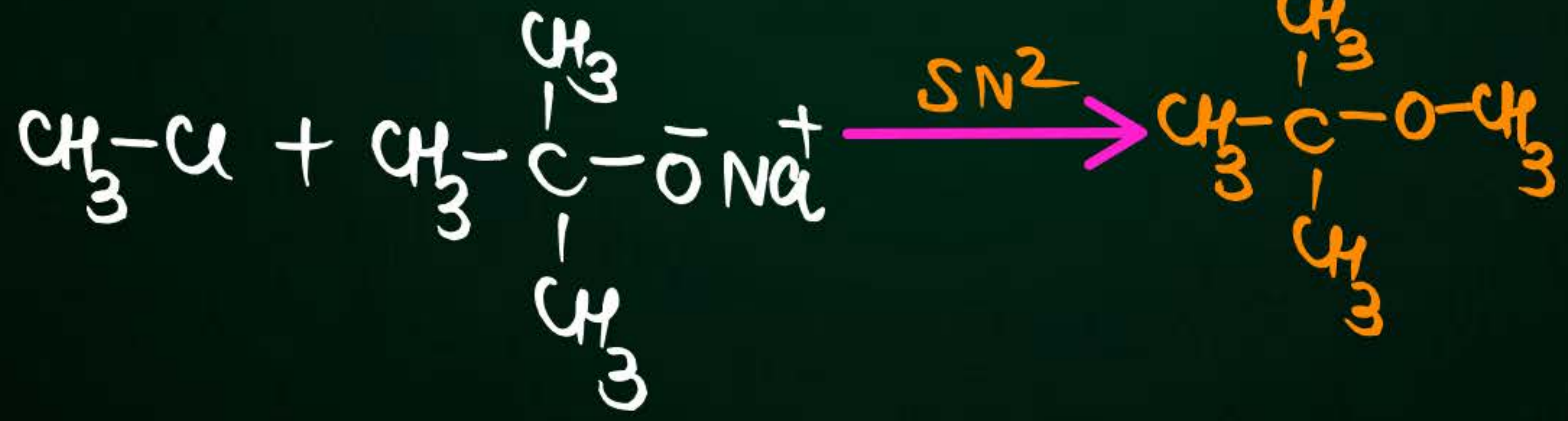
R–X $R\bar{O}\ \overset{+}{Na}|K^+$



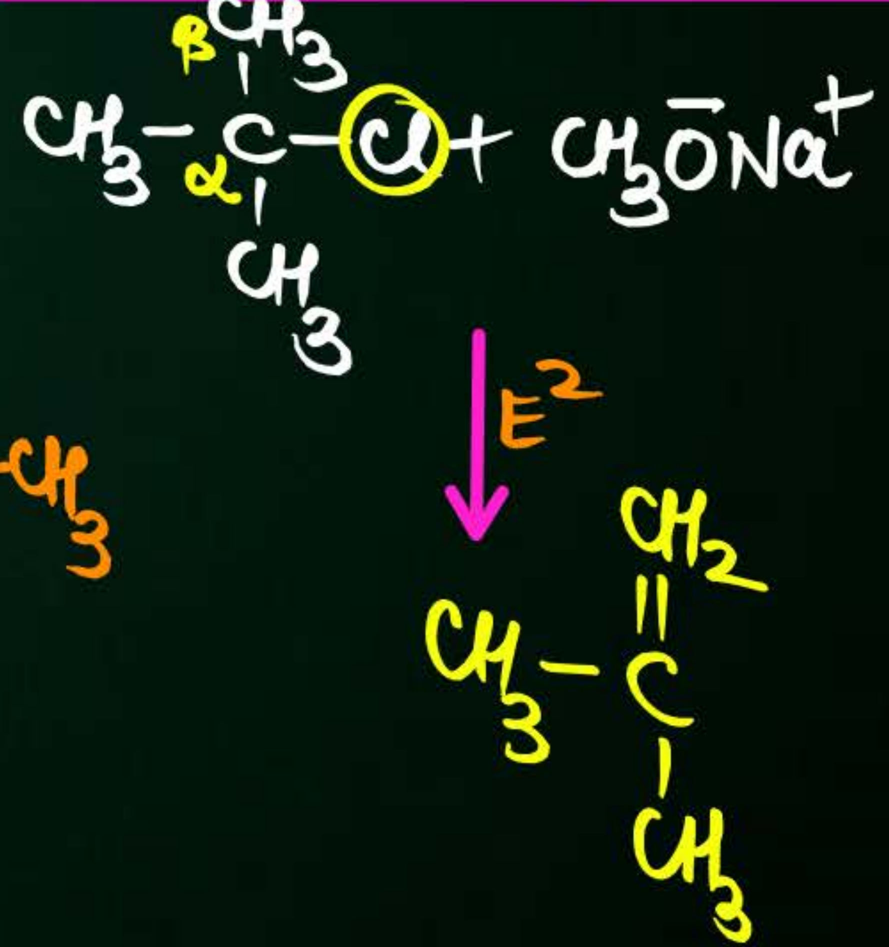
$R-X \xrightarrow[SN^2]{R\bar{O}} RO-R$

1° R–X	Ether (SN^2)
2° R–X	SN^2 Ether / Alkene E^2
3° R–X	Alkene E^2

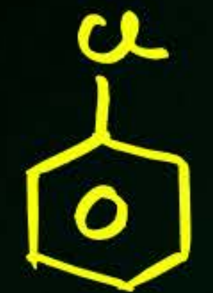
Q ① $CH_3-Cl + CH_3\bar{O}\overset{+}{Na} \xrightarrow{SN^2} CH_3-O-CH_3$

② 

$CH_3-Cl + CH_3-\underset{CH_3}{\overset{CH_3}{C}}-\bar{O}\overset{+}{Na} \xrightarrow{SN^2} CH_3-\underset{CH_3}{\overset{CH_3}{C}}-O-CH_3$

③ 

$CH_3-\underset{\alpha\ CH_3}{\overset{\beta\ CH_3}{C}}-Cl + CH_3\bar{O}\overset{+}{Na} \xrightarrow{E^2} CH_3-\underset{CH_3}{\overset{CH_2}{\overset{\|}{C}}}$

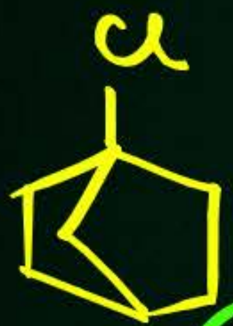
④ 

$+ CH_3\bar{O}Na^+ \longrightarrow$ No Rxn

Partial double bond charac in Ph–Cl

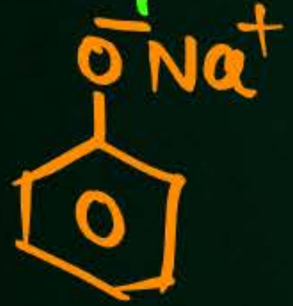
⑤ $CH_2=CH-Cl + CH_3\bar{O}Na^+ \longrightarrow$ "

Partial double bond charac in $CH_2=CH-Cl$

⑥ 

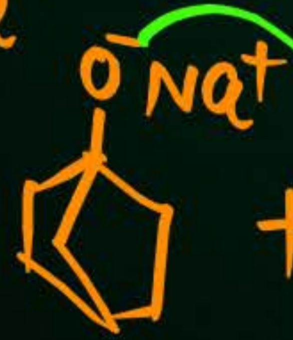
$+ CH_3\bar{O}Na^+ \longrightarrow$ "

Bredt's rule

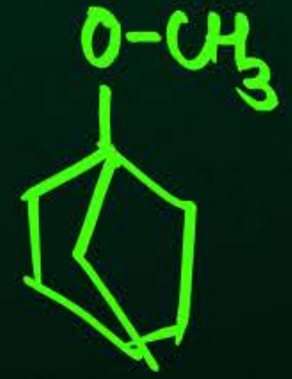
⑦ 

$+ CH_3-Cl \longrightarrow$ Anisol PhOCH$_3$

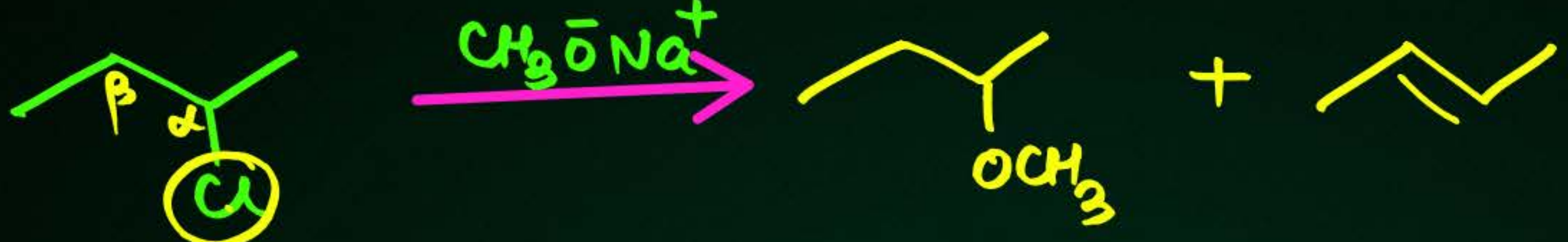
⑧ $CH_2=CH-\bar{O}Na^+ + CH_3-Cl \longrightarrow CH_2=CH-O-CH_3$

⑨ 

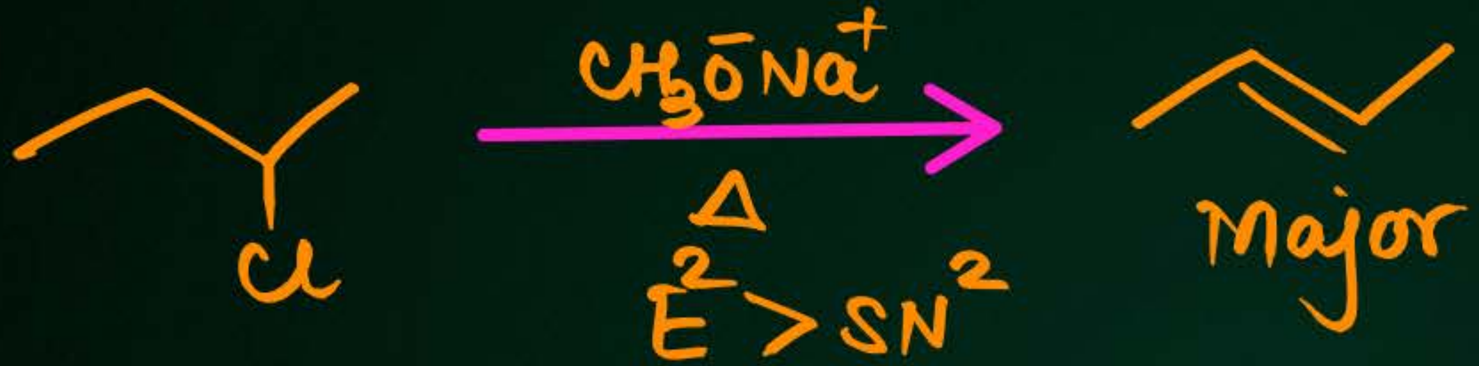
$+ CH_3-Cl \longrightarrow$



⑩


β
α
Cl
$CH_3\bar{O}Na^+$
OCH_3
+

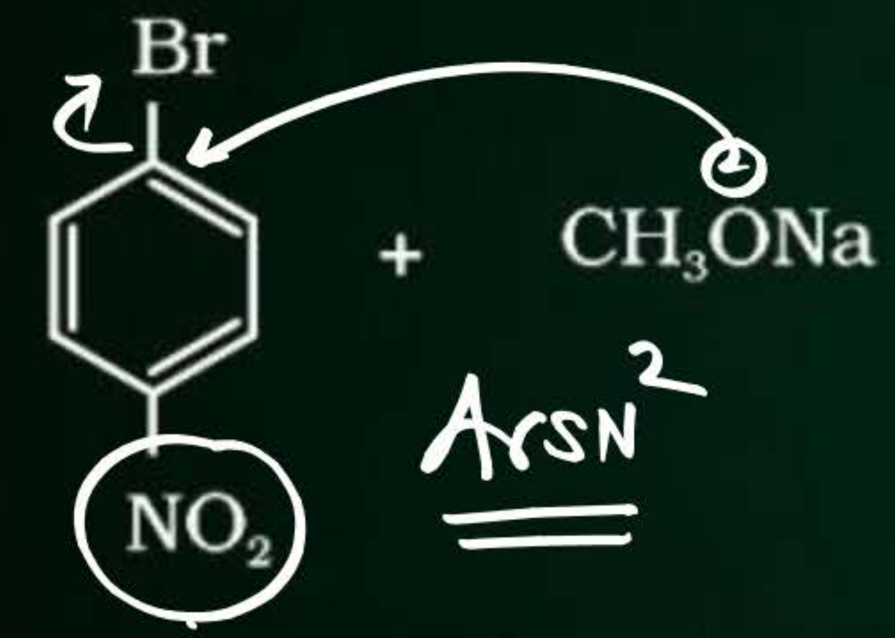
⑪


Cl
$CH_3\bar{O}Na^+$
Δ
$E^2 > SN^2$
Major

QUESTION (NCERT Example)

Which of the following is an appropriate set of reactants for the preparation of 1-methoxy-4-nitrobenzene and why?

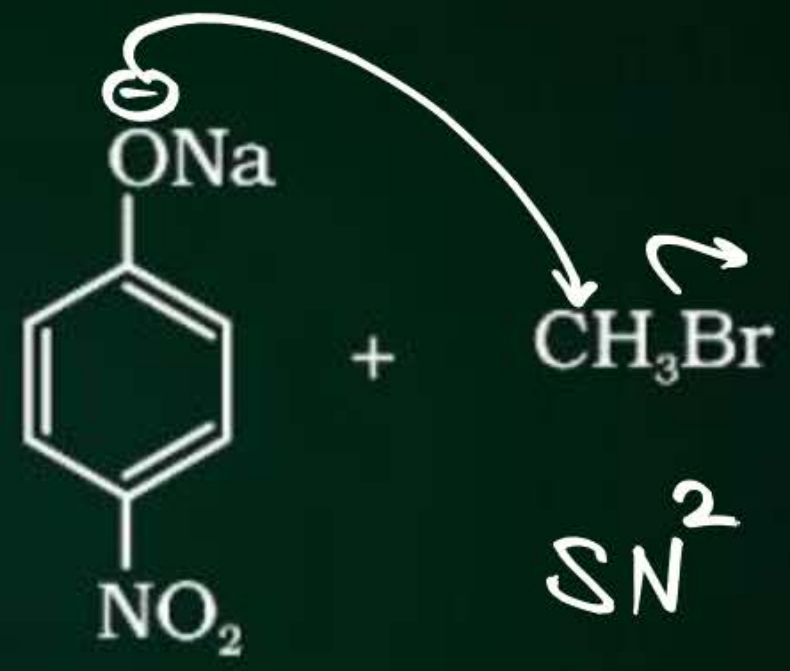
(i)



Br
NO2
+
CH3ONa
ArSN2

<

(ii)



ONa
NO2
+
CH3Br
SN2

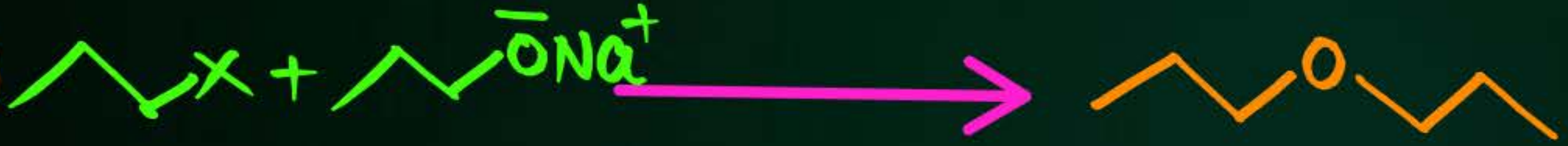
✓

QUESTION (NCERT Exercise)

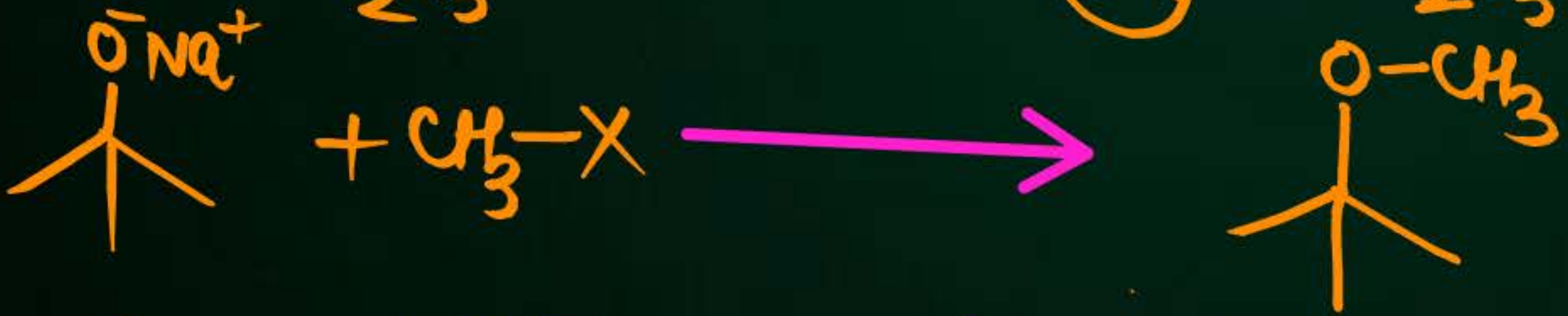
Write the names of reagents and equations for the preparation of the following ethers by Williamson's synthesis:

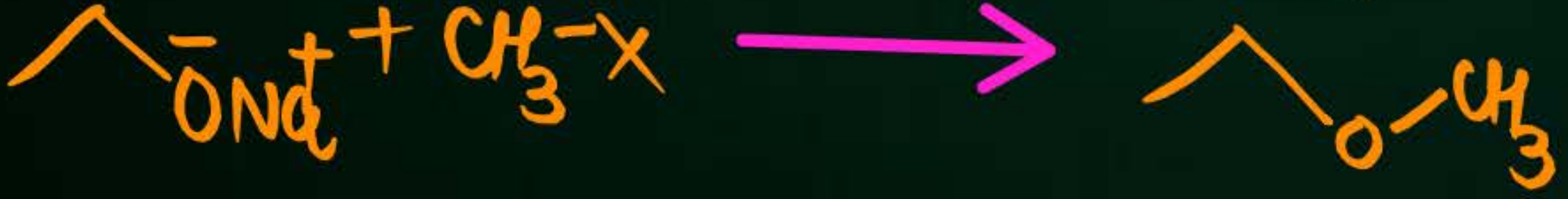
(i) 1-Propoxypropane (ii) Ethoxybenzene

(iii) 2-Methoxy-2-methylpropane (iv) 1-Methoxyethane

①

X
+
$\overset{-}{O}Na^+$
O

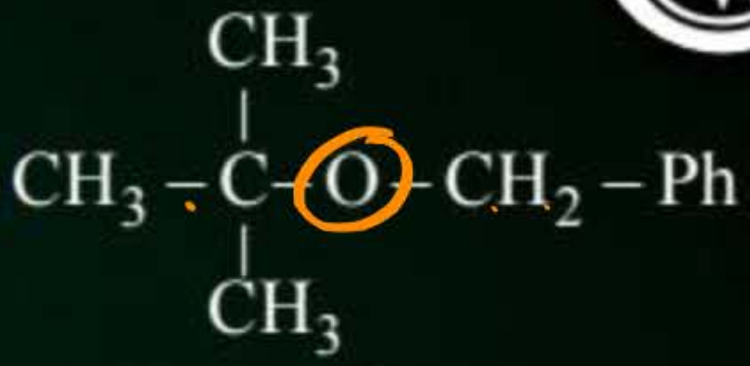
② $Ph\overset{-}{O}Na^+ + C_2H_5-X \longrightarrow Ph-O-C_2H_5$

③

$\overset{-}{O}Na^+$
$+ CH_3-X$
$O-CH_3$

④

$\overset{-}{O}Na^+$
$+ CH_3-X$
O
CH_3

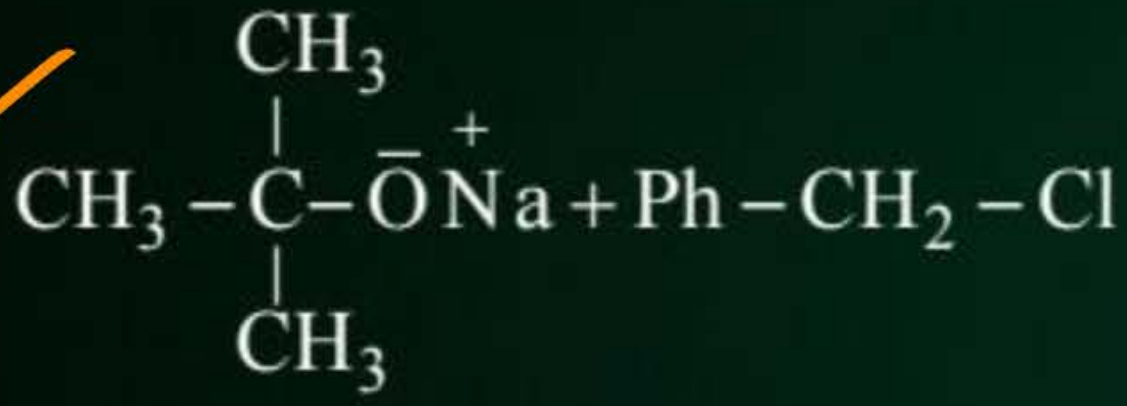
QUESTION (AIIMS 2018)

What will be the suitable reactant for the following ether synthesis



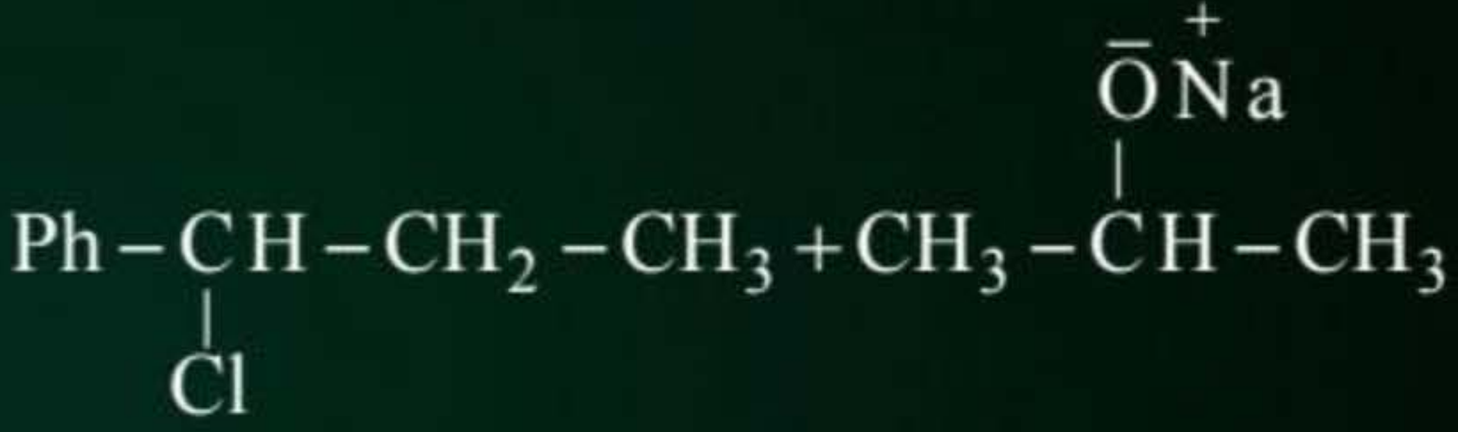
$CH_3-\overset{\overset{CH_3}{|}}{\underset{\underset{CH_3}{|}}{C}}-O-CH_2-Ph$

(A) ✓



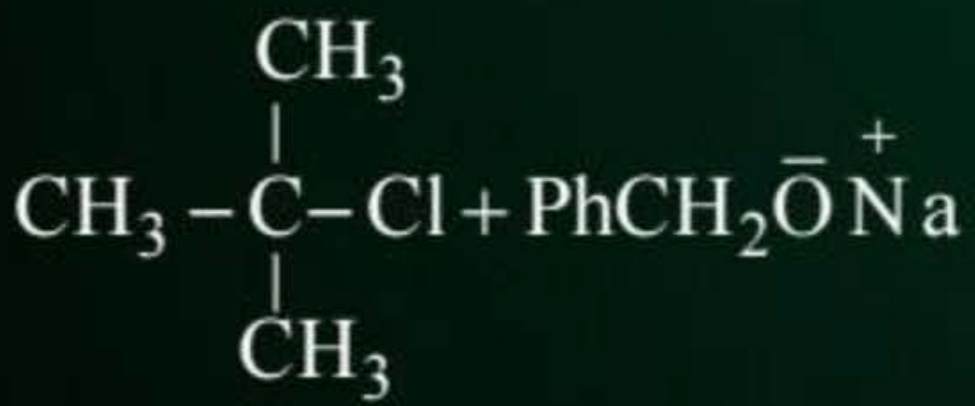
$CH_3-\overset{\overset{CH_3}{|}}{\underset{\underset{CH_3}{|}}{C}}-\bar{O}\overset{+}{N}a+Ph-CH_2-Cl$

(B)



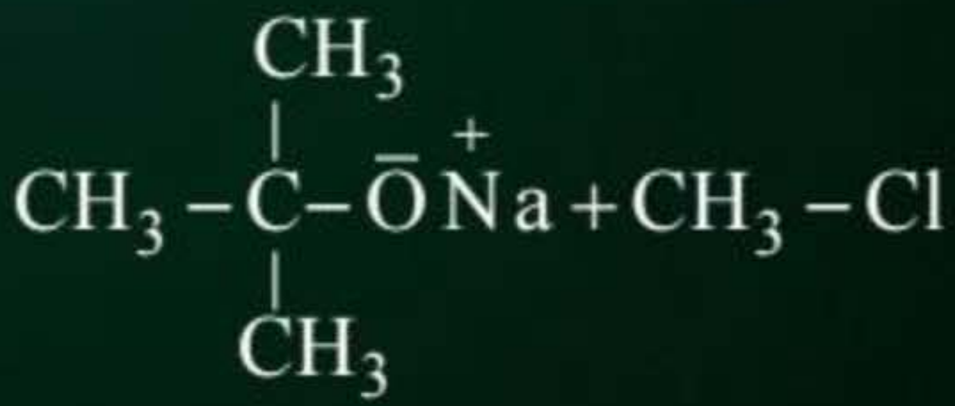
$Ph-\underset{\underset{Cl}{|}}{C}H-CH_2-CH_3+CH_3-\overset{\overset{\bar{O}\overset{+}{N}a}{|}}{C}H-CH_3$

(C)



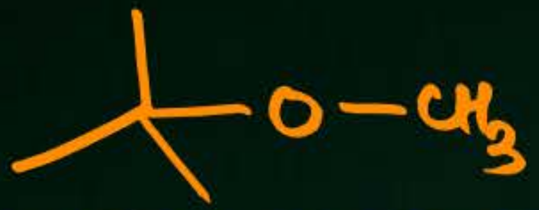
$CH_3-\overset{\overset{CH_3}{|}}{\underset{\underset{CH_3}{|}}{C}}-Cl+PhCH_2\bar{O}\overset{+}{N}a$

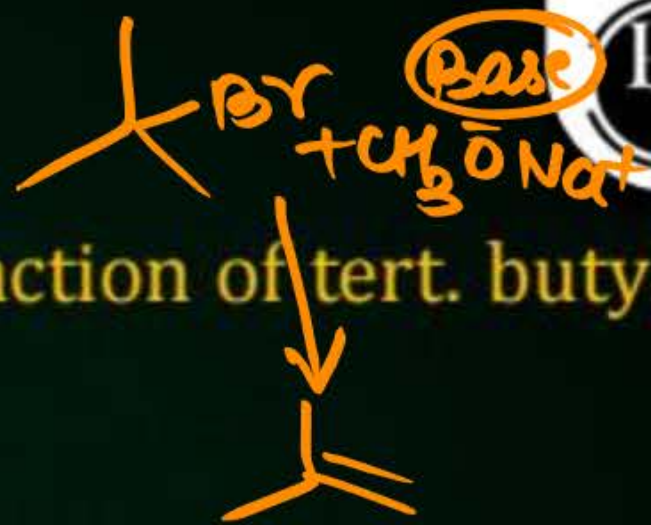
(D)



$CH_3-\overset{\overset{CH_3}{|}}{\underset{\underset{CH_3}{|}}{C}}-\bar{O}\overset{+}{N}a+CH_3-Cl$

QUESTION





Assertion(A): Tert. butyl methyl ether is not prepared by the reaction of tert. butyl bromide with sodium methoxide.

Reason(R): Sodium methoxide is a strong nucleophile.

-ve charge $CH_3\overset{\ominus}{O}Na^+$

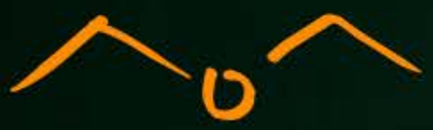
- **A** If both (A) and (R) are correct and (R) is the correct explanation of (A).
- [✓ **B**] If both (A) and (R) are correct but (R) is not the correct explanation of (A).
- **C** If (A) is correct but (R) is incorrect.
- **D** If (A) is incorrect but (R) is correct.

QUESTION

Reaction of sodium ethoxide and ethyl chloride will give:

$CH_3CH_2\bar{O}\overset{+}{Na} + CH_3-CH_2-Cl$

- [✓ A] ether



- B ethyl alcohol
- C acetaldehyde
- D acetic acid

QUESTION

The product (D) in the following sequence of reaction is:

$$\underset{CH_2=CH_2}{C_2H_4} \xrightarrow{HBr} \underset{CH_3-CH_2-Br}{(A)} \xrightarrow{NaOH(aq.)} \underset{CH_3CH_2-OH}{(B)} \xrightarrow{Na} \underset{CH_3CH_2\overset{-}{O}Na^+}{(C)} \xrightarrow{CH_3I} \underset{CH_3CH_2OCH_3}{(D)}$$

A butane

B ethane

C propane

[✓ D] ethyl methyl ether

QUESTION

Which of the followings pairs of reagents will not form ether?

(A) ✓ $C_2H_5Br + CH_3CO\overset{-}{O}Na^+$ $\quad CH_3-\overset{O}{\overset{\|}{C}}-O-C_2H_5$ Ester

1°

(B) $C_2H_5Br + C_2H_5\overset{-}{O}Na^+$ $\quad C_2H_5-OC_2H_5$

1°

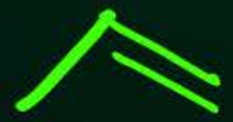
(C) $C_2H_5Br + (CH_3)_2CH\overset{-}{O}Na^+$ $\quad C_2H_5O-CH(CH_3)_2$

1°

(D) $(\overset{\beta}{C}H_3)_2\overset{\alpha}{C}HBr + CH_3\overset{-}{O}Na^+$ $\quad (CH_3)_2CH-OCH_3$

2°

+



QUESTION

Excess of ethanol when heated with conc. H_2SO_4 at 140°C, the compound obtained is:

Ⓐ ethene

Ⓑ diethyl sulphate

[✓ Ⓒ] ethoxy ethane

Ⓓ ethyl hydrogen sulphate

QUESTION

Williamson's synthesis involves:

A S_N1 mechanism

B nucleophilic addition

[✓ C] S_N2 mechanism

D S_E mechanism

ESR

QUESTION

From Williamson's synthesis, the preparation of which of the following is possible?

$CH_3\bar{O}Na^+ + CH_3-Cl \longrightarrow CH_3OCH_3$

$CH_3CH_2\bar{O}Na^+ + CH_3-Cl \longrightarrow CH_3CH_2OCH_3$

A Only symmetrical ethers

B Only asymmetrical ethers

[✓ C Both (A) and (B)]

D None of the above

QUESTION

'A' reacts with $\underline{C_2H_5I}$ giving 'B' and NaI. Here 'A' and 'B' respectively are:

(A) $CH_3COONa, CH_3\underset{\times}{O}CH_3$

[✓ (B)] $C_2H_5\overset{\ominus}{O}Na, \underline{C_2H_5OC_2H_5}$

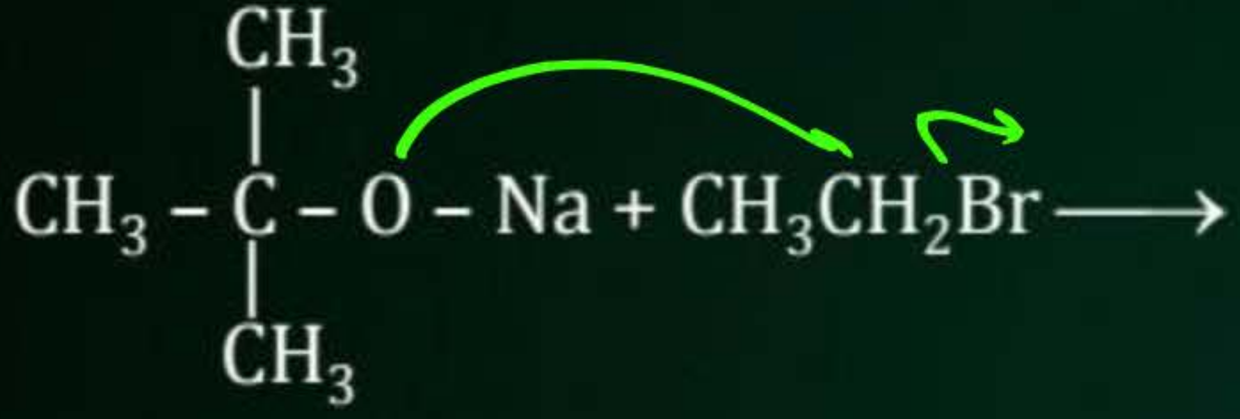
(C) ✗ $C_2H_5OC_2H_5, C_2H_5COOC_2H_5$

(D) $\underline{\underline{C_2H_5OH}}, C_2H_5OC_2H_5$

QUESTION

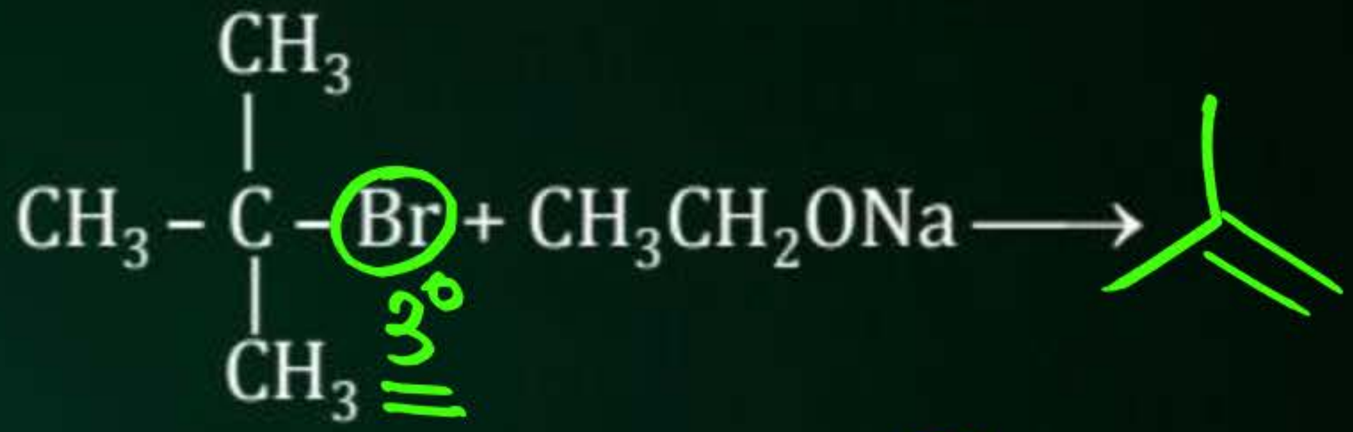
Which of the following reaction does not form ether as major product?

(A)



$CH_3-\underset{CH_3}{\overset{CH_3}{C}}-O-Na + CH_3CH_2Br \longrightarrow$

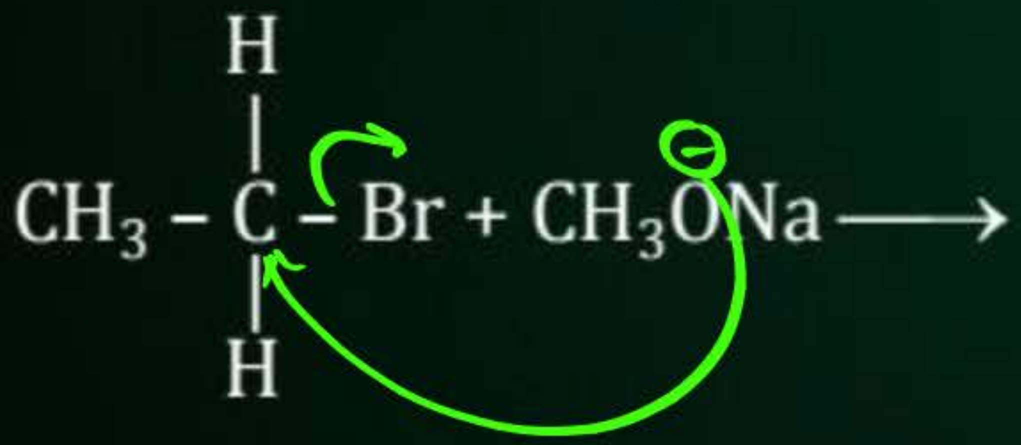
(B) ✓



$CH_3-\underset{CH_3}{\overset{CH_3}{C}}-Br + CH_3CH_2ONa \longrightarrow$

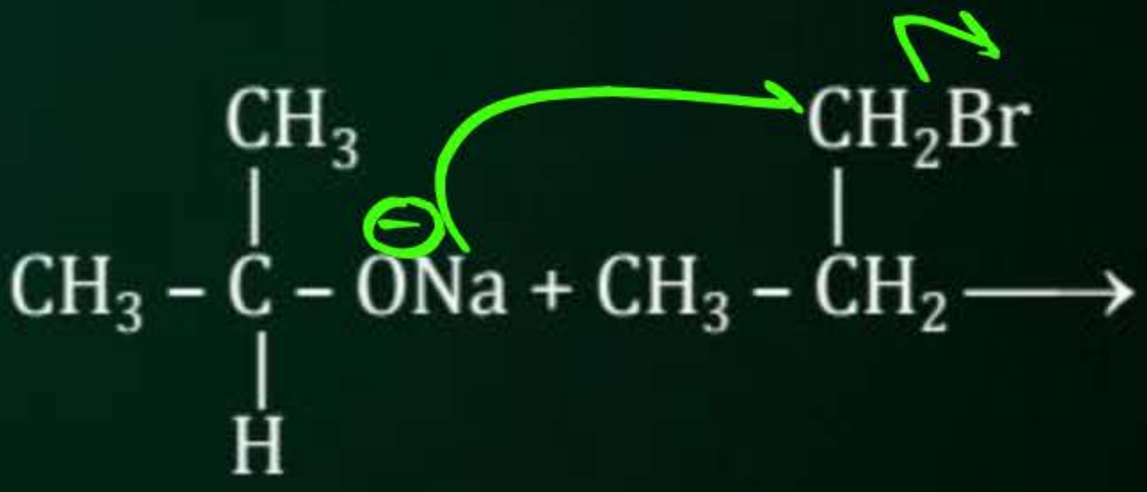
3°

(C)



$CH_3-\underset{H}{\overset{H}{C}}-Br + CH_3ONa \longrightarrow$

(D)



$CH_3-\underset{H}{\overset{CH_3}{C}}-ONa + CH_3-\overset{CH_2Br}{CH_2} \longrightarrow$

QUESTION

The reaction,

$$C_2H_5ONa + C_2H_5I \longrightarrow C_2H_5OC_2H_5 + NaI$$

is called:

(A) Wurtz reaction

(B) Kolbe's reaction

(C) [✓ Williamsion's synthesis]

(D) Grignard synthesis

QUESTION

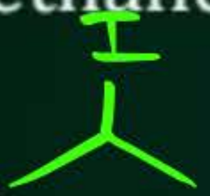
In which case would a Williamson ether synthesis fail?

CH_3-I

A Sodium ethoxide + iodomethane

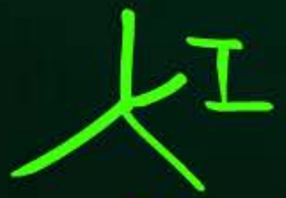
CH_3CH_2-I

B Sodium ethoxide + iodoethane



C Sodium ethoxide + 2-iodopropane

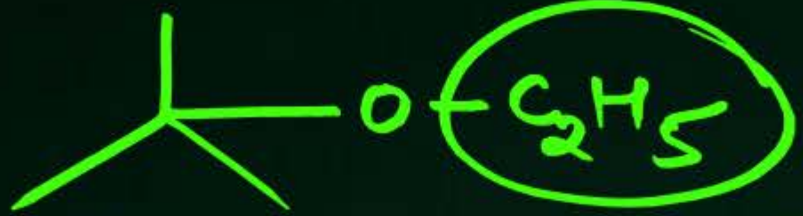
[✓ **D**] Sodium ethoxide + 2-iodo-2-methylpropane



3°

E②

QUESTION



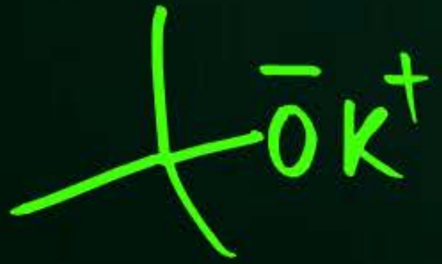
Which of the following reagents should be used to prepare tert-butyl ethyl ether?

A ✗ tert-butyl bromide and sodium ethoxide

B ✗ tert-butyl alcohol and ethyl bromide

C ✗ tert-butyl alcohol and ethanol

[✓ D] potassium tert-butoxide and ethyl bromide



CH_3CH_2Br

QUESTION

What will be the reactant and reaction condition required for the given reaction?

$CH_3CH_2OH + ? \rightarrow C_2H_5OC_2H_5$

[✓ A H_2SO_4, 413 K]

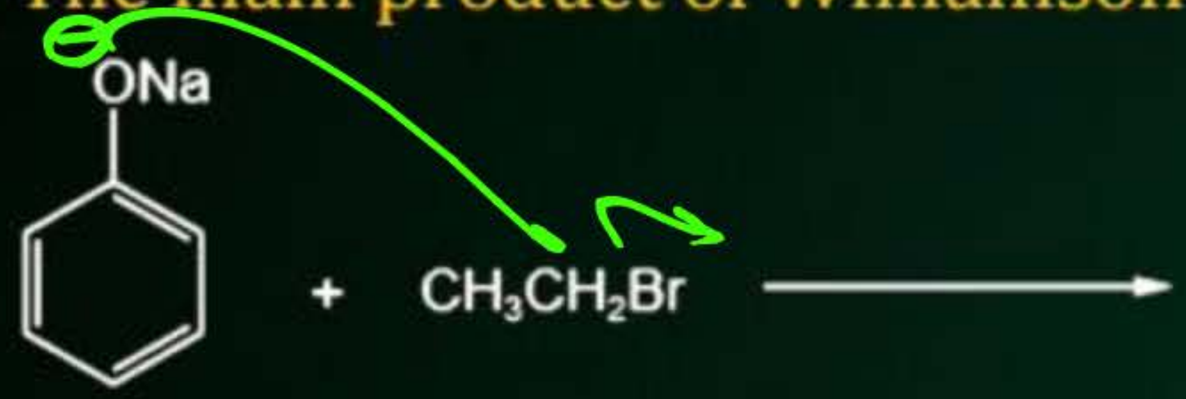
B H_2SO_4, 443 K

C HNO_3, 413 K

D HNO_3, 443 K

QUESTION

The main product of Williamson's ether synthesis reaction will be:



A Benzene

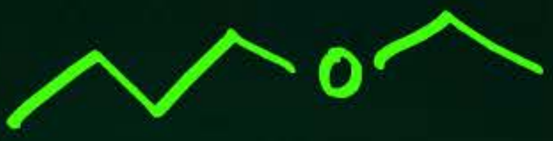
B Methoxy benzene

[✓ **C**] Ethoxy benzene

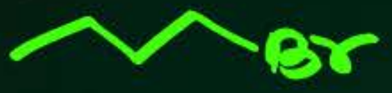
D Ethane

QUESTION

Identify Z in the sequence of reactions-



$$CH_3CH_2CH=CH_2 \xrightarrow[\text{Antimar}]{\overset{+}{H}\overset{-}{Br}/H_2O_2} Y \xrightarrow{C_2H_5ONa} Z$$



[✓ A] $CH_3-(CH_2)_3-O-CH_2CH_3$

B $(CH_3)_2CH_2-O-CH_2CH_3$

C $CH_3(CH_2)_4-O-CH_3$

D $CH_3CH_2-CH(CH_3)-O-CH_2CH_3$

QUESTION

An equimolar quantities of ethanol (2 mol) and propanol (2 mol) are heated with conc. H_2SO_4. The product formed is:

A $C_2H_5OC_2H_5$

B $C_3H_7OC_3H_7$

C $C_2H_5OC_3H_7$

[✓ D] all of these

Possible product

$\text{Et}\boxed{\text{OH} + \text{H}}\text{OEt}$

$\text{Et}\boxed{\text{OH} + \text{H}}\text{O npr}$

$\text{npr-}\boxed{\text{OH} + \text{H}}\text{O npr}$

QUESTION

$$\overset{\alpha}{} \quad \overset{\beta}{} \quad \overset{\beta}{} \quad \overset{\alpha}{}$$

$$\textcircled{Cl}-\overset{\alpha}{CH_2}-\overset{\beta}{CH_2}-O-\overset{\beta}{CH_2}-\overset{\alpha}{CH_2}-\textcircled{Cl}$$

$$H_2\overset{+}{C}=\overset{-}{C}H_2 + (A) \longrightarrow ClCH_2-CH_2OH \xrightarrow[140°C]{H_2SO_4} (B) \xrightarrow[\text{Heat}]{\text{Alc. KOH}} (C)$$

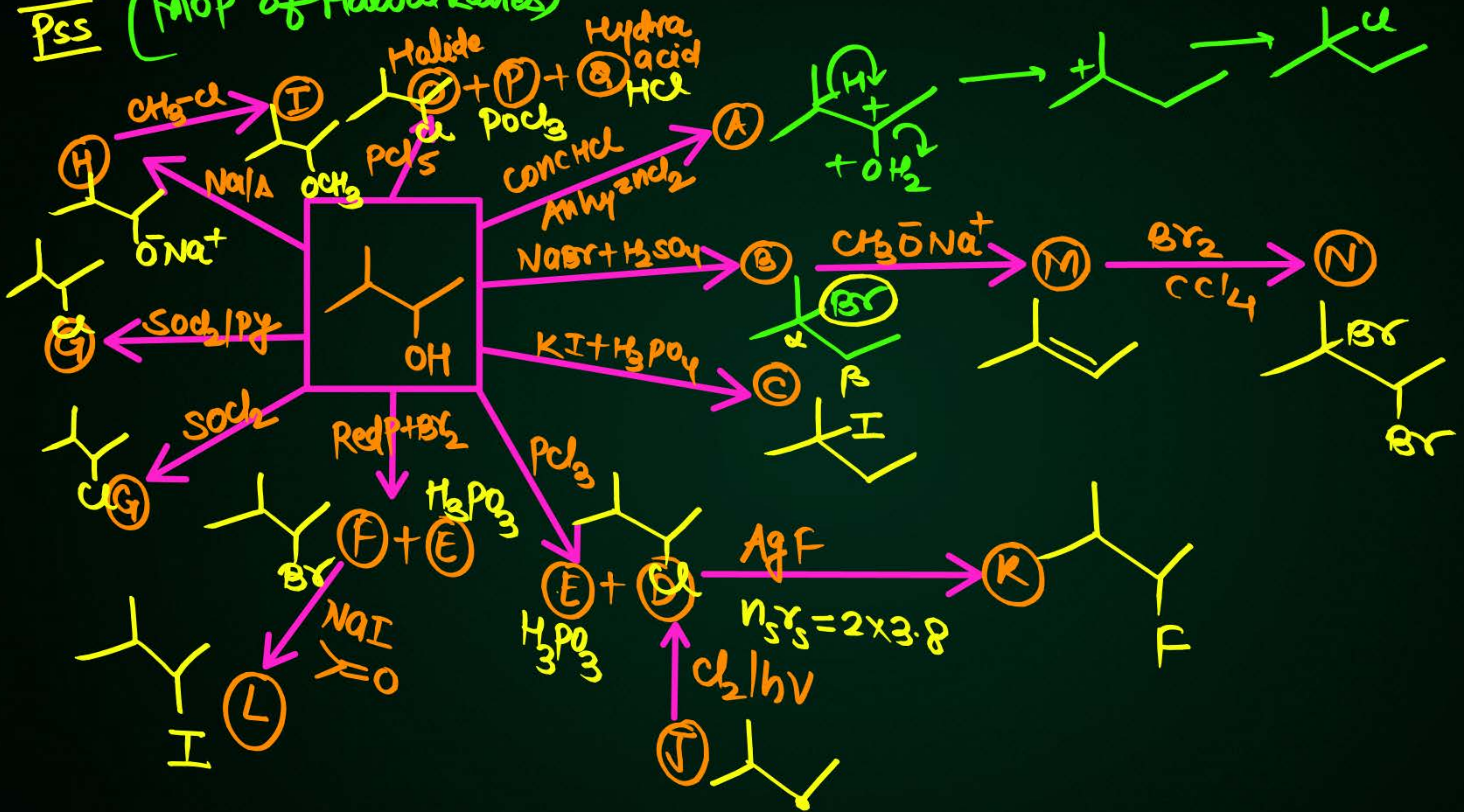
$Cl_2 + H_2O$

$H\overset{-}{O}Cl^{+}$

$Cl-CH_2-CH_2\boxed{-OH + H}OCH_2CH_2Cl$

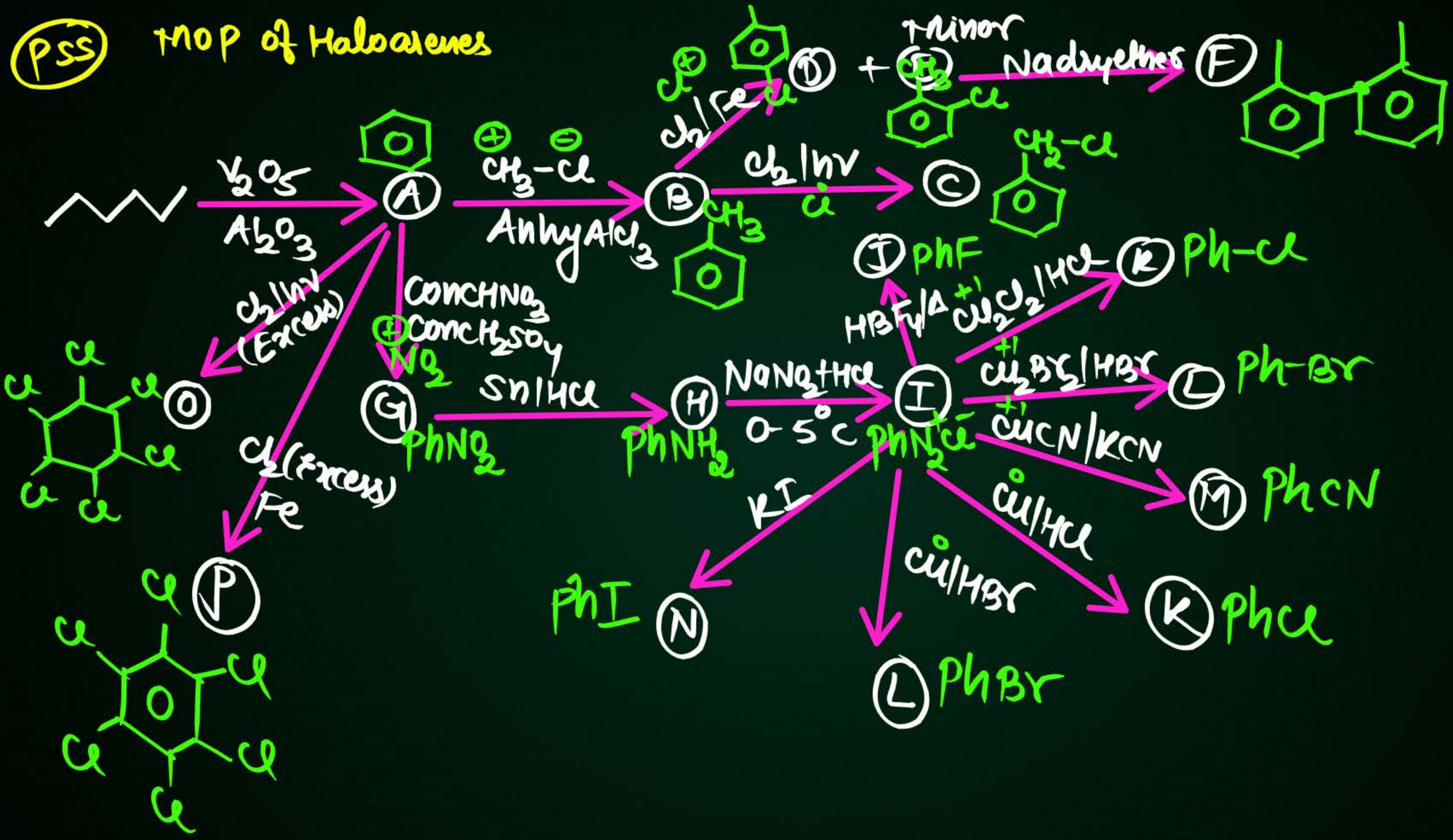
$CH_2=CH-O-CH=CH_2$

PSS (MOP of Haloalkanes)



CH_3-Cl
I
OCH₃
H
$\bar{O}Na^+$
Na/Δ
Halide
O + P + Q
Hydra acid
HCl
Cl
PCl₅
POCl₃
conc HCl
Anhy ZnCl₂
A
H
+
+OH₂
+
Cl
NaBr+H₂SO₄
B
Br
α
β
CH₃ŌNa⁺
M
Br₂
CCl₄
N
Br
Br
KI+H₃PO₄
C
I
Cl
G
SOCl₂/Py
SOCl₂
Cl
G
OH
Red P+Br₂
F + E
H₃PO₃
Br
NaI
=O
I
L
PCl₃
E + D
Cl
H₃PO₃
AgF
K
$n_s r_s = 2 \times 3.8$
F
Cl₂/hν
J

PSS Mop of Haloarenes


V2O5
Al2O3
A
⊕ CH3–Cl ⊖
Anhy AlCl3
B
CH3
Cl2/hν
Cl·
C
CH2–Cl
Cl2/Fe
Cl⊕
Cl
D
+
E
minor
CH3
Cl
Na dry ether
F
Conc HNO3
Conc H2SO4
⊕NO2
G
PhNO2
Sn/HCl
H
PhNH2
NaNO2+HCl
0-5°C
I
PhN2+Cl−
HBF4/Δ
J
PhF
+1
Cu2Cl2/HCl
K
Ph–Cl
+1
Cu2Br2/HBr
L
Ph–Br
+1
CuCN/KCN
M
PhCN
Cu°/HCl
K
PhCl
Cu°/HBr
L
PhBr
KI
N
PhI
Cl2/hν
(Excess)
O
Cl
Cl
Cl
Cl
Cl
Cl
Cl2 (Excess)
Fe
P
Cl
Cl
Cl
Cl
Cl
Cl

Home Work From PW Module (Yakeen NEET)

Prarambh: Q 61, 62, 63, 64, 65

Prabal: Q 26, 28

MARK THE DATE 4th May, 2025

Only 04 Months left for the NEET

Ab sirf practice aur practice,
Nahi toh Medical Dream miss!

NEET RANKERS TEST SERIES-2025
10
14
NTA NEET 2025
RANKERS TEST SERIES
Attempted by 1 LAKH+ Students Last Year
14 TEST BOOKLET
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- As Per NMC NEET UG 2024 Syllabus

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Thank you!!

14th Jan 15th JAN

12 - 12:30 pm — 12:00AM complete O.C

100% Course Coverage JEE Wallah ✓

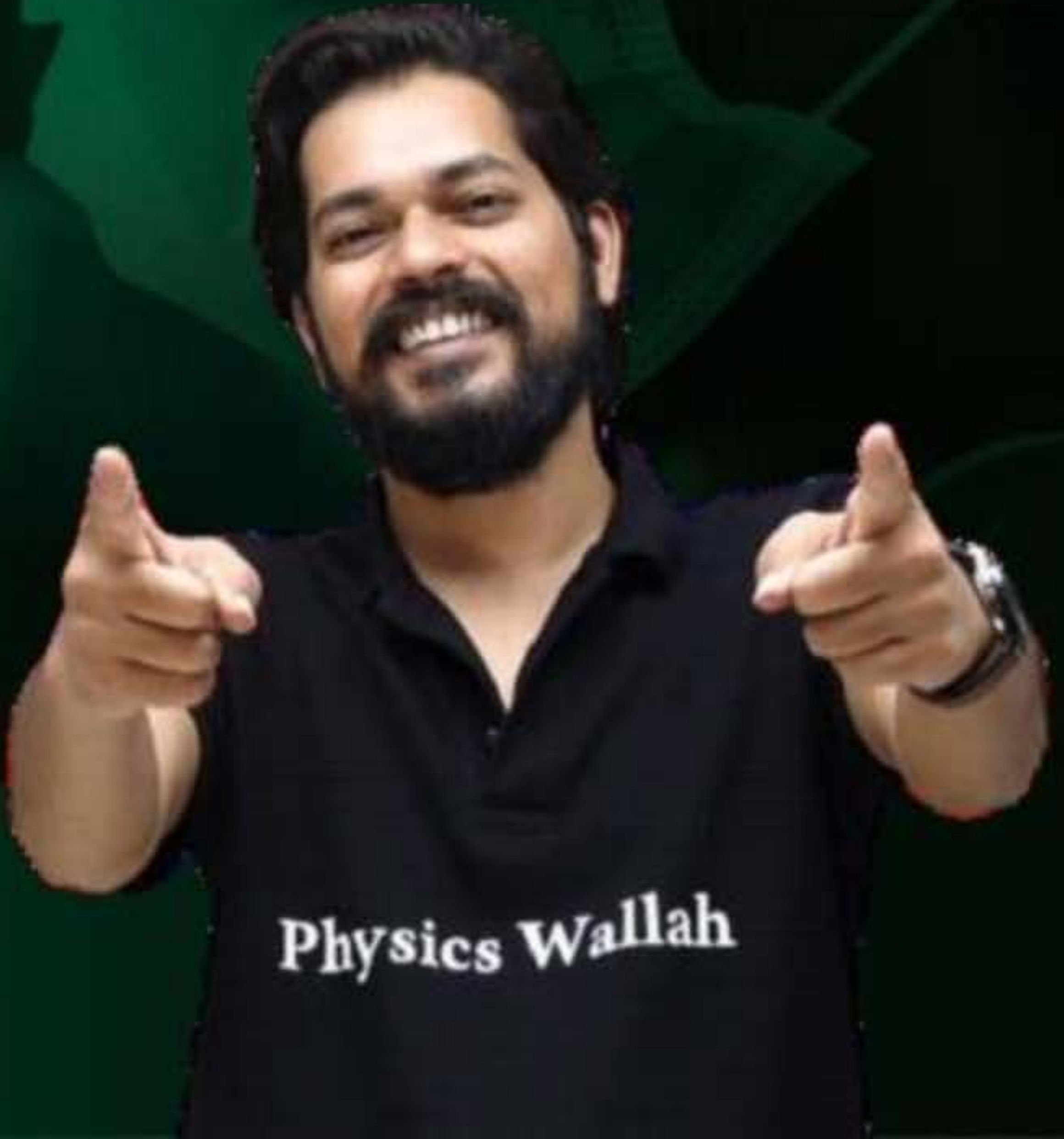
YAKEEN 2.0

FOR NEET 2025

Lecture- 06 Organic Chemistry

Alcohols, Phenols and Ethers

By- Pankaj Sir(POPU MAMA)


Physics Wallah

Topics *to be covered*

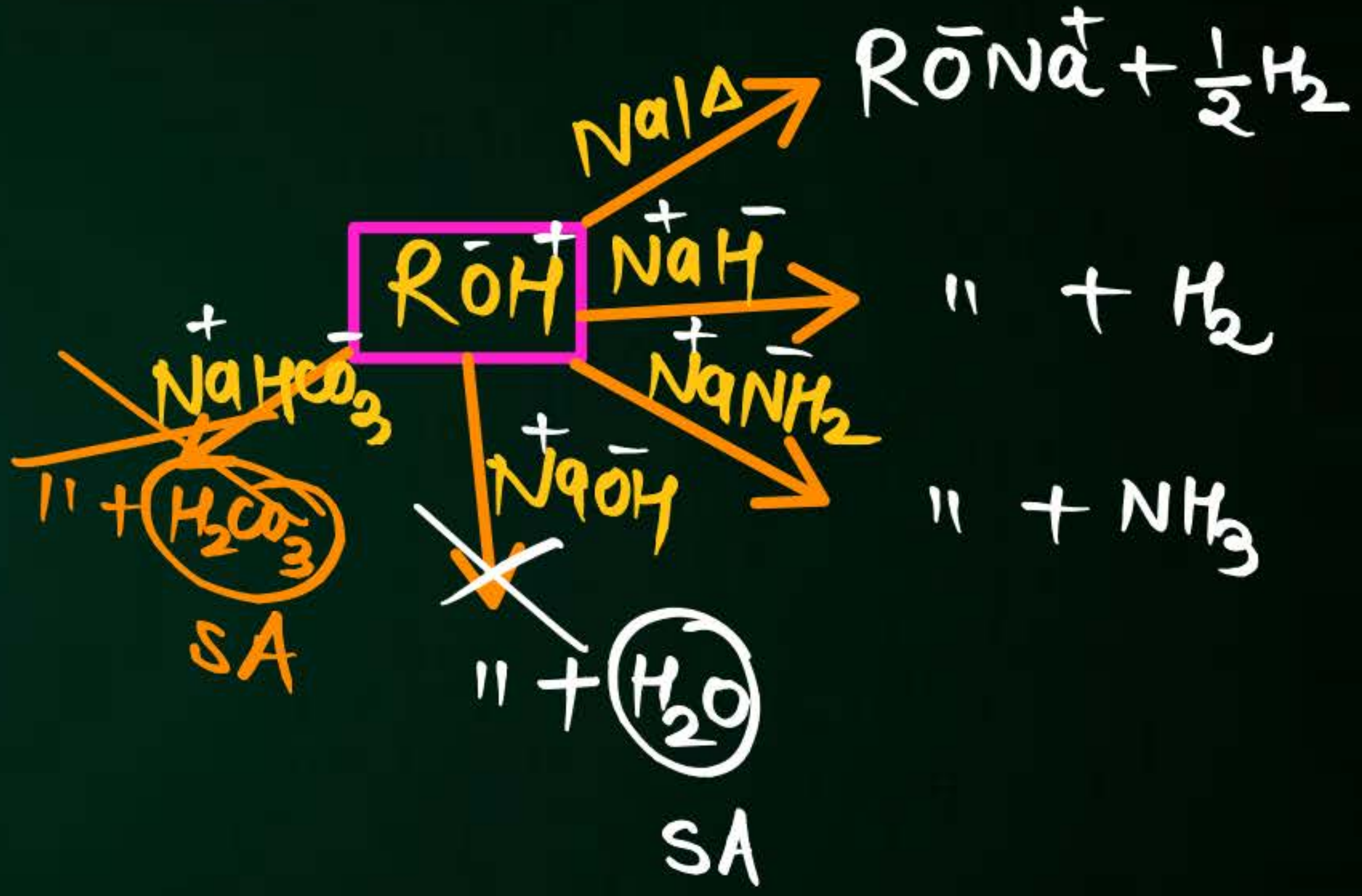
1. Chemical Properties of Alcohols ✓
2. Practice

Chemical Properties of Alcohols

$$\underset{SA}{CH_3OH} + NaOH \longrightarrow CH_3\bar{O}Na^+ + \underset{WA}{H_2O}$$

1. Acidic Nature of alcohol:

$$RO{-}H \rightleftharpoons \underset{(stable)}{R\bar{O}} + H^+$$



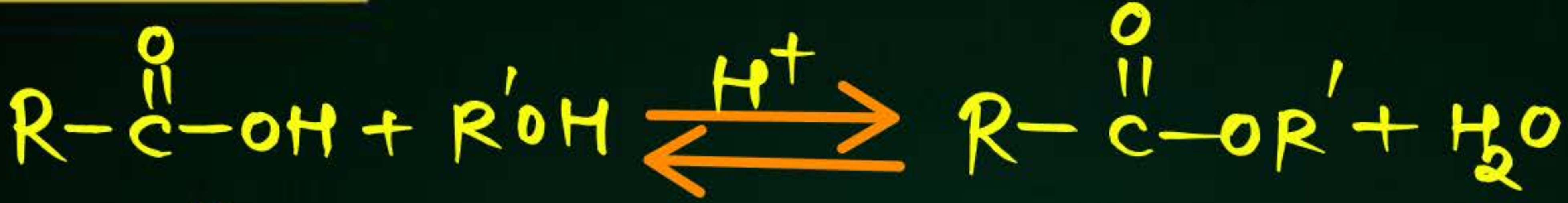
$R\bar{O}H^+$
Na|Δ
$R\bar{O}Na^+ + \frac{1}{2}H_2$
$\overset{+}{Na}\overset{-}{H}$
" + H_2
$\overset{+}{Na}\overset{-}{NH_2}$
" + NH_3
$\overset{+}{Na}\overset{-}{OH}$
" + H_2O
SA
$\overset{+}{Na}\overset{-}{HCO_3}$
" + H_2CO_3
SA

2. Esterification:

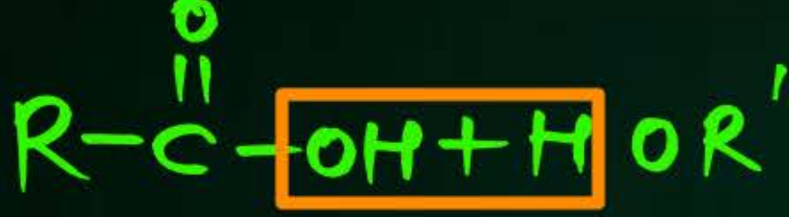
(ROR ∝ $\frac{1}{SH}$)

R.O.R of Alcohol
1° > 2° > 3°

①

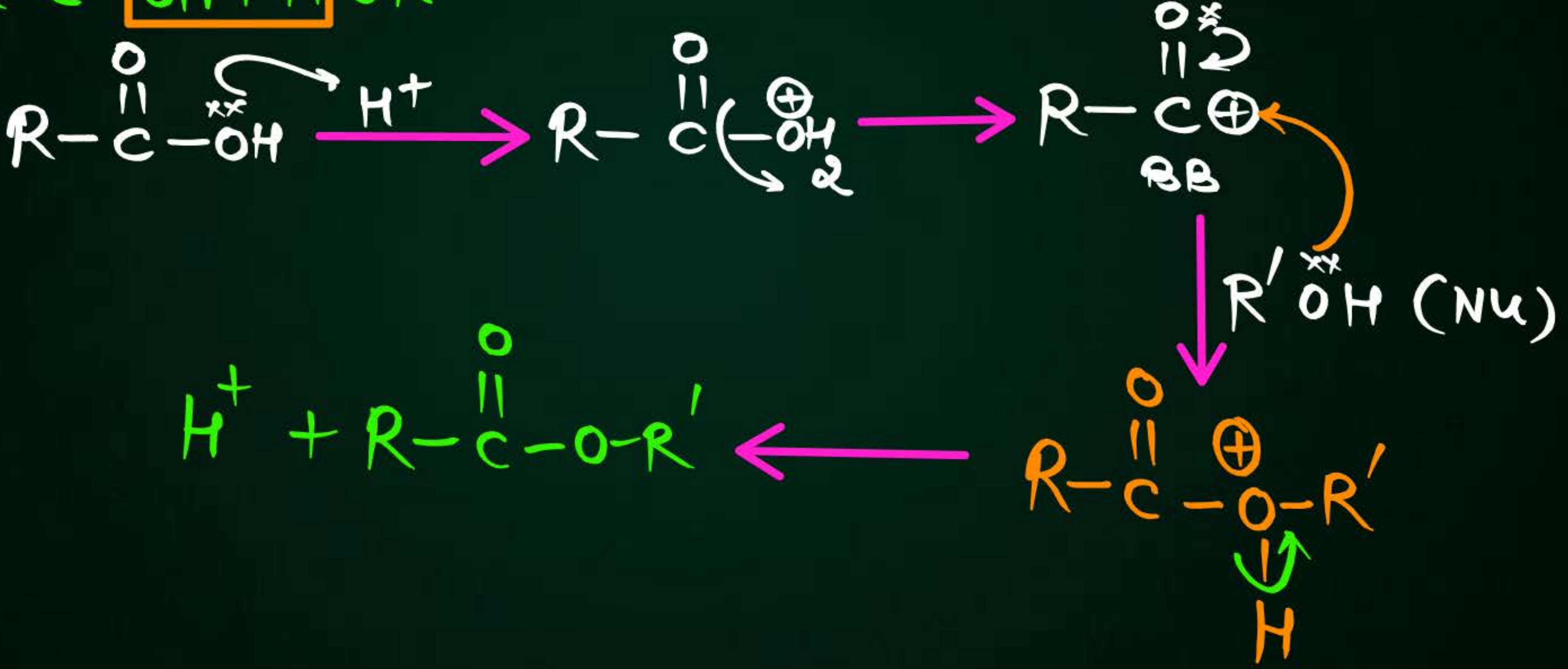


$$R-\overset{O}{\overset{\|}{C}}-OH + R'OH \overset{H^+}{\rightleftharpoons} R-\overset{O}{\overset{\|}{C}}-OR' + H_2O$$



$$R-\overset{O}{\overset{\|}{C}}-\boxed{OH + H}OR'$$

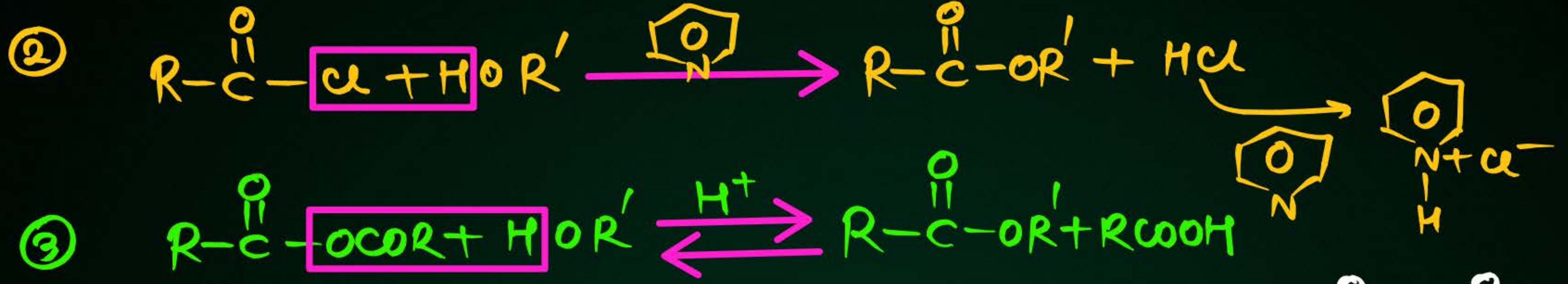
Mech:



$$R-\overset{O}{\overset{\|}{C}}-\ddot{O}H \xrightarrow{H^+} R-\overset{O}{\overset{\|}{C}}-\overset{\oplus}{O}H_2 \longrightarrow R-\overset{O}{\overset{\|}{C}}{}^{\oplus}$$

$$\downarrow R'\ddot{O}H\ (Nu)$$

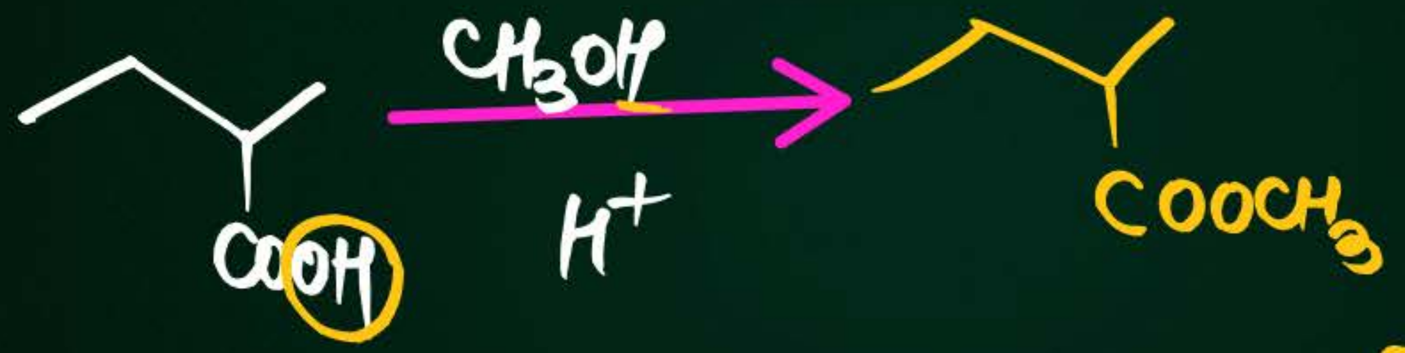
$$H^+ + R-\overset{O}{\overset{\|}{C}}-O-R' \longleftarrow R-\overset{O}{\overset{\|}{C}}-\underset{H}{\overset{\oplus}{O}}-R'$$



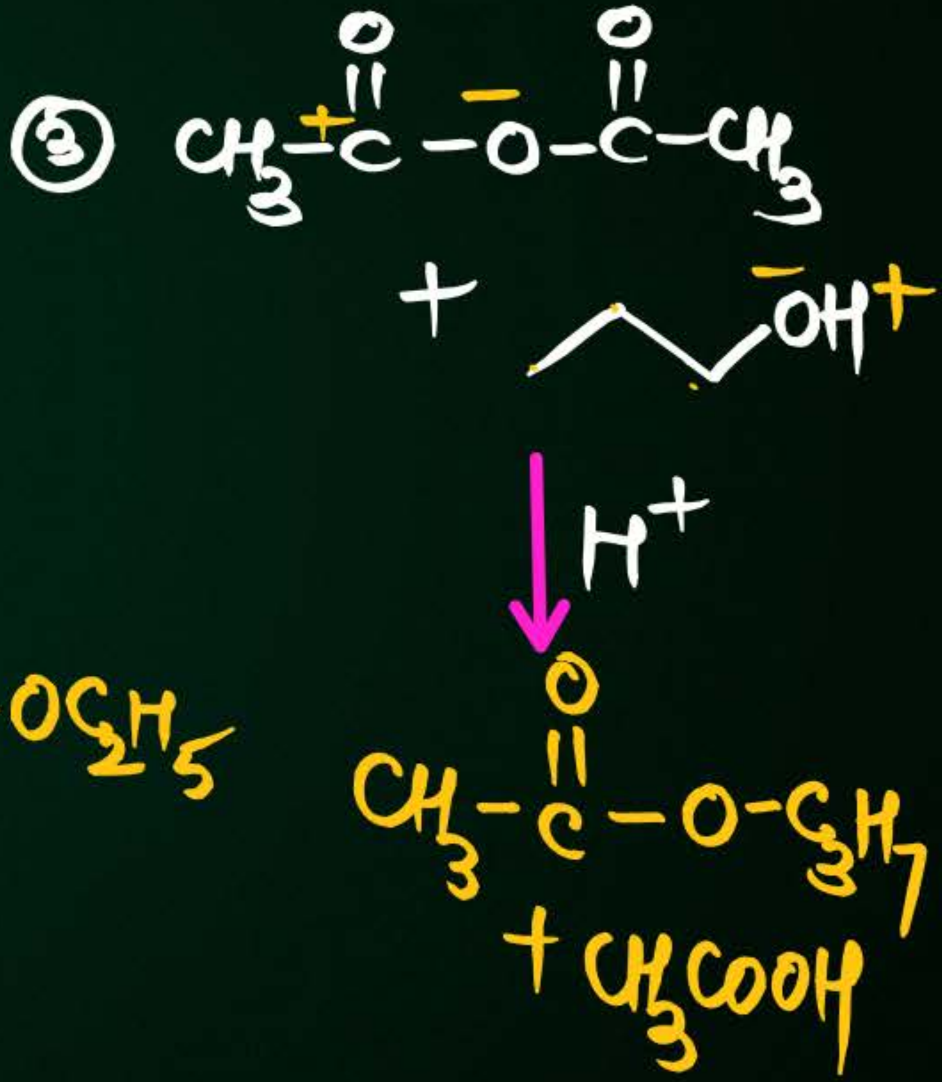
② $R-\overset{O}{\overset{\|}{C}}-\boxed{Cl+H}OR' \longrightarrow R-\overset{O}{\overset{\|}{C}}-OR' + HCl \longrightarrow N^{+}Cl^{-}$

③ $R-\overset{O}{\overset{\|}{C}}-\boxed{OCOR+H}OR' \overset{H^+}{\rightleftharpoons} R-\overset{O}{\overset{\|}{C}}-OR' + RCOOH$

Q

① 

② $PhCOCl + C_2H_5OH \xrightarrow{Py} Ph-\overset{O}{\overset{\|}{C}}-OC_2H_5$

③ 

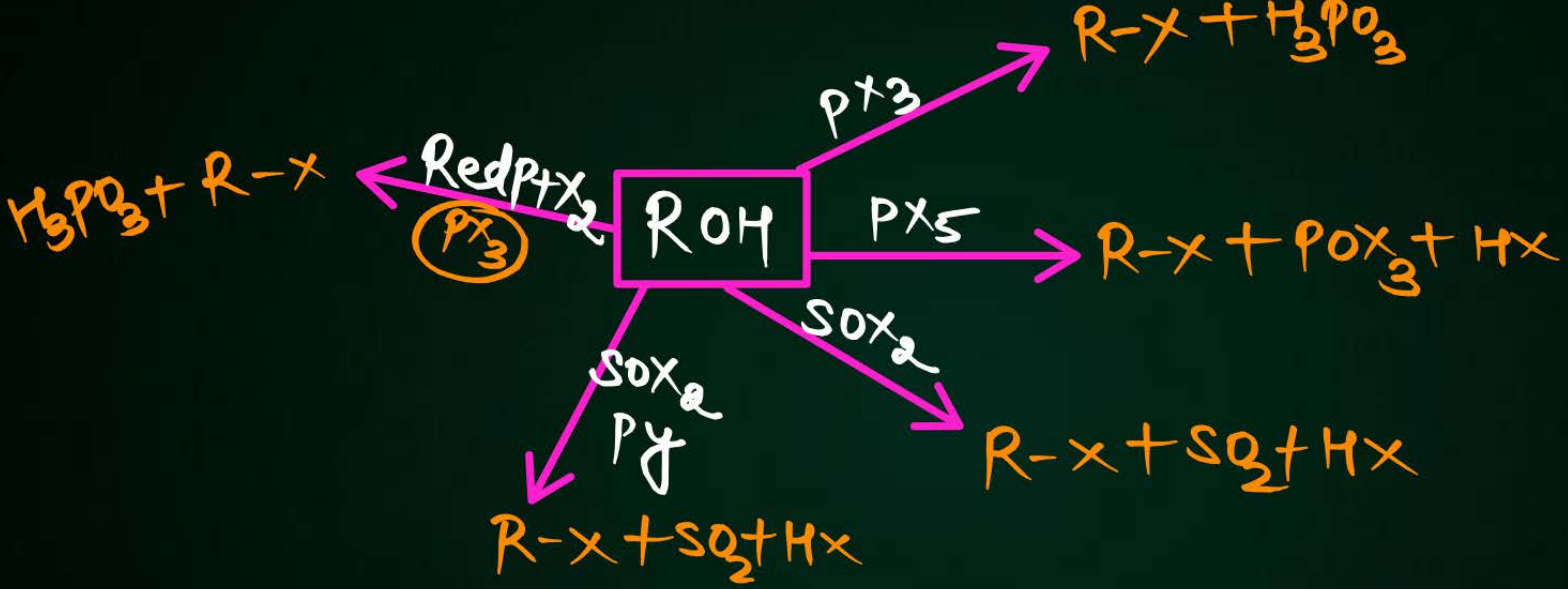
$CH_3-\overset{O}{\overset{\|}{C}}-O-\overset{O}{\overset{\|}{C}}-CH_3$

+ OH

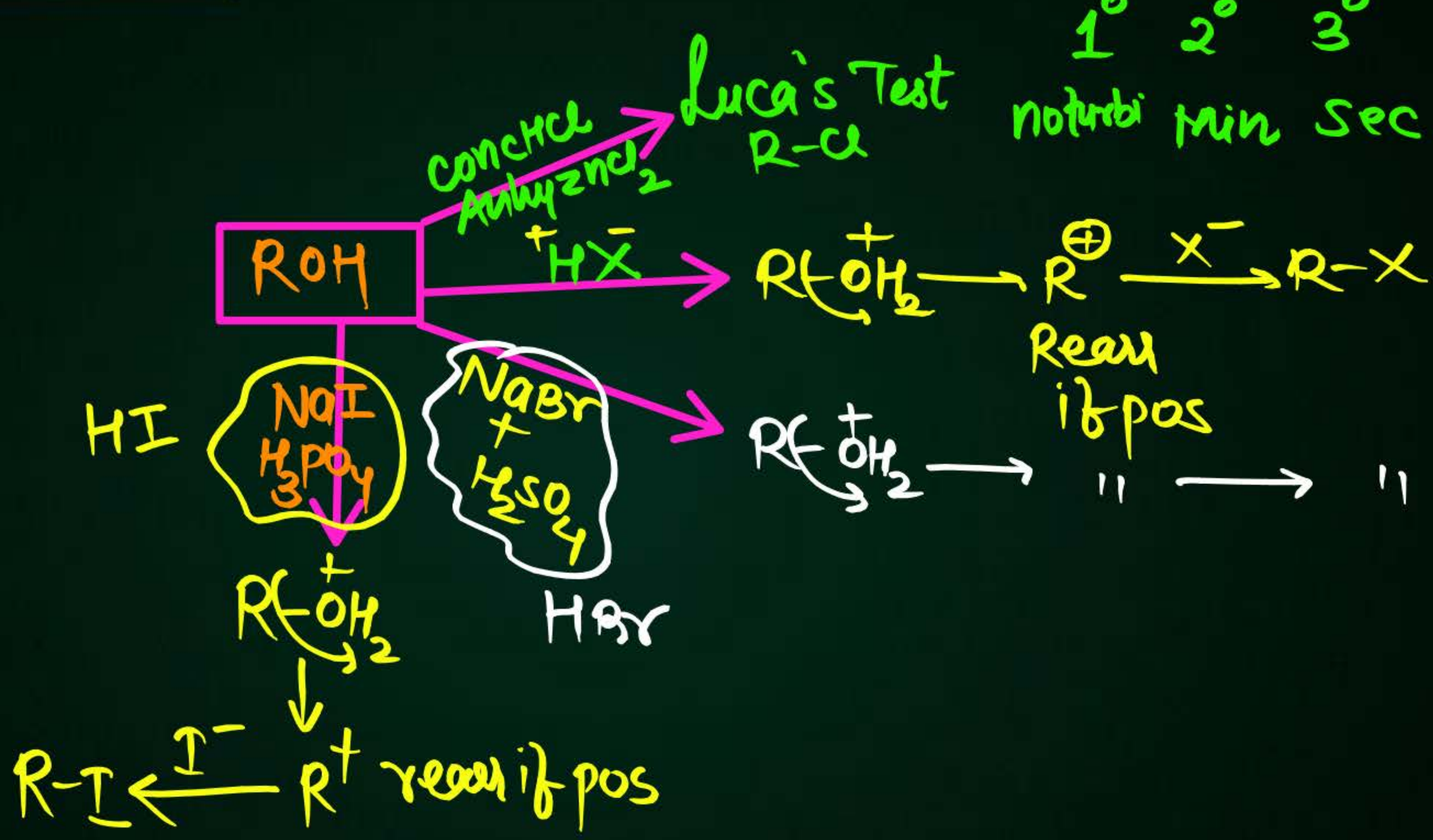
$\downarrow H^+$

$CH_3-\overset{O}{\overset{\|}{C}}-O-C_3H_7 + CH_3COOH$

3. Reaction with PX_3, PX_5 & SOX_2 :


ROH
px3
R-x + H3PO3
Px5
R-x + POx3 + Hx
Sox2
R-x + SO2 + Hx
Sox2
Py
R-x + SO2 + Hx
Red P + X2
Px3
H3PO3 + R-x

4. Reaction with HX:

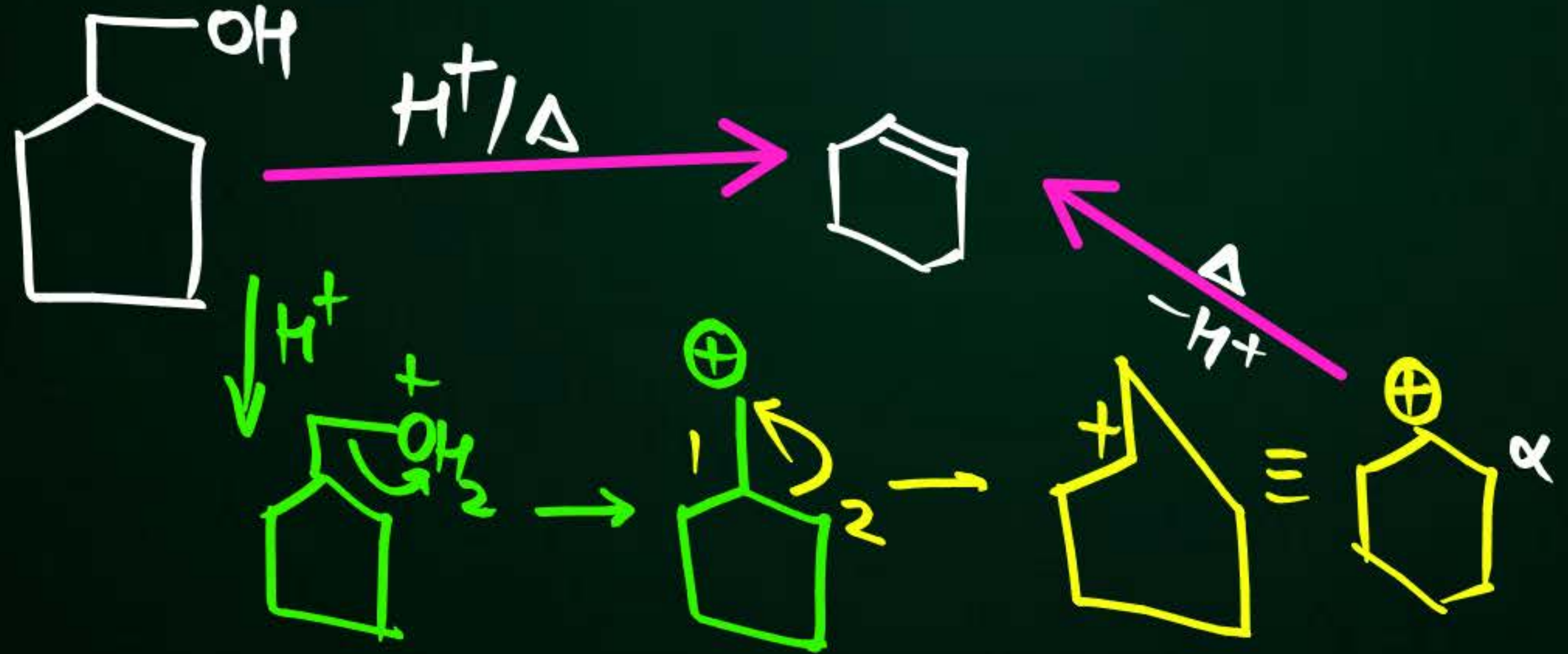

conc HCl
Anhy ZnCl$_2$
Luca's Test
R–Cl
1° 2° 3°
no turbi min sec
ROH
$\overset{+}{H}\overset{-}{X}$
$R-\overset{+}{O}H_2 \longrightarrow R^{\oplus} \xrightarrow{X^-} R-X$
Rearr if pos
$R-\overset{+}{O}H_2 \longrightarrow$ " $\longrightarrow$ "
HI
NaI + H$_3$PO$_4$
NaBr + H$_2$SO$_4$
HBr
$R-\overset{+}{O}H_2$
$R-I \xleftarrow{I^-} R^+$ rearr if pos

5. Dehydration:

E1

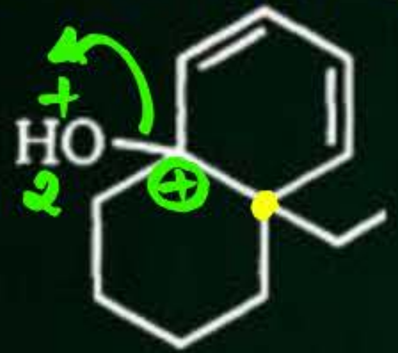
$$\begin{tikzcd}[column sep=huge]
R{-}OH \arrow[r, "\overset{H^+}{KHSO_4}/\Delta \quad conc\,H_2SO_4/\Delta", "or\ conc\,H_3PO_4/\Delta\ or\ H^+/\Delta"'] \arrow[d, "H^+"'] & \overset{\text{More stable Major}}{\text{Alkene}} \\
R{-}\overset{\oplus}{O}H_2 \arrow[r] & R^{\oplus} \arrow[u, "\Delta"']
\end{tikzcd}$$

Q

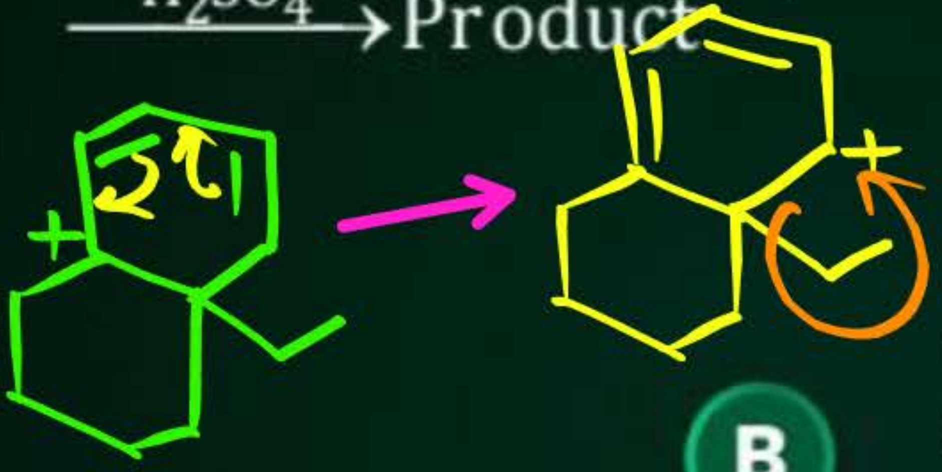


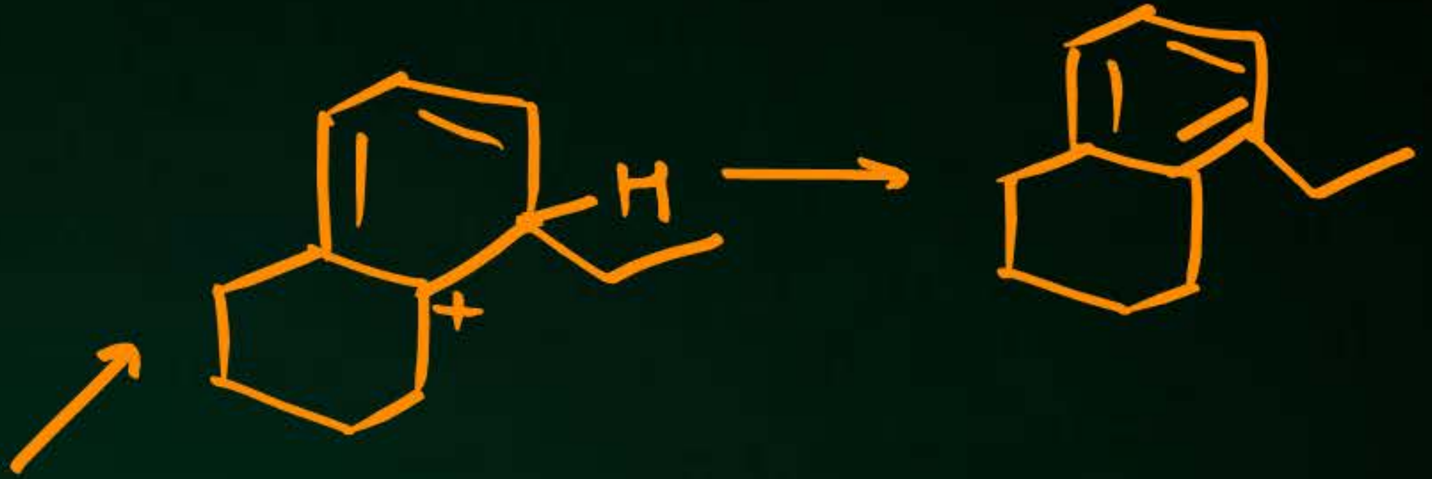
QUESTION

Identify the major product.

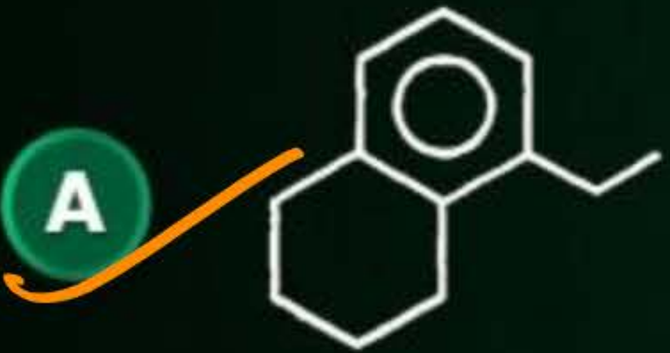


$\xrightarrow{H_2SO_4}$ Product

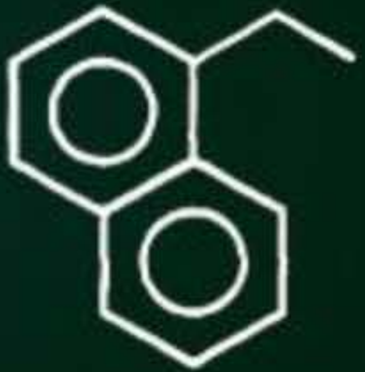




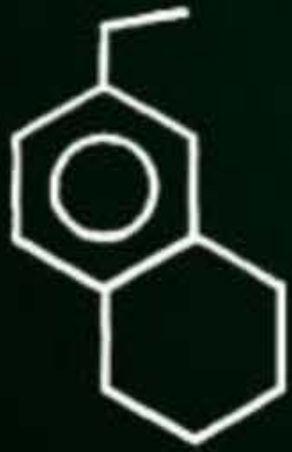
A



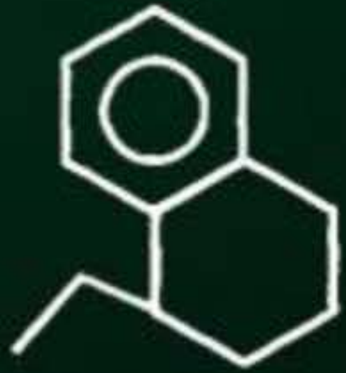
B



C



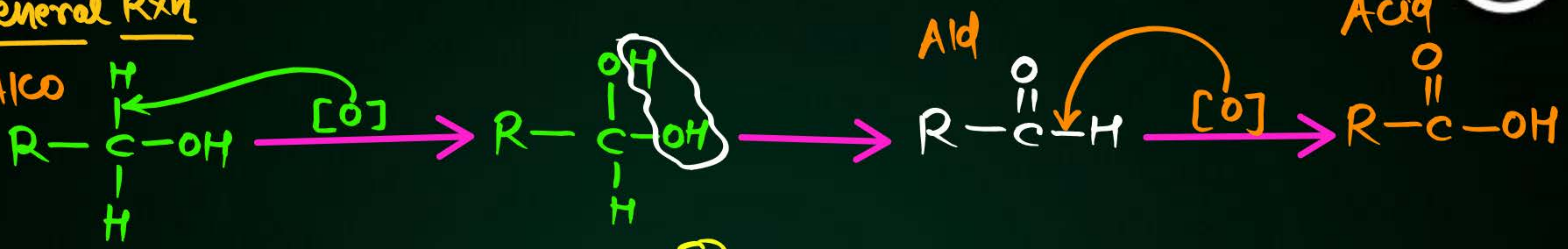
D



6. Oxidation:

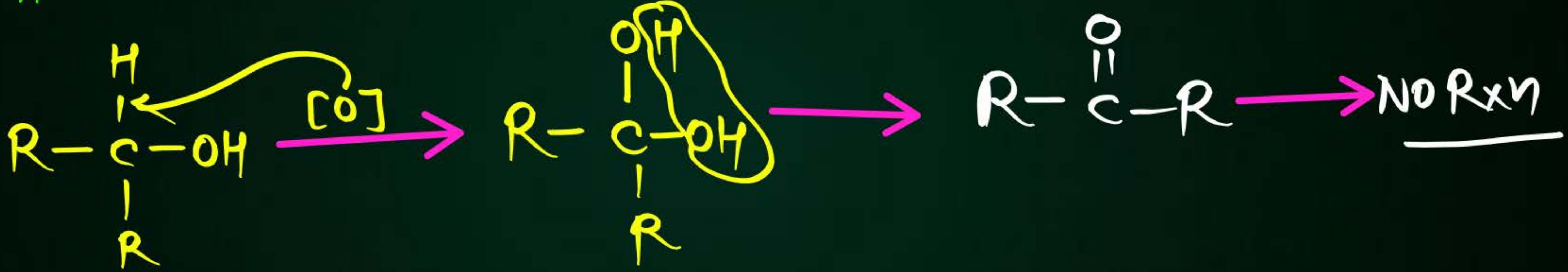
General Rxn

1° Alco



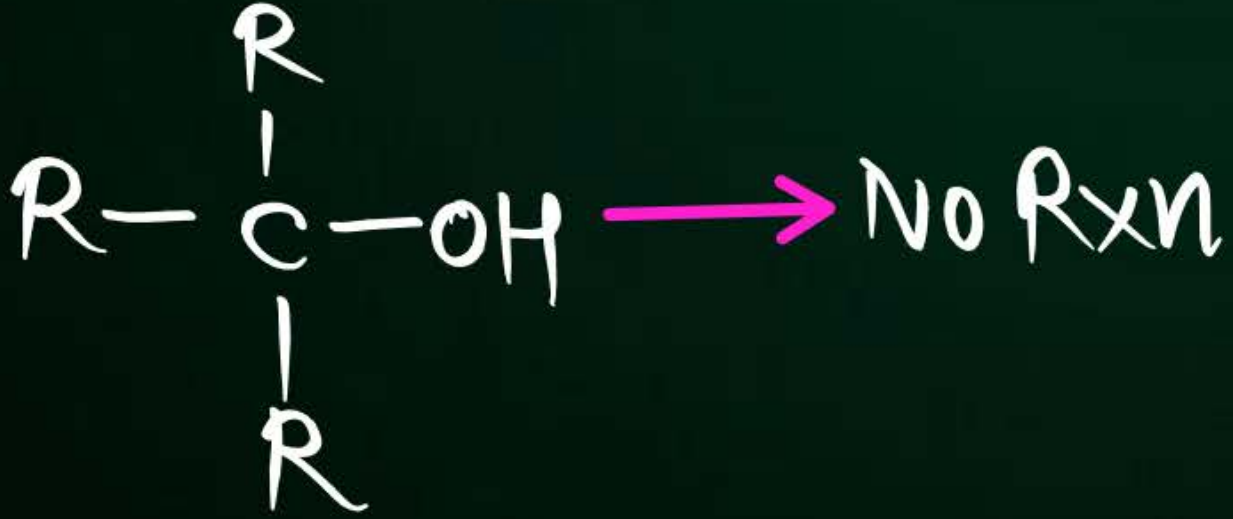
$$R-\overset{\overset{H}{|}}{\underset{\underset{H}{|}}{C}}-OH \xrightarrow{[O]} R-\overset{\overset{OH}{|}}{\underset{\underset{H}{|}}{C}}-OH \longrightarrow R-\overset{\overset{O}{\|}}{C}-H \xrightarrow{[O]} R-\overset{\overset{O}{\|}}{C}-OH$$

2° Alco



$$R-\overset{\overset{H}{|}}{\underset{\underset{R}{|}}{C}}-OH \xrightarrow{[O]} R-\overset{\overset{OH}{|}}{\underset{\underset{R}{|}}{C}}-OH \longrightarrow R-\overset{\overset{O}{\|}}{C}-R \longrightarrow \text{No Rxn}$$

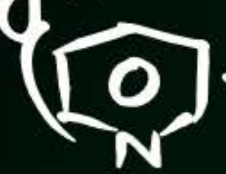
3° Alco



$$R-\overset{\overset{R}{|}}{\underset{\underset{R}{|}}{C}}-OH \longrightarrow \text{No Rxn}$$

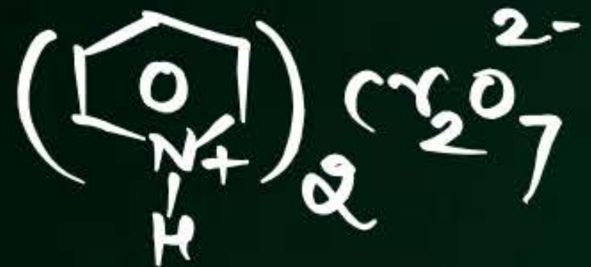
Mild oxidising agent (MOA)

① PCC (Pyridinium chlorochromate)



$+ HCl + CrO_3)$

② PDC (Pyridinium dichromate)

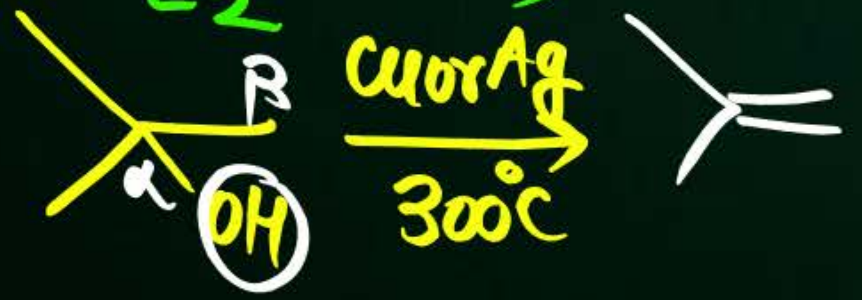


③ anhy. CrO_3 or CrO_3

④ $CrO_3 + 2py$ or CH_2Cl_2 or acetone

⑤* Cu or Ag | 300°C

$(3^\circ ROH \xrightarrow[E_2]{} Alkene)$



Strong O.A (SOA)

① $KMnO_4 + H^+$ or $KMnO_4/\Delta$ or Hot $KMnO_4$ or Alk $KMnO_4/\Delta$ / H^+ (Strong)

② $K_2Cr_2O_7 + H^+$ or $K_2Cr_2O_7/\Delta$ or Hot $K_2Cr_2O_7$

③ Conc HNO_3

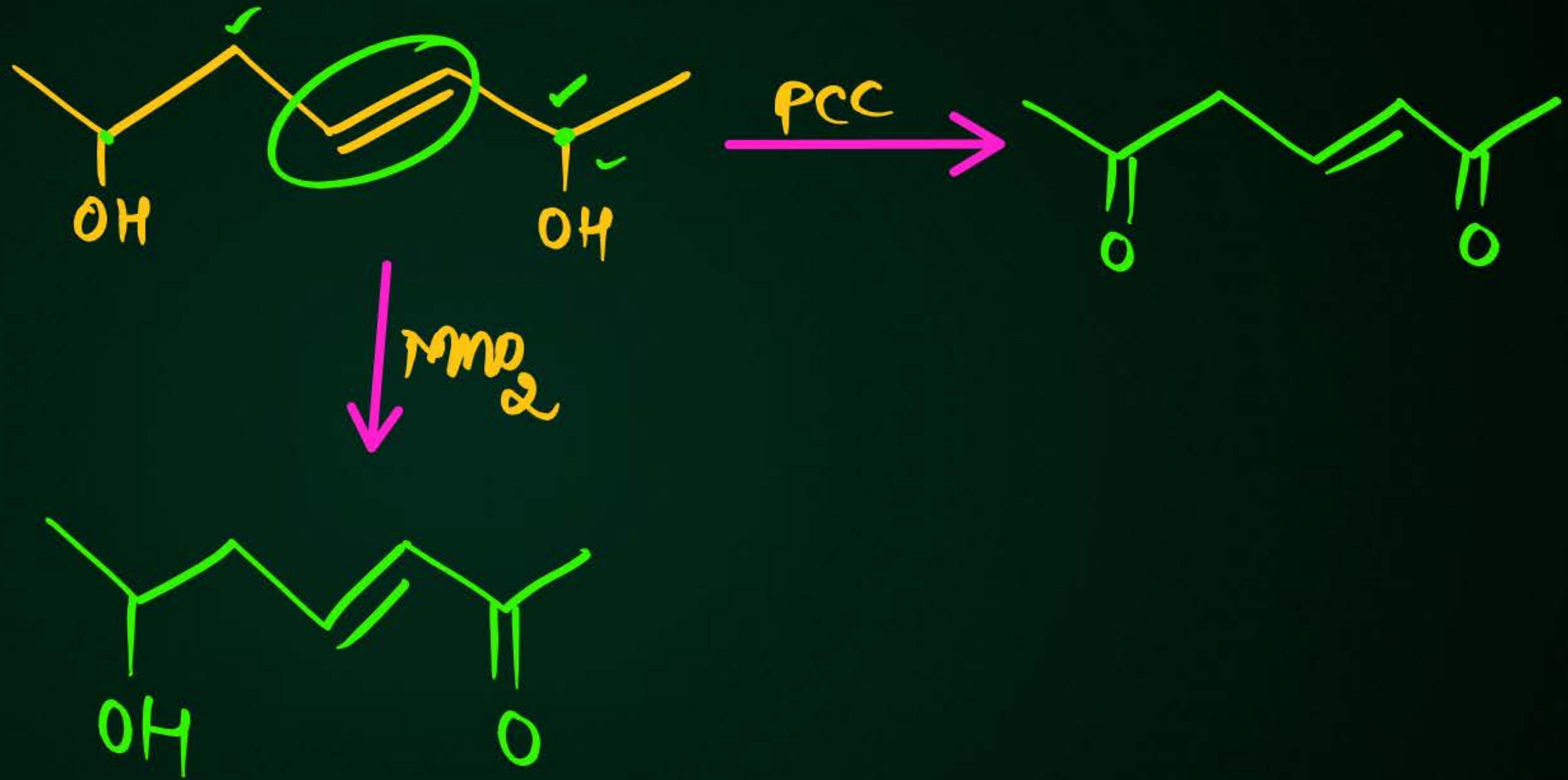
④ $CrO_3 + H_2SO_4$ or H^+ (Jone's reagent)

⑤ CrO_3 + aq or H_2CrO_4 or $CrO_3(aq)$

Special MOA – MnO_2

Allylic Alcohol ✓

Benzylic Alcohol ✓


OH
OH
PCC
O
O
MnO_2
OH
O

QUESTION (NCERT Exemplar)

What is the correct order of reactivity of alcohols in the following reaction?

$$\overset{+}{R}-\overset{+}{O}H_2 + HCl \xrightarrow{ZnCl_2} R-Cl + H_2O$$

A $1° > 2° > 3°$

B $1° < 2° > 3°$

[✓ C] $3° > 2° > 1°$

D $3° > 1° > 2°$

QUESTION (NCERT Exemplar)

CH_3CH_2OH can be converted into CH_3CHO by ____________.

A catalytic hydrogenation

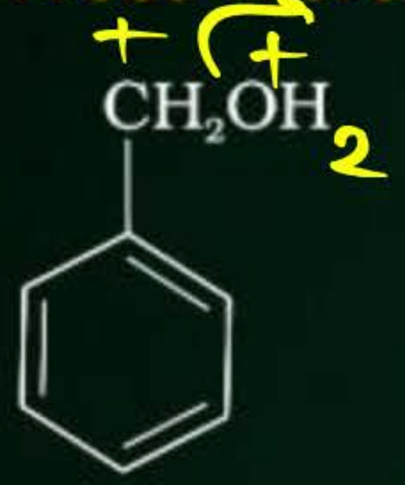
B treatment with $LiAlH_4$

[✓ C] treatment with pyridinium chlorochromate

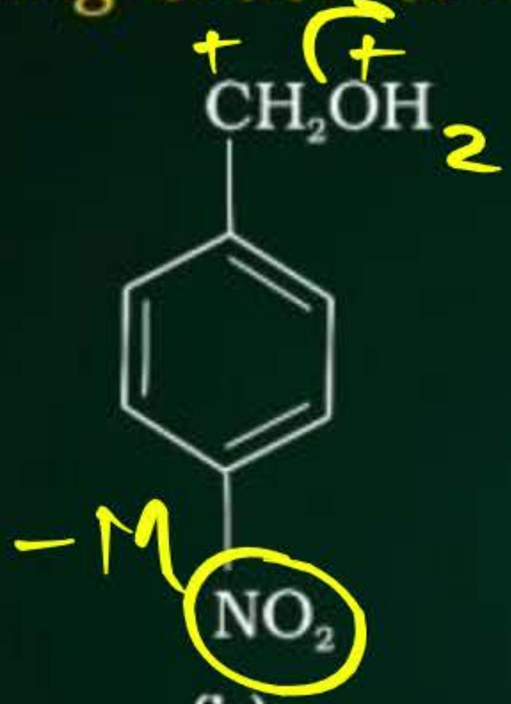
D treatment with $KMnO_4$

QUESTION (NCERT Exemplar)

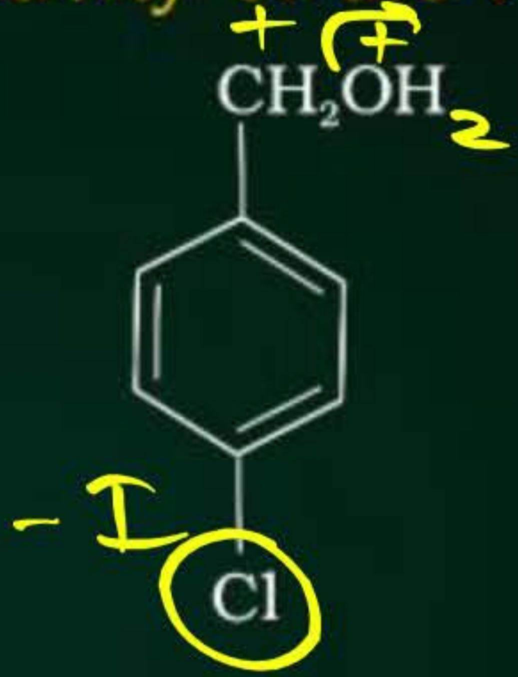
Mark the correct increasing order of reactivity of the following compounds with HBr/HCl.



(a)


+
+
CH₂OH₂
-M
NO₂

(b)



(c)

ROR ∝ stability of $C^{\oplus}$

A a < b < c

B b < a < c

[✓ C] b < c < a

D c < b < a

QUESTION (NCERT Exemplar)

Which of the following reagents cannot be used to oxidize primary alcohols to aldehydes?

- A CrO_3 in anhydrous medium.
- [✓ B] $KMnO_4$ in acidic medium.
- C Pyridinium chlorochromate.
- D Heat in the presence of Cu at 573K.

QUESTION (NCERT Exemplar)

$<$ PhOH

✓ **Assertion:** Ethanol is a weaker acid than phenol.

Reason: Sodium ethoxide may be prepared by the reaction of ethanol with aqueous NaOH. ✗

$EtOH + NaOH \rightarrow Et\bar{O}Na^+$

- **A** Assertion and reason both are correct and reason is correct explanation of assertion.
- **B** Assertion and reason both are wrong statements.
- [✓ **C**] Assertion is correct statement but reason is wrong statement.
- **D** Assertion is wrong statement but reason is correct statement.

QUESTION (AIIMS 2004)

The most suitable reagent for the conversion of $RCH_2OH \longrightarrow RCHO$ is:

A $KMnO_4$

B $K_2Cr_2O_7$

C CrO_3

[✓ D] PCC (Pyridine chlorochromate)

QUESTION (AIIMS 2002)

Lucas test is used for the detection of

(A) [✓ alcohols]

(B) alkyl halides

(C) phenols

(D) aldehydes

QUESTION

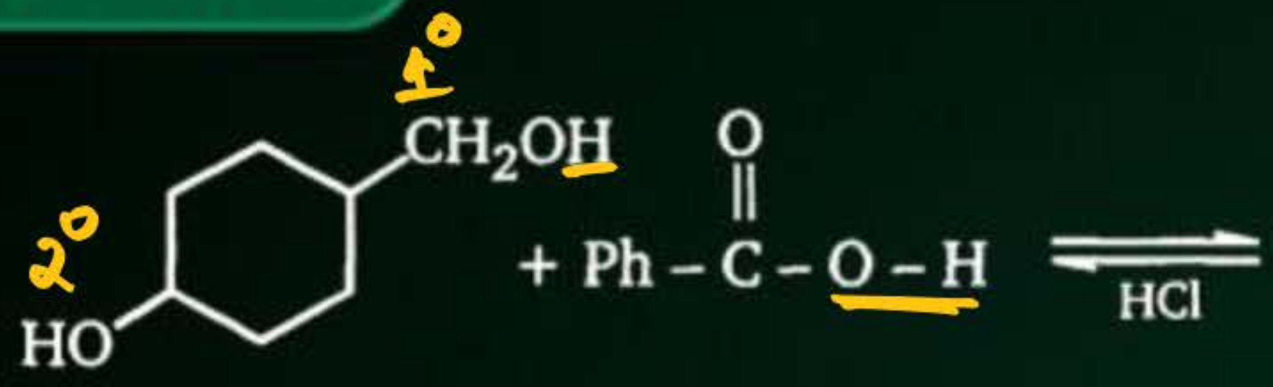
$C^{\oplus}$

Assertion: In Lucas test, 3° alcohols react immediately.

Reason: An equimolar mixture of anhyd. $ZnCl_2$ and conc. HCl is called Lucas reagent.

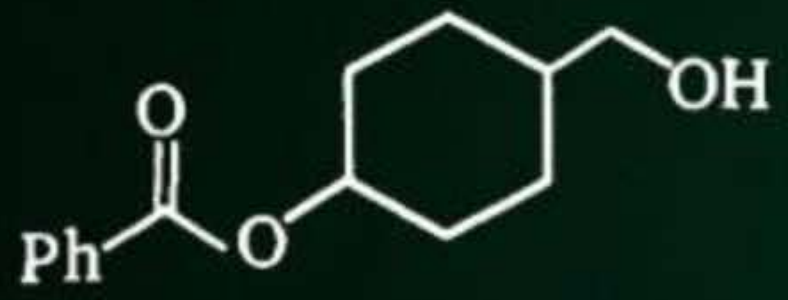
- Ⓐ If both Assertion and Reason are correct and the reason is a correct explanation of the Assertion.
- [✓ Ⓑ] If both Assertion and Reason are correct but Reason is not a correct explanation of the Assertion.
- Ⓒ If the Assertion is correct but Reason is incorrect.
- Ⓓ If both the Assertion and Reason are incorrect.

QUESTION

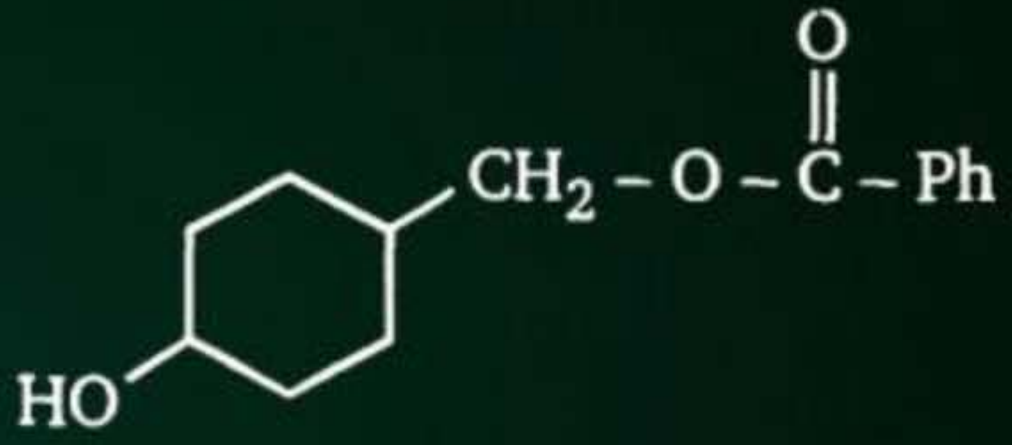

1°
CH₂OH
2°
HO
+ Ph – C – O – H
O
HCl

Major product of above esterification reaction is:

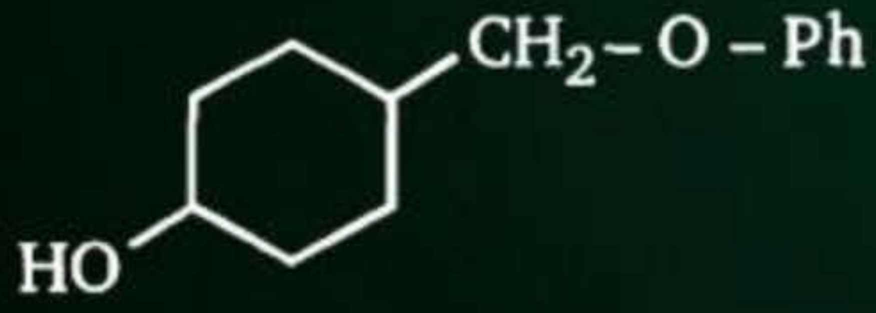
(A)



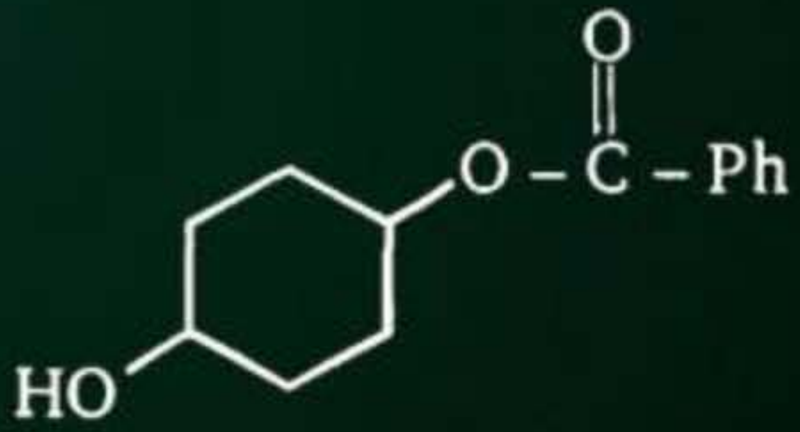
[✓ (B)]


O
CH₂ – O – C – Ph
HO

(C)



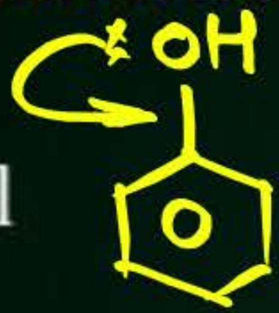
(D)



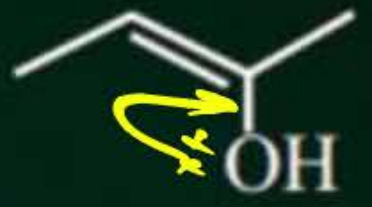
QUESTION

Which of the following will show Lucas test?

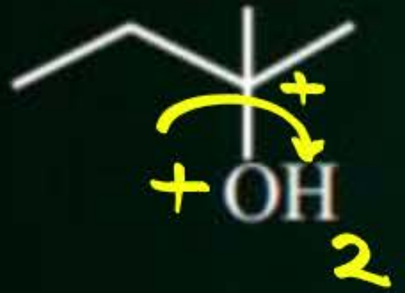
A ✗ Phenol



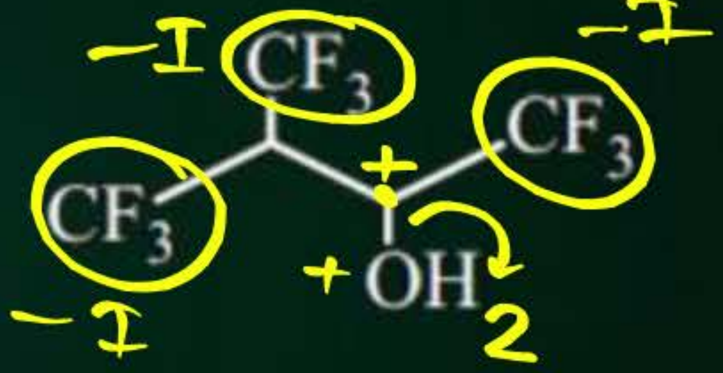
B ✗



✓ **C**



✗ **D**


-I
CF3
-I
CF3
CF3
-I
+
+OH
2

QUESTION

HX

$H^{\oplus}$ BE↓ ROR↑

Fro the reaction,

$$C_2H_5OH + HX \xrightarrow{ZnX_2} C_2H_5X$$

The decreasing order of reactivity of halogen acids is:

- (A) HI > HCl > HBr
- [✓ (B)] HI > HBr > HCl
- (C) HCl > HBr > HI
- (D) HBr > HI > HCl

QUESTION

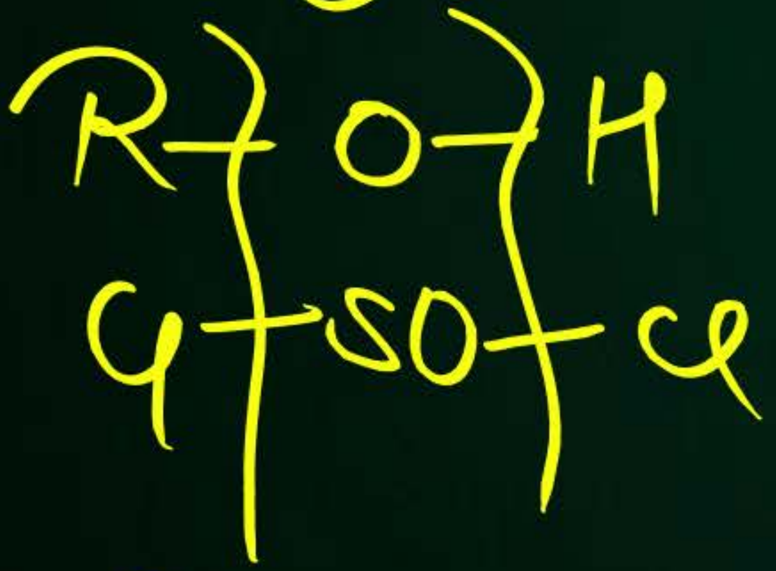
Which reaction is termed as Darzen's reaction?

A $ROH + HCl$

B $ROH + PCl_5$

[✓ **C** $ROH + SOCl_2$]

D $ROH + PCl_3$

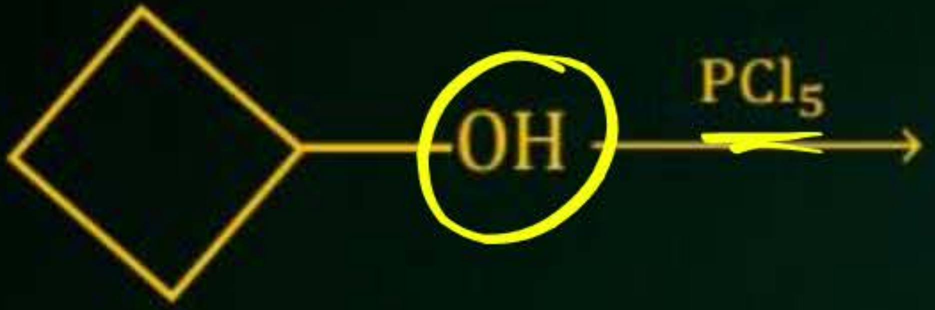


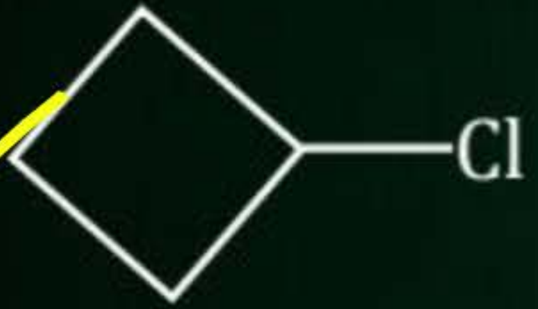
$R-O-H$

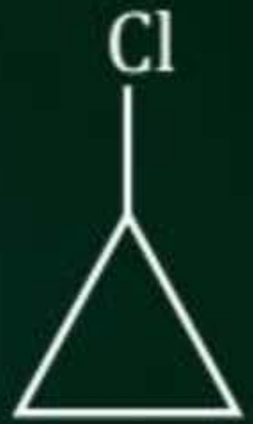
$Cl-SO-Cl$

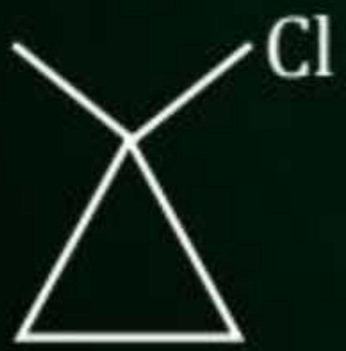
$RCl + SO_2\uparrow + HCl\uparrow$

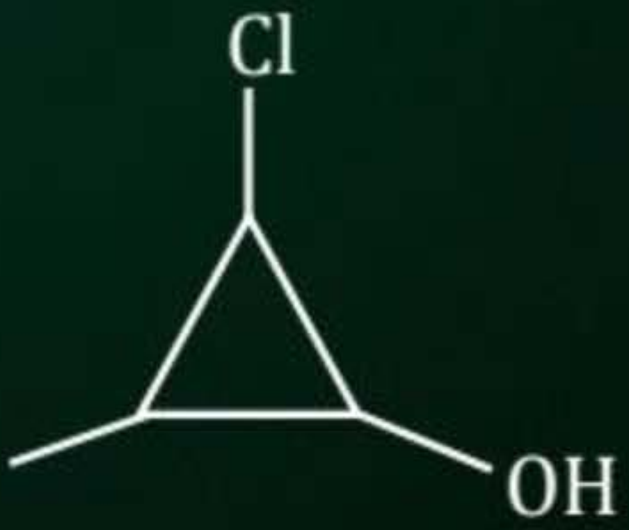
QUESTION



[✓ A] 

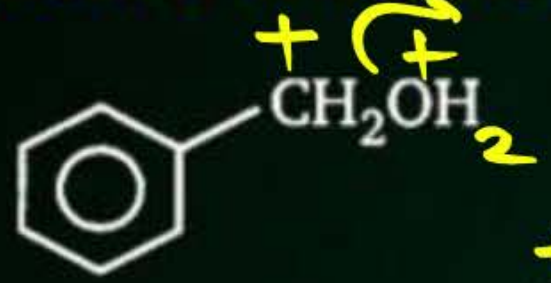
B 

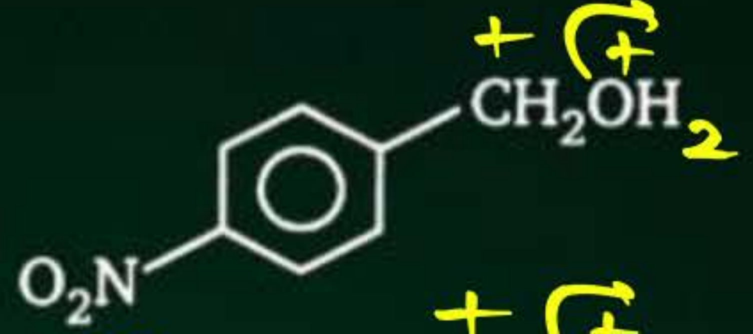
C 

D 

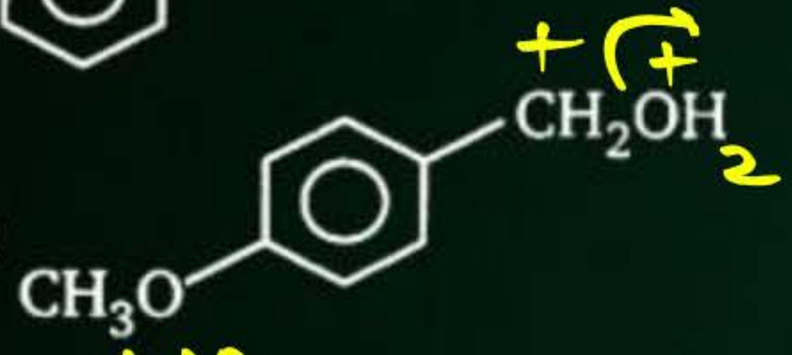
QUESTION

Consider the following alcohols,

(I)


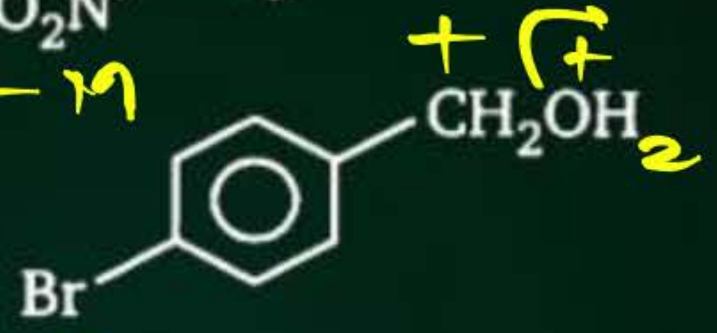
(II)


−M

(III)


+ (+
CH$_2$OH$_2$
CH$_3$O

+M

(IV)


−I

ROR ∝ stability of carbocation

The order of decreasing reactivities of these alcohols towards nucleophilic substitution with HBr is:

[✓ A] III > I > IV > II

B III > I > II >IV

C I > III >IV >II

D I >III >II >IV

QUESTION

Identify the correct esterification reaction,

Here $O^{18} = O^{*}$

$RC\overset{*}{O}OR'$

✗ A $RC\overset{*}{O}\underline{\overset{*}{O}H} + R^{1}O\underline{H} \xrightleftharpoons{H^{(+)}} RC\overset{*}{O}\overset{*}{O}R^{1} + H_2O$

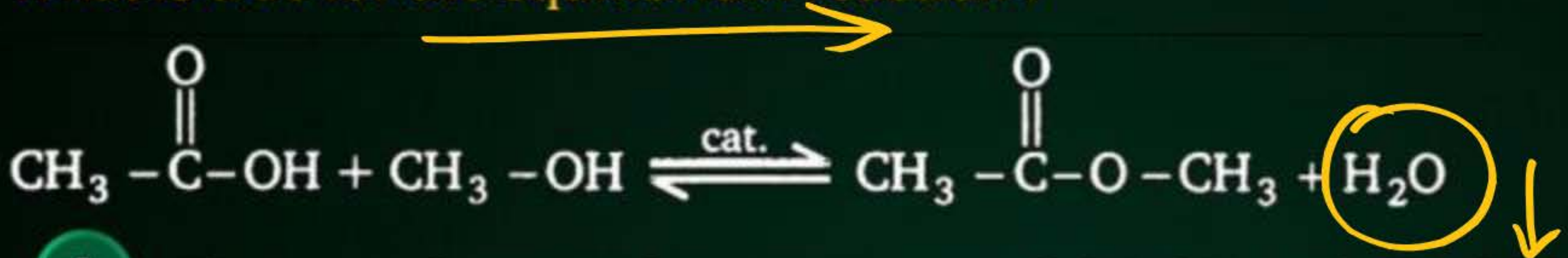
[✓ B] $RCO_{\underline{2}}H + R^{1}\overset{*}{O}\underline{H} \xrightleftharpoons{H^{(+)}} RCO\underline{\overset{*}{O}}R^{1} + H_2O$

C $RCO\underline{OH} + R^{1}\overset{*}{O}\underline{H} \xrightleftharpoons{H^{(+)}} RCOOR^{1} + H_2\overset{*}{O}$

D All are correct

QUESTION

What is true for the equilibrium reaction ?



$$CH_3-\overset{\overset{O}{\|}}{C}-OH + CH_3-OH \xrightleftharpoons{\text{cat.}} CH_3-\overset{\overset{O}{\|}}{C}-O-CH_3 + H_2O$$

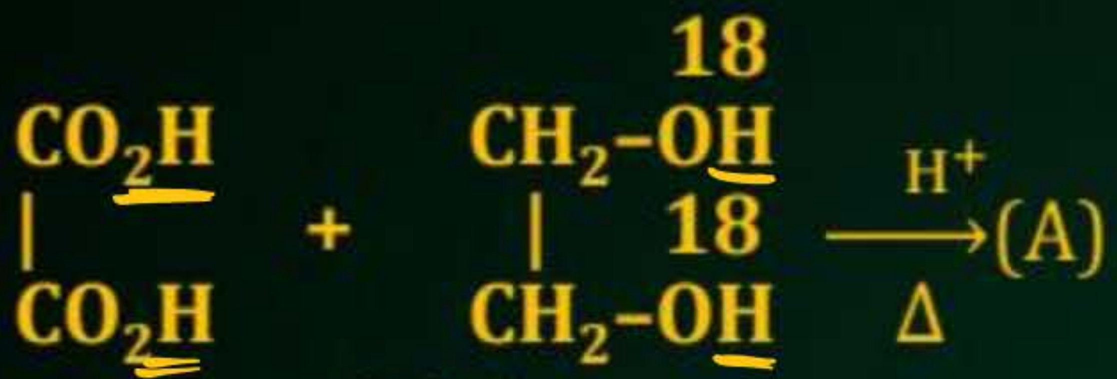
(A) The use of equimolar quantities of CH_3OH and CH_3COOH will give the greatest yield of the ester at equilibrium.

[✓ (B)] Removal of water will increase the amount of ester at equilibrium

(C) Addition of CH_3COOCH_3 will cause the formation of equal an equal number of moles of water

(D) Application of pressure increases the amount of ester at equilibrium.

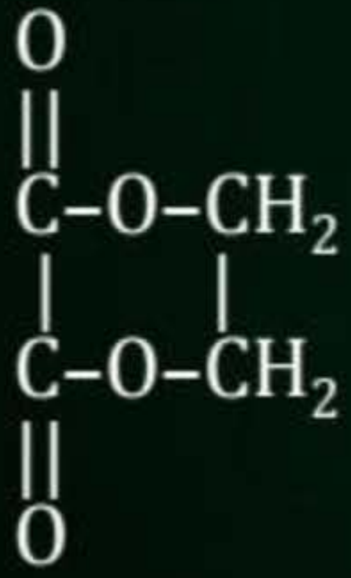
QUESTION



$$\begin{array}{l} CO_{\underline{2}}\underline{H} \\ | \\ CO_{\underline{2}}\underline{H} \end{array} + \begin{array}{l} \quad\quad\ \ \ 18 \\ CH_2-O\underline{H} \\ |\quad\quad\ \ 18 \\ CH_2-O\underline{H} \end{array} \xrightarrow[\Delta]{H^+} (A)$$

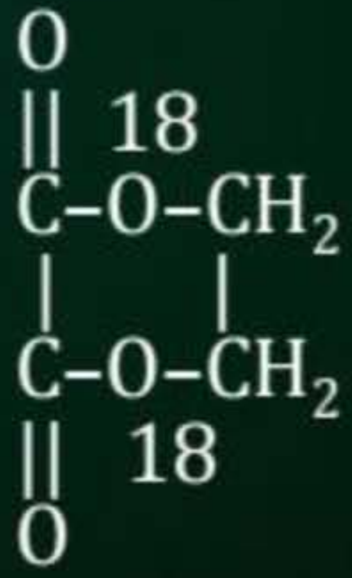
Product (A) is:

Ⓐ



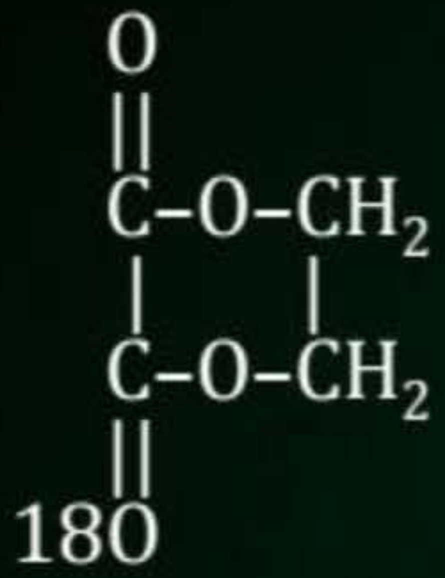
$$\begin{array}{l} O \\ \| \\ C-O-CH_2 \\ |\quad\quad\ \ | \\ C-O-CH_2 \\ \| \\ O \end{array}$$

✓ Ⓑ

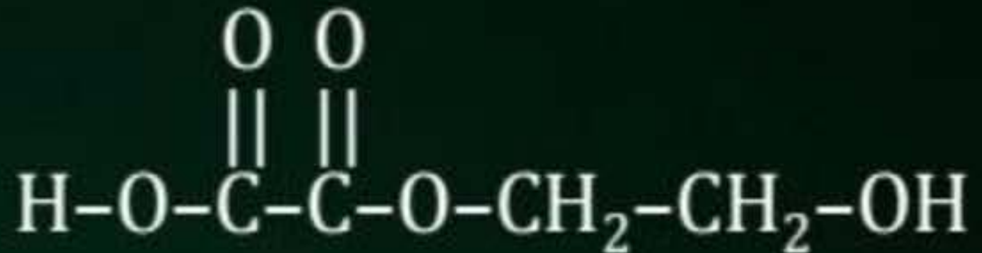


$$\begin{array}{l} O \\ \|\ 18 \\ C-O-CH_2 \\ |\quad\quad\ \ | \\ C-O-CH_2 \\ \|\ 18 \\ O \end{array}$$

Ⓒ

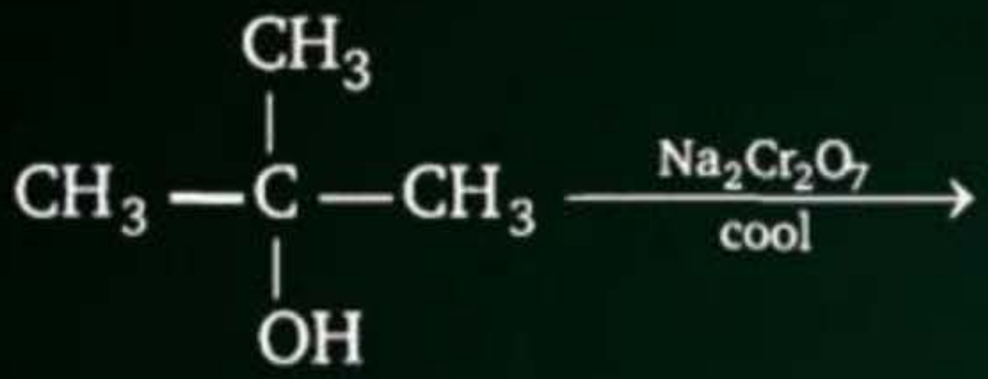

O
C–O–CH₂
C–O–CH₂
18O

Ⓓ

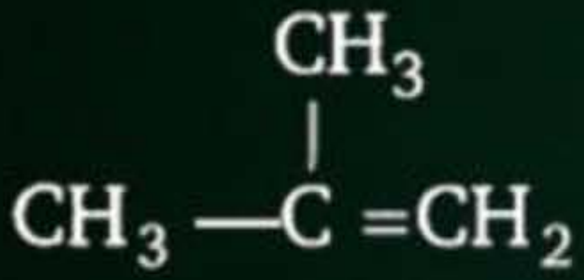


$H-O-\overset{\overset{O}{\|}}{C}-\overset{\overset{O}{\|}}{C}-O-CH_2-CH_2-OH$

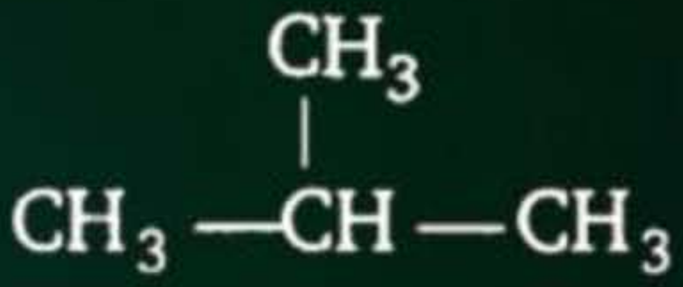
QUESTION



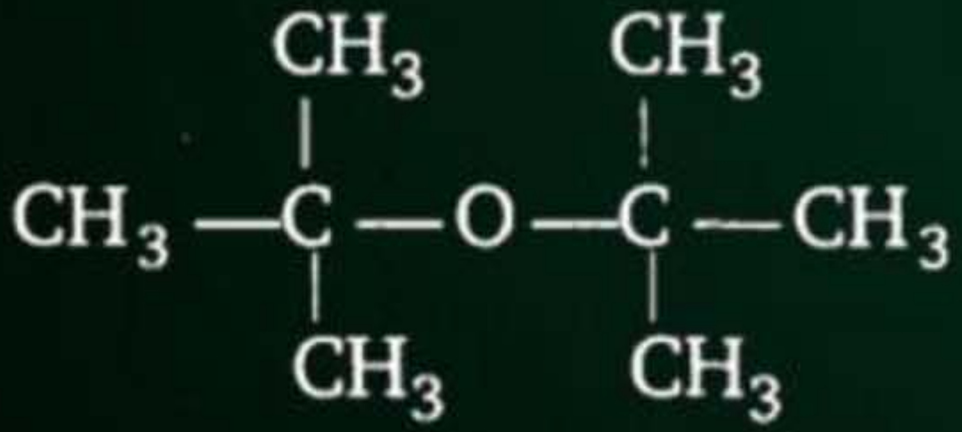
$CH_3-\overset{\displaystyle CH_3}{\underset{\displaystyle OH}{C}}-CH_3 \xrightarrow[\text{cool}]{Na_2Cr_2O_7}$ (P); Product (P) in the reaction is:

A 

$CH_3-\overset{\displaystyle CH_3}{C}=CH_2$

B 

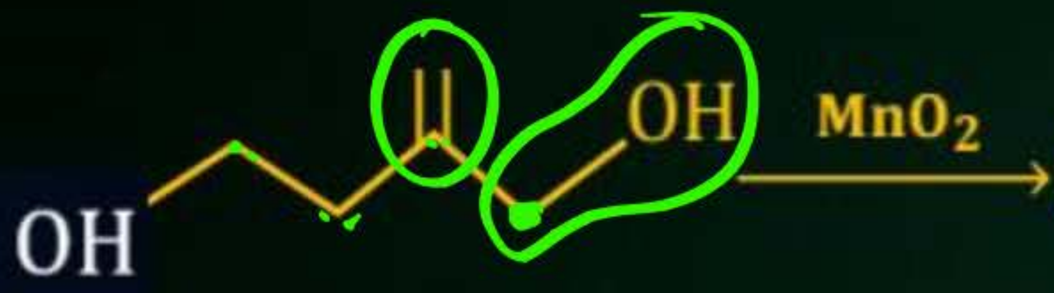
$CH_3-\overset{\displaystyle CH_3}{CH}-CH_3$

C 

$CH_3-\overset{\displaystyle CH_3}{\underset{\displaystyle CH_3}{C}}-O-\overset{\displaystyle CH_3}{\underset{\displaystyle CH_3}{C}}-CH_3$

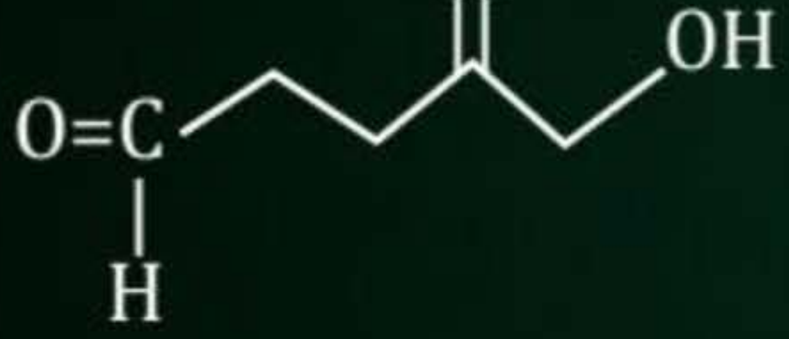
D [✓ No reaction]

QUESTION

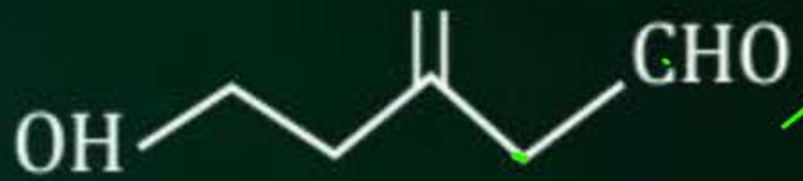


(A). Product (A) is:

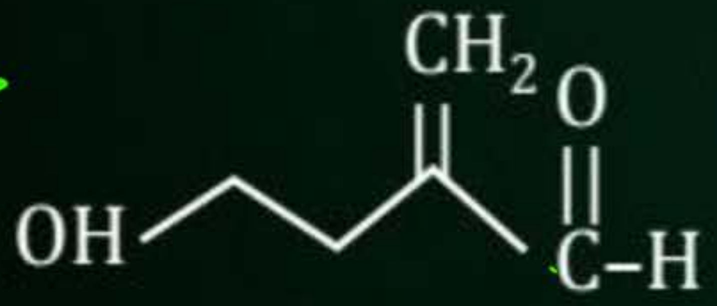
A



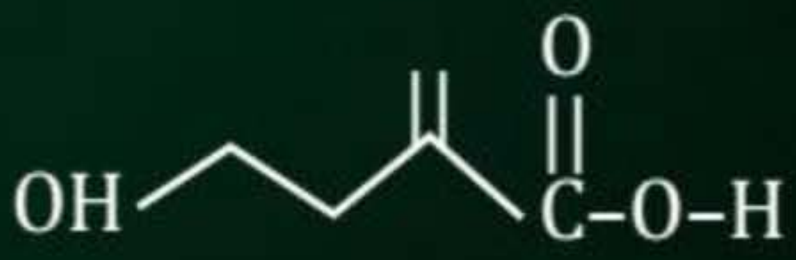
B



C



D



QUESTION

Which of the following reactions require an oxidising agent?

A $CH_3-CH=CH_2 \rightarrow CH_3-CH_2-CH_3$

[✓ B] $CH_3-CH_2OH \rightarrow CH_3CHO$

C $CH_3-CH_2Cl \rightarrow CH_3-CH_3$

D $CH_3-CH_2OH \rightarrow CH_3-CH_2Cl$

QUESTION

Which of the following compound obtain on oxidation of 2° alcohol with H_2CrO_4 or $KMnO_4$?

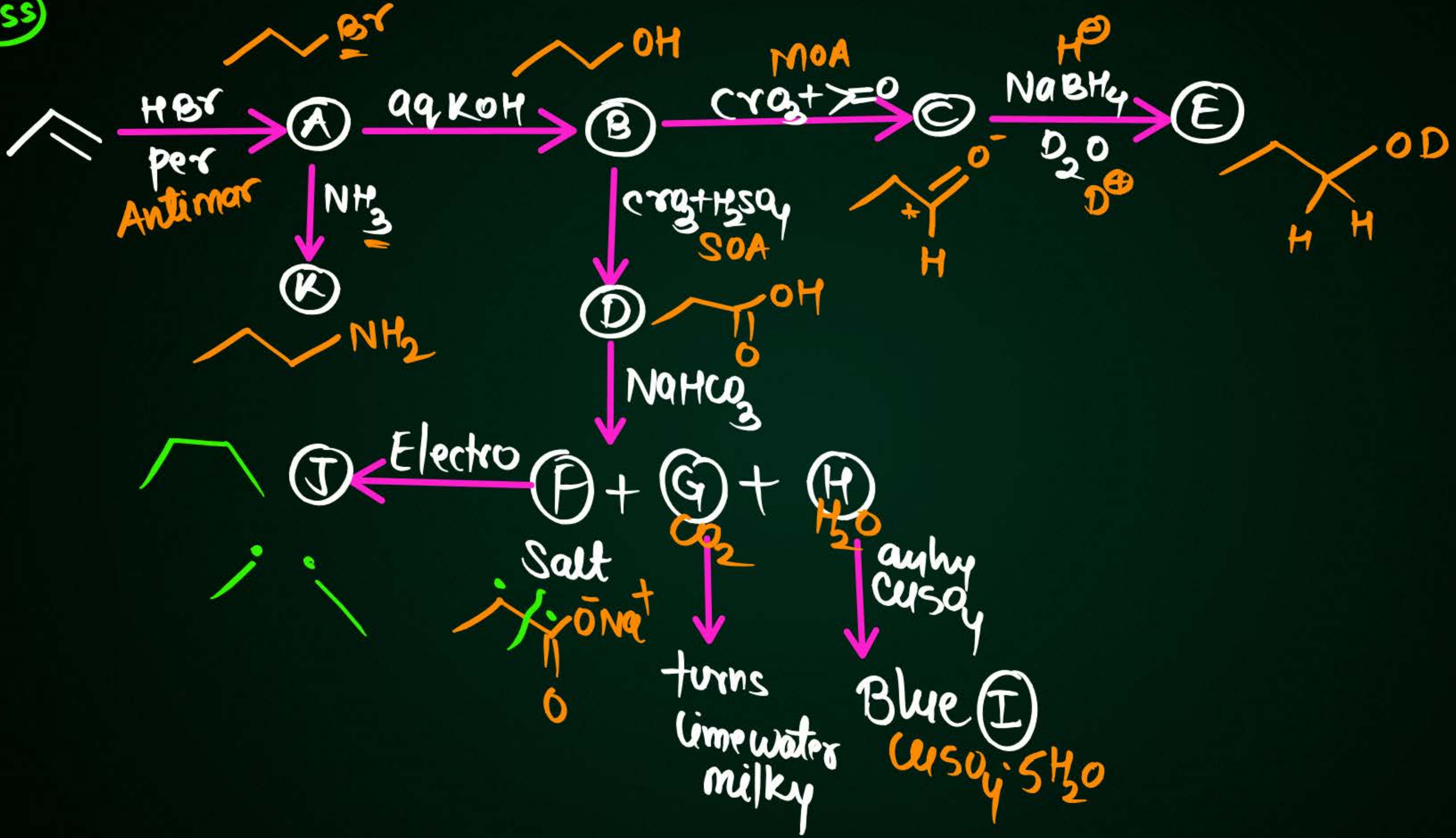
Ⓐ Aldehyde

Ⓑ [✓ Ketone]

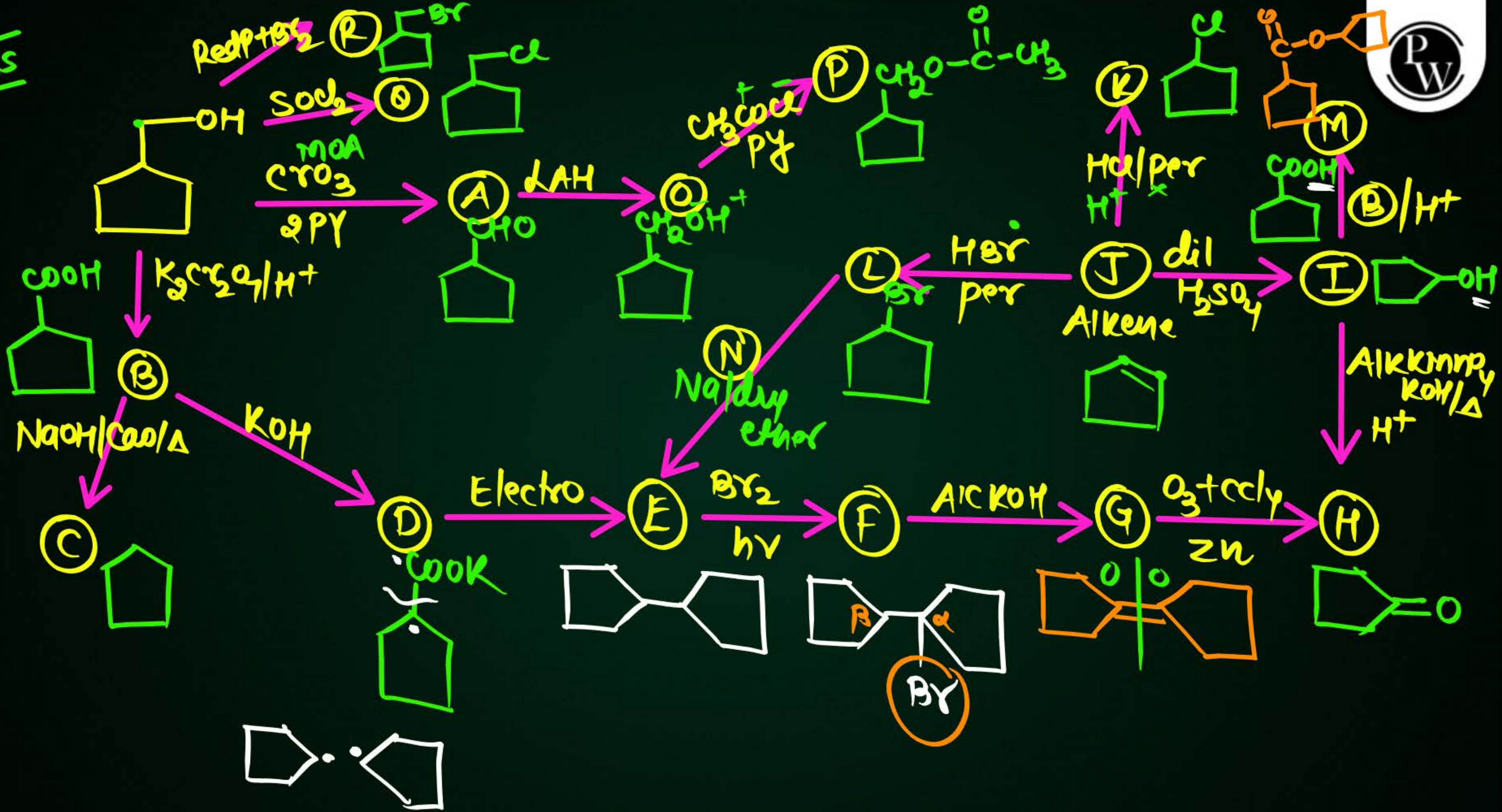
Ⓒ Ester

Ⓓ None of these

PSS


Br
OH
HBr
per
Antimar
A
aq KOH
B
MOA
CrO_3 + ⟩=O
C
NaBH₄
H⊖
D_2O
D⊕
E
OD
H
H
O⁻
H
NH₃
K
NH_2
$CrO_3 + H_2SO_4$
SOA
D
OH
O
$NaHCO_3$
J
Electro
F
+
G
+
H
CO_2
H_2O
Salt
ŌNa⁺
O
anhy $CuSO_4$
turns limewater milky
Blue
I
$CuSO_4 \cdot 5H_2O$

PSS



Red P + Br2
R
Br
SOCl2
Q
Cl
OH
mnA
CrO3
2PY
A
CHO
LAH
O
CH2OH
H+
CH3COCl
Py
P
CH2O-C(=O)-CH3
K
Cl
HCl/per
H+
M
O=C-O
COOH
B/H+
I
OH
dil
H2SO4
J
Alkene
HBr
per
L
Br
N
Na/dry ether
Alk KMnO4
KOH/Δ
H+
K2Cr2O7/H+
COOH
B
NaOH/CaO/Δ
C
KOH
D
COOK
Electro
E
Br2
hν
F
β
α
Br
Alc KOH
G
O3 + CCl4
Zn
H
O
O
O

Home Work

QUESTION 01

The compounds A, B and C in the reaction sequence are given by the set:

$$CH_3CH_2OH \xrightarrow[\Delta]{HBr} A \xrightarrow{Mg} B \xrightarrow[(ii)\ H_3O^{\oplus}]{(i)\ CH_3CHO} C$$

A $CH_3CH_2Br, CH_3CH_2MgBr, (CH_3)_3COH$

B $CH_3CH_2Br, (CH_3CH_2)_2Mg, (CH_3)_2CHCH_2OH$

C $CH_3CH_2Br, CH_3CH_2MgBr, CH_3CH(OH)CH_2CH_3$

D $CH_3CHBr_2, CH_3CH(MgBr)_2, CH_3CH(OH)CH_3$

QUESTION 02

Isopropyl alcohol on oxidation forms:

- (A) Acetone
- (B) Ether
- (C) Ethylene
- (D) Acetaldehyde

QUESTION 03

What reagent(s) can be used to convert 2-methyl pentanol into 2-methyl pentanal?

(A) $Na_2Cr_2O_7$

(B) $LiAlH_4$

(C) CrO_3–pyridine

(D) $KMnO_4$

QUESTION 04

The compound which gives turbidity immediately with Lucas reagent at room temperature is:

(A) butan-1-ol

(B) butan-2-ol

(C) 2-methylpropan-2-ol

(D) 2-methylpropan-1-ol

QUESTION 05

$$CH_3CH_2OH \xrightarrow{\text{Alkaline } KMnO_4 + \text{Heat}} CH_3COOH$$

In the above given reaction, alkaline $KMnO_4$ acts as:

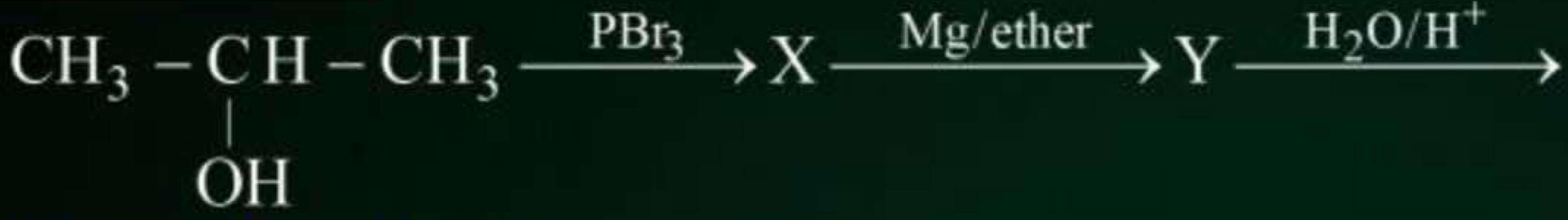
(A) Oxidising agent

(B) reducing agent

(C) catalyst

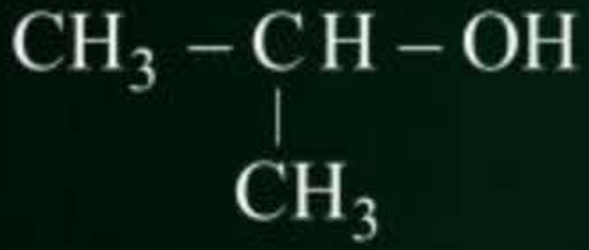
(D) dehydrating agent

QUESTION 06



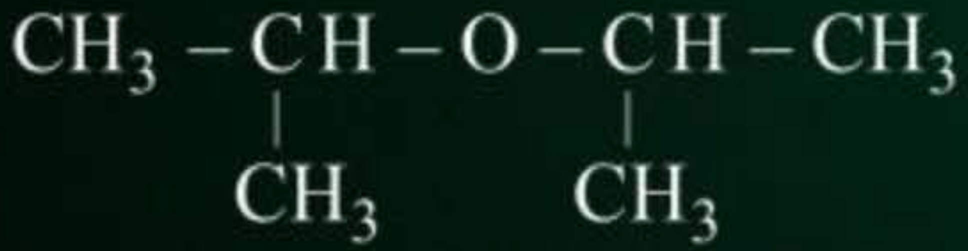
$CH_3-\underset{\substack{|\\ OH}}{CH}-CH_3 \xrightarrow{PBr_3} X \xrightarrow{Mg/ether} Y \xrightarrow{H_2O/H^+}$

The final product is:

A 

$CH_3-\underset{\substack{|\\ CH_3}}{CH}-OH$

B $CH_3-CH_2-CH_2-OH$

C 

$CH_3-\underset{\substack{|\\ CH_3}}{CH}-O-\underset{\substack{|\\ CH_3}}{CH}-CH_3$

D $CH_3-CH_2-CH_3$

QUESTION 07

When ethyl alcohol (C_2H_5OH) reacts with thionyl chloride, in the presence of pyridine, the product obtained is:

A $CH_3CH_2Cl + HBr$

B $C_2H_6 + HCl + SO_2$

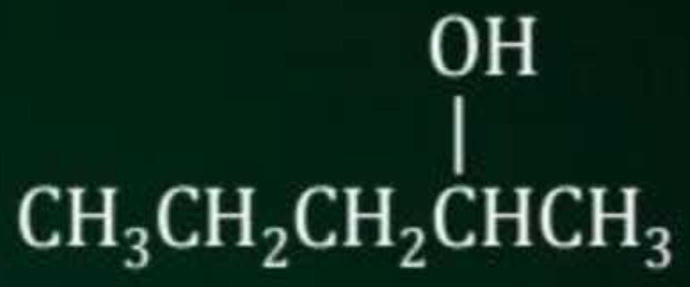
C $CH_3CH_2Cl + H_2O + SO_2$

D $CH_3CH_2Cl + HCl + SO_2$

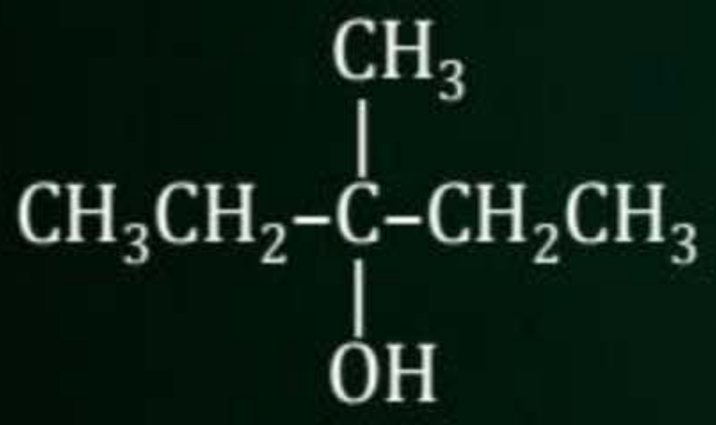
QUESTION 08

Among the following compounds which can be dehydrated very easily?

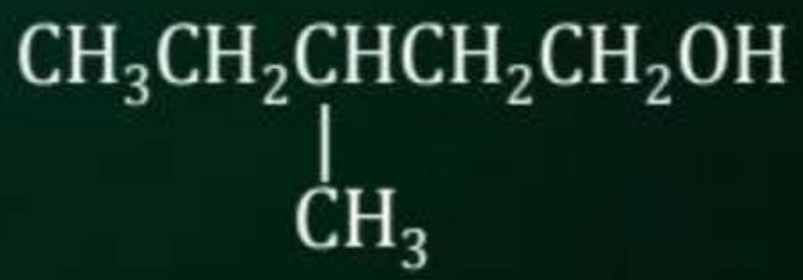
Ⓐ $CH_3CH_2CH_2CH_2CH_2OH$

Ⓑ 

$CH_3CH_2CH_2\overset{OH}{\overset{|}{C}}HCH_3$

Ⓒ 

$CH_3CH_2-\underset{\underset{OH}{|}}{\overset{\overset{CH_3}{|}}{C}}-CH_2CH_3$

Ⓓ 

$CH_3CH_2\underset{\underset{CH_3}{|}}{C}HCH_2CH_2OH$

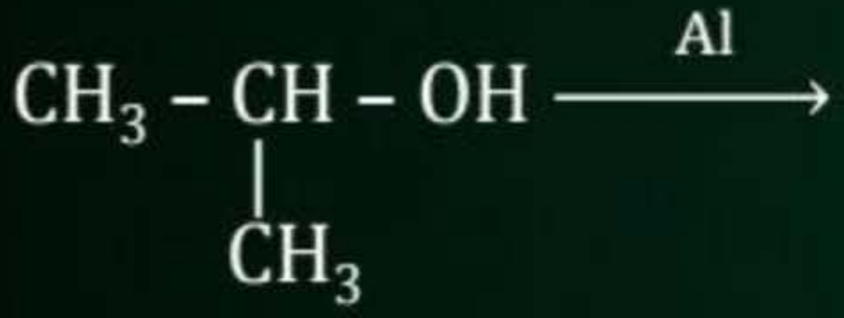
QUESTION 09

In which of the following reactions hydrogen gas will not be evolved?

(A) $CH_3-CH_2-OH \xrightarrow{Na}$

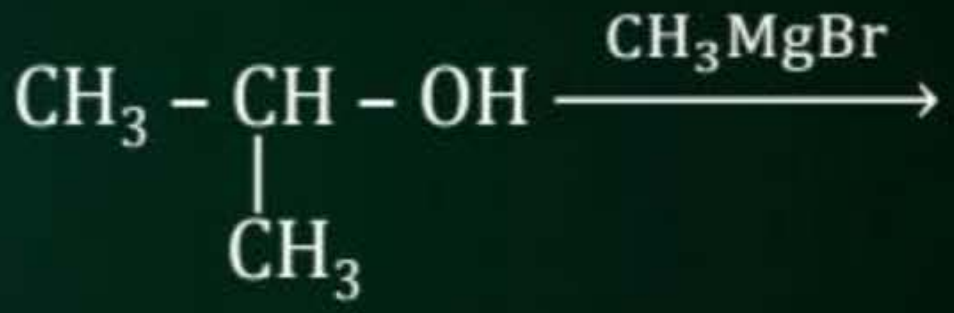
(B) $CH_3-CH_2-OH \xrightarrow{K}$

(C)



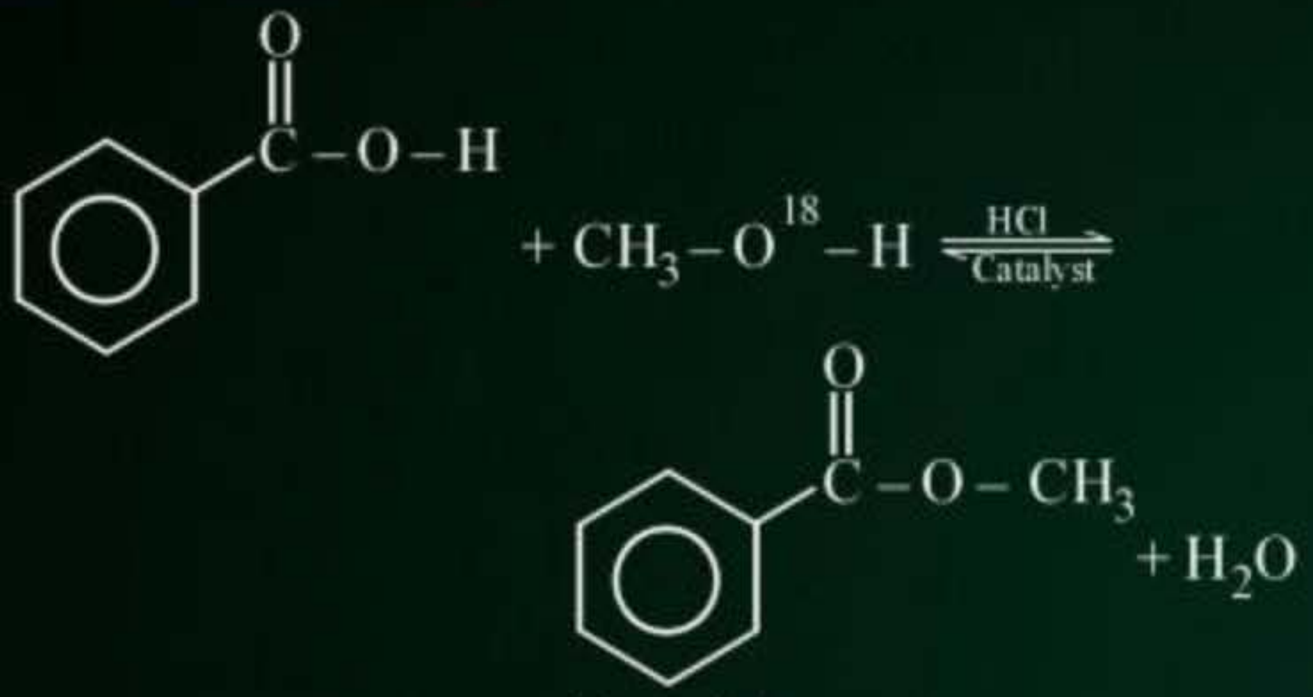
$\underset{\displaystyle CH_3}{CH_3-\underset{|}{CH}-OH} \xrightarrow{Al}$

(D)



$\underset{\displaystyle CH_3}{CH_3-\underset{|}{CH}-OH} \xrightarrow{CH_3MgBr}$

QUESTION 10


C–O–H
+ CH₃–O¹⁸–H
HCl
Catalyst
C–O–CH₃
+ H₂O

Methyl benzoate

The labelled $-O^{18}$ will be in:

A H_2O

B Methyl benzoate

C Both (A) and (B)

D Benzoic acid

ANSWER KEY

1. C
2. A
3. C
4. C
5. A
6. D
7. D
8. C
9. D
10. B

Home Work From PW Module (Yakeen NEET)

Prarambh: Q 19, 28, 30, 33, 34, 36, 40

Prabal: Q 06, 07, 12, 14, 26, 28, 32

Pariskhit: Q 11, 16, 17, 23

MARK THE DATE 4th May, 2025

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Thank you!!

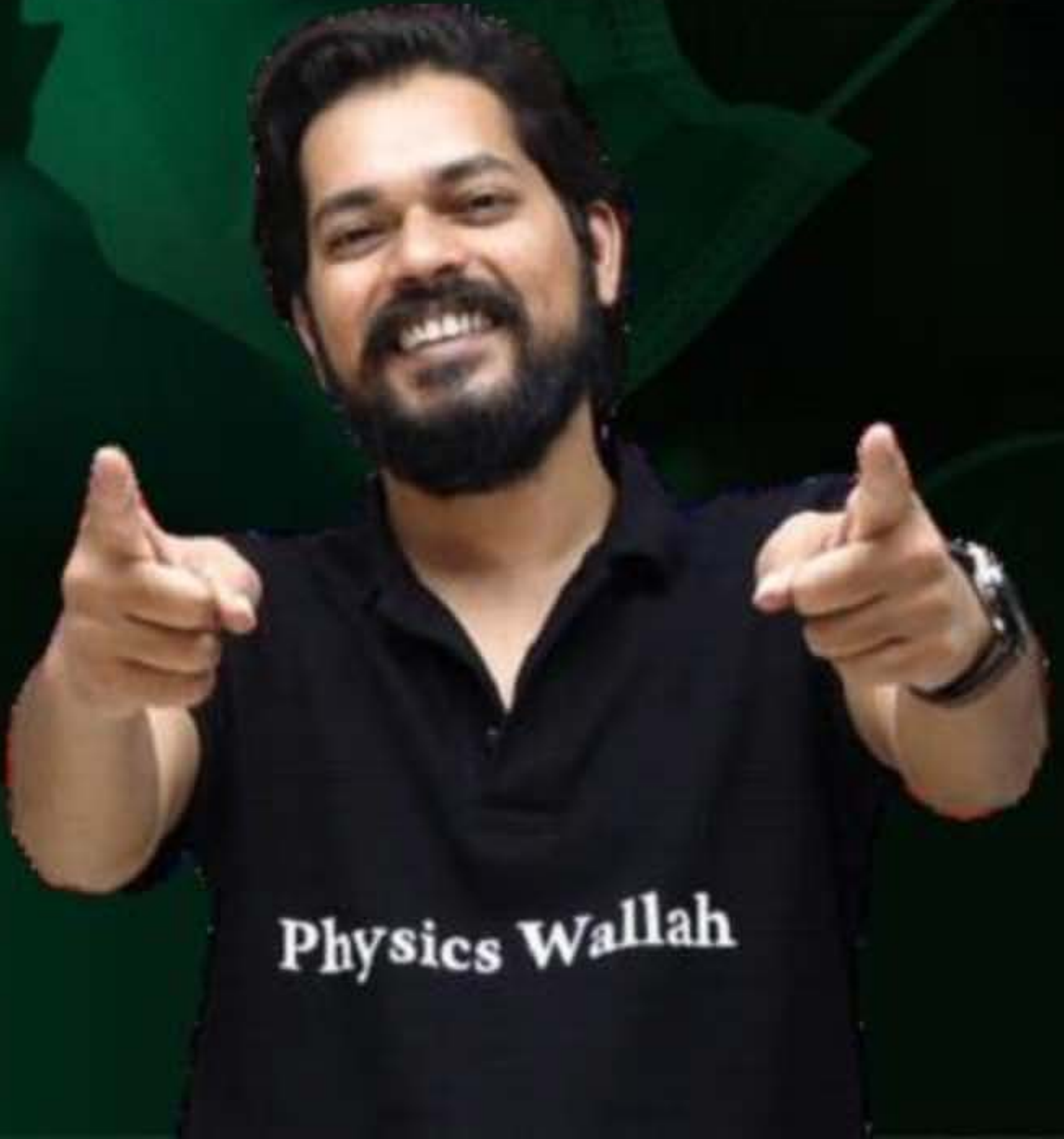
YAKEEN 2.0

FOR NEET 2025

Lecture- 07 Organic Chemistry

Alcohols, Phenols and Ethers

By- Pankaj Sir(POPU MAMA)


Physics Wallah

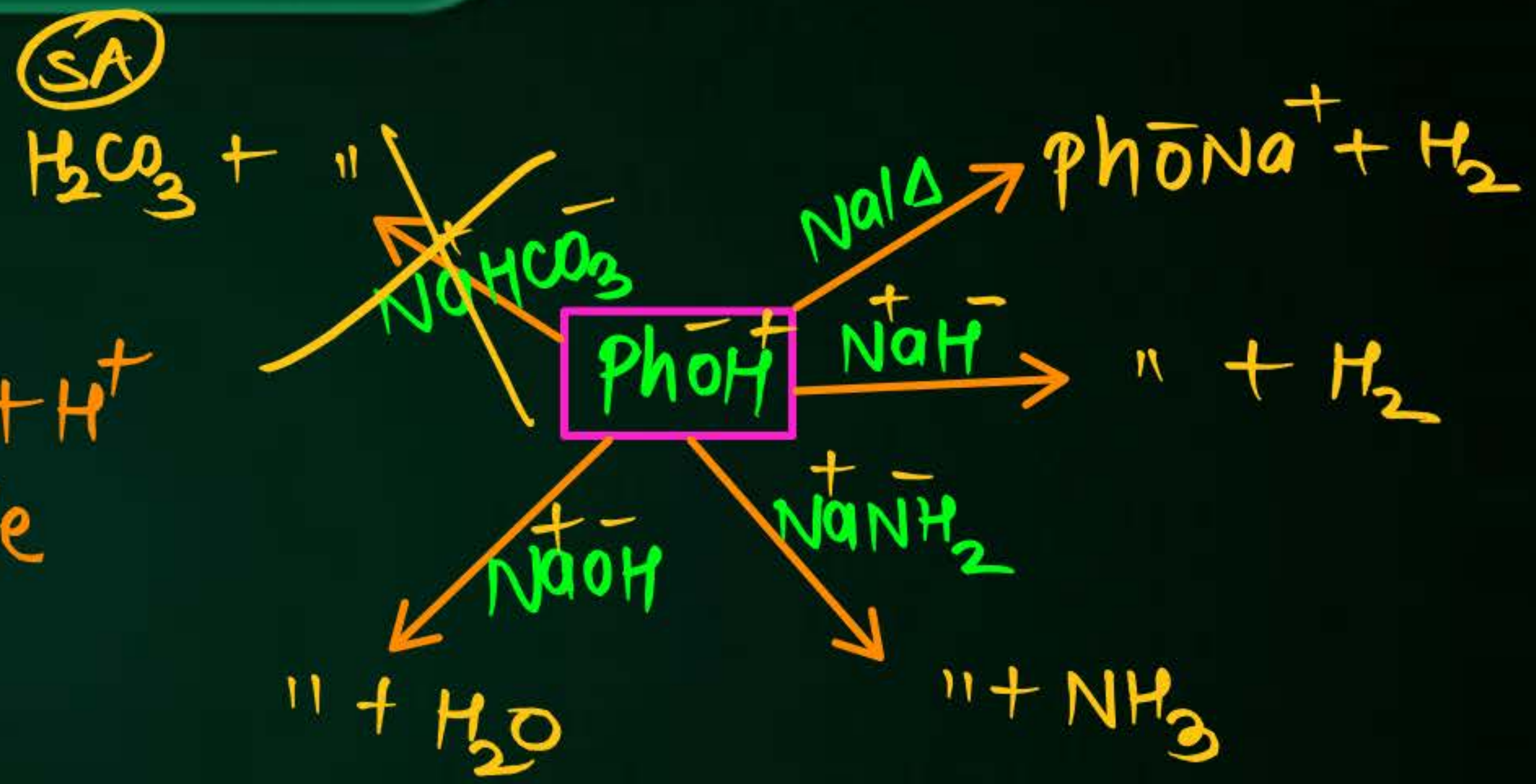
Topics *to be covered*

1. Chemical Properties of Phenols ✓
2. Practice

Chemical Properties of Phenols

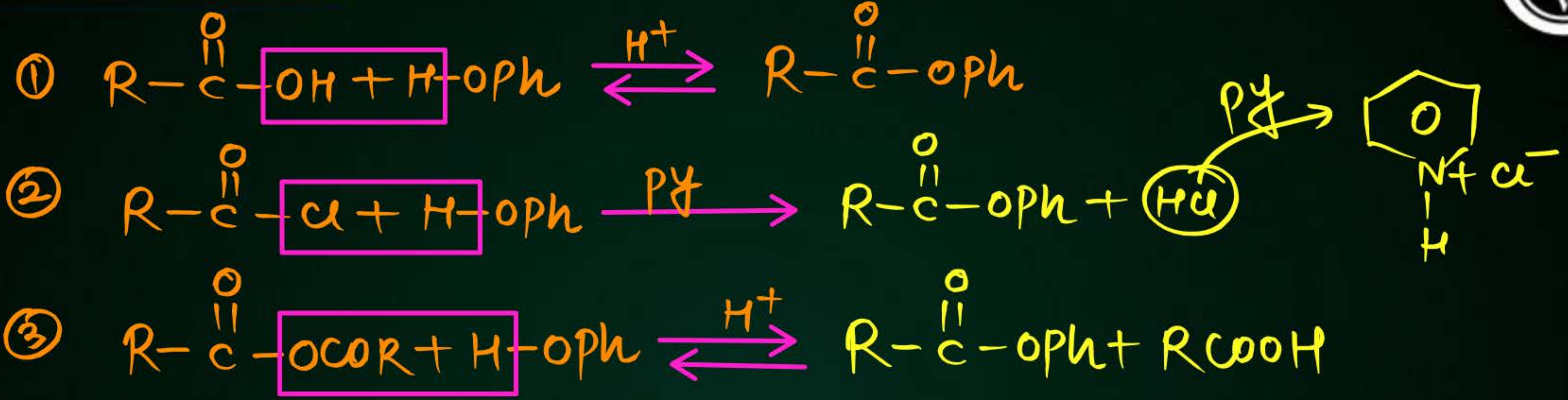
1. Acidic Nature of Phenol:

$$\underset{\text{(Carbolic acid)}}{PhOH} \rightleftharpoons \underset{\text{Stable}}{Ph\overset{\ominus}{O}} + H^{+}$$



SA
H₂CO₃ + "
NaHCO₃⁻
PhO⁻H⁺
Na/Δ
PhO⁻Na⁺ + H₂
Na⁺H⁻
" + H₂
Na⁺OH⁻
" + H₂O
Na⁺NH₂⁻
" + NH₃

2. Esterification:



① $R-\overset{O}{\overset{\|}{C}}-\boxed{OH+H}-OPh \overset{H^+}{\rightleftharpoons} R-\overset{O}{\overset{\|}{C}}-OPh$

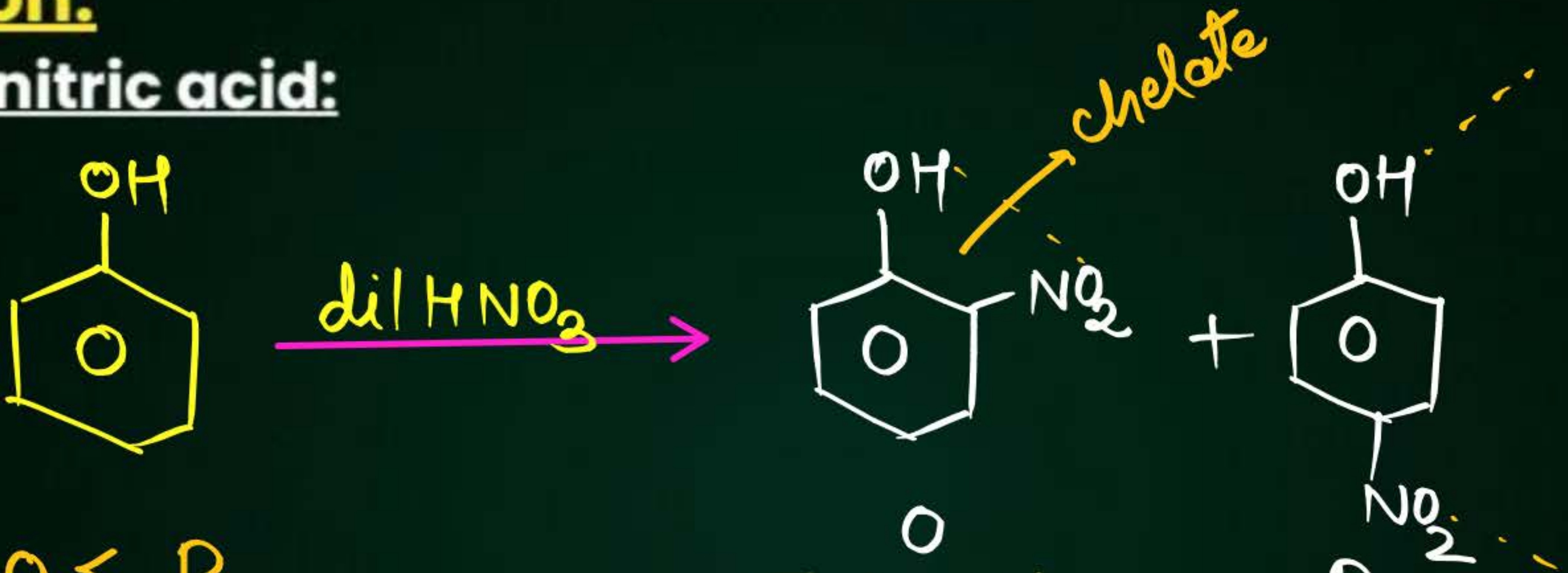
② $R-\overset{O}{\overset{\|}{C}}-\boxed{Cl+H}-OPh \xrightarrow{Py} R-\overset{O}{\overset{\|}{C}}-OPh+HCl$

③ $R-\overset{O}{\overset{\|}{C}}-\boxed{OCOR+H}-OPh \overset{H^+}{\rightleftharpoons} R-\overset{O}{\overset{\|}{C}}-OPh+RCOOH$

3. Electrophilic Aromatic Substitution reactions:

A. Nitration:

With dilute nitric acid:



OH
dil HNO_3
OH
NO_2
chelate
OH
NO_2

o

Intra H bond

p

Inter H Bond

(Association of molecules)

$(VP \propto \frac{1}{B.P})$

B.P $o < p$

V.P $o > p$

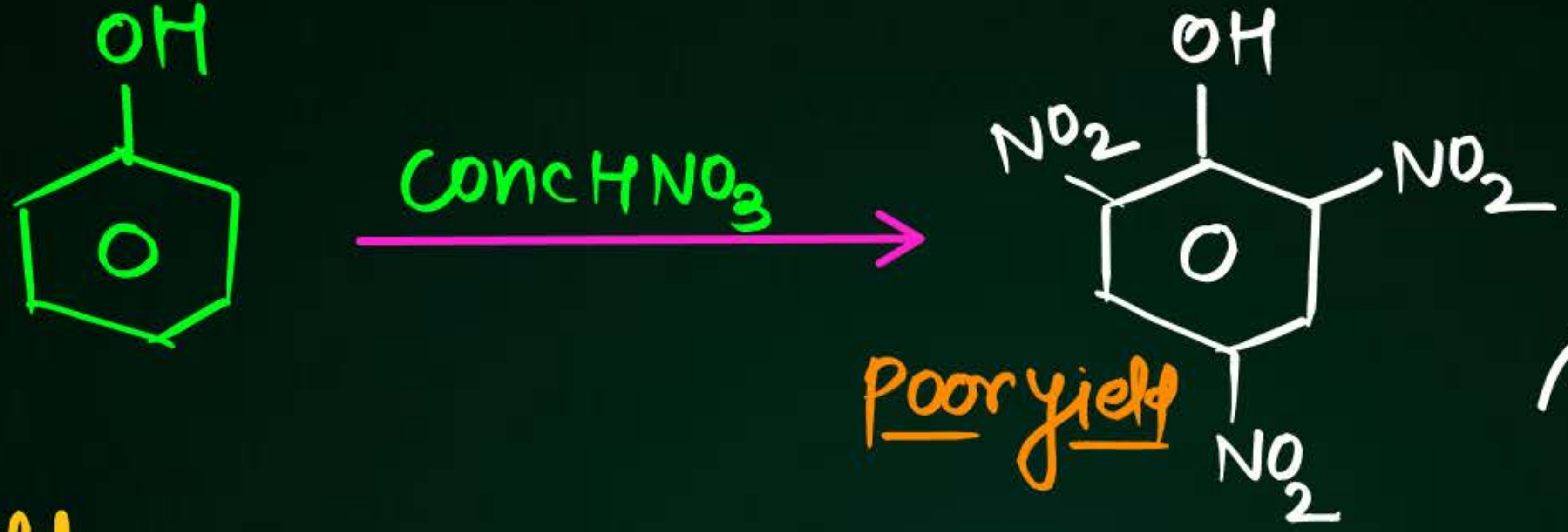
(Volatility

o & p can be sep by steam distillation

OP Points:

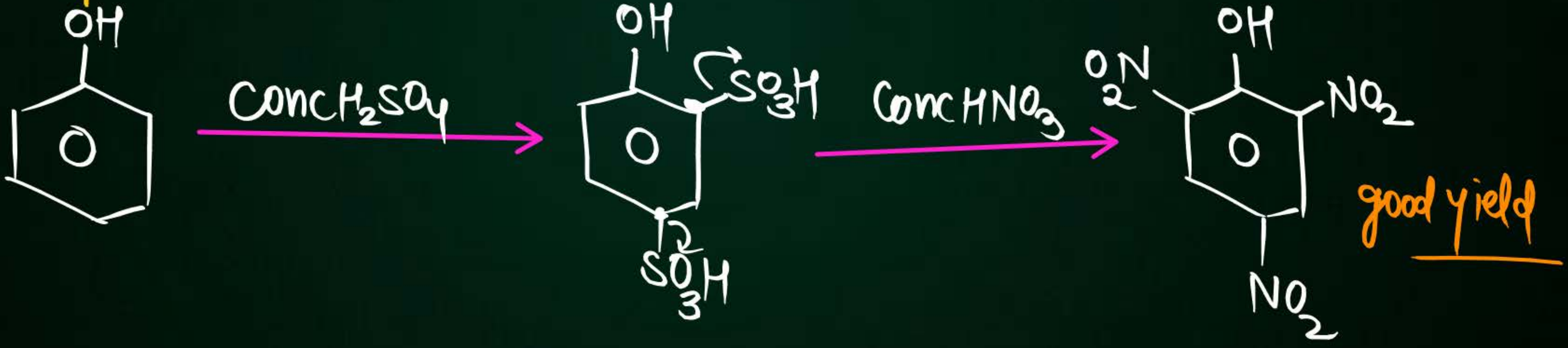
1. The ortho and para isomers can be separated by steam distillation.
2. o-Nitrophenol is steam volatile due to intramolecular hydrogen bonding while p-nitrophenol is less volatile due to intermolecular hydrogen bonding which cause the association of molecules.

With Conc. nitric acid:


OH
Conc HNO$_3$
OH
NO$_2$
NO$_2$
NO$_2$
Poor yield

2,4,6 Trinitrophenol
or
Picric acid

for good yield


OH
Conc H$_2$SO$_4$
OH
SO$_3$H
SO$_3$H
Conc HNO$_3$
OH
O$_2$N
NO$_2$
NO$_2$
good yield

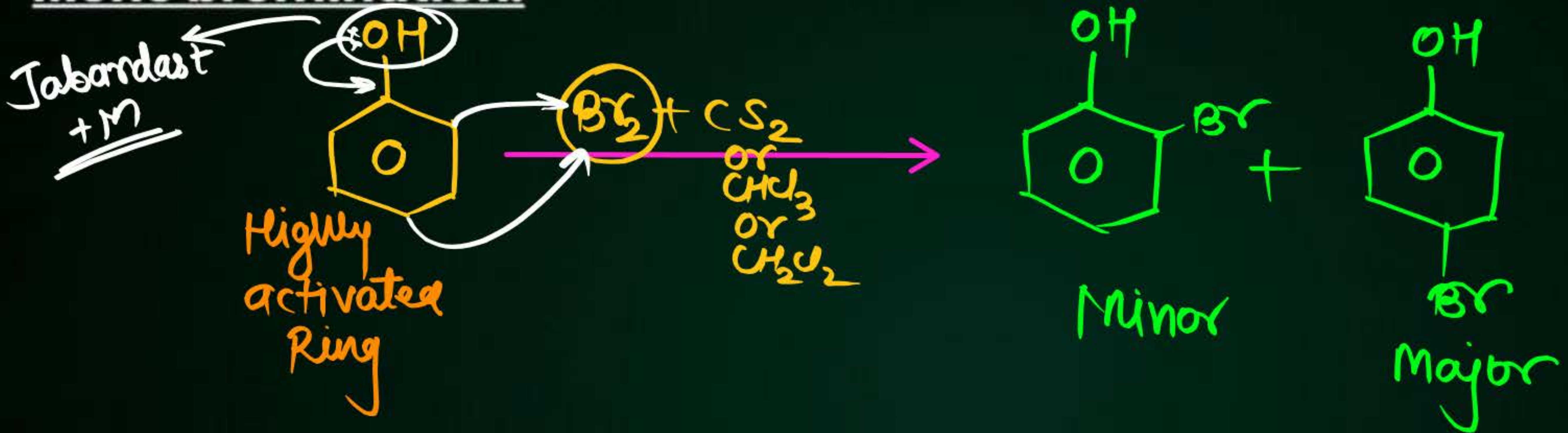
Misconception

every rxn
SA ⟶ WA

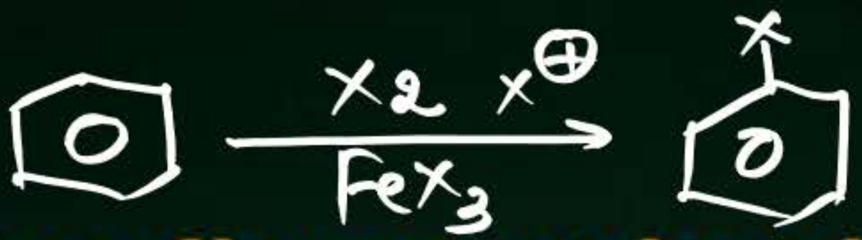
Concept
in Acid Base Rxn
SA → WA ✓

B. Halogenation:

Mono bromination:


Jabardast
+M
OH
Highly activated Ring
Br_2 + CS_2
or
$CHCl_3$
or
CH_2Cl_2
OH
Br
Minor
OH
Br
Major

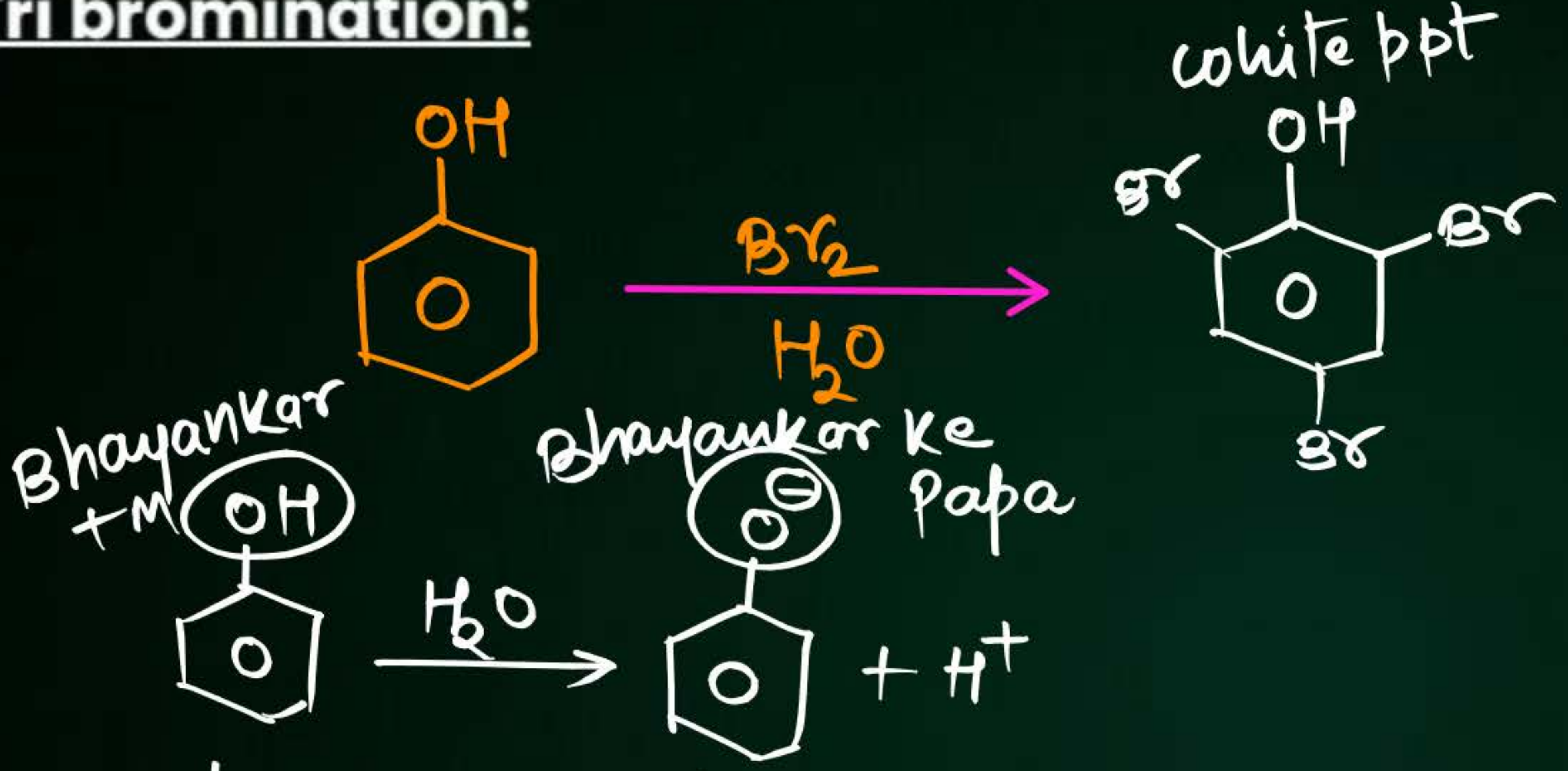
OP Points:



$X-X+FeX_3 \longrightarrow X^+ + FeX_4^-$

1. The usual halogenation of benzene takes place in the presence of a Lewis acid, such as $FeBr_3$ which polarises the halogen molecule.
2. In case of phenol, the polarization of bromine molecule takes place even in the absence of Lewis acid.
3. It is due to the highly activating effect of –OH group attached to the benzene ring.

Tri bromination:

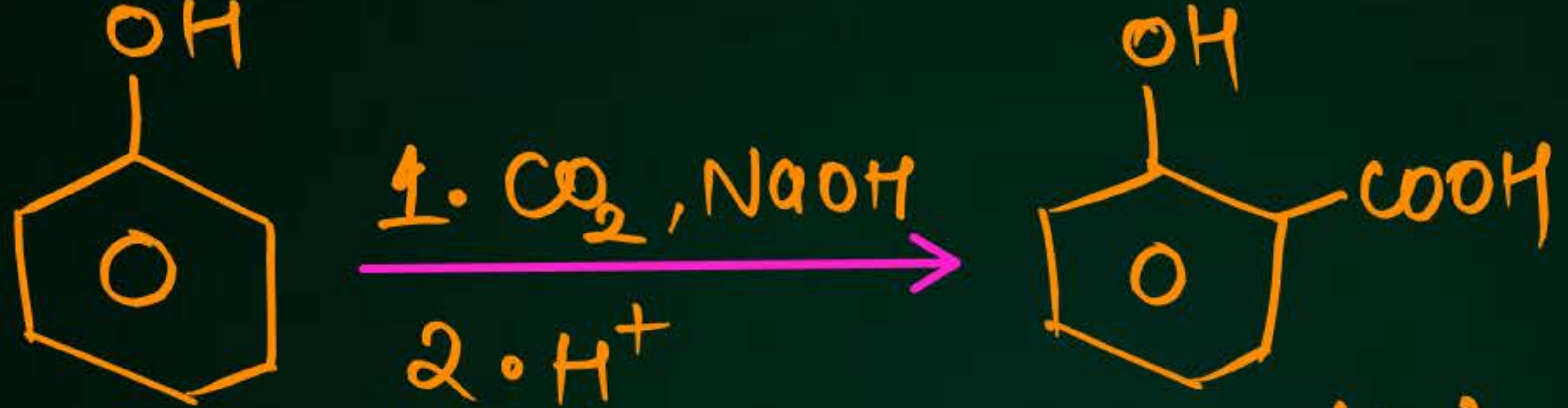

white ppt
OH
Br_2
H_2O
OH
Br
Br
Br
Bhayankar
+M
OH
H_2O
Bhayankar ke Papa
$O^{\ominus}$
$+ H^+$

2,4,6 Tribromophenol

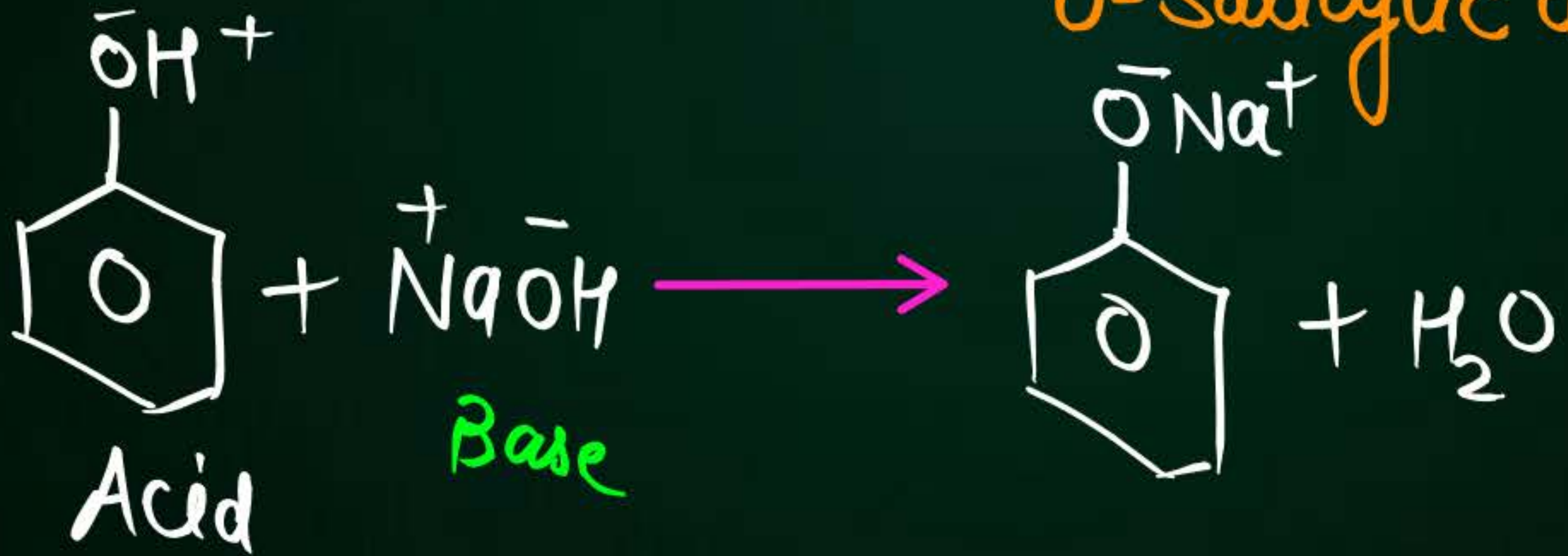
+M power of $-\overset{\ominus}{O} > -OH$

4. Kolbe's reaction:

1. Phenoxide ion generated by treating phenol with sodium hydroxide is even more reactive than phenol towards electrophilic aromatic substitution.

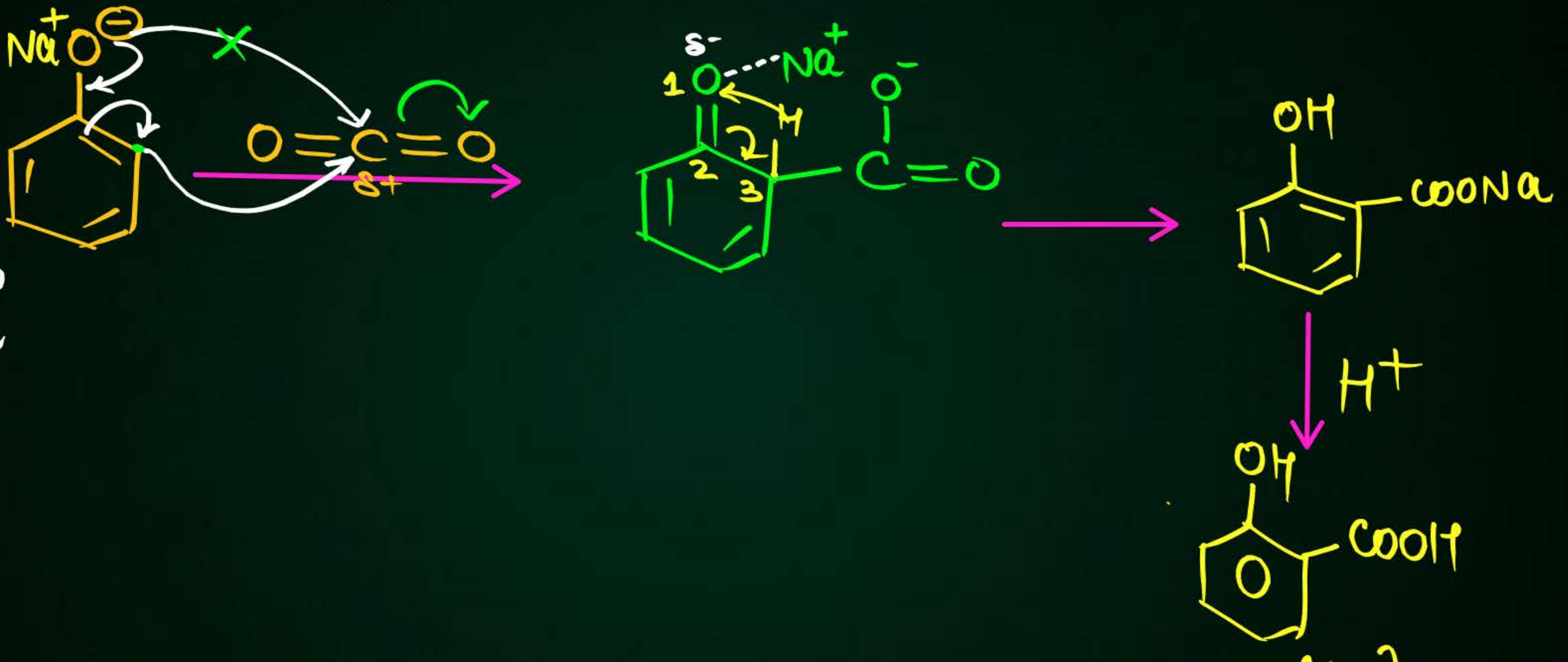

OH
1. CO_2, NaOH
2. H^+
OH
COOH

o-Salicylic acid


$\bar{O}H^+$
$\overset{+}{Na}\bar{O}H$
$\bar{O}Na^+$
H_2O
Acid
Base

+M power $\underline{-O^{\ominus} > -OH}$

2. Hence, it undergoes electrophilic substitution with carbon dioxide, a weak electrophile. Ortho hydroxybenzoic acid is formed as the main reaction product.

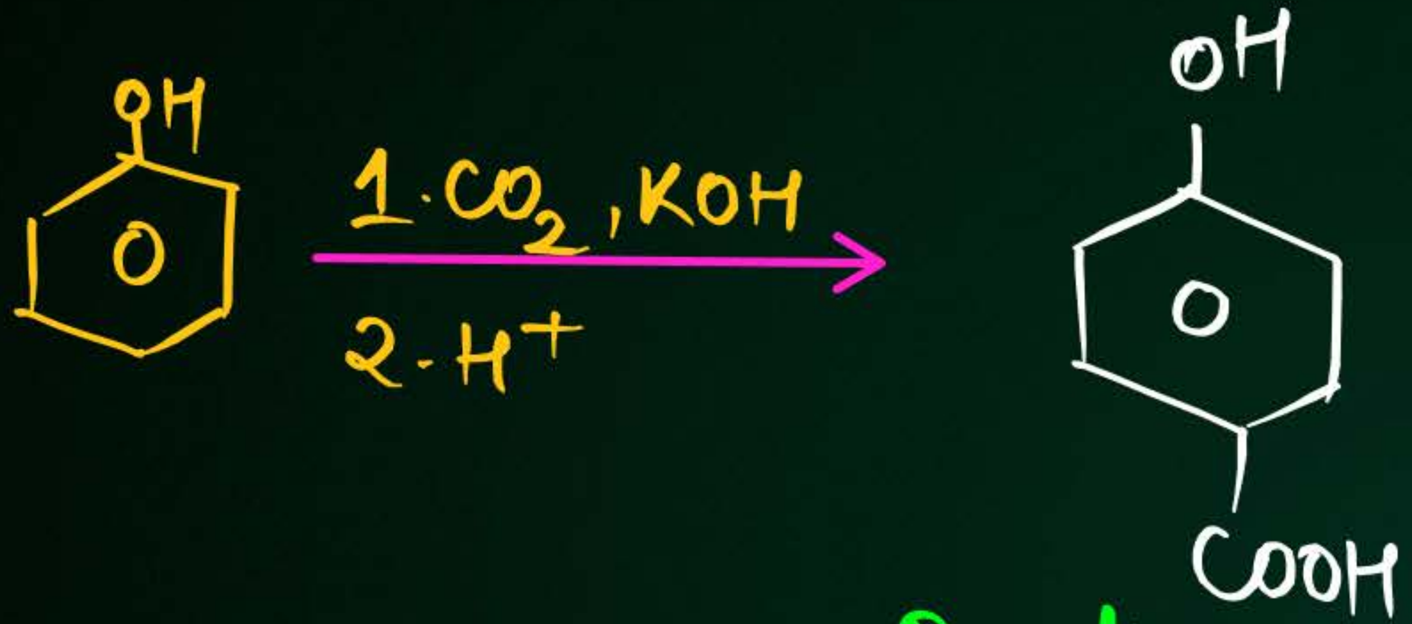

Na+ O⊖
×
O=C=O
δ+
δ-
1 O
Na+
O-
2
2
3
H
C=O
OH
COONa
H+
OH
COOH

O-Salicylic acid

Nu

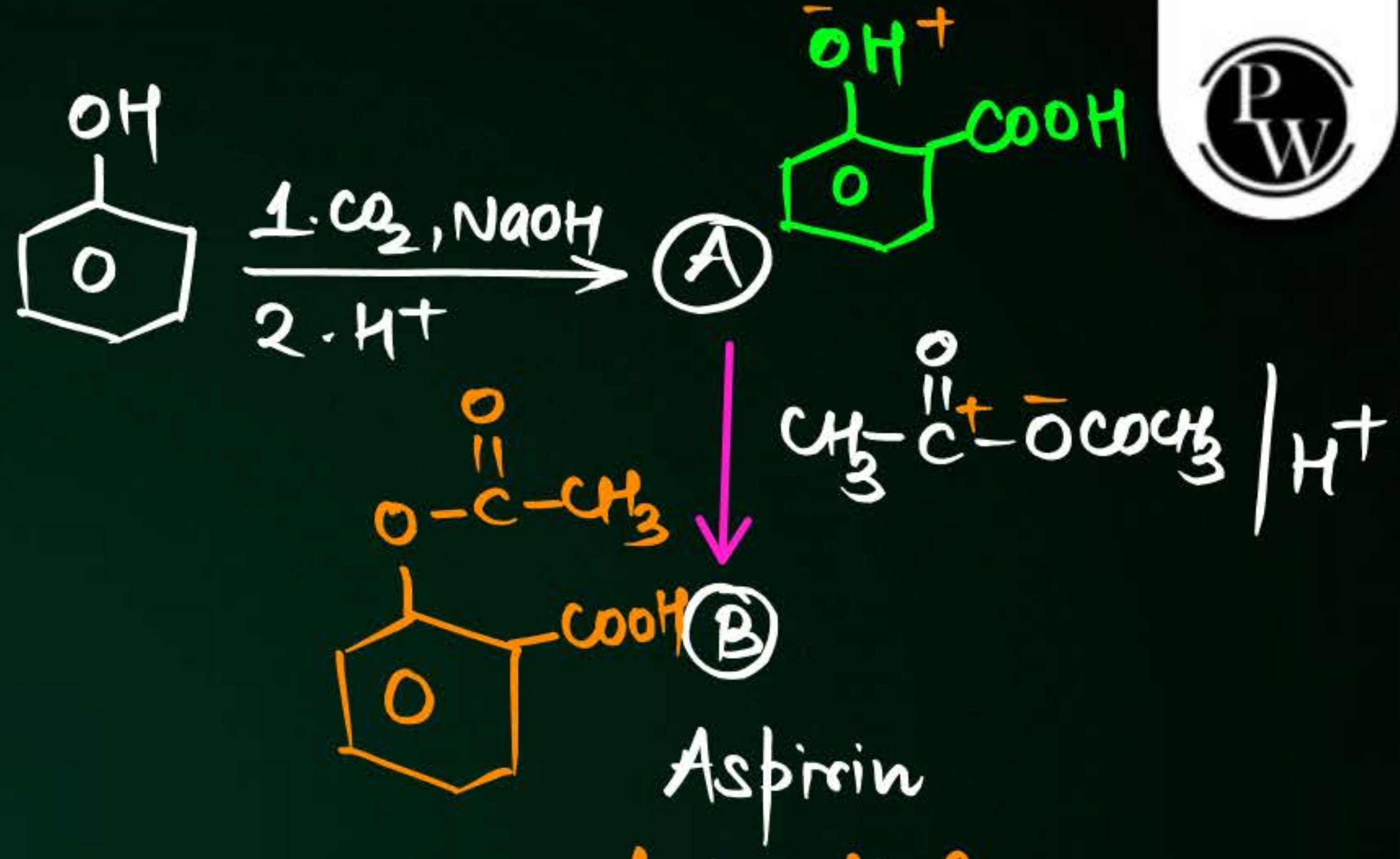
$\underbrace{C^{\ominus} > O^{\ominus}}$

for P-salicylic acid


OH
1. CO_2, KOH
2. H^+
OH
COOH

P-salicylic acid

Q.

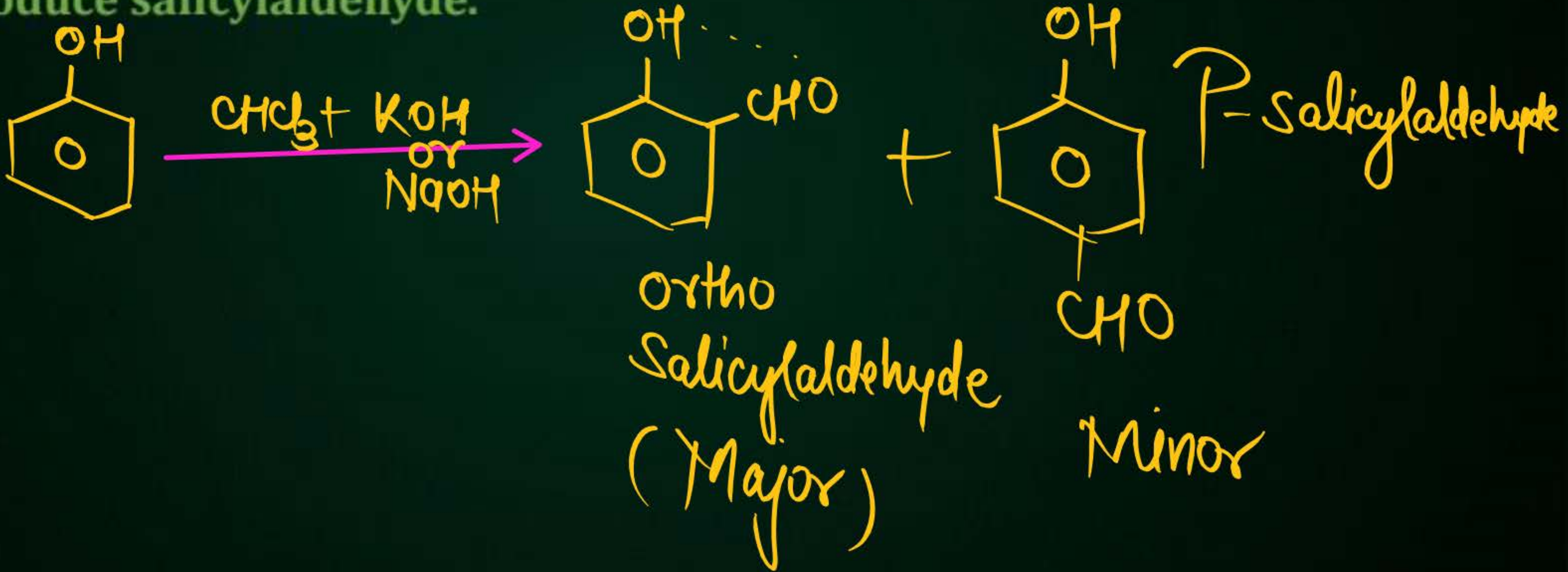

OH
1. CO_2, NaOH
2. H^+
Ⓐ
$\bar{O}H^+$
COOH
$CH_3-\overset{O}{\overset{\|}{C}}^{+}-\bar{O}COCH_3$ / H^+
$O-\overset{O}{\overset{\|}{C}}-CH_3$
COOH
Ⓑ

Aspirin

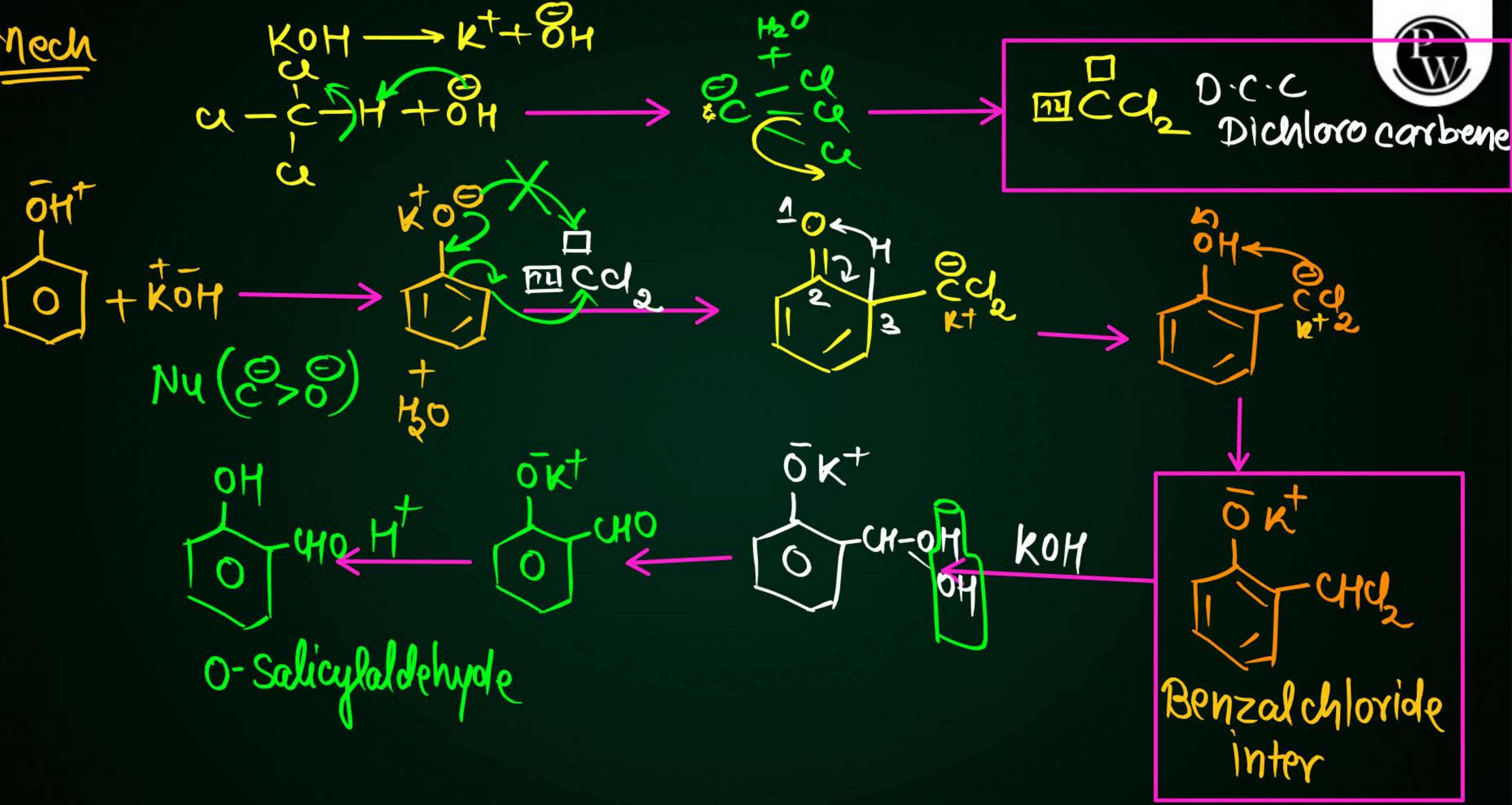
O-acetyl salicylic acid

5. Reimer–Tiemann Reaction:

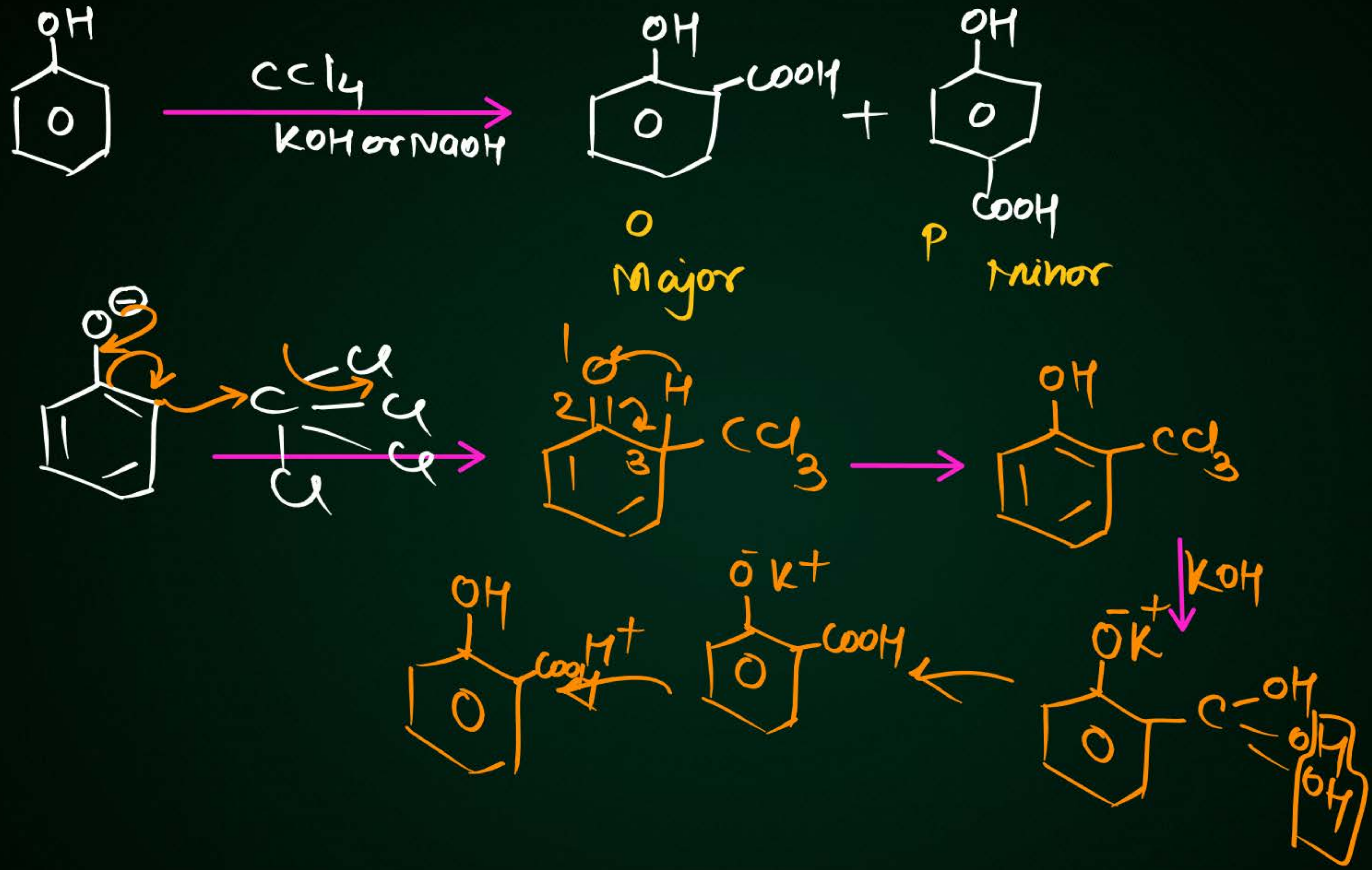
1. On treating phenol with chloroform in the presence of sodium hydroxide, –CHO group is introduced at ortho and para position of benzene ring.
2. The intermediate substituted benzal chloride is hydrolyzed in the presence of alkali to produce salicylaldehyde.


OH
CHCl3 + KOH
or
NaOH
OH
CHO
+
OH
CHO
P-Salicylaldehyde
ortho
Salicylaldehyde
(Major)
Minor

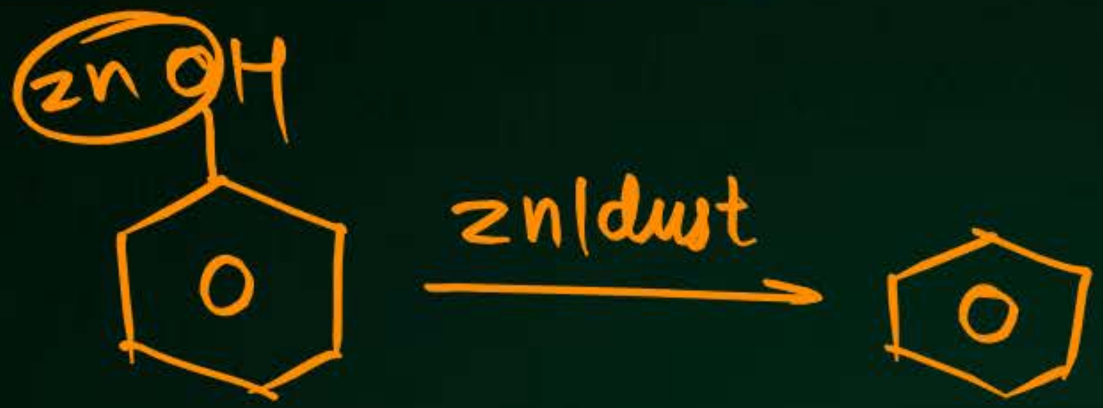
Mech


KOH ⟶ K⁺ + OH⁻
H₂O
D·C·C
:CCl₂
Dichloro carbene
OH
+ KOH
K⁺O⁻
Nu (C⁻ > O⁻)
H₂O
1
2
3
K⁺
CCl₂
OK
CHCl₂
Benzal chloride inter
KOH
CH–OH
OH
CHO
H⁺
OH
O-Salicylaldehyde

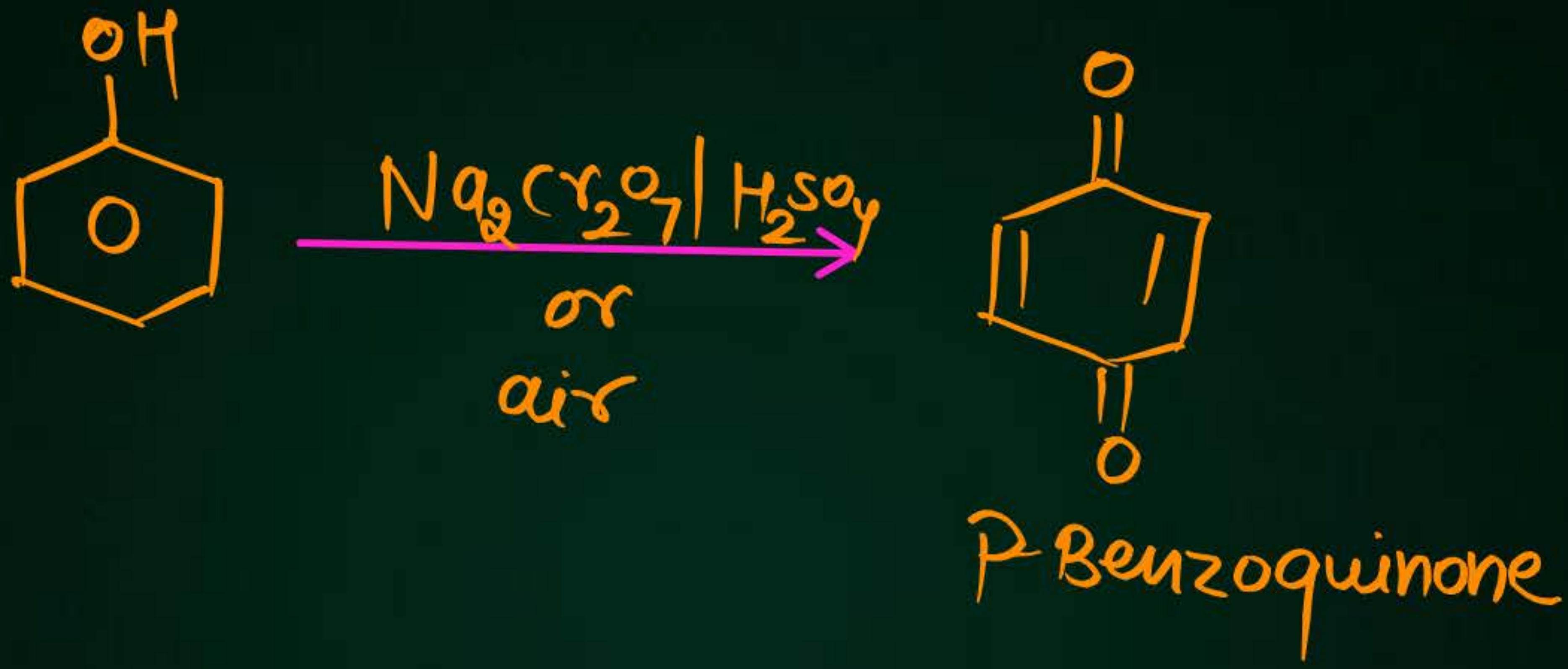
Ext of RTR


OH
CCl4
KOH or NaOH
OH
COOH
+
OH
COOH
o
Major
p
Minor
O⊖
C
Cl
Cl
Cl
Cl
1
O
H
2
1
2
3
CCl3
OH
CCl3
KOH
O⁻K⁺
C
OH
OH
OH
O⁻K⁺
COOH
OH
COOH
H⁺

6. Reaction with zinc dust:


Zn OH
Zn|dust

7. Oxidation of Phenol:

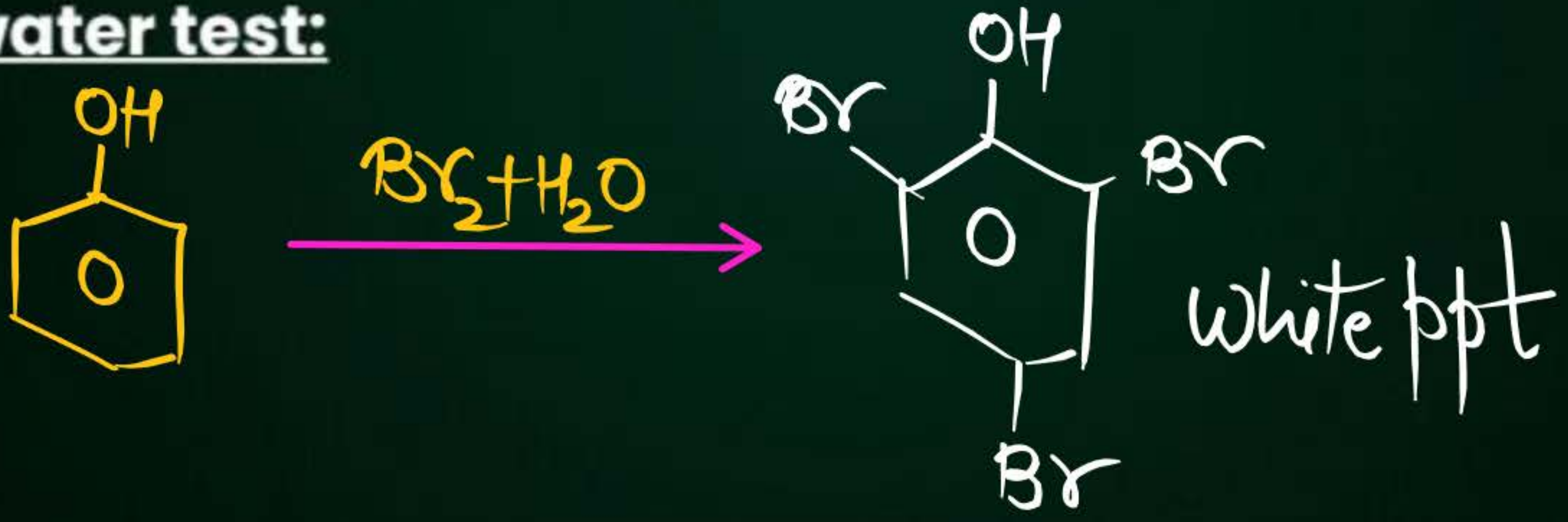

OH
$Na_2Cr_2O_7 | H_2SO_4$
or
air
O
O
P-Benzoquinone

8. Test of phenol:

1. Neutral $FeCl_3$ Test:

$$6PhOH + FeCl_3 \longrightarrow \underset{\text{Violet}}{[Fe(OPh)_6]^{3-}} + 3H^+ + 3HCl$$

2. Bromine water test:

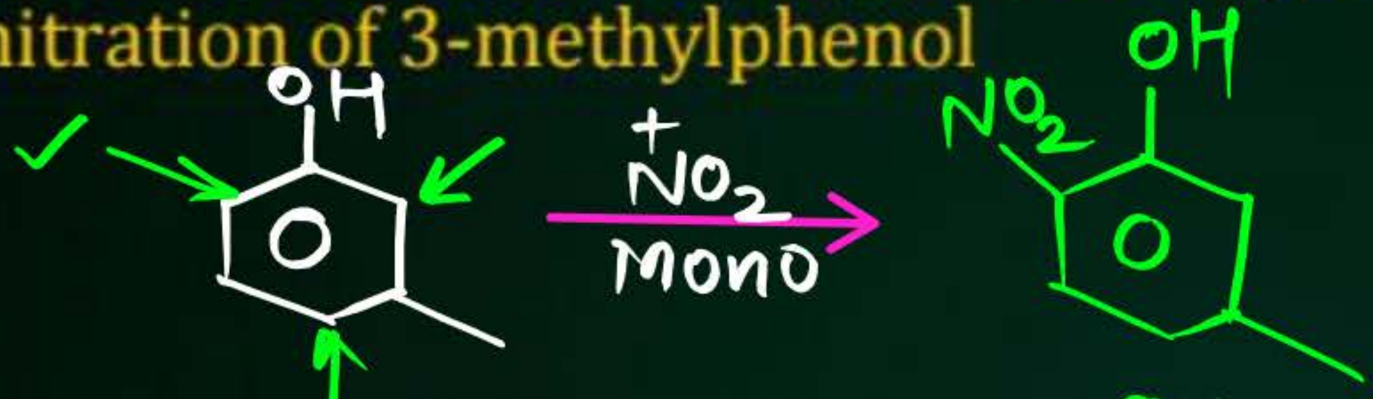

OH
$Br_2 + H_2O$
OH
Br
Br
Br

white ppt

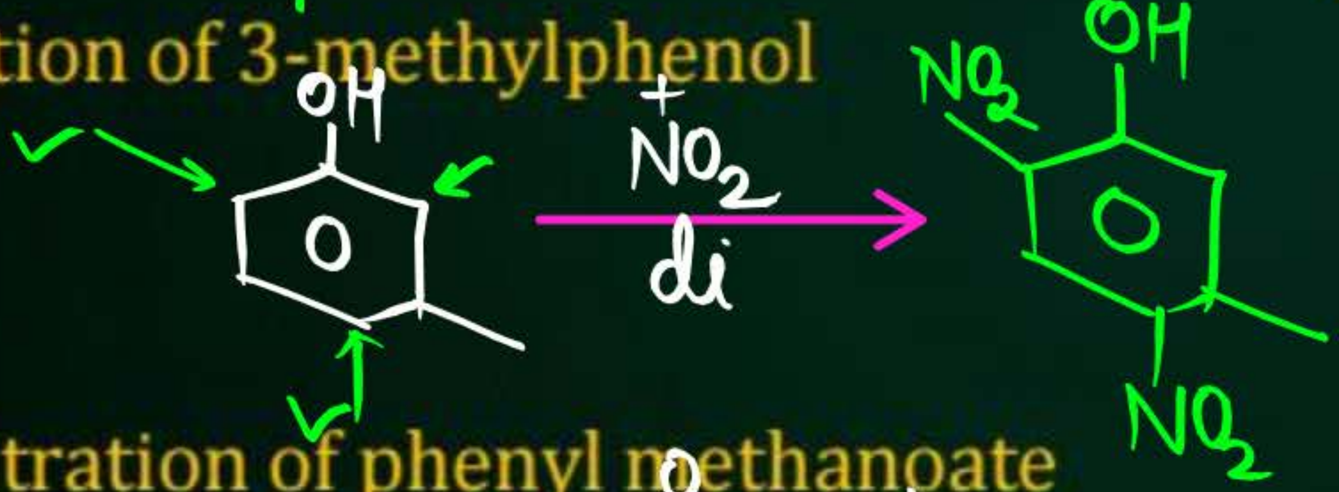
QUESTION (NCERT Example)

Write the structures of the major products expected from the following reactions:

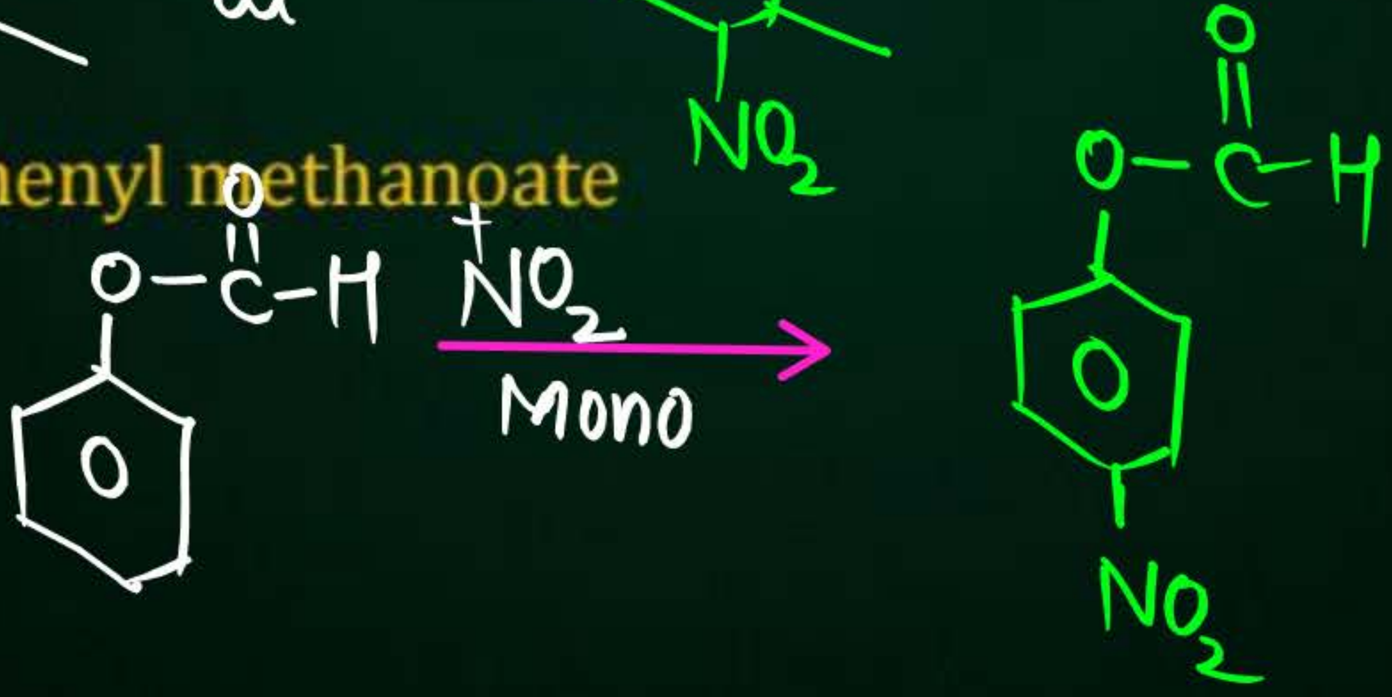
(a) Mononitration of 3-methylphenol


OH
$\overset{+}{N}O_2$
Mono
NO_2
OH

(b) Dinitration of 3-methylphenol


OH
$\overset{+}{N}O_2$
di
NO_2
OH
NO_2

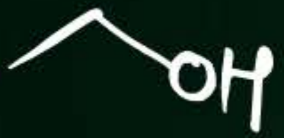
(c) Mononitration of phenyl methanoate


O–C–H
O
$\overset{+}{N}O_2$
Mono
O–C–H
O
NO_2

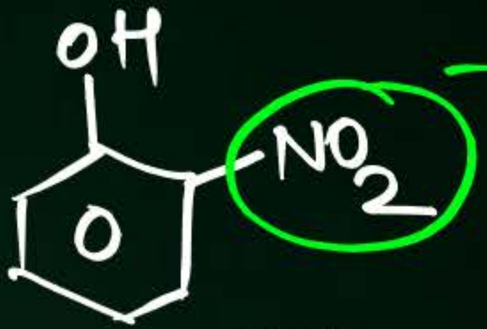
QUESTION (NCERT Exemplar)

Phenol is less acidic than ___________.

A ethanol

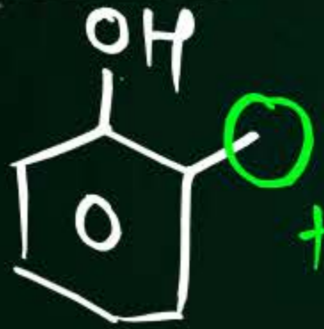


B *o*-nitrophenol



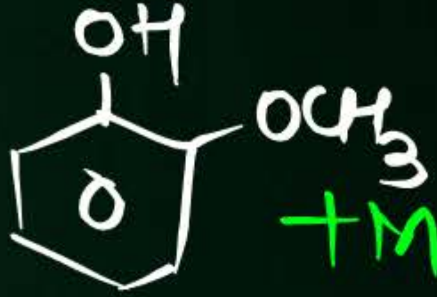
−M > ~~−I~~

C *o*-methylphenol



+H
+I

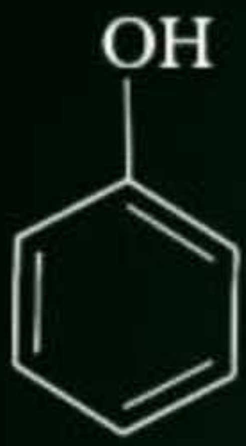
D *o*-methoxyphenol

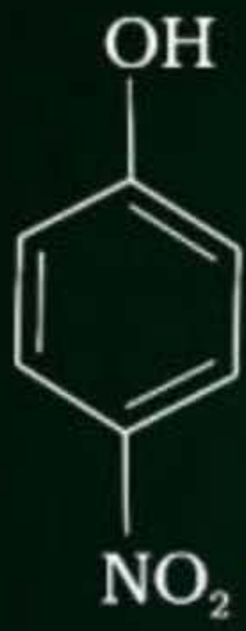


+M > ~~−I~~

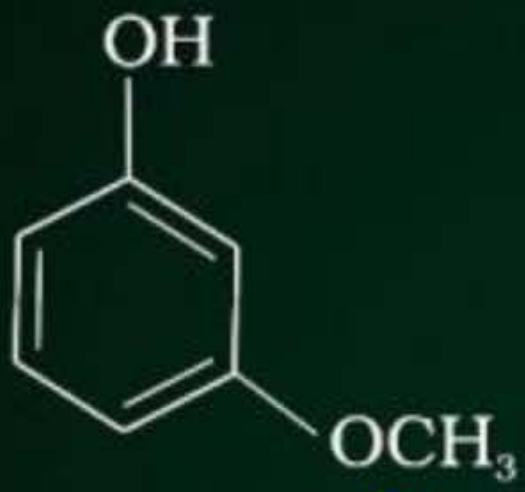
QUESTION (NCERT Exemplar)

Mark the correct order of decreasing acid strength of the following compounds.

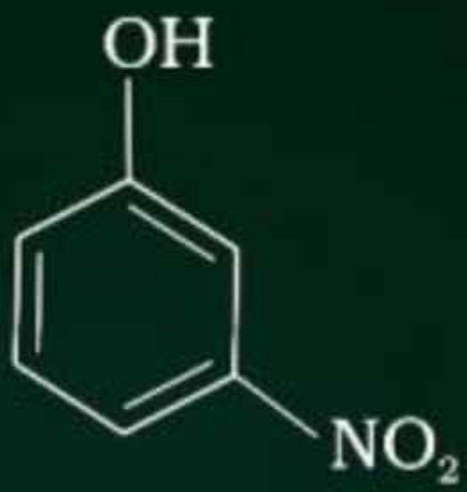

(a)


−M

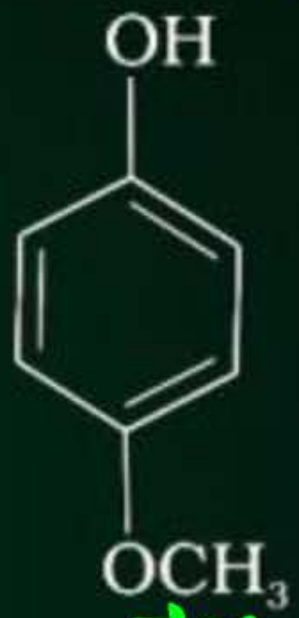
(b)


−I

(c)


−I

(d)


+M

(e)

(A) e > d > b > a > c

[✓ (B)] b > d > c > a > e

(C) d > e > c > b > a

(D) e > d > c > b > a

QUESTION (NCERT Exemplar)

Phenol can be distinguished from ethanol by the reactions with _______.

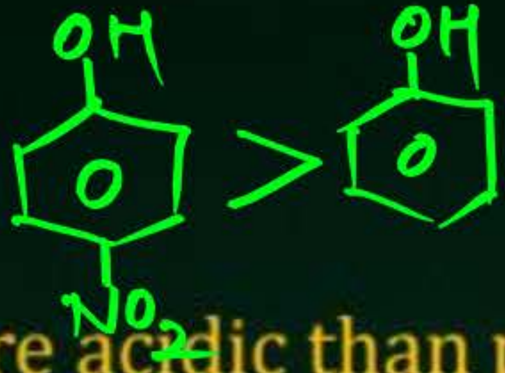
[✓ A] Br_2/water

B Na

[✓ C] Neutral $FeCl_3$

[✓ D] Both (A) & (C)

QUESTION (NCERT Exemplar)



Assertion: p-nitrophenol is more acidic than phenol.

Reason: Nitro group helps in the stabilization of the phenoxide ion by dispersal of negative charge due to resonance.

[✓ A] Assertion and reason both are correct and reason is correct explanation of assertion.

B Assertion and reason both are wrong statements.

C Assertion is correct statement but reason is wrong statement.

D Assertion is wrong statement but reason is correct statement.

QUESTION (NCERT Exemplar)

Assertion: Like bromination of benzene, bromination of phenol is ~~also~~ carried out in the presence of Lewis acid.

Reason: Lewis acid polarises the bromine molecule. ✓

- A Assertion and reason both are correct and reason is correct explanation of assertion.
- B Assertion and reason both are wrong statements.
- C Assertion is correct statement but reason is wrong statement.
- [✓ D] Assertion is wrong statement but reason is correct statement.

QUESTION (NCERT Exemplar)

Assertion: Phenol forms 2, 4, 6–tribromophenol on treatment with Br_2 in carbon disulphide at 273K.

Reason: Bromine polarises in carbon disulphide.

(A) Assertion and reason both are correct and reason is correct explanation of assertion.

[✓ (B)] Assertion and reason both are wrong statements.

(C) Assertion is correct statement but reason is wrong statement.

(D) Assertion is wrong statement but reason is correct statement.

QUESTION (NCERT Exemplar)

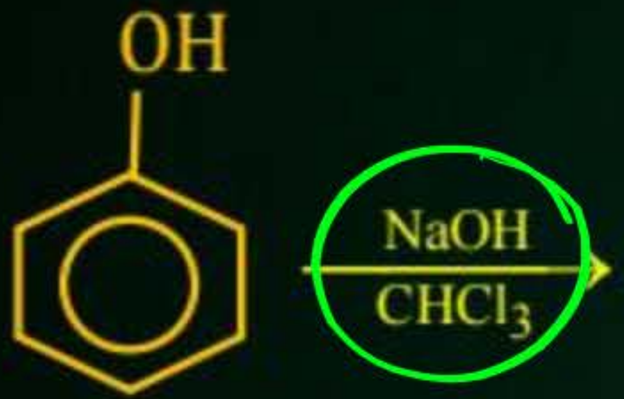
Assertion: ✗ Phenols give o-and p-nitrophenol on nitration with conc. HNO_3 and H_2SO_4 mixture.

Reason: ✓ —OH group in phenol is *o*–, *p*– directing.

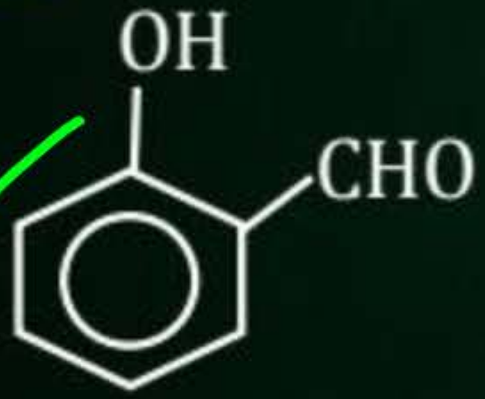
- (A) Assertion and reason both are correct and reason is correct explanation of assertion.
- (B) Assertion and reason both are wrong statements.
- (C) Assertion is correct statement but reason is wrong statement.
- [✓ (D)] Assertion is wrong statement but reason is correct statement.

QUESTION (AIIMS 2018)

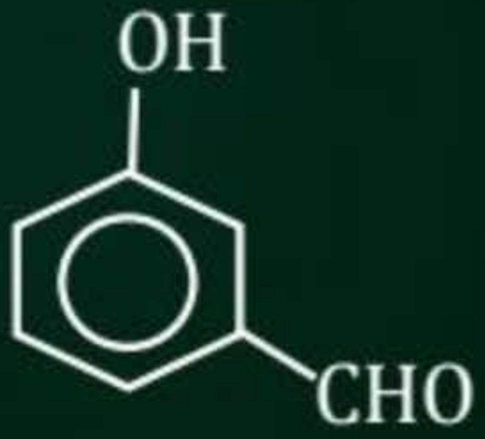
The major product obtained in the following reaction is:


OH
NaOH
CHCl$_3$

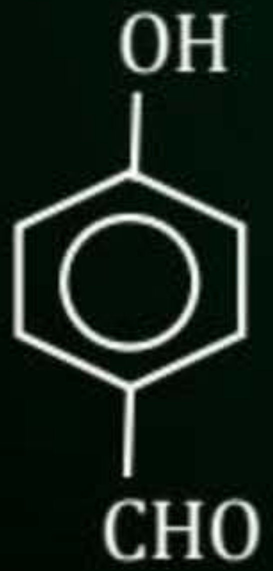
[✓ A]



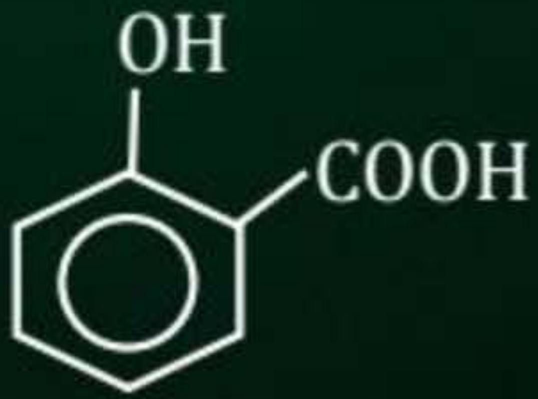
B



C



D

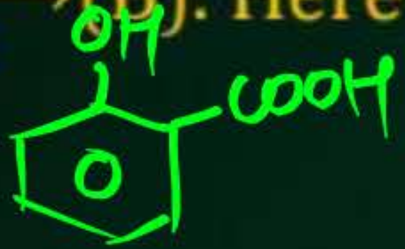


QUESTION (AIIMS 2017)

In the reaction

Phenol $\xrightarrow{NaOH}$ (A) $\xrightarrow[140°C]{CO_2+HCl}$ (B). Here B is:

PhO^-Na^+

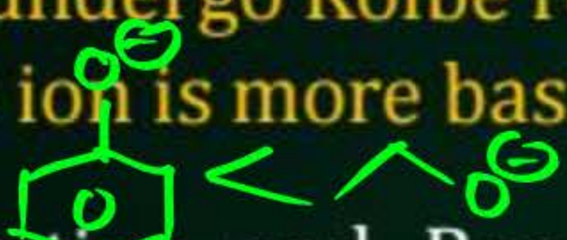


- (A) benzaldehyde
- (B) chlorobenzene
- (C) benzoic acid
- (D) [✓ salicylic acid]

QUESTION (AIIMS 2014)

Assertion: Phenol undergo Kolbe reaction, ethanol does not. ✓

Reason: Phenoxide ion is more basic than ethoxide ion. ✗

BS =


(A) If both Assertion and Reason are correct and the Reason is the correct explanation of Assertion.

(B) If both Assertion and Reason are correct but Reason is not the correct explanation of Assertion.

[✓ (C)] If Assertion is correct but Reason is incorrect.

(D) If both the Assertion and Reason are incorrect.

QUESTION (AIIMS 2010)

Assertion: Reimer-Tiemann reaction of phenol with CCl_4 in NaOH ✓ at 340 K give salicylic acid as the major product.

Reason: The reaction occurs through intermediate formation of dichlorocarbene. ✗

- (A) If both Assertion and Reason are correct and the Reason is the correct explanation of Assertion.
- (B) If both Assertion and Reason are correct but Reason is not the correct explanation of Assertion.
- [✓ (C)] If Assertion is correct but Reason is incorrect.
- (D) If both the Assertion and Reason are incorrect.

QUESTION

Phenol reacts with bromine in CS_2 at low temperature to give

Ⓐ ✗ m-bromophenol

[✓ Ⓑ] o-and p-bromophenol

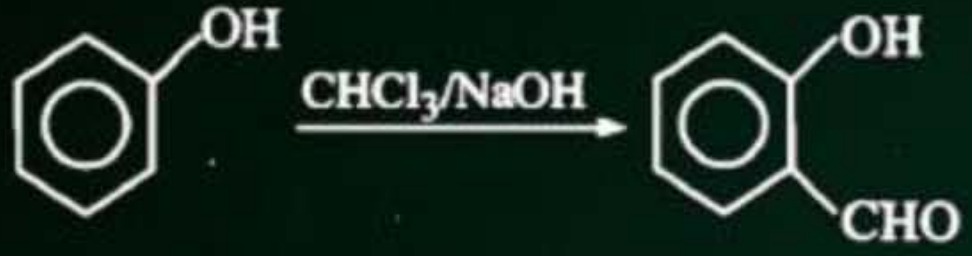
Ⓒ p-bromophenol

Ⓓ ✗ 2, 4, 6-tribromophenol

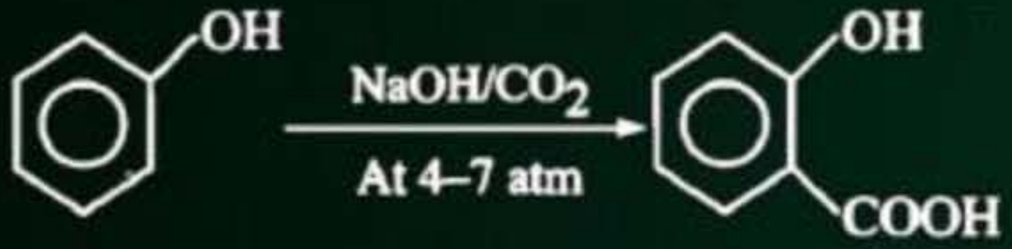
QUESTION

Which represents Riemer-Tiemann reaction?

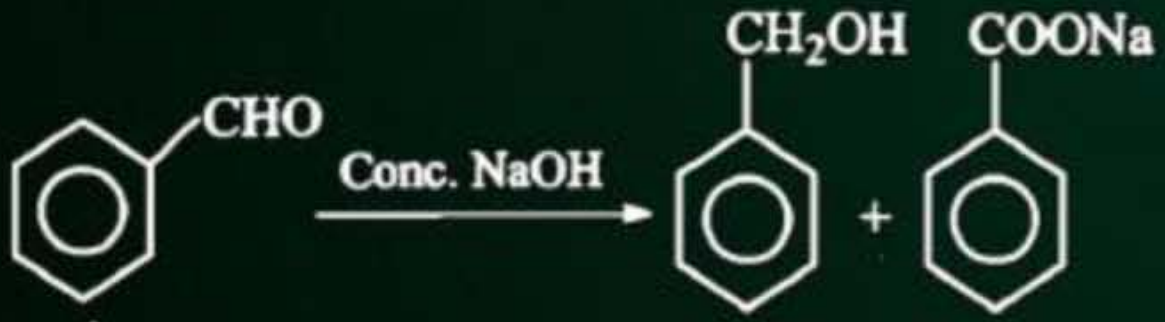
[✓ A]


OH
CHCl₃/NaOH
OH
CHO

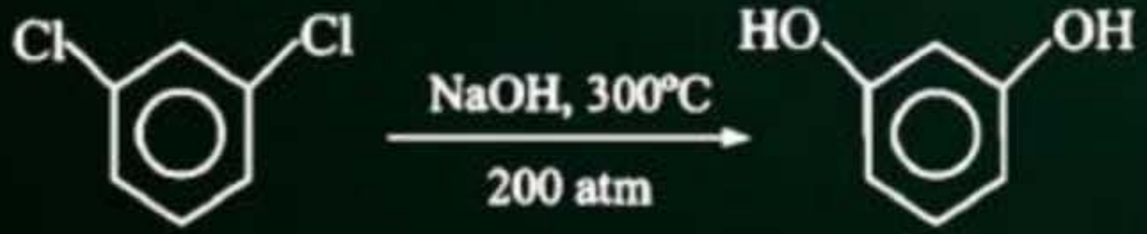
B


OH
NaOH/CO₂
At 4–7 atm
OH
COOH

C


CHO
Conc. NaOH
CH₂OH
COONa
+

D


Cl
Cl
NaOH, 300°C
200 atm
HO
OH

QUESTION

Phenol can be converted into salicylic acid by

(A) Etard's reaction ✗

(B) Kolbe's reaction

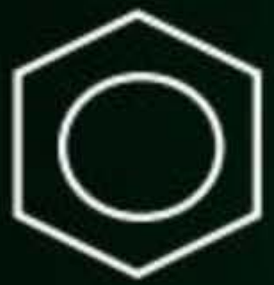
(C) Phenol with CCl_4 in basic medium

[✓ (D)] Both (B) and (C)

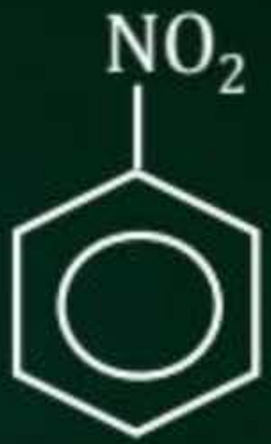
QUESTION

Which of the following compound will not undergo Reimer-Tiemann reaction?

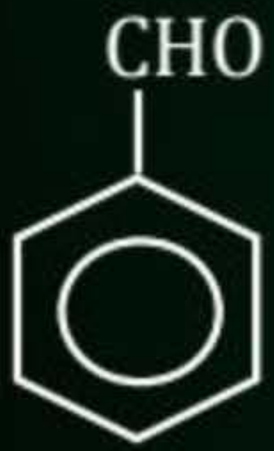
(A)



(B)



(C)



(D) [✓ All of these]

QUESTION

Electrophile in Reimer-Tiemann reaction is:

A $\overset{\ominus}{C}Cl_3$

B CH_2Cl_2

C $CHCl_3$

[✓ D $:CCl_2$]

QUESTION

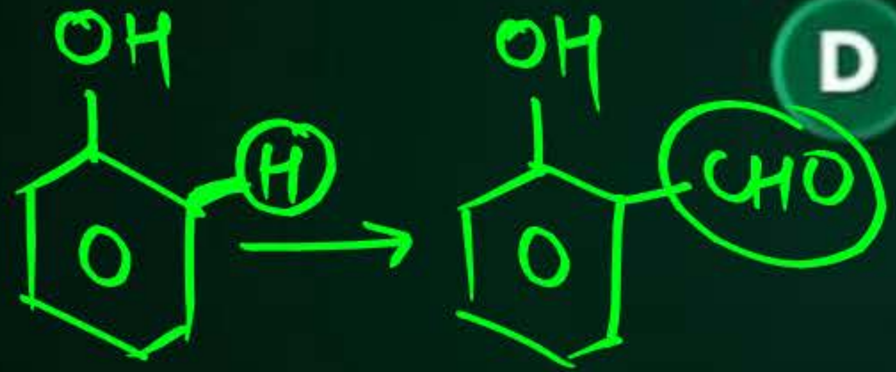
In Reimer-Teiemann reaction molecular weight of phenol increases by:

[✓ A 28]

B 29

C 30

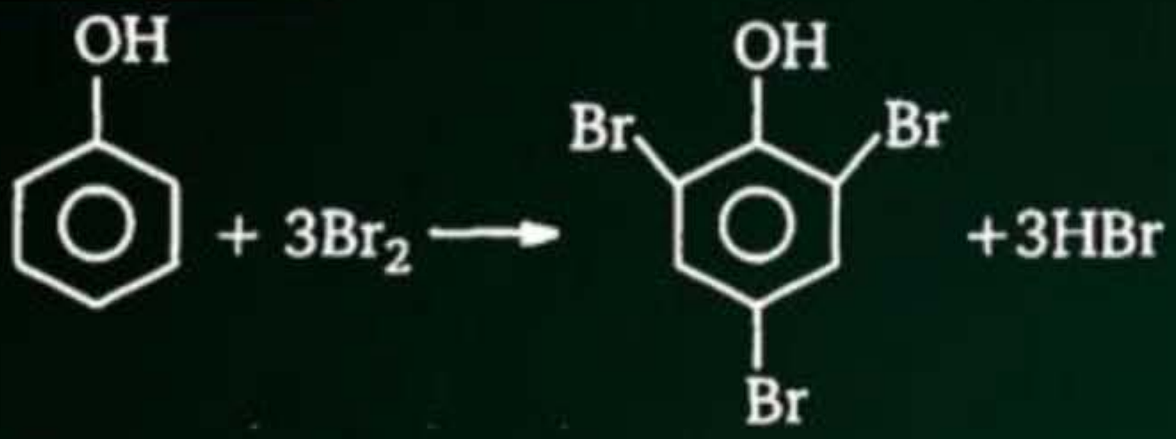
D 31



$\boxed{CO}$

$12+16=\boxed{28}$

QUESTION


OH
+ 3Br2
Br
OH
Br
Br
+3HBr

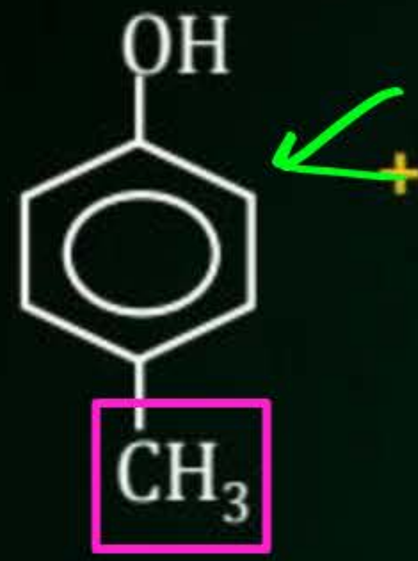
Ⓐ Nucleophilic addition

Ⓑ Nucleophilic substitution

Ⓒ Electrophilic addition

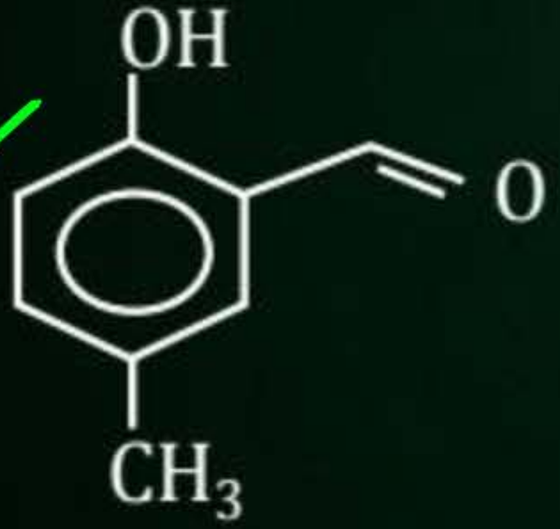
[✓ Ⓓ] Electrophilic substitution

QUESTION

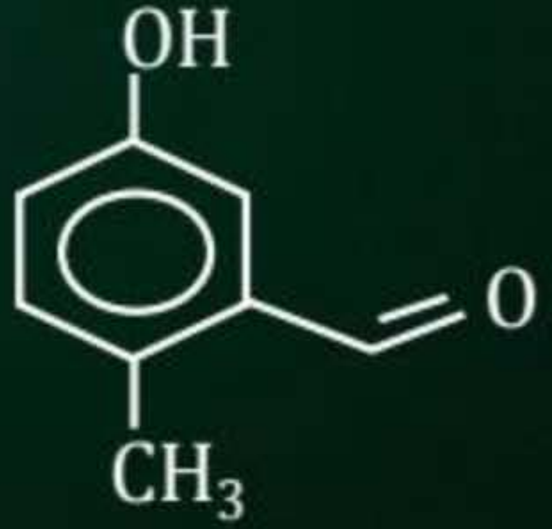


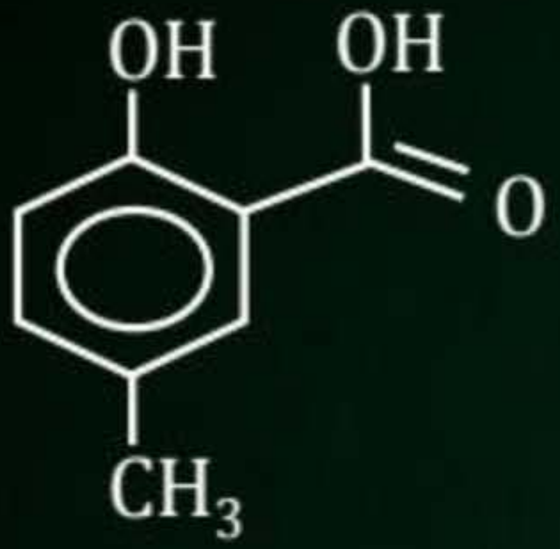
+ $CHCl_3$ + NaOH $\xrightarrow[2H^{\oplus}]{}$ (A); Product (A) is:

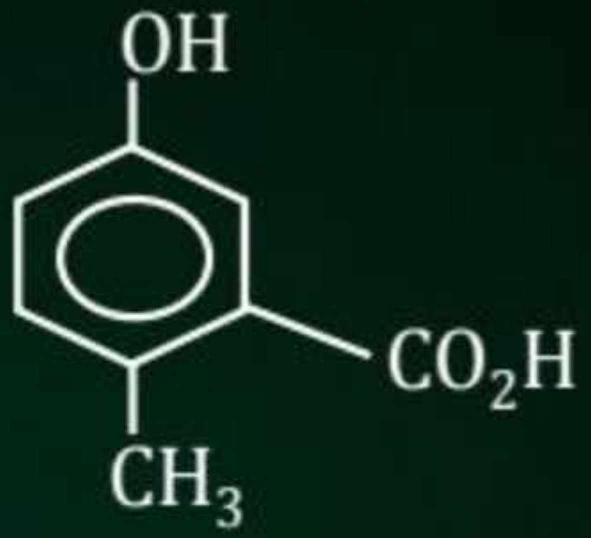
A



B



C 

D 

QUESTION

Phenols do not react with:

$$PhOH + NaHCO_3 \cancel{\longrightarrow} PhONa + \underset{SA}{H_2CO_3}$$

- A sodium bicarbonate ✓
- B sodium hydroxide
- C potassium hydroxide
- D ferric chloride

QUESTION

Phenolic group

Neutral $FeCl_3$ gives purple colour with:

Ⓐ only phenol

Ⓑ only salicylic acid

[✓ Ⓒ] both phenol and salicylic acid

Ⓓ only benzoic acid

QUESTION

Phenol on treatment with dil. HNO_3 gives:

- A picric acid
- [✓ B o-and p-nitrophenols]
- C o-and m-nitrophenols
- D p-and m-nitrophenols

QUESTION

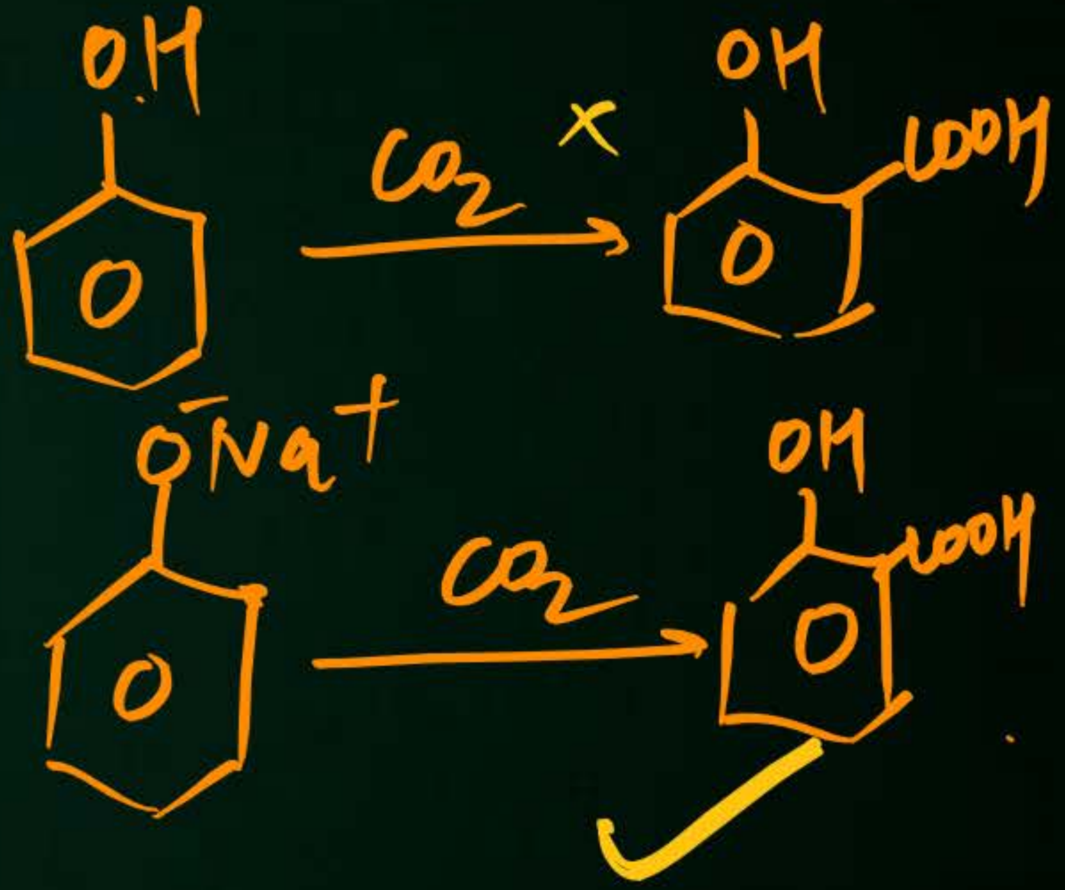
Phenol gives Reimer Tiemann reaction with:

- A $CHCl_3$
- B CCl_4
- [✓ C $CHCl_3$ and CCl_4]
- D C_6H_5CHCl

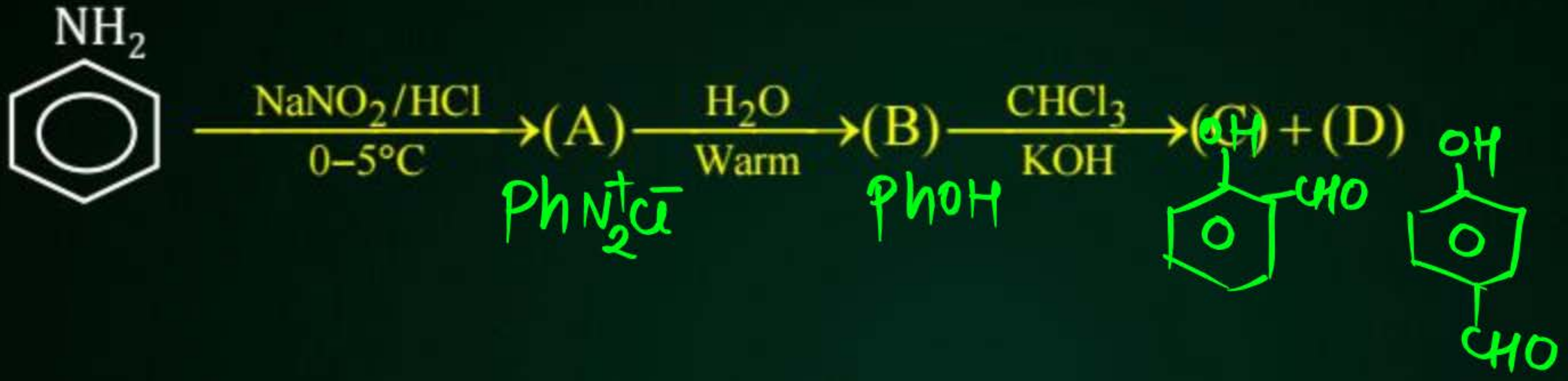
QUESTION

Kolbe's reaction consists in obtaining:

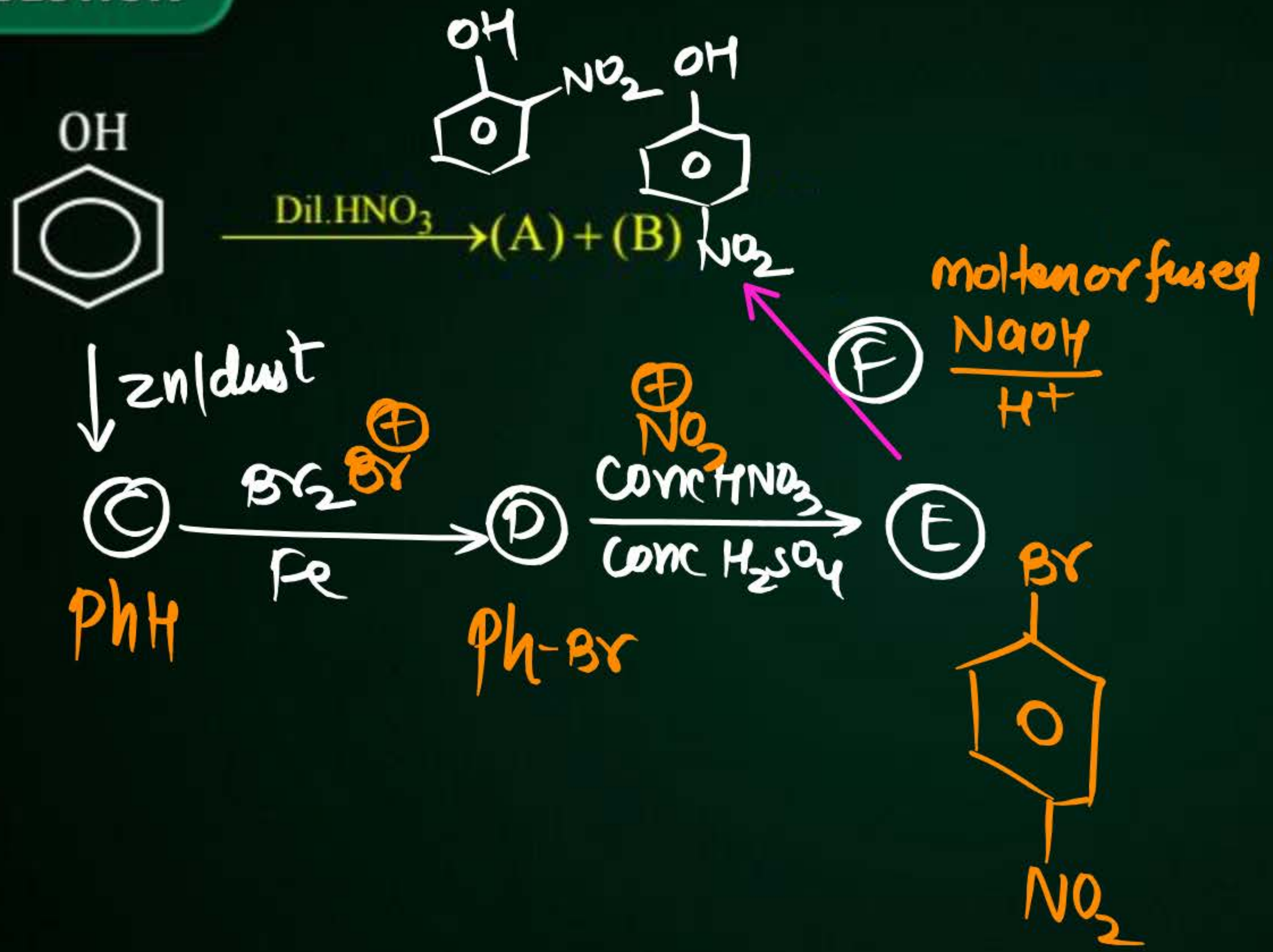
- **A** anisol from phenol ✗
- **B** salicylaldehyde from phenol and CHI_3 ✗
- **C** salicylic acid from sodium phenate and CO_2 ✓
- **D** salicylic acid from phenol and CO_2


OH
CO_2
×
OH
COOH
O^-Na^+
CO_2
OH
COOH
✓

QUESTION


NH_2
$NaNO_2/HCl$
0–5°C
(A)
H_2O
Warm
(B)
$CHCl_3$
KOH
(C) + (D)
$PhN_2^+Cl^-$
PhOH
OH
CHO
OH
CHO

QUESTION



OH
Dil.HNO3
(A)+(B)
OH
NO2
OH
NO2
zn/dust
C
PhH
Br2
Br+
Fe
D
Ph-Br
NO2+
Conc HNO3
Conc H2SO4
E
F
molten or fused
NaOH
H+
Br
NO2

Home Work

QUESTION 01

Whe phenol is treated with excess of bromine water, it gives:

A m-bromophenol

B o-and p-bromophenol

C 2, 4-dibromophenol

D 2, 4, 6-tribromophenol

QUESTION 02

When phenol is distilled with zinc dust. the main product is:

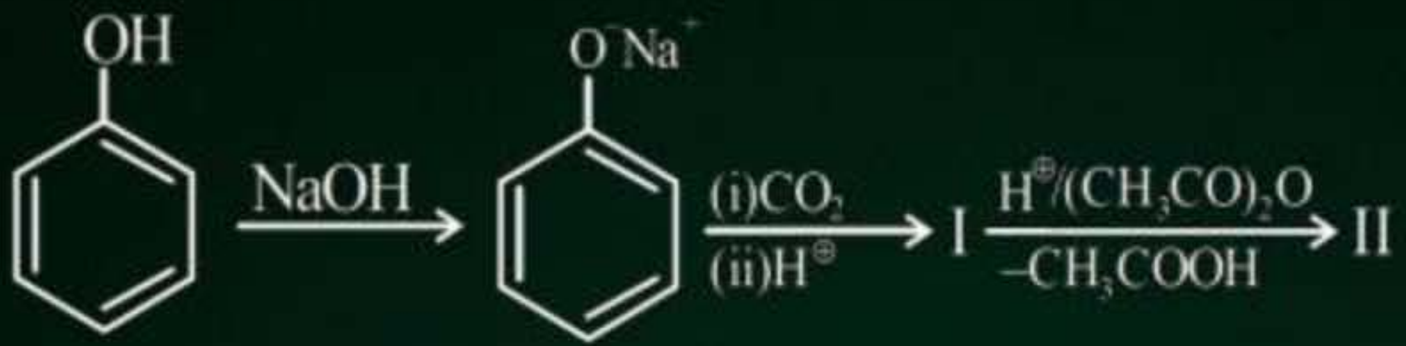
A biphenyl

B benzene

C benzaldehyde

D phenolphthalein

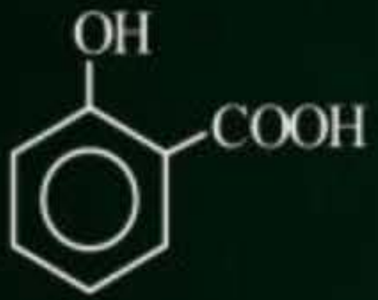
QUESTION 03


OH
NaOH
O⁻Na⁺
(i)CO₂
(ii)H⊕
I
H⊕/(CH₃CO)₂O
–CH₃COOH
II

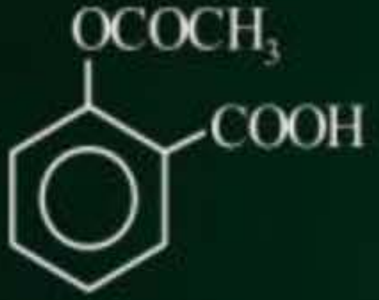
Identify I and II in above reaction.

A

(I)

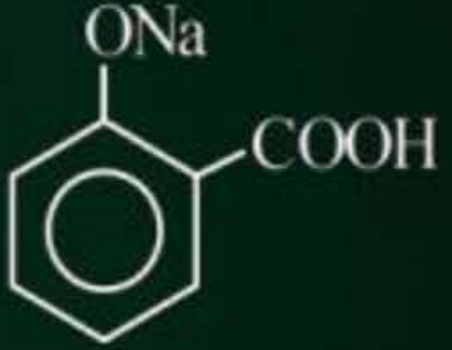


(II)

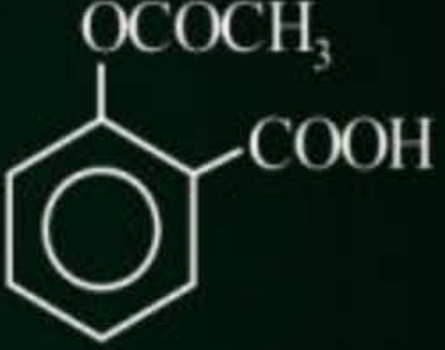

OCOCH₃
COOH

B

(I)

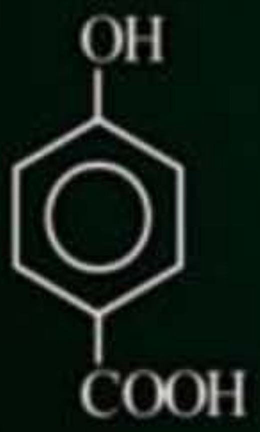


(II)

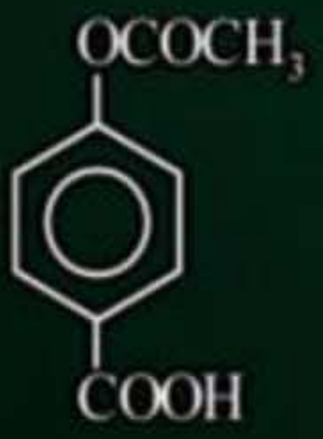

OCOCH₃
COOH

C

(I)

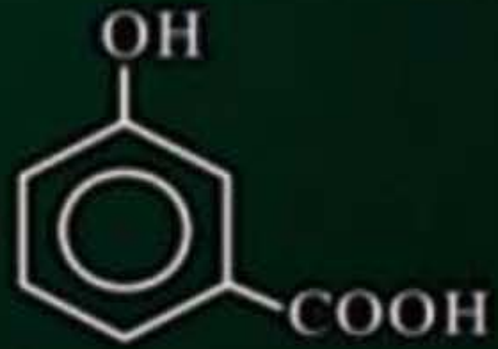


(II)

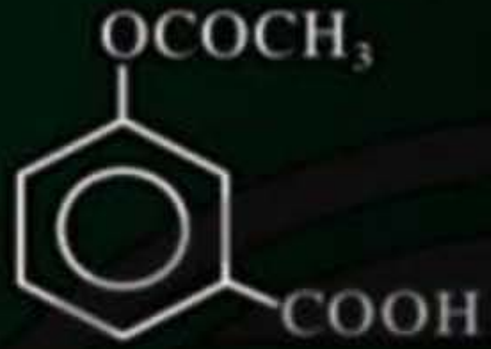

OCOCH₃
COOH

D

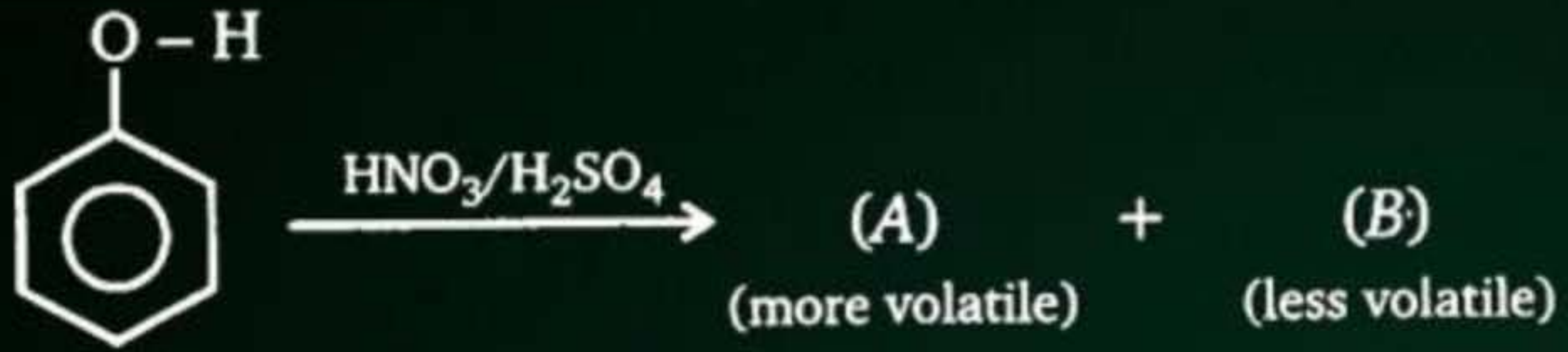
(I)



(II)

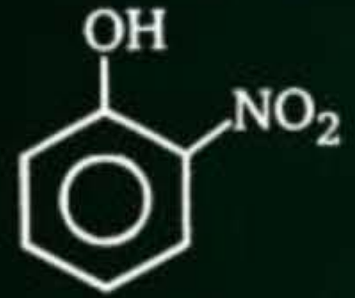

OCOCH₃
COOH

QUESTION 04

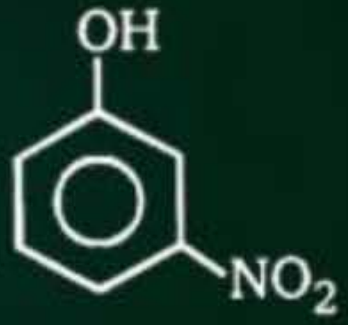

O – H
HNO₃/H₂SO₄
(A)
(more volatile)
+
(B)
(less volatile)

Product (A) of the above reaction is:

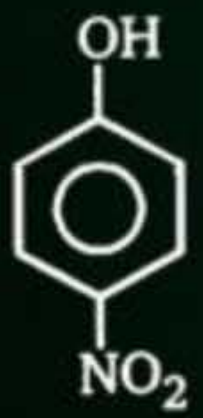
A



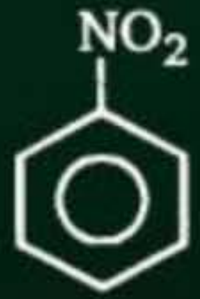
B



C

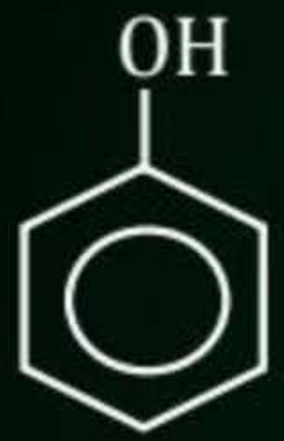


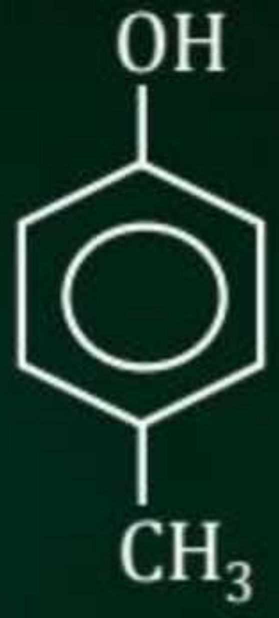
D

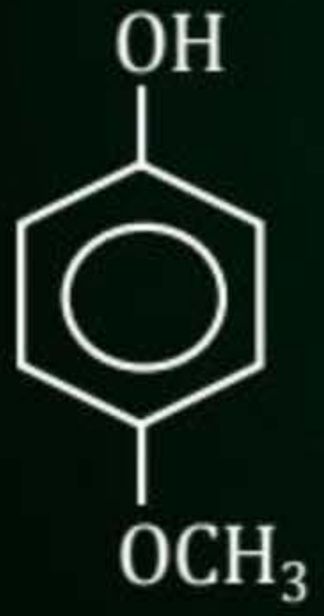


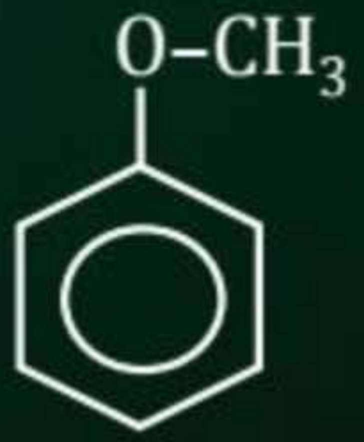
QUESTION 05

Which of the following will not give Reimer-Teimann reaction?

A


B


C


D


QUESTION 06

The product of the Reimer-Tiemann reaction is a mixture of o-hydroxy benzaldehyde (major product) and p-hydroxy benzaldehyde (minor product). The constituents of the mixture are best separated by

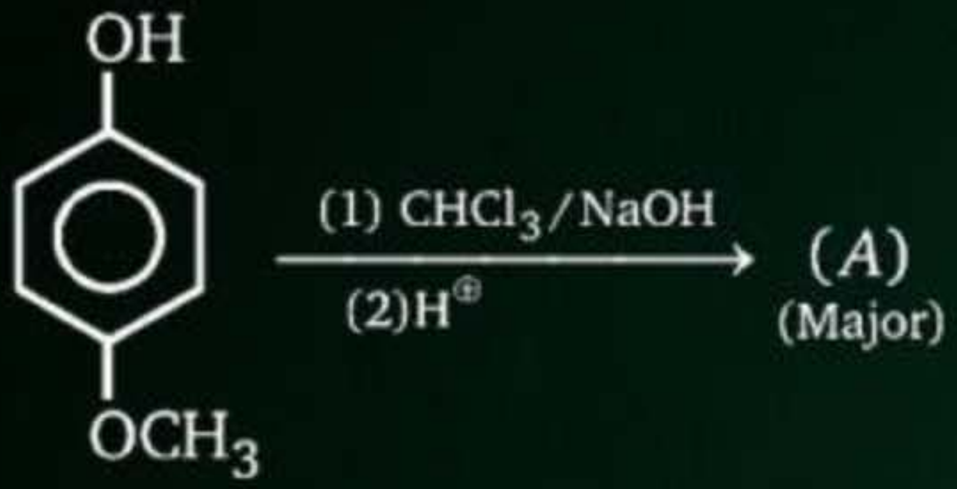
Ⓐ crystallization

Ⓑ distillation

Ⓒ steam distillation

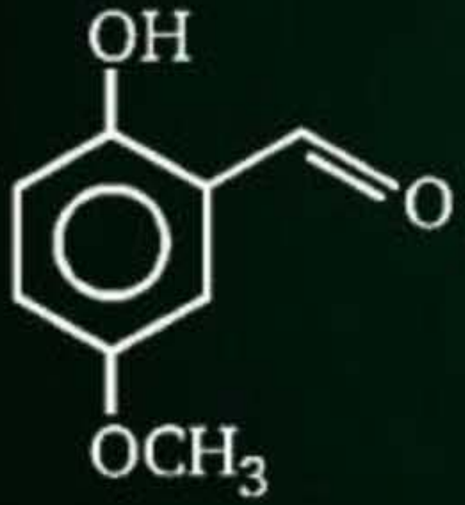
Ⓓ sublimation

QUESTION 07

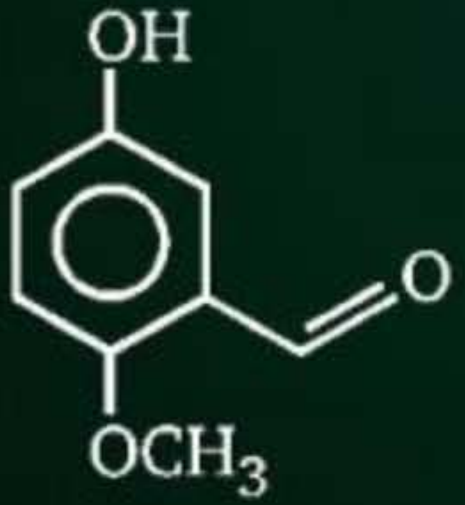

OH
(1) $CHCl_3/NaOH$
(2)$H^{\oplus}$
(A)
(Major)
OCH_3

Product (A) is:

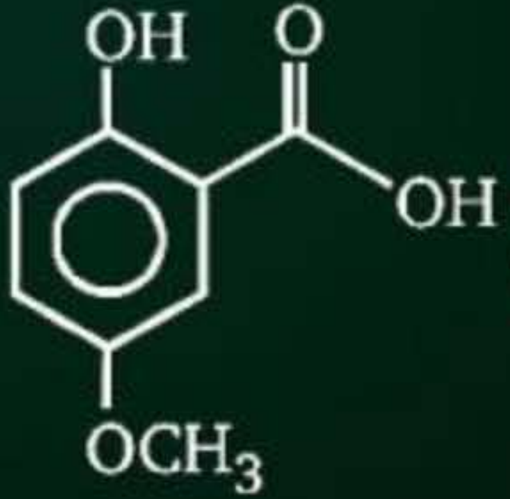
A



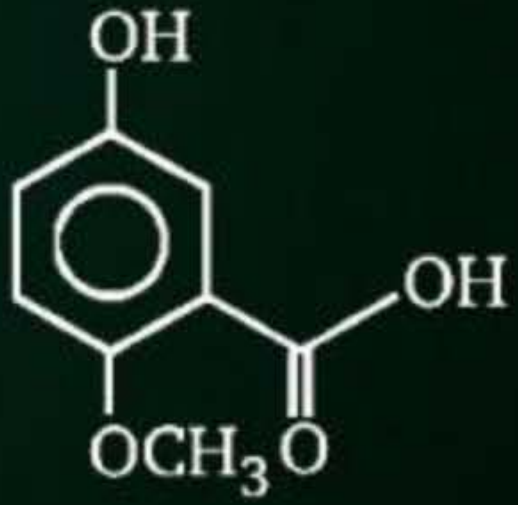
B



C

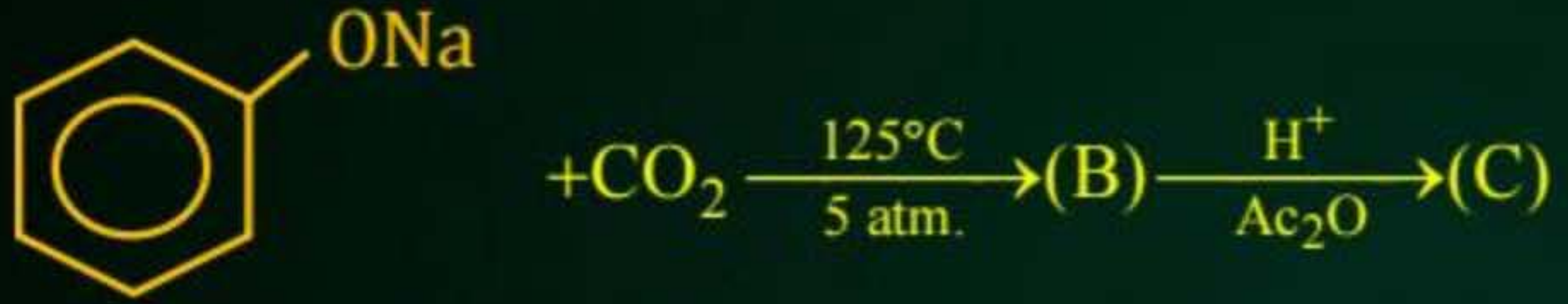


D



QUESTION 08

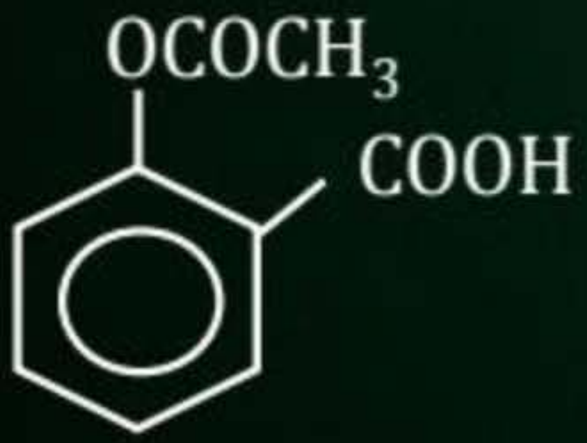
Sodium phenoxide when heated with CO_2 under pressure at 125°C yields a product which an acetylation produces (C).



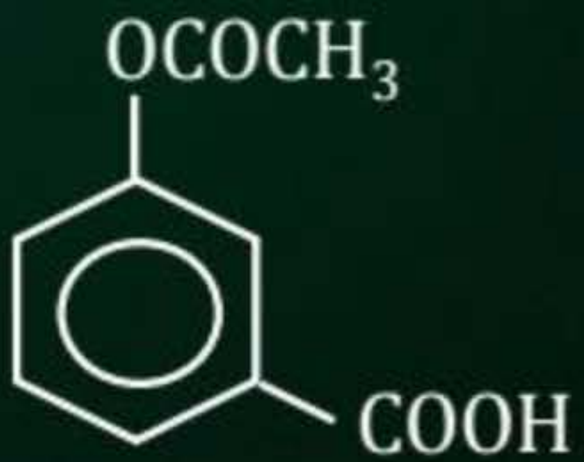
$$+CO_2 \xrightarrow[5\ \text{atm.}]{125^\circ C} (B) \xrightarrow[Ac_2O]{H^+} (C)$$

The major product (C) would be:

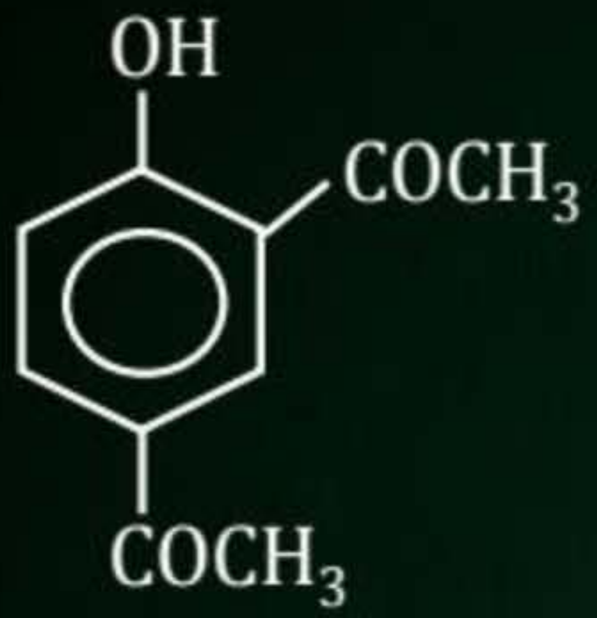
(A)


OCOCH₃
COOH

(B)

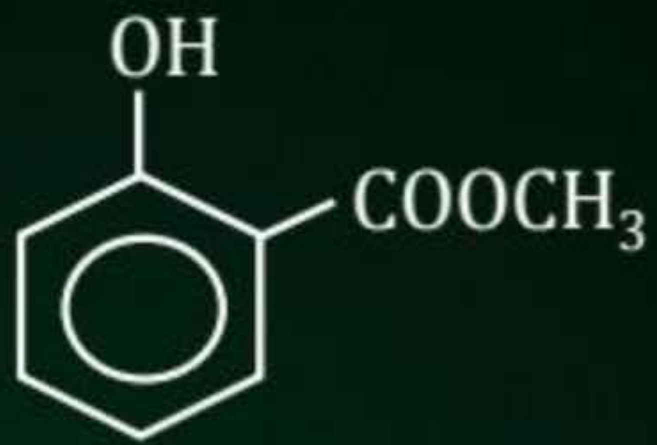

OCOCH₃
COOH

C

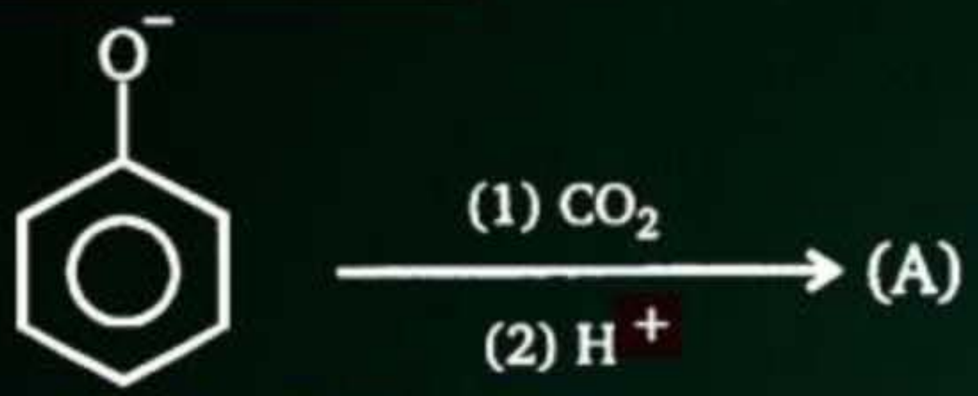


OH
COCH3
COCH3

D



QUESTION 09

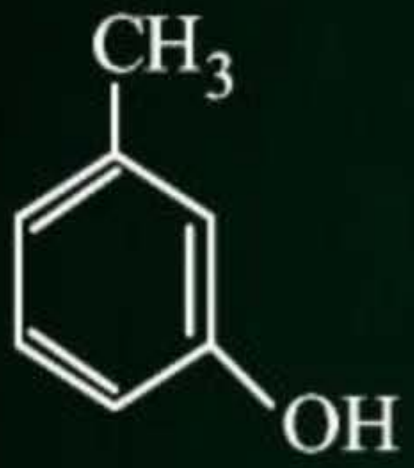


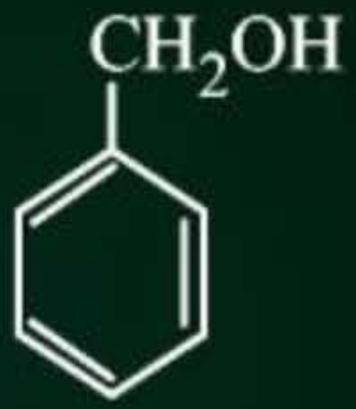
Which of the following is true statement about the reaction?

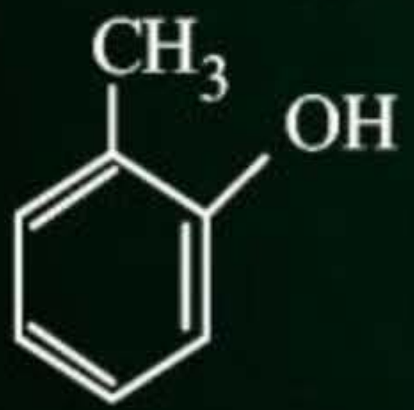
- **A** Ortho isomer is major if PhONa is used.
- **B** Para isomer is major if PhOK is used.
- **C** Product formed is further used for preparation of drug aspirin.
- **D** All of these

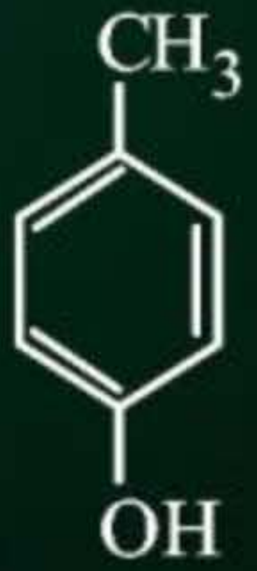
QUESTION 10

The structure of the compound that gives tribromo derivative on treatment with bromine water is:

A


B


C


D


ANSWER KEY

1. D
2. B
3. A
4. A
5. D
6. C
7. A
8. A
9. D
10. A

Home Work From PW Module (Yakeen NEET)

Prarambh: Q 05, 06, 08, 11, 13, 15, 35, 43, 44, 45, 46, 47, 48, 49

Prabal: Q 02, 21, 23

MARK THE DATE 4th May, 2025

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Thank you!

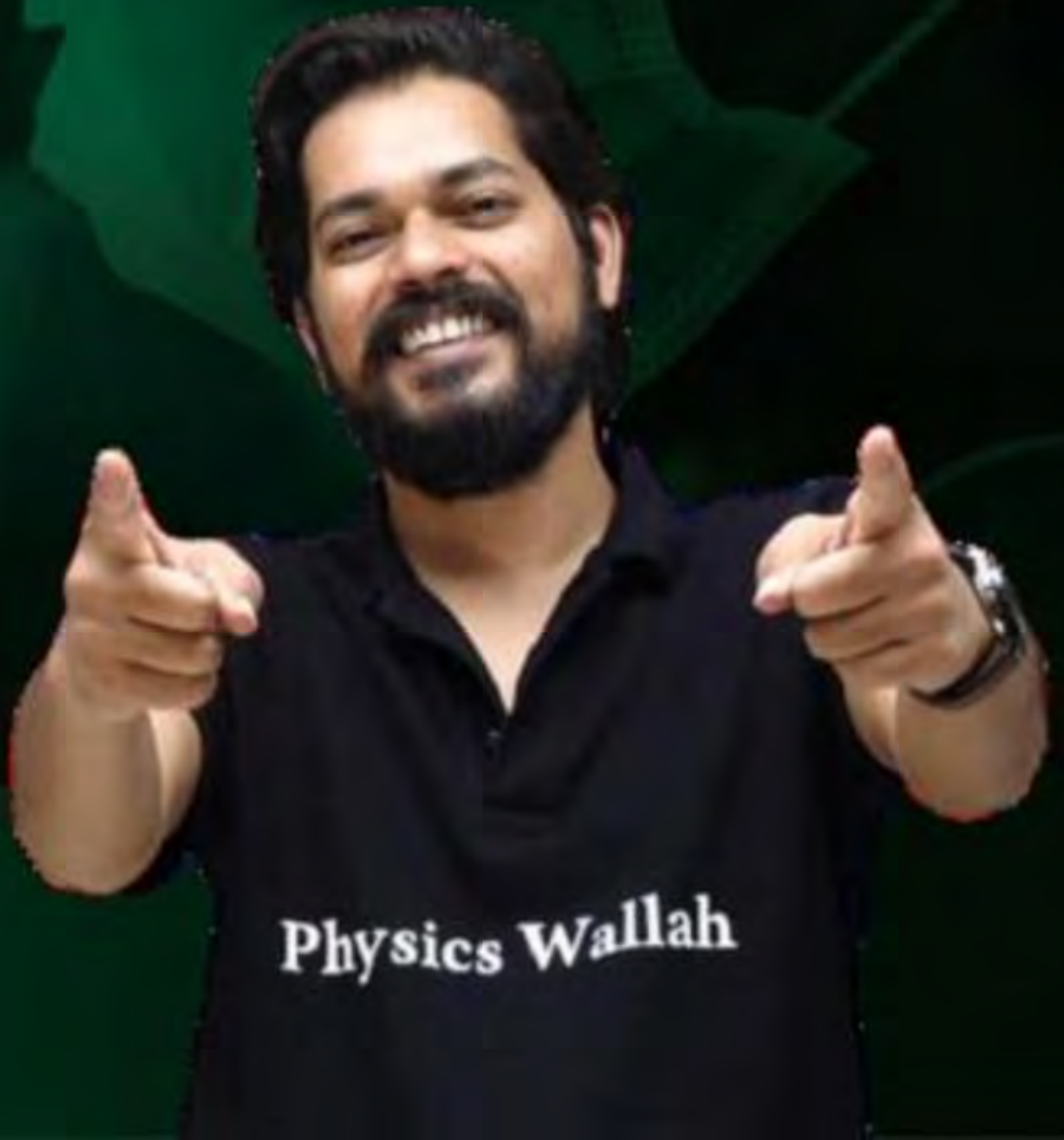
YAKEEN 2.0

FOR NEET 2025

Lecture- 08 Organic Chemistry

Alcohols, Phenols and Ethers

By- Pankaj Sir(POPU MAMA)


Physics Wallah

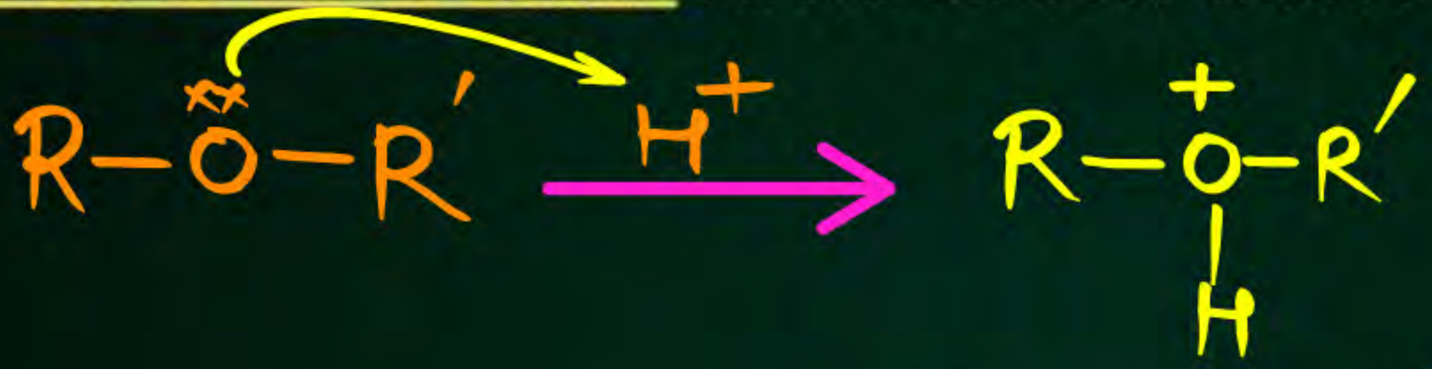
Topics *to be covered*

1. Chemical Properties of Ethers ✓
2. Practice

Chemical Properties of Ethers

[HI > HBr > HCl]

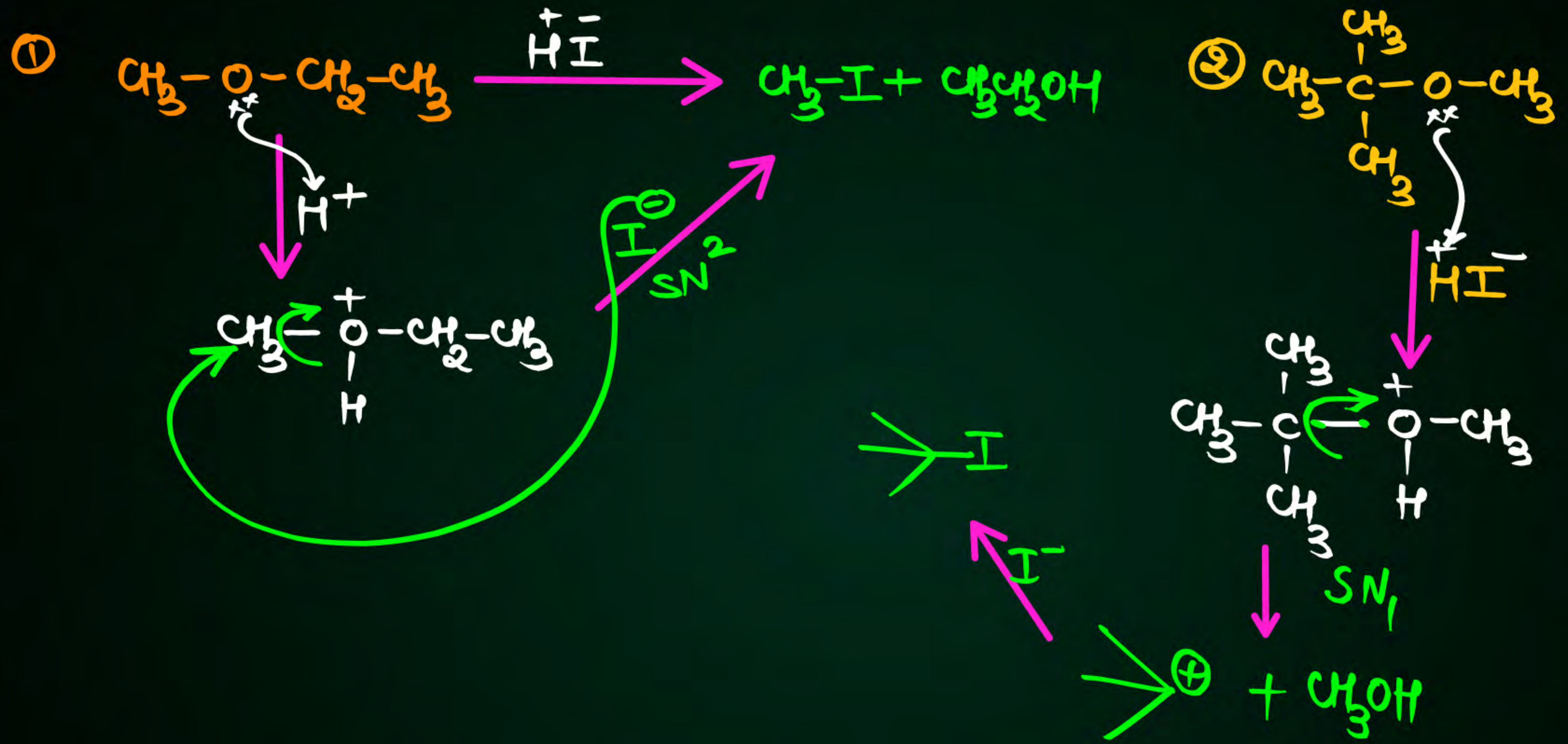
1. Cleavage of C–O bond: A. Reaction with $\overset{+}{H}\overset{-}{X}$



$$R-\ddot{O}-R' \xrightarrow{H^+} R-\underset{\underset{H}{|}}{\overset{+}{O}}-R'$$

R or R' 3° $\overset{+}{C}$, Resostab 1°, 2°, 3° C^+ SN^1

otherwise SN^2


①
$CH_3-\ddot{O}-CH_2-CH_3 \xrightarrow{\overset{+}{H}\overset{-}{I}} CH_3-I + CH_3CH_2OH$
H^+
$CH_3-\overset{+}{O}(H)-CH_2-CH_3$
$I^{\ominus}$
SN^2
②
$CH_3-C(CH_3)_2-\ddot{O}-CH_3$
$\overset{+}{H}\overset{-}{I}$
$CH_3-C(CH_3)_2-\overset{+}{O}(H)-CH_3$
SN_1
$\oplus + CH_3OH$
I^-
I

14th JAN 2025

Jee wallah

Complete NCERT

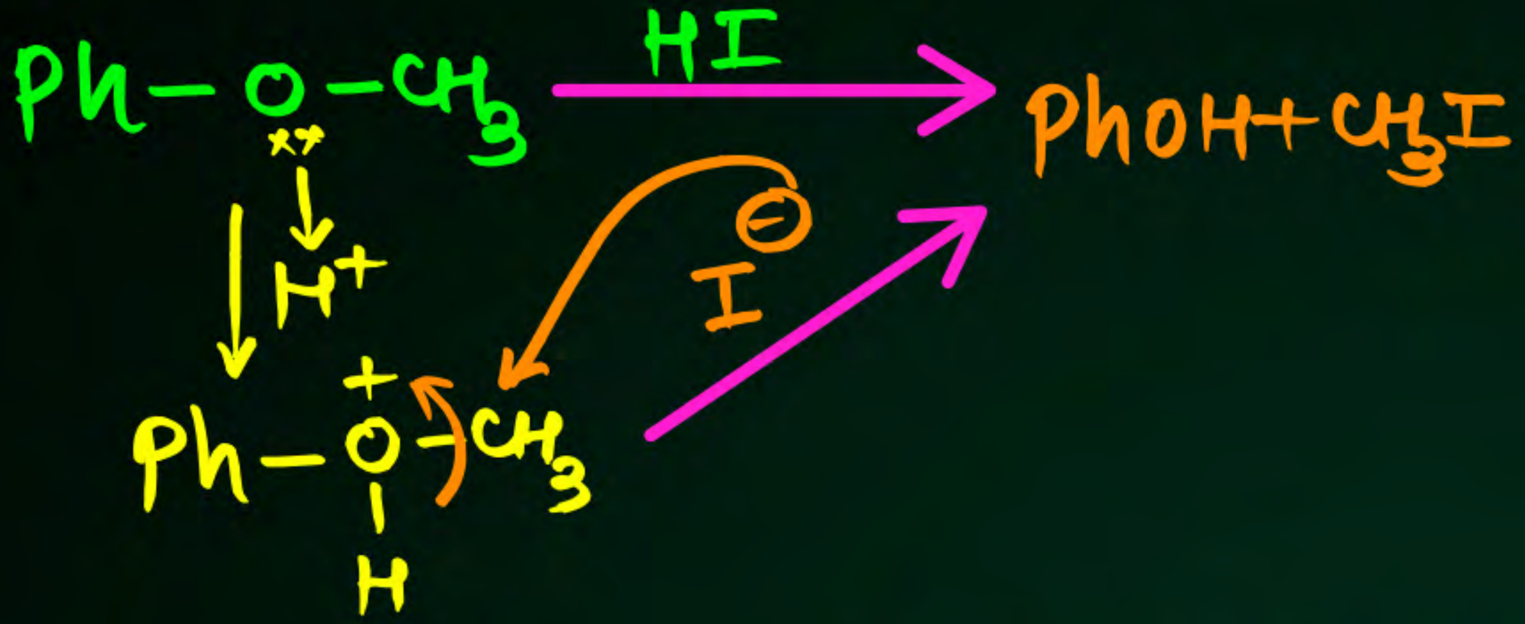
Theory + PYQs

12 hour

IUPAC — POC

Subah 11 Baje

Q

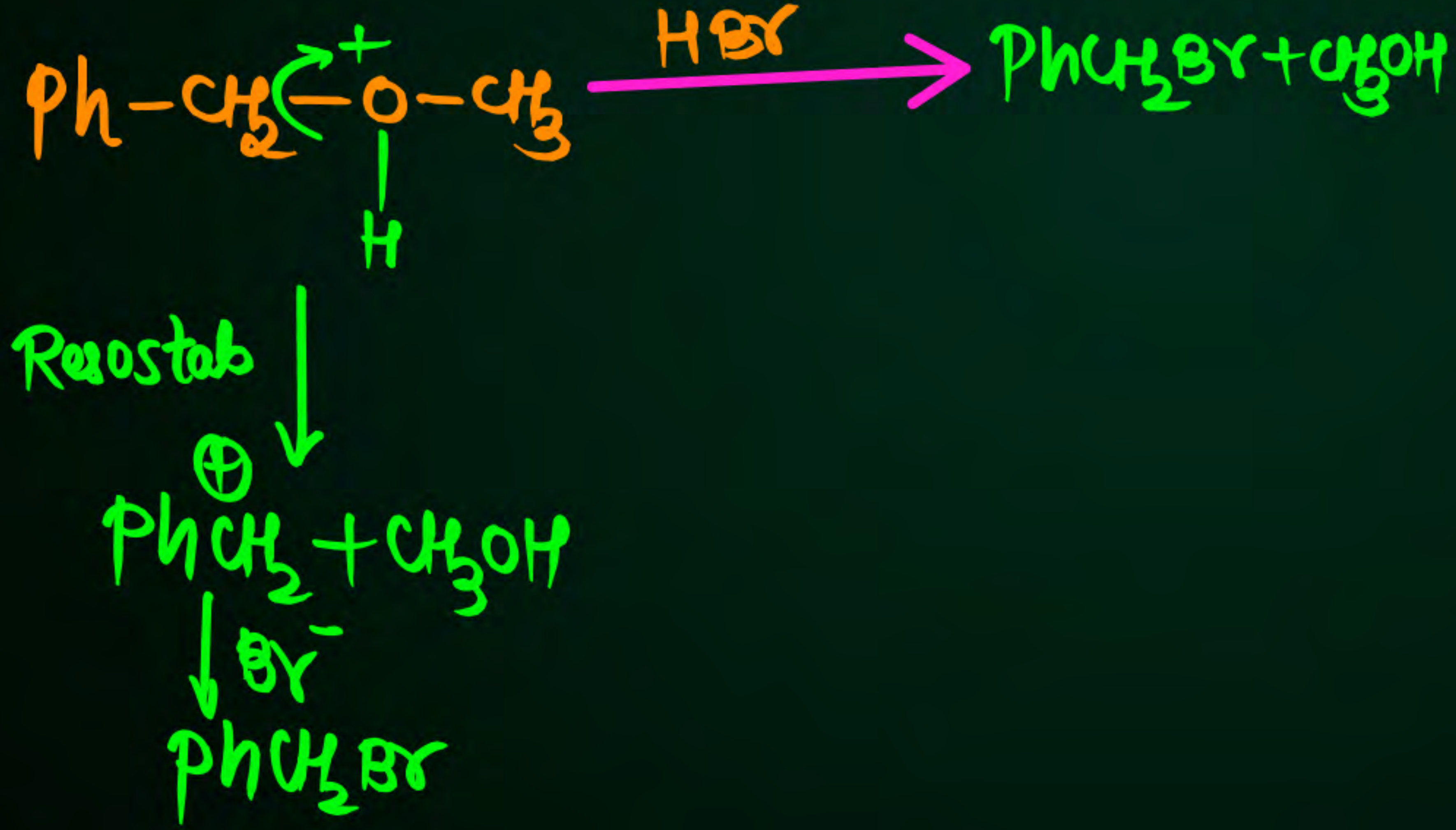


$$Ph-\ddot{O}-CH_3 \xrightarrow{HI} PhOH + CH_3I$$

$$\downarrow H^+$$

$$Ph-\underset{\displaystyle H}{\overset{+}{O}}-CH_3 \xrightarrow{I^{\ominus}} PhOH + CH_3I$$

Q



$$Ph-CH_2-\underset{\displaystyle H}{\overset{+}{O}}-CH_3 \xrightarrow{HBr} PhCH_2Br + CH_3OH$$

Resostab

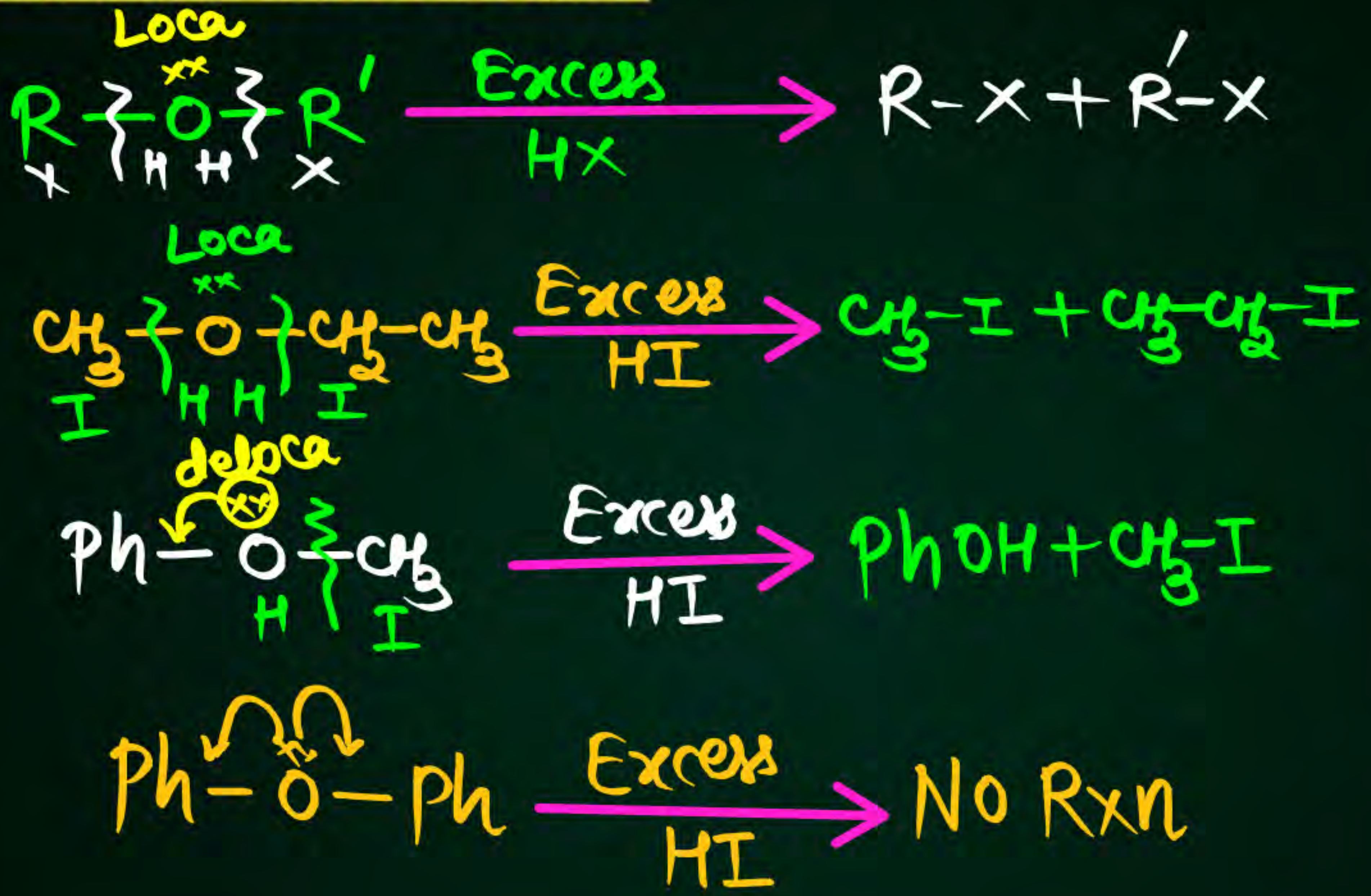
$$\downarrow$$

$$Ph\overset{\oplus}{C}H_2 + CH_3OH$$

$$\downarrow Br^-$$

$$PhCH_2Br$$

B. Reaction with excess HX:



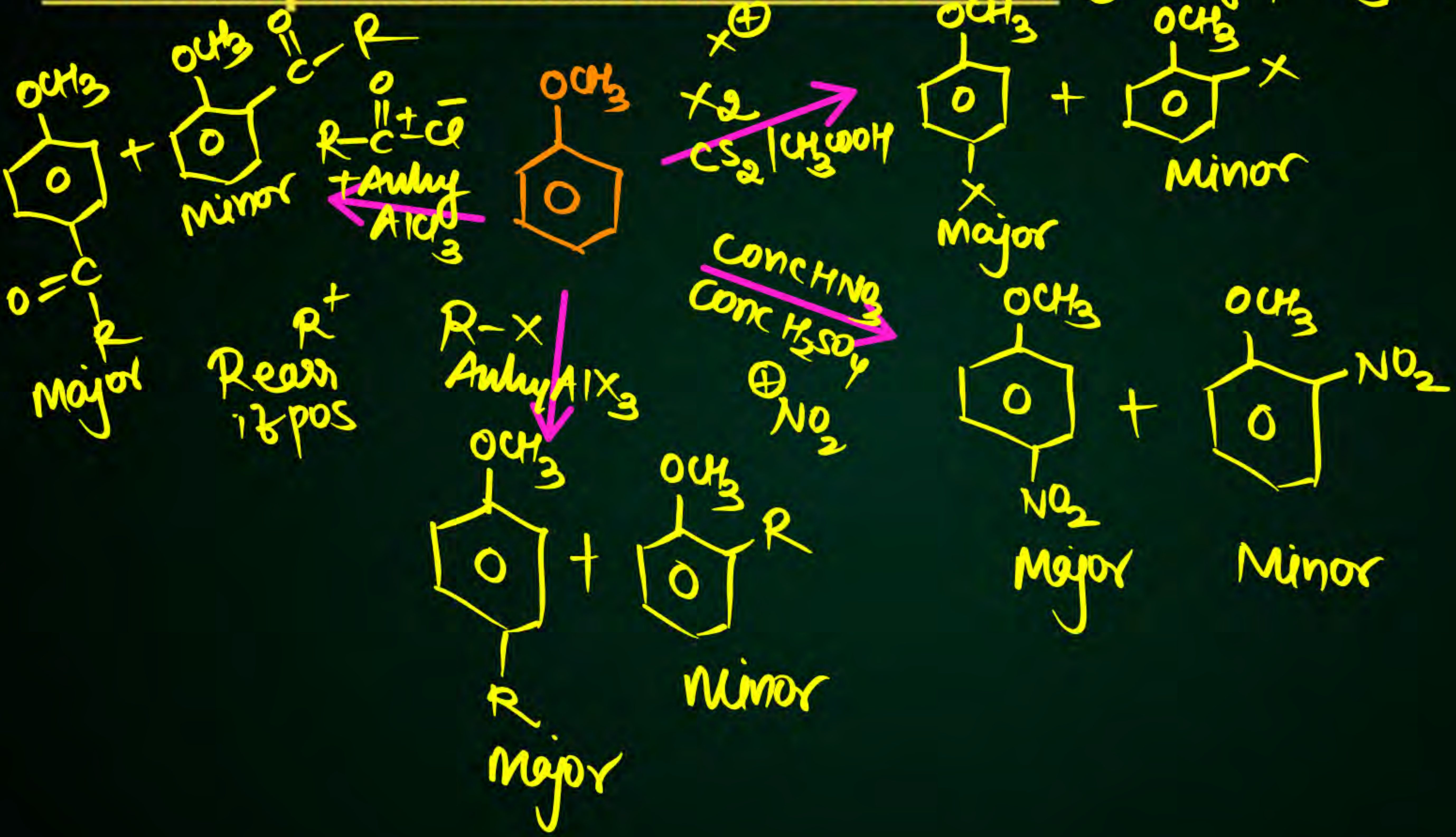
$$R-\overset{\text{Loca}}{\ddot{O}}-R' \xrightarrow[HX]{\text{Excess}} R-X + R'-X$$

$$CH_3-\overset{\text{Loca}}{\ddot{O}}-CH_2-CH_3 \xrightarrow[HI]{\text{Excess}} CH_3-I + CH_3-CH_2-I$$

$$Ph-\overset{\text{deloca}}{\ddot{O}}-CH_3 \xrightarrow[HI]{\text{Excess}} PhOH + CH_3-I$$

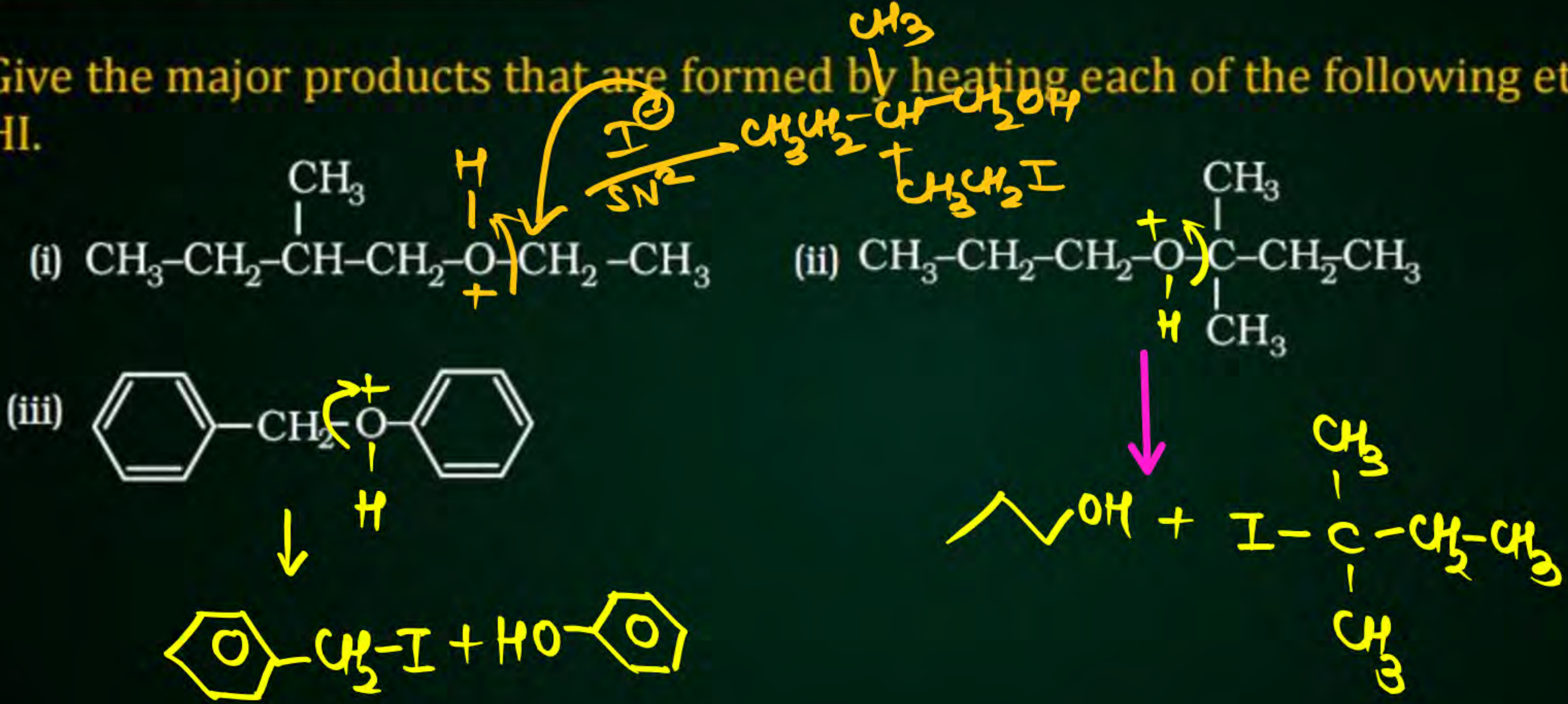
$$Ph-\ddot{O}-Ph \xrightarrow[HI]{\text{Excess}} \text{No Rxn}$$

2. Electrophilic Substitution reactions: (always 'p' major)


OCH3
$R-\overset{O}{\overset{\|}{C}}-Cl$
+ Anhy $AlCl_3$
$O=C-R$
Major
Minor
R^+
Rearr
1° pos
R–X
Anhy AlX_3
$X^{\oplus}$
X_2
CS_2 / CH_3COOH
X
Major
Minor
Conc HNO_3
Conc H_2SO_4
$\oplus NO_2$
NO_2
Major
Minor
R
Major
Minor

QUESTION (NCERT Example)

Give the major products that are formed by heating each of the following ethers with HI.



I⊖
SN2
H
+
CH3CH2-CH(CH3)-CH2OH
+ CH3CH2I
+
H
OH +
I-C(CH3)2-CH2-CH3
+
H
CH2-I + HO-

(i) $CH_3-CH_2-\overset{\overset{CH_3}{|}}{CH}-CH_2-O-CH_2-CH_3$

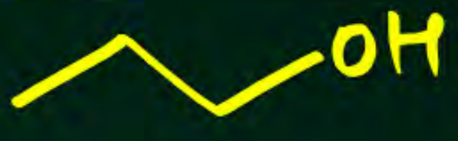
(ii) $CH_3-CH_2-CH_2-O-\overset{\overset{CH_3}{|}}{\underset{\underset{CH_3}{|}}{C}}-CH_2-CH_3$

(iii)

QUESTION (NCERT Example)

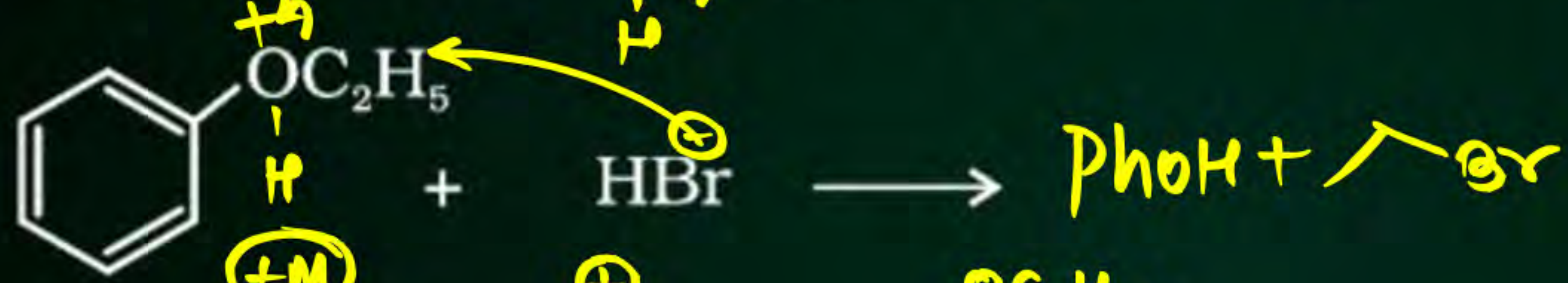
Predict the products of the following reactions:

(i) $CH_3-CH_2-CH_2-\overset{+}{O}-CH_3 + \overset{+}{H}\overset{\ominus}{Br} \rightarrow$

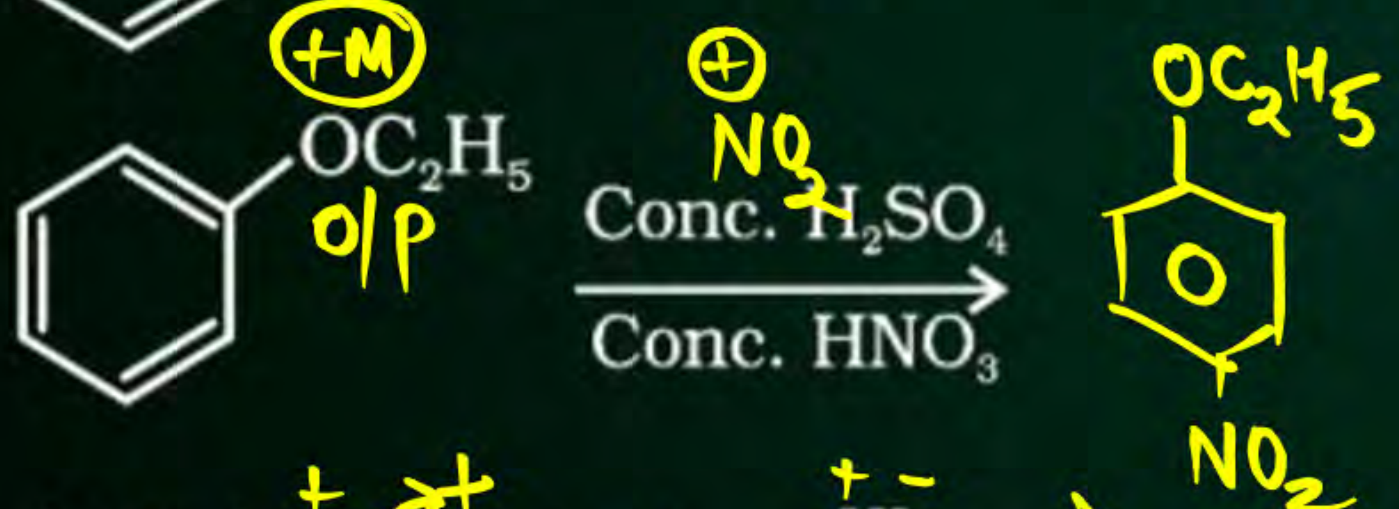


$+ CH_3Br$

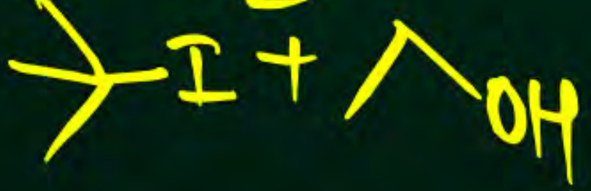
(ii)


+H
OC₂H₅
H
+
HBr
PhOH +
Br

(iii)


+M
OC₂H₅
O/P
⊕
NO₂
Conc. H₂SO₄
Conc. HNO₃
OC₂H₅
NO₂

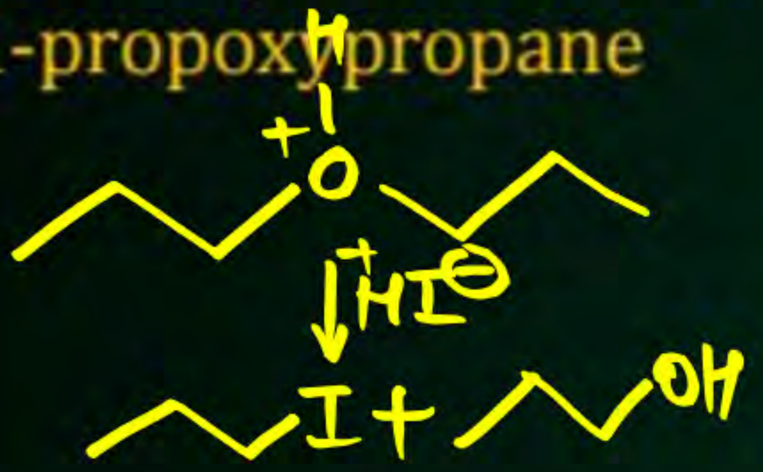
(iv) $(CH_3)_3\overset{+}{C}-\overset{+}{\underset{\underset{H}{|}}{O}}C_2H_5 \xrightarrow{\overset{+}{H}\overset{-}{I}}$



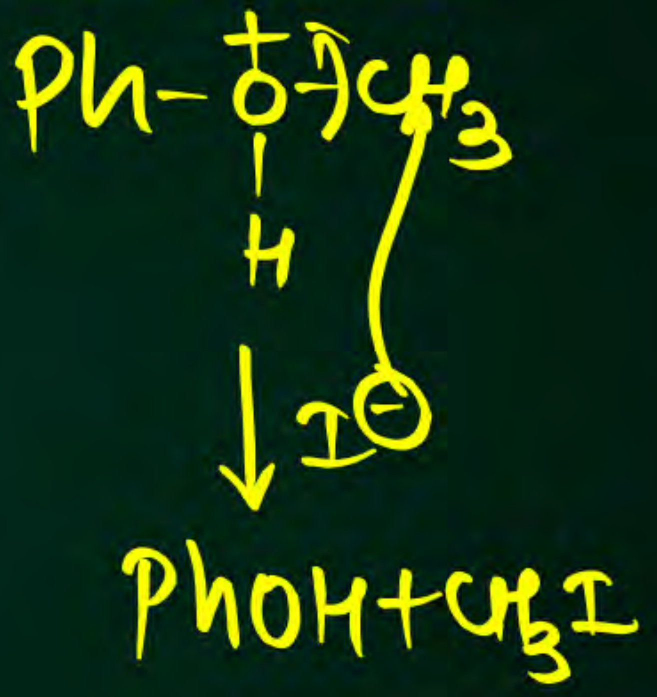
QUESTION (NCERT Exercise)

Write the equation of the reaction of hydrogen iodide with:

(i) 1-propoxypropane

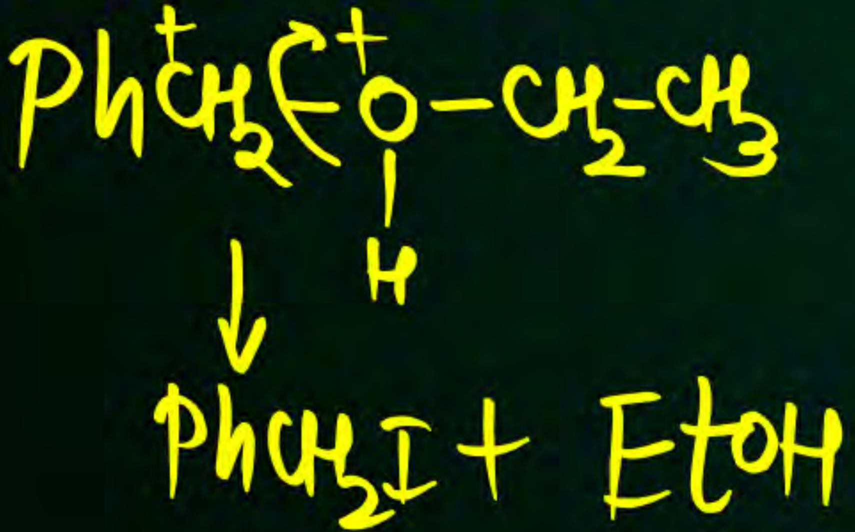


(ii) methoxybenzene



$$Ph-\overset{+}{\underset{H}{O}}-CH_3 \xrightarrow{I^{-}} PhOH + CH_3I$$

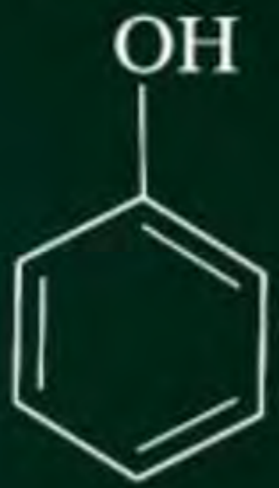
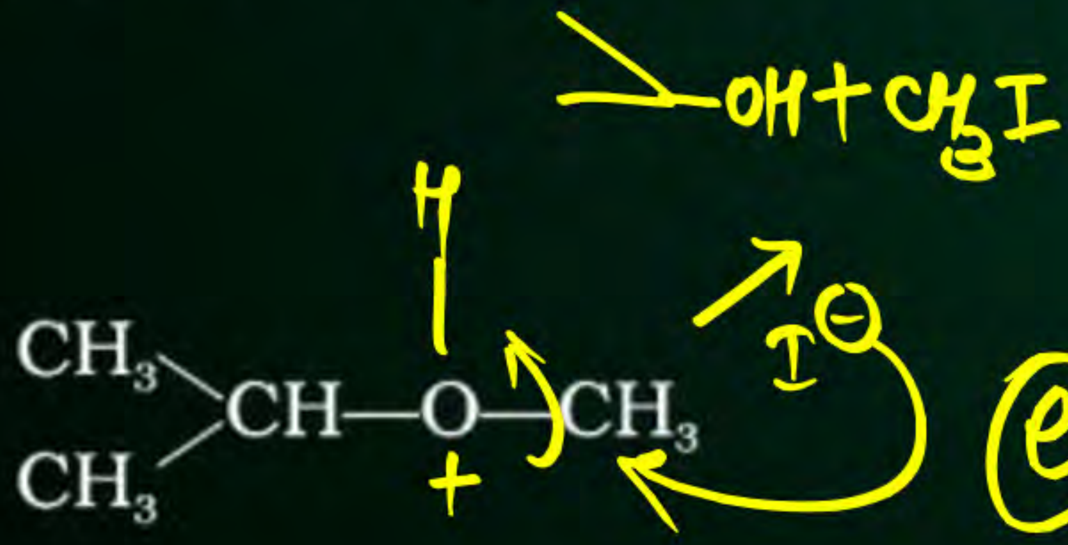
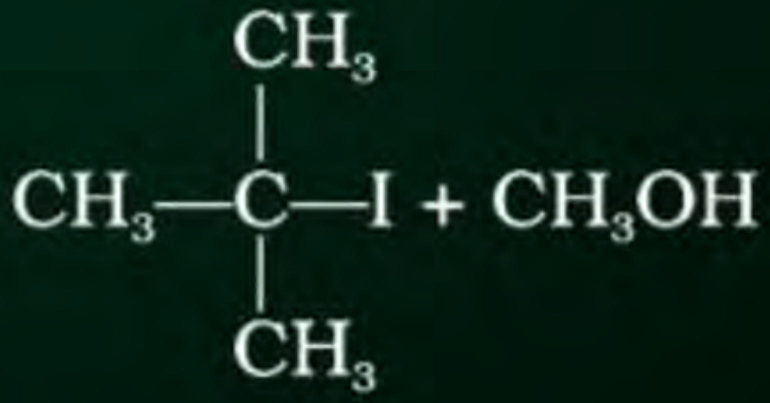
(iii) benzyl ethyl ether



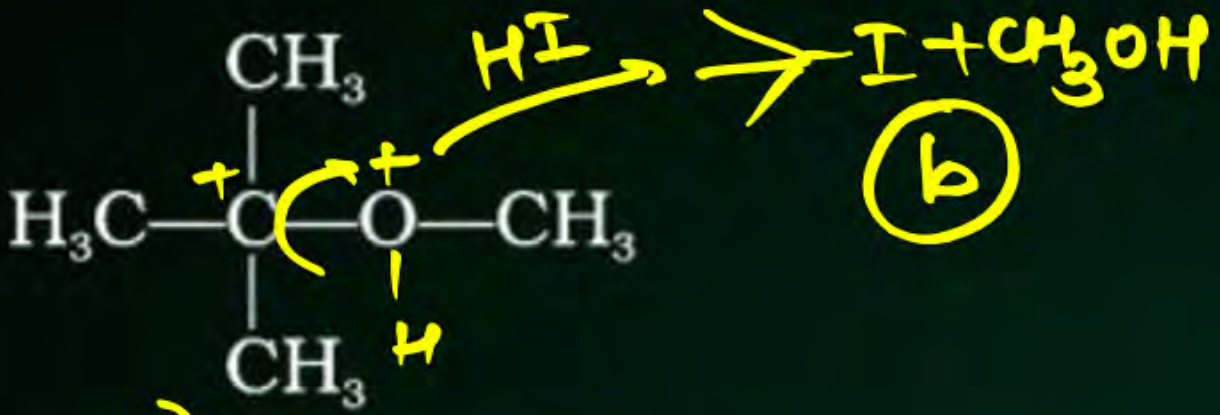
$$Ph\overset{+}{C}H_2-\overset{+}{\underset{H}{O}}-CH_2-CH_3 \longrightarrow PhCH_2I + EtOH$$

QUESTION (NCERT Exemplar)

Match the starting materials given in Column I with the products formed by these (Column II) in the reaction with HI.

Column I	Column II
(i) CH_3-O-CH_3 $\xrightarrow{HI} CH_3-I + CH_3OH$ ⓓ	(a)  + CH_3I
(ii)  ⓔ	(b)  $CH_3-\overset{CH_3}{\underset{CH_3}{C}}-I + CH_3OH$

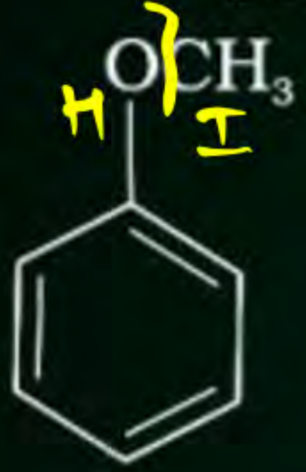
(iii)

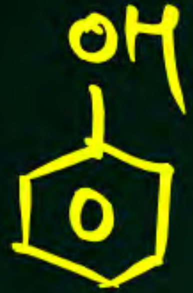


$$(CH_3)_3C-O-CH_3 \xrightarrow{HI} (CH_3)_3C-I + CH_3OH$$

ⓑ

(iv)

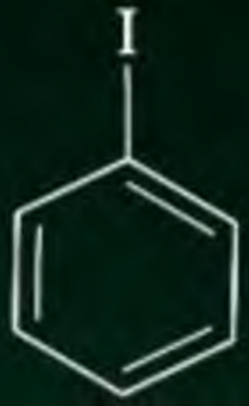




$+ CH_3-I$

ⓐ

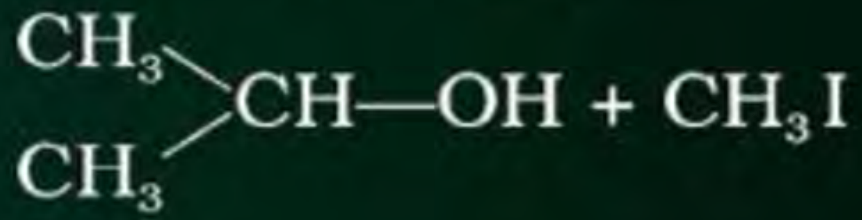
(c)



$+ CH_3OH$

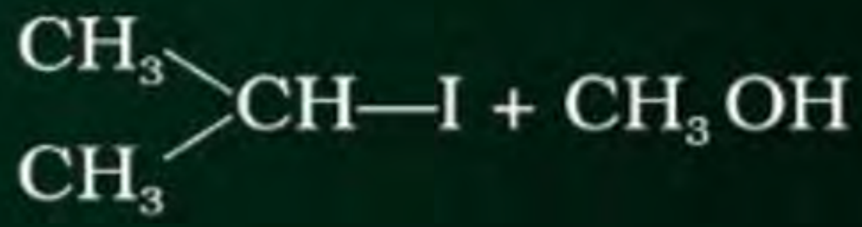
(d) $CH_3-OH + CH_3-I$

(e)



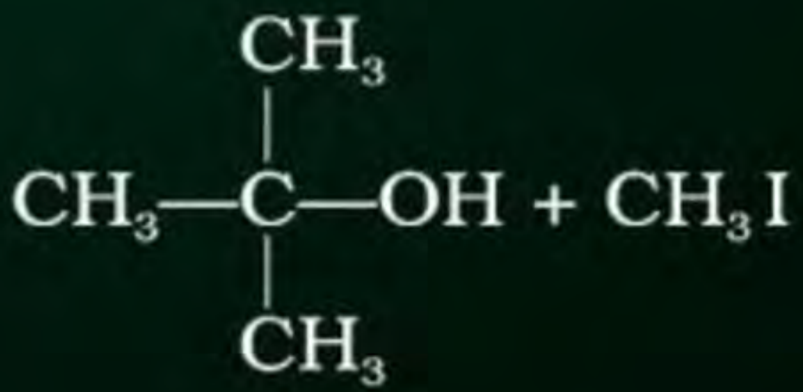
$$(CH_3)_2CH-OH + CH_3I$$

(f)



$$(CH_3)_2CH-I + CH_3OH$$

(g)



$$(CH_3)_3C-OH + CH_3I$$

QUESTION (AIIMS 2012)

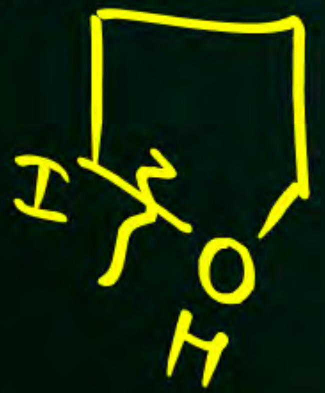
An aromatic ether is not cleaved by HI even at 523 K. The compound is:

(A) $C_6H_5OCH_3 \xrightarrow{HI} \text{PhOH} + CH_3I$

✓ (B) $C_6H_5\overset{\curvearrowleft\curvearrowright}{O}C_6H_5$

(C) $C_6H_5OC_3H_7 \longrightarrow \text{PhOH} + C_3H_7I$

(D) Tetrahydrofuran



QUESTION (AIIMS 2011)

Assertion: Iodide ion combines with smaller group to avoid steric hindrance.

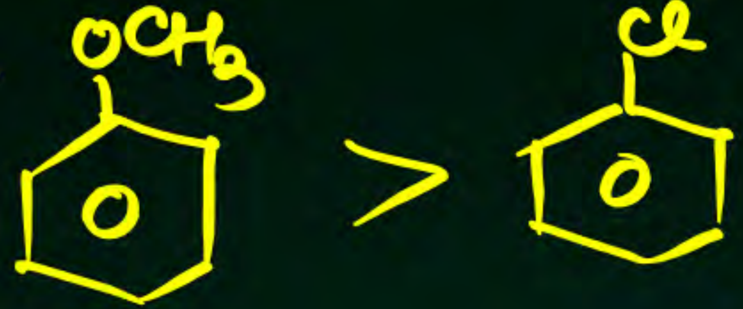
Reason: With HI, anisole gives Iodobenzene and methyl alcohol.

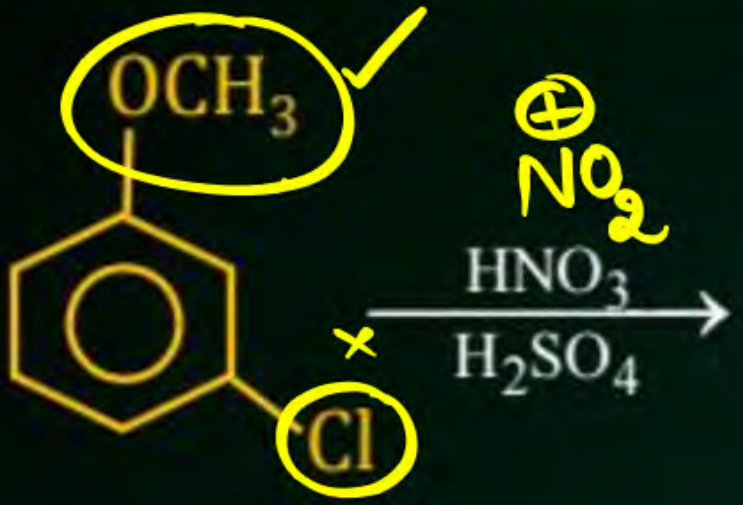
$$Ph-\overset{+}{\underset{H}{O}}-CH_3 \xrightarrow{I^{\ominus}} PhOH + CH_3I$$

- **A** If both Assertion and Reason are correct and the Reason is the correct explanation of Assertion.
- **B** If both Assertion and Reason are correct but Reason is not the correct explanation of Assertion.
- [✓ **C**] If Assertion is correct but Reason is incorrect.
- **D** If both the Assertion and Reason are incorrect.

QUESTION (AIIMS 2019)

ROR

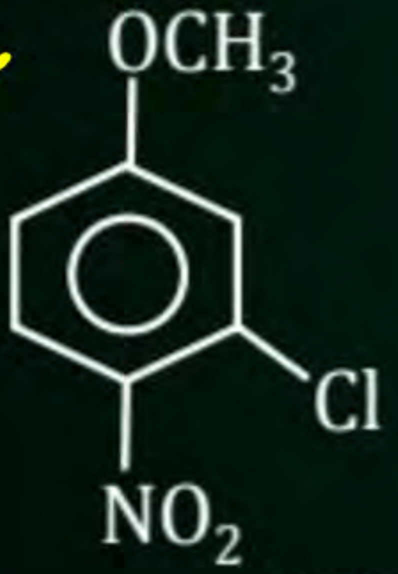




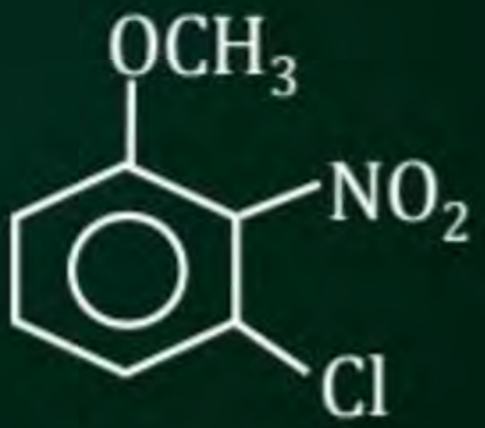
OCH3
Cl
⊕
NO2
HNO3
H2SO4

Major Product. Product will be:

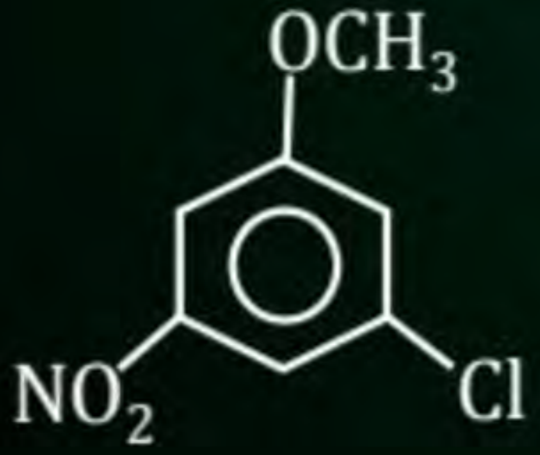
A



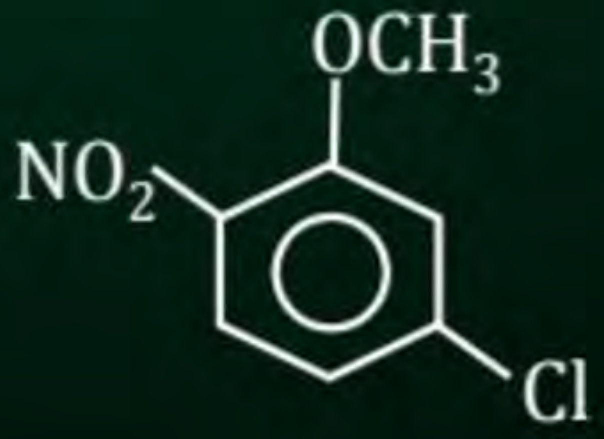
B



C



D

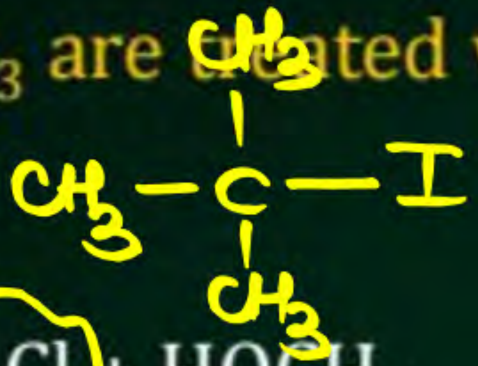


QUESTION (AIIMS 2007)

I H I H

$CH_3OC_2H_5$ and $(CH_3)_3C-OCH_3$ are treated with hydroiodic acid. The fragments obtained after reactions are:

SN2 SN1



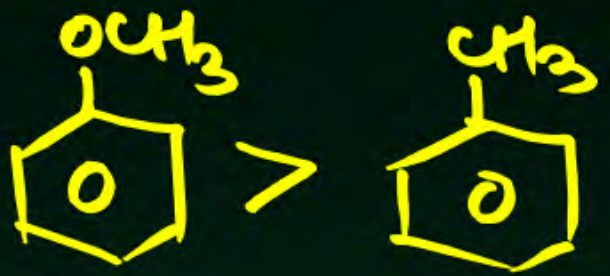
[✓ A] $CH_3I + HOC_2H_5$; $\boxed{(CH_3)_3Cl}$ + $HOCH_3$

B $CH_3OH + C_2H_5I$; $(CH_3)_3Cl + HOCH_3$

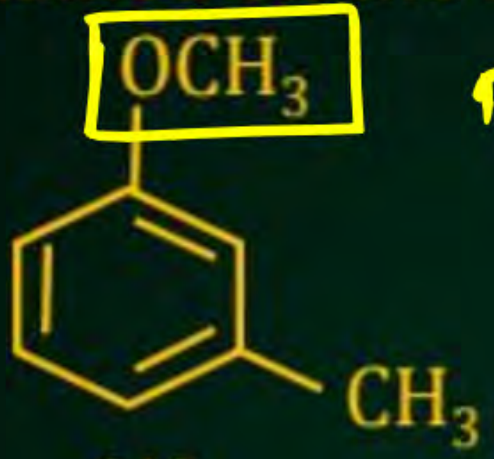
C $CH_3OH + C_2H_5I$; $(CH_3)_3COH + CH_3I$

D $CH_3I + HOC_2H_5$; $CH_3I + (CH_3)_3COH$

QUESTION (AIIMS 2006)



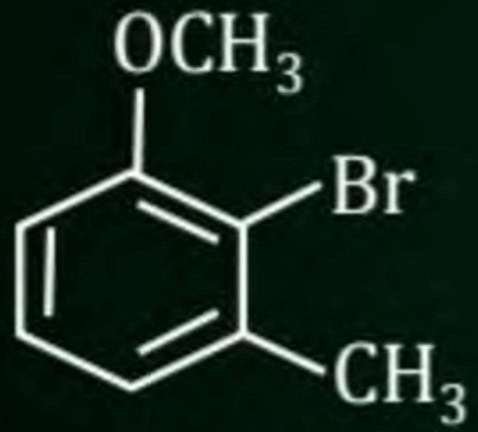
The major product obtained on the monobromination (with $Br_2/FeBr_3$) of the following compound A is:



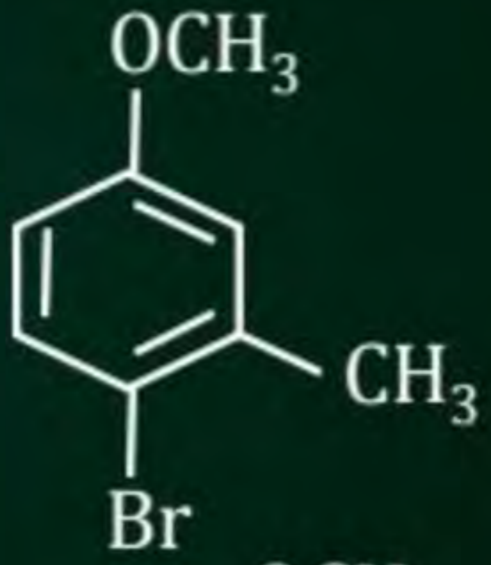
(A)

$Br^{\oplus}$

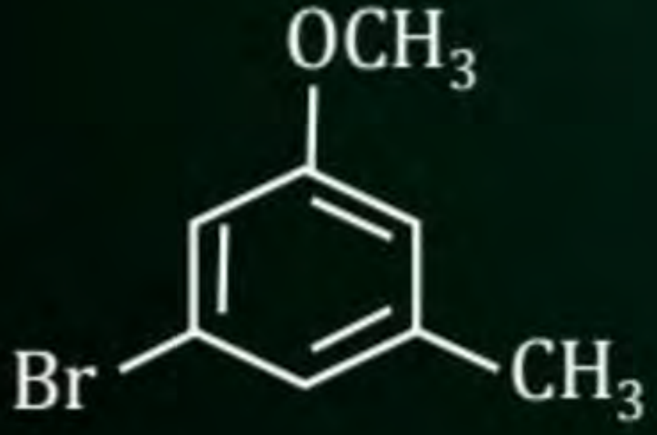
A



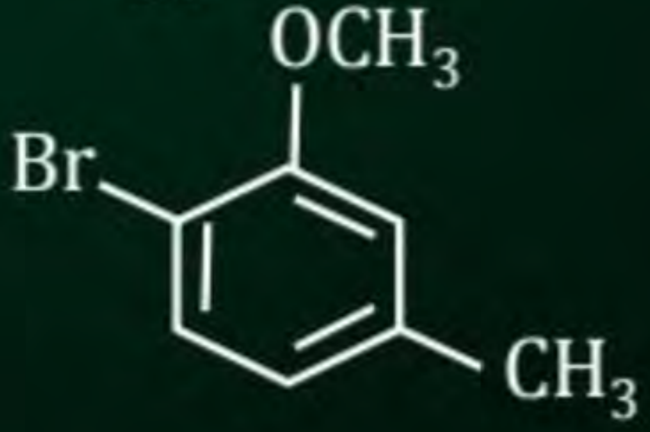
B ✓



C

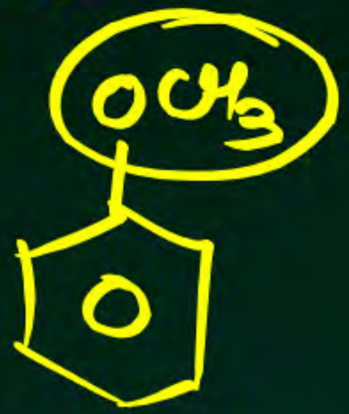


D



QUESTION

Anisole on treatment with Br_2/CS_2 gives:



o/p

A bromobenzene

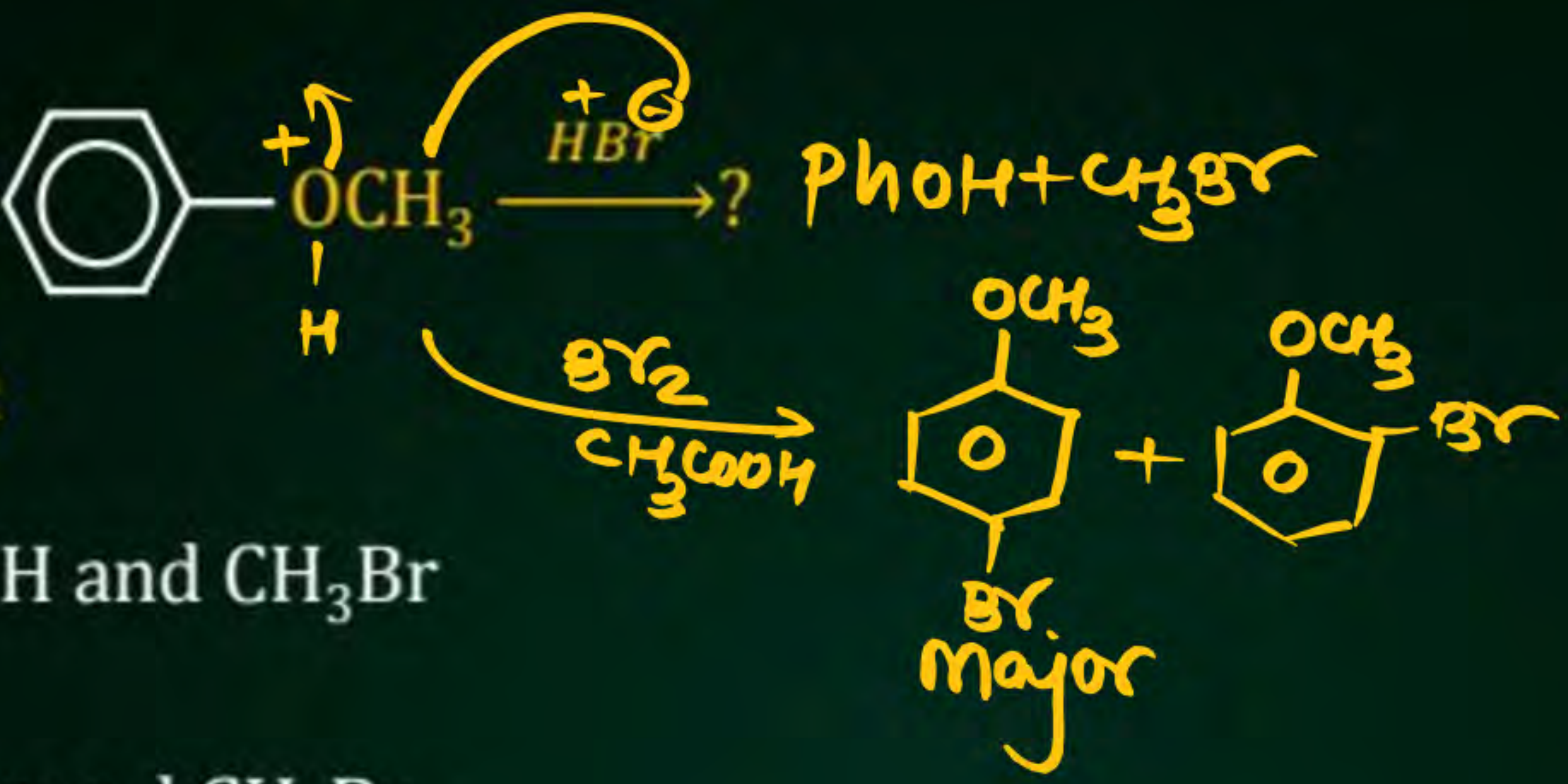
B methyl-2-bromophenyl ether

[✓ **C**] o-and p-bromoanisole

D phenol

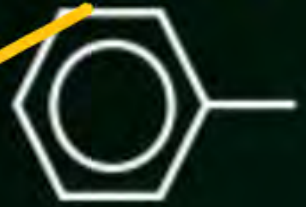
QUESTION

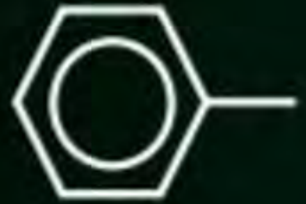
In the reaction

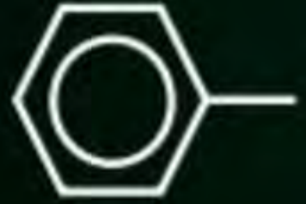


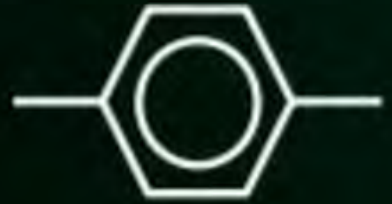
OCH_3
+
H
$\overset{+}{H}\overset{\ominus}{Br}$
?
PhOH+CH_3Br
Br_2
CH_3COOH
OCH_3
Br
+
OCH_3
Br
Major

the product are:

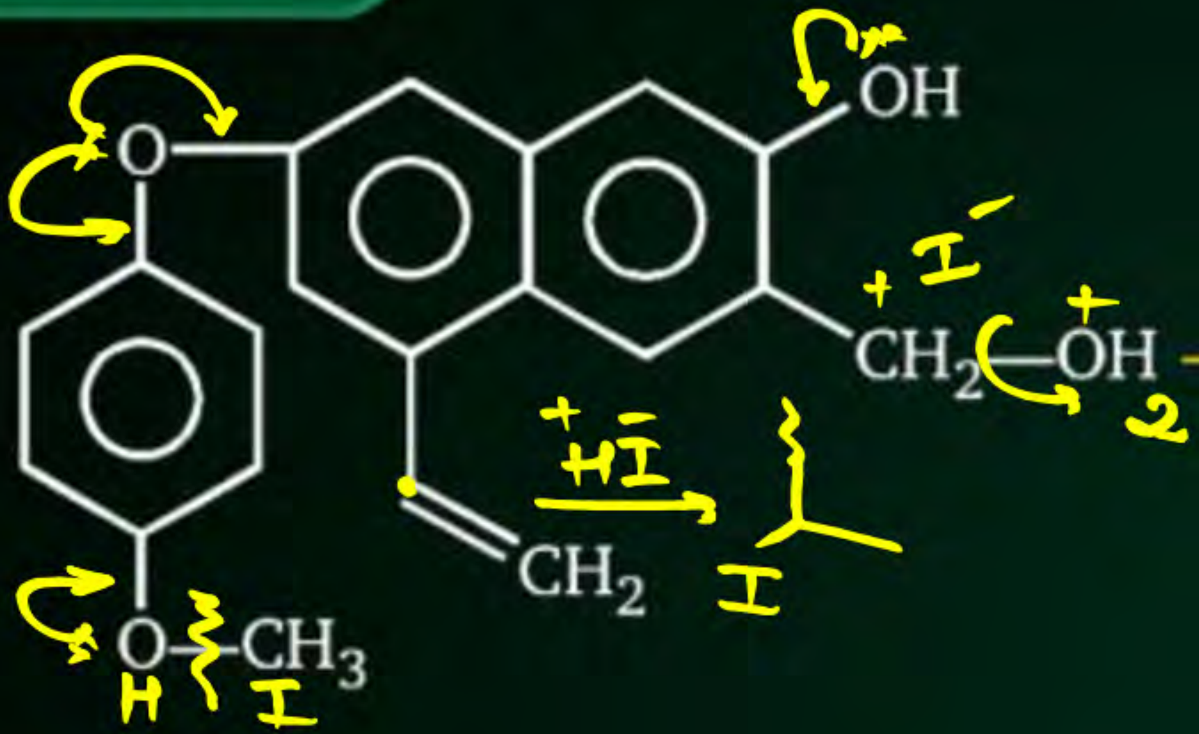
A  OH and CH_3Br

B  Br and CH_3Br

C  Br and CH_3OH

D Br  OCH_3 and H_2

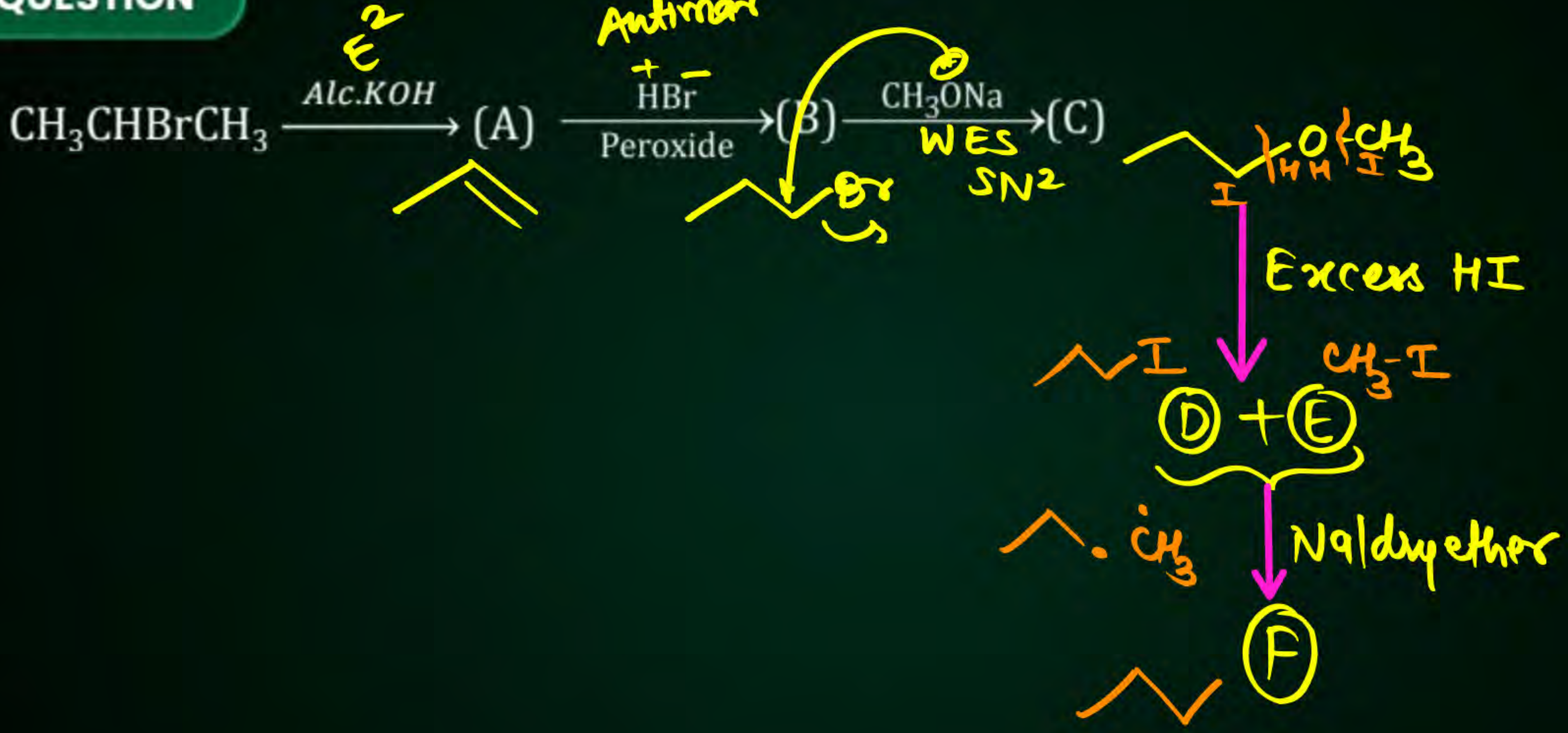
QUESTION


OH
O
O
CH$_3$
CH$_2$
CH$_2$—OH
I$^-$
HI
I
I
H
2

$\xrightarrow{\text{xHI}}$ value of x is:

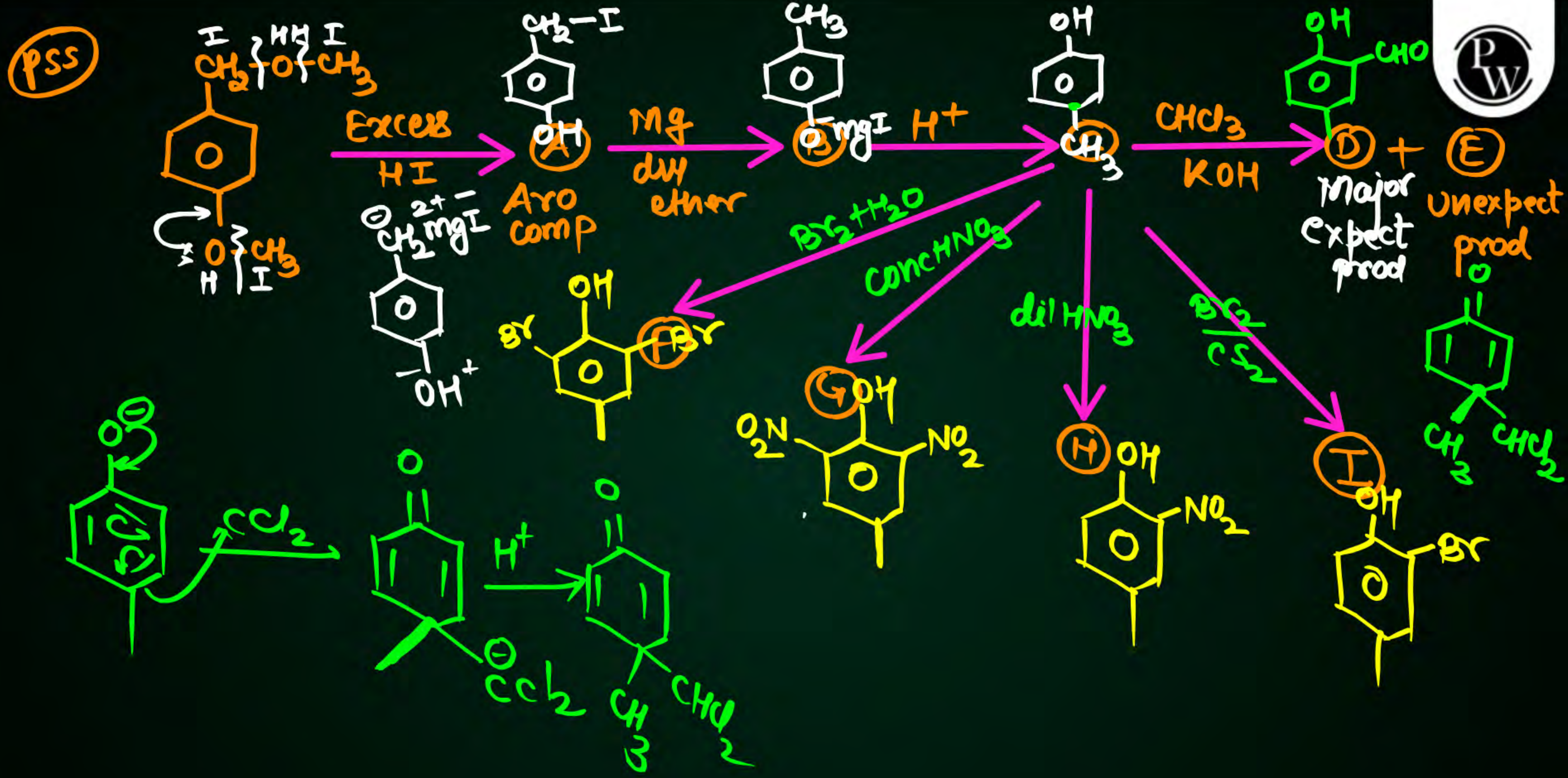
- (A) 2
- [✓ (B) 3]
- (C) 4
- (D) 5

QUESTION



$$CH_3CHBrCH_3 \xrightarrow{Alc.KOH} (A) \xrightarrow[\text{Peroxide}]{HBr} (B) \xrightarrow{CH_3ONa} (C)$$

E2
Antimar
+ −
Br
WES
SN2
O
CH3
I
Excess HI
I
CH3-I
D + E
CH3
Naldryether
F


PSS
Excess
HI
A
Aro comp
Mg
dry
ether
B
H+
CHCl3
KOH
D
+
E
Major
expect
prod
Unexpect
prod
Br2+H2O
F
conc HNO3
G
dil HNO3
H
Br2
CS2
I
CCl2
H+

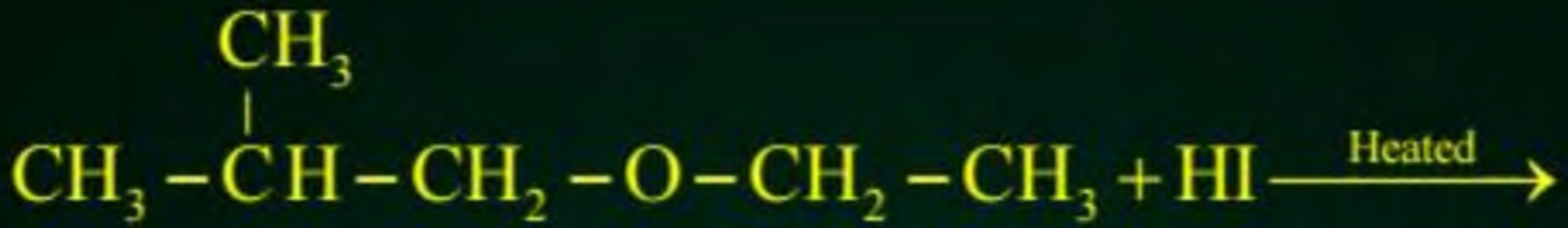
QUESTION 02

An organic compound of molecular formula $C_4H_{10}O$ does not react with sodium. With excess of HI, it gives only one type of alkyl iodide. The compound is:

- (A) ethoxy ethane
- (B) 2-methoxy propane
- (C) 1-methoxy propane
- (D) 1-butanol

QUESTION 03

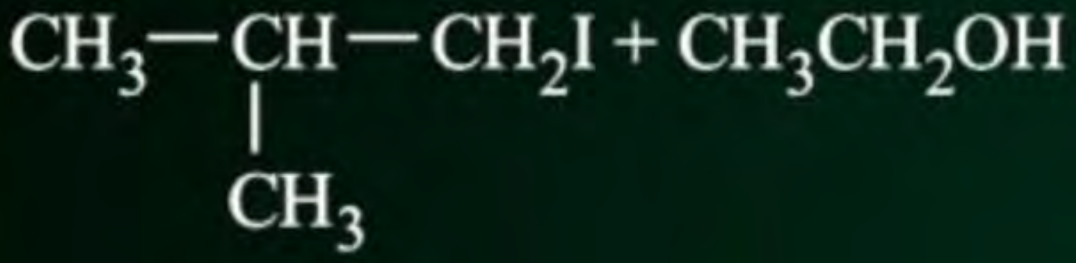
In the reaction:



$CH_3-\overset{\overset{CH_3}{|}}{C}H-CH_2-O-CH_2-CH_3+HI\xrightarrow{\text{Heated}}$

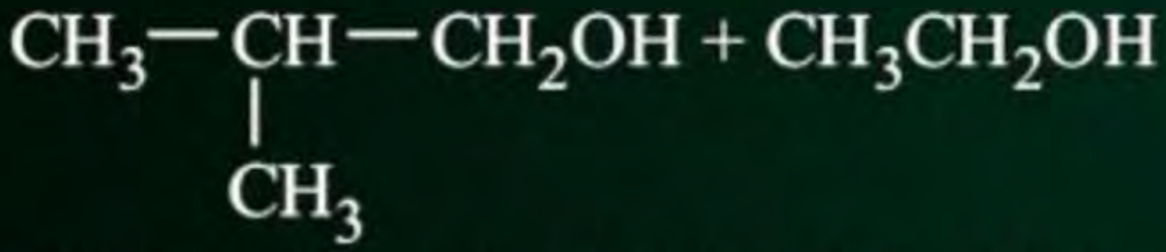
Which of the following products will be formed?

A



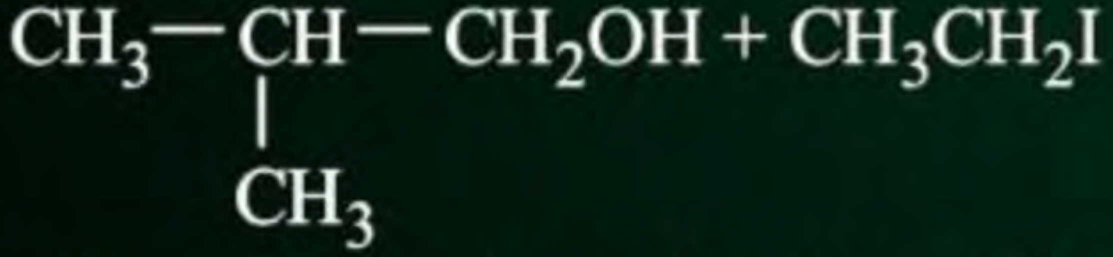
$CH_3-\underset{\underset{CH_3}{|}}{CH}-CH_2I+CH_3CH_2OH$

B



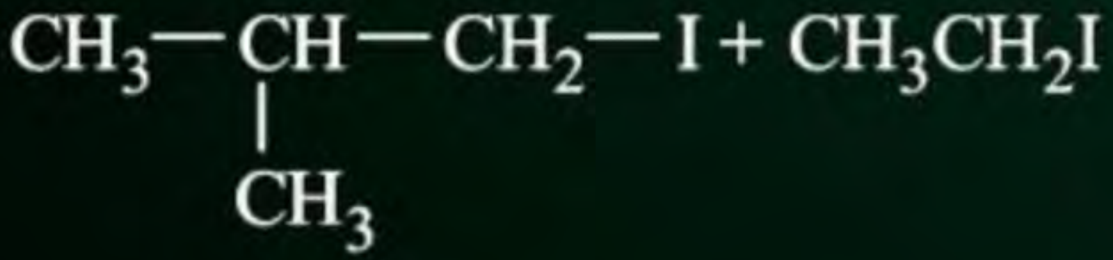
$CH_3-\underset{\underset{CH_3}{|}}{CH}-CH_2OH+CH_3CH_2OH$

C



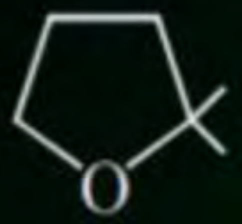
$CH_3-\underset{\underset{CH_3}{|}}{CH}-CH_2OH+CH_3CH_2I$

D



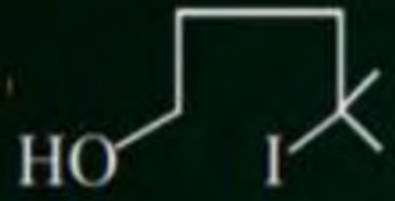
$CH_3-\underset{\underset{CH_3}{|}}{CH}-CH_2-I+CH_3CH_2I$

QUESTION 04

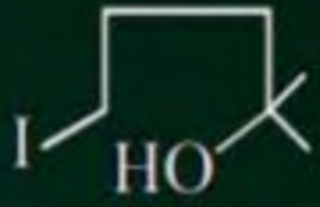


$+ \underset{\text{(1 eq.)}}{\text{HI}} \longrightarrow$ Product, Product is :

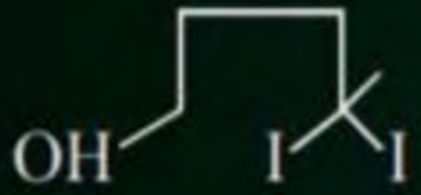
A



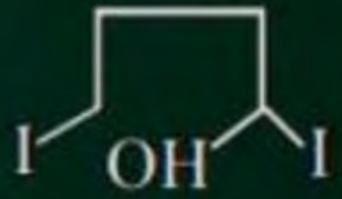
B



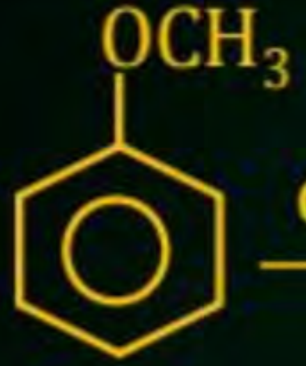
C



D

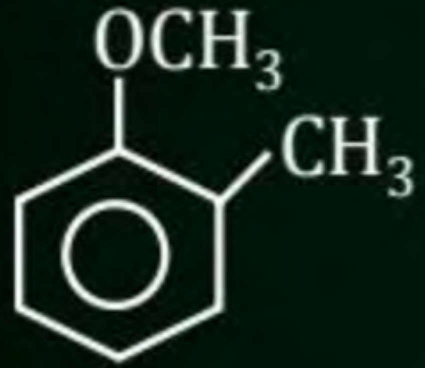


QUESTION 05

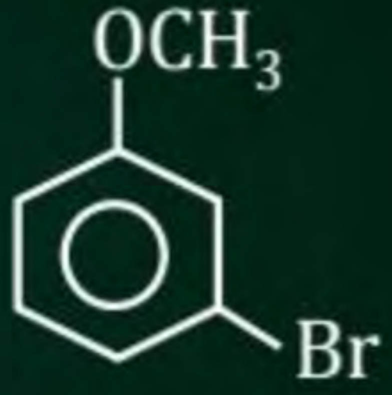


$\xrightarrow{CH_3Br/FeBr_3}$? Major product is:

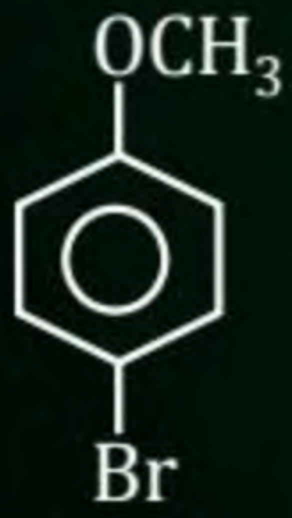
A



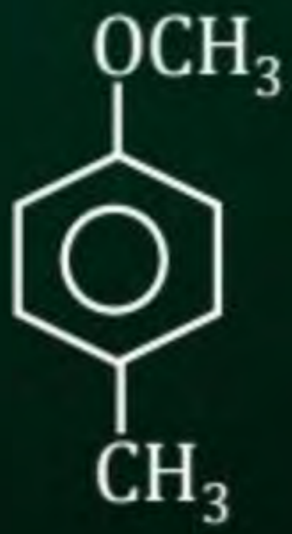
B



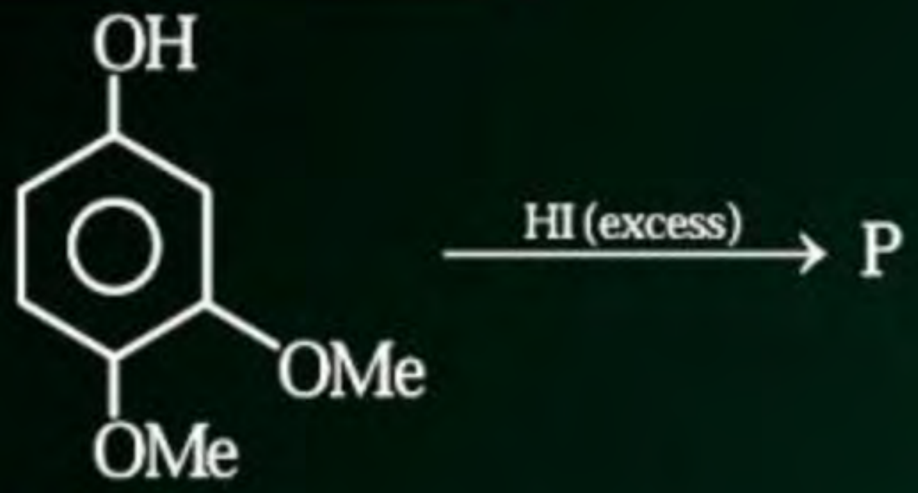
C



D

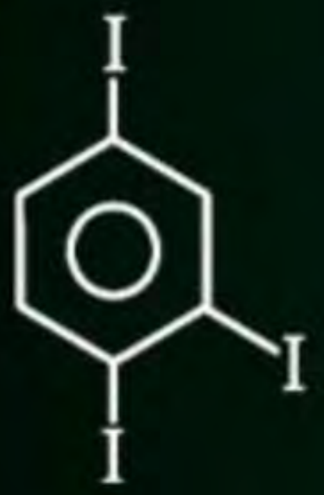


QUESTION 06

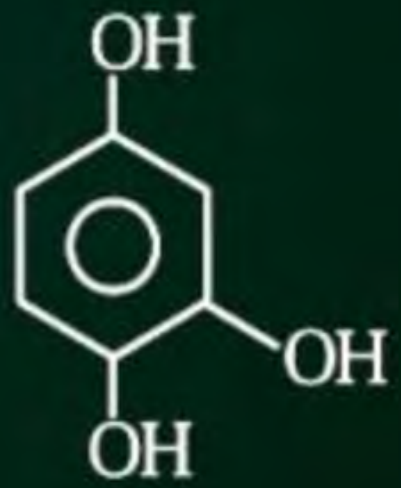

OH
OMe
OMe
HI (excess)
P

P is:

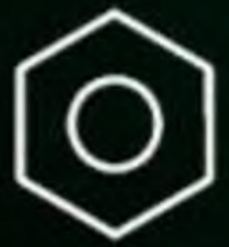
A



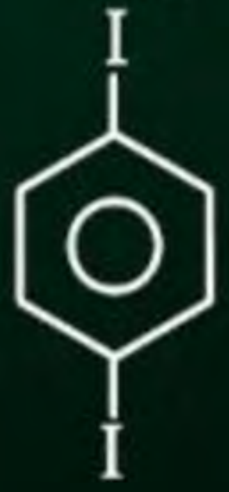
B



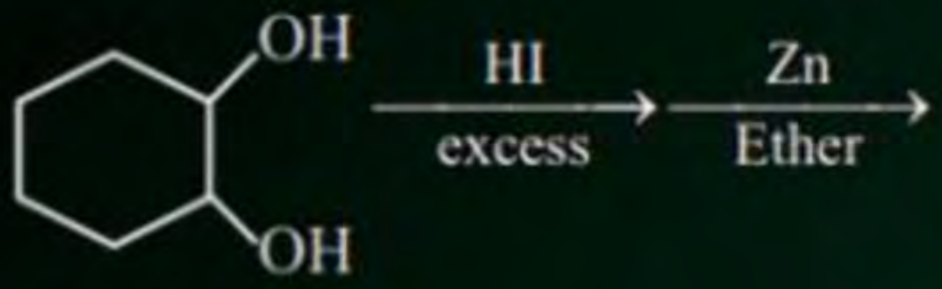
C



D

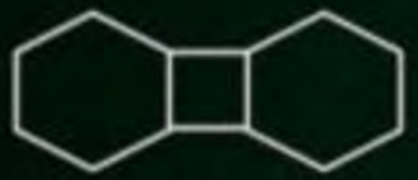


QUESTION 07

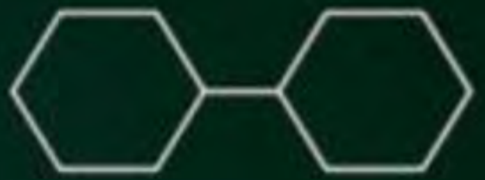

OH
OH
HI
excess
Zn
Ether

P, Product P is:-

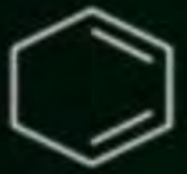
A



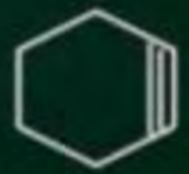
B



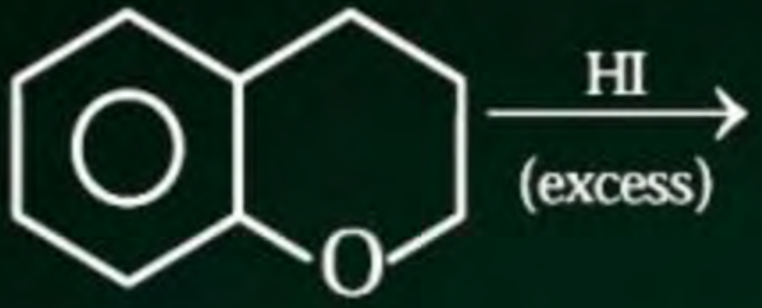
C



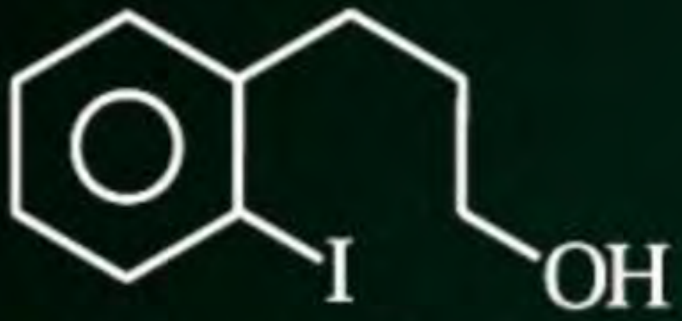
D

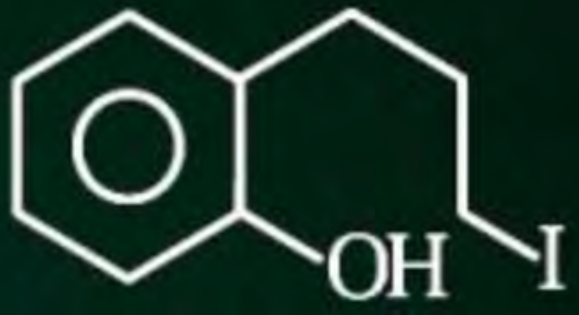


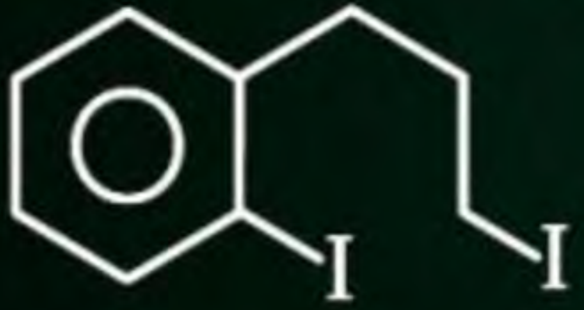
QUESTION 08

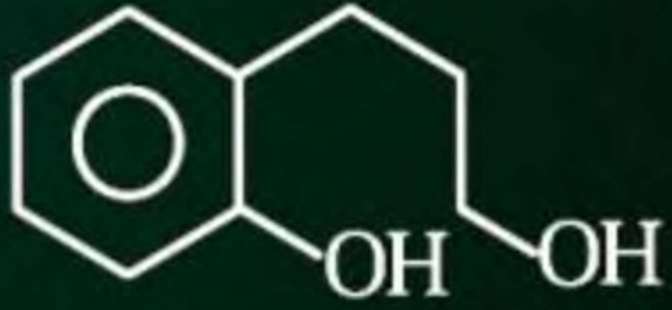
For the give reaction: 

the major product of reaction is:

A 

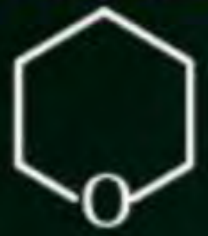
B 

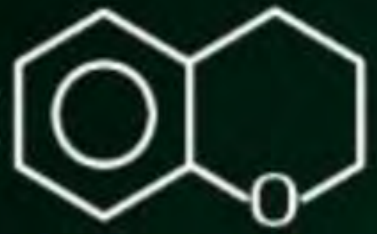
C 

D 

QUESTION 09

Consider the reaction of HI with the following:

I


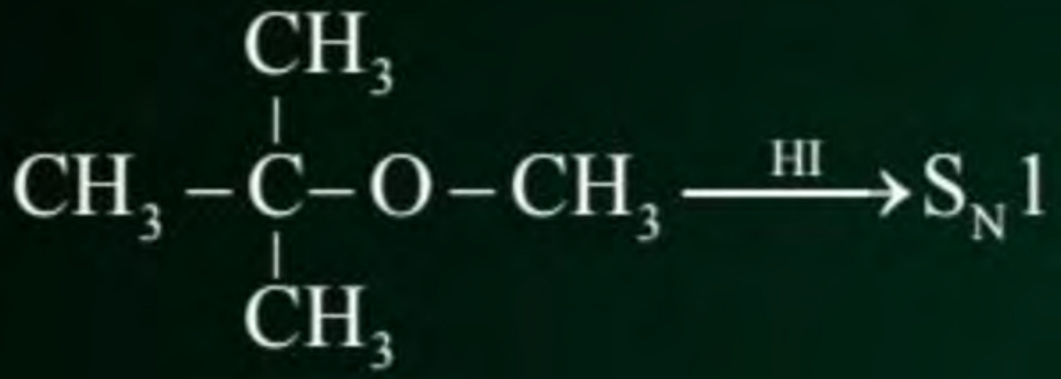
II


Which forms di-iodide on reaction with HI (excess)?

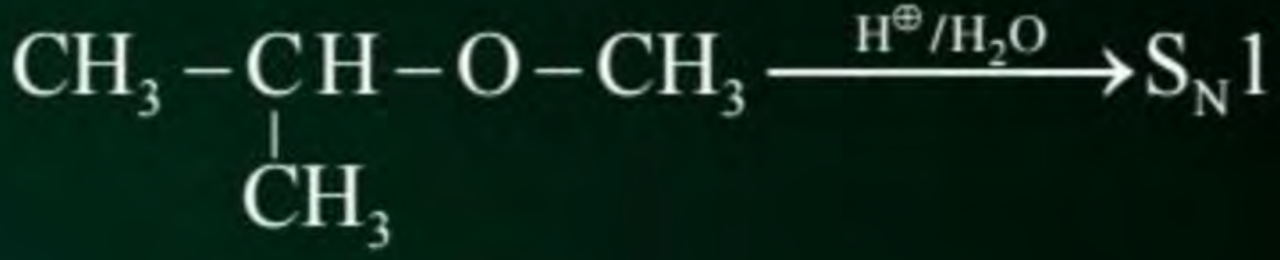
- **A** I and II both
- **B** II only
- **C** I only
- **D** None of these

QUESTION 10

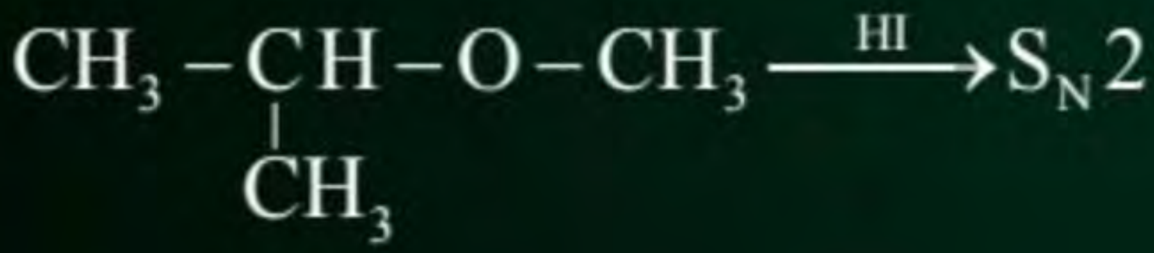
Which of the following reactions are not correctly matched?

Ⓐ 

$CH_3-\overset{\overset{CH_3}{|}}{\underset{\underset{CH_3}{|}}{C}}-O-CH_3 \xrightarrow{HI} S_N1$

Ⓑ 

$CH_3-\underset{\underset{CH_3}{|}}{CH}-O-CH_3 \xrightarrow{H^{\oplus}/H_2O} S_N1$

Ⓒ 

$CH_3-\underset{\underset{CH_3}{|}}{CH}-O-CH_3 \xrightarrow{HI} S_N2$

Ⓓ $CH_3-O-CH_2CH_3 \xrightarrow{HI} S_N1$

ANSWER KEY

1. A
2. A
3. C
4. A
5. D
6. B
7. B
8. B
9. C
10. D

Home Work From PW Module (Yakeen NEET)

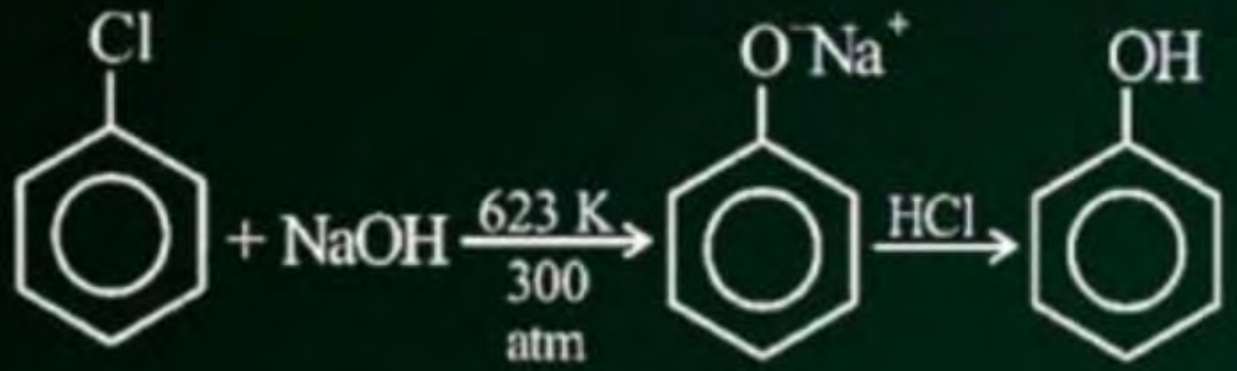
Prarambh: Q 61, 62, 63, 64, 65

Parikshit: Q 03, 30, 31, 33

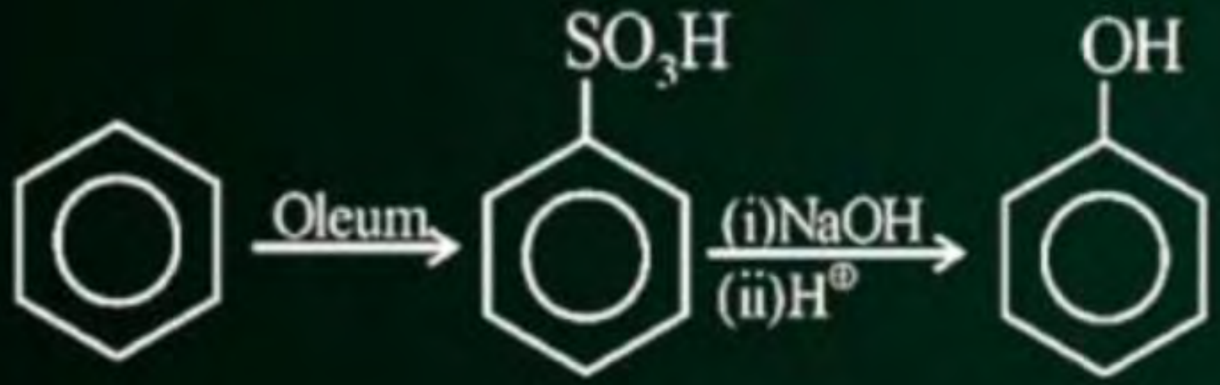
QUESTION 01

Identify which is/are the correct method(s) to synthesis the phenol?

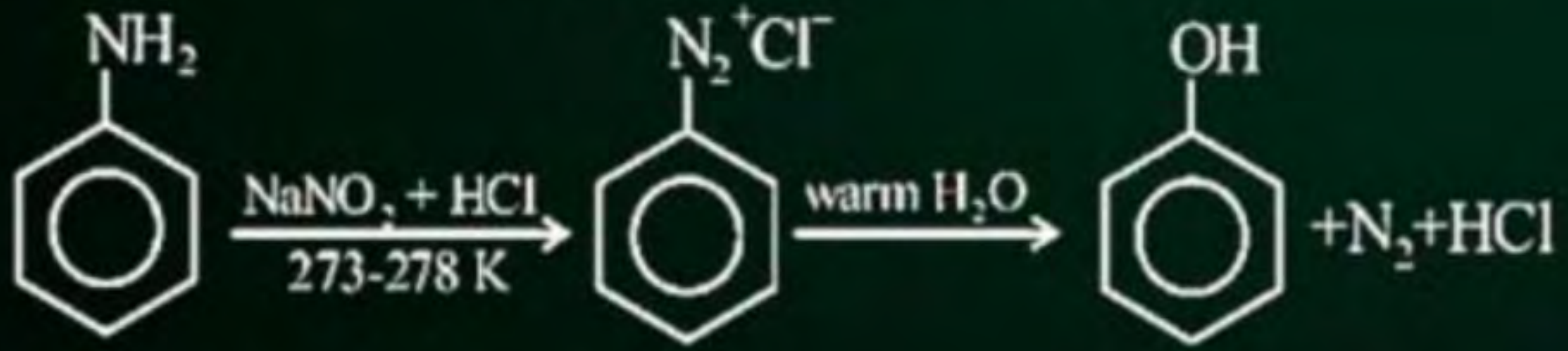
A


Cl
+ NaOH
623 K
300 atm
O⁻Na⁺
HCl
OH

B


Oleum
SO₃H
(i) NaOH
(ii) H⊕
OH

C


NH₂
NaNO₂ + HCl
273-278 K
N₂⁺Cl⁻
warm H₂O
OH
+N₂+HCl

[✓ D] All of the above

QUESTION 02

When sodium benzene sulphonate is fused with sodium hydroxide (solid), the product formed is:

A benzene

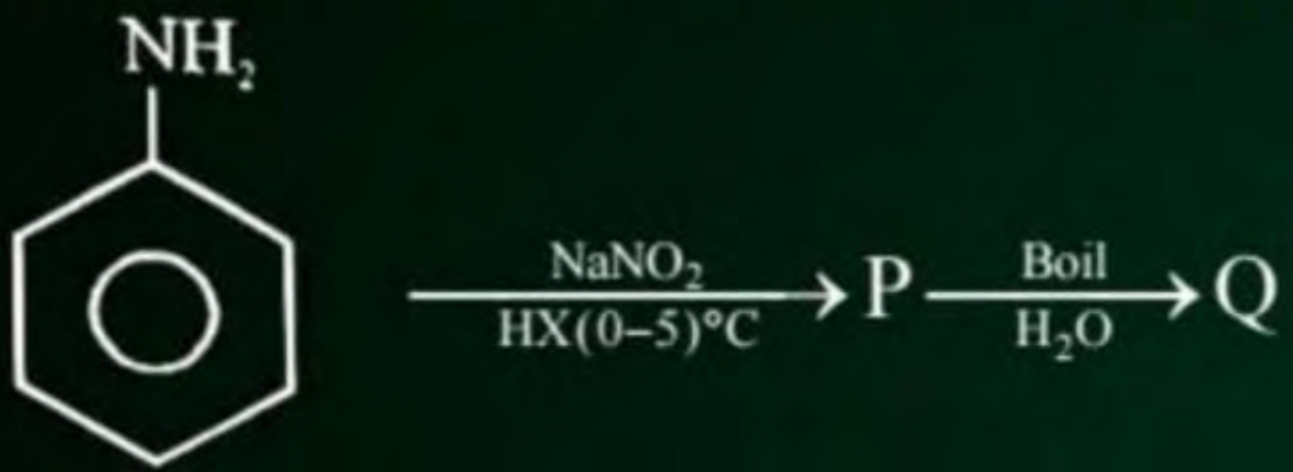
[✓ B] phenol

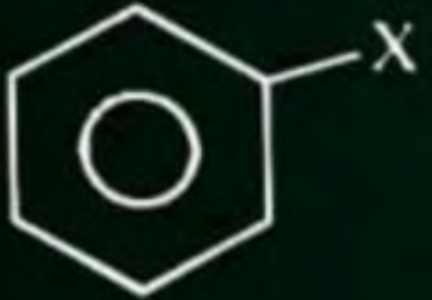
C benzene triphenol

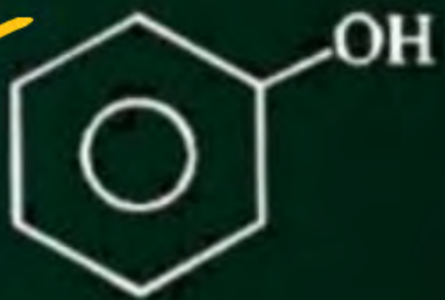
D none of these

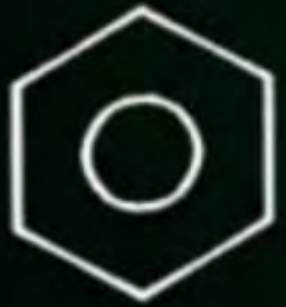
QUESTION 03

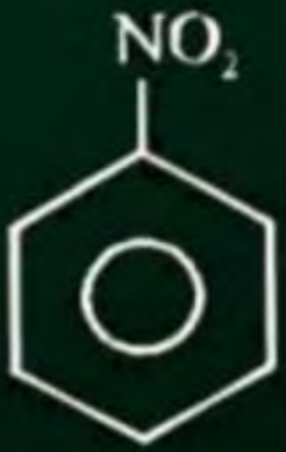
The product Q in the following reaction sequence is:


NH$_2$
NaNO$_2$
HX(0–5)°C
P
Boil
H$_2$O
Q

A


[✓ B]


C


D


QUESTION 04

Benzene diazonium chloride on hydrolysis gives:

(A) benzene

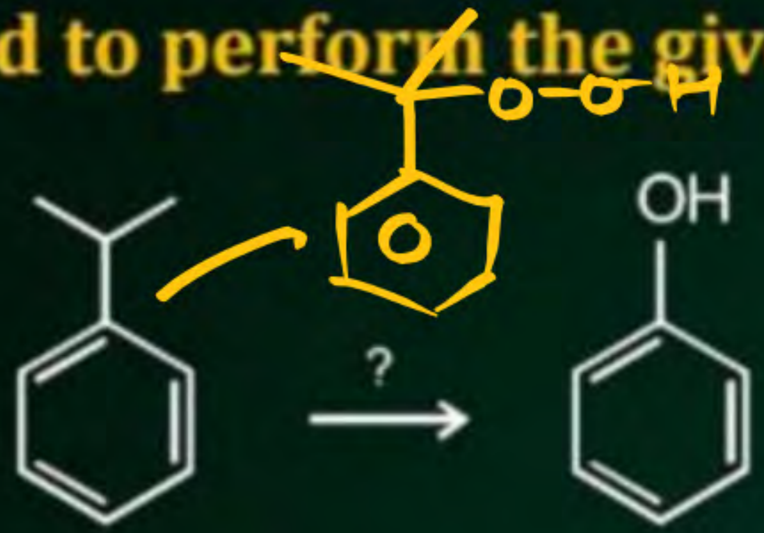
(B) benzyl alcohol

[✓ (C) phenol]

(D) chlorobenzene

QUESTION 05

Reagents required to perform the given transformation is:



[✓ **A** (i) O_2 oxidation (ii) H_3O^+]

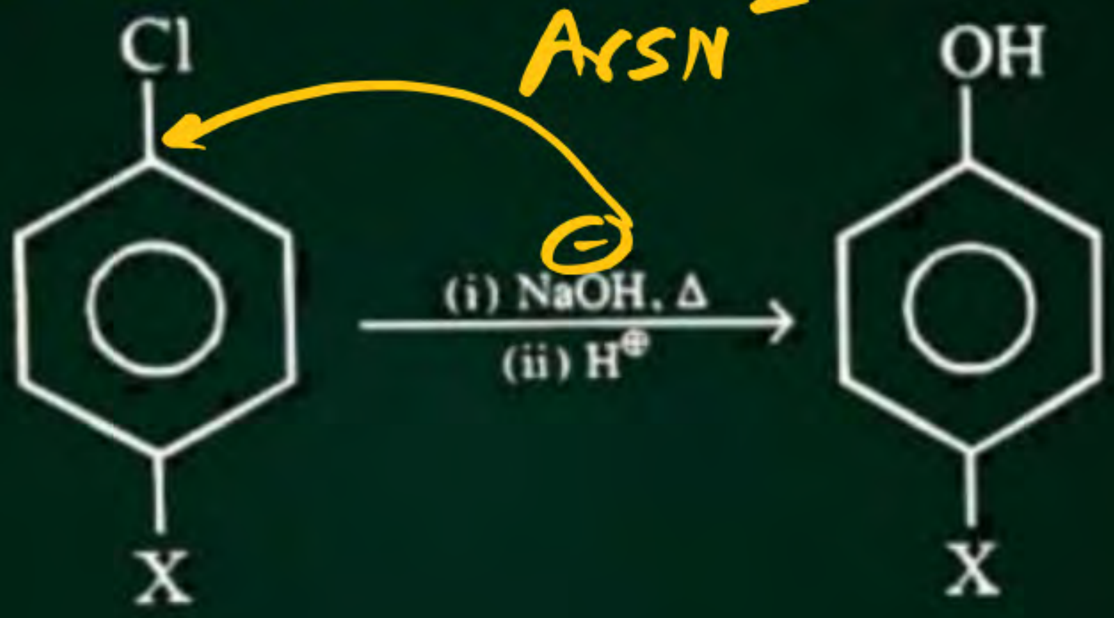
B (i) $KMnO_4$, hot (ii) $LiAlH_4$ (iii) H_3O^+

C (i) Hot $KMnO_4$ (ii) $NaBH_4$ (iii) H_3O^+

D (i) H_2CrO_4 (ii) $CaO + NaOH, \Delta$ (iii) $NaOH$

QUESTION 06

For the following reaction, best possible X is:


Cl
(i) NaOH, Δ
(ii) H⊕
OH
X
X
ArSN2
⊖

A CH_3

B OCH_3

C H

[✓ **D**] NO_2

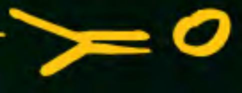
QUESTION 07

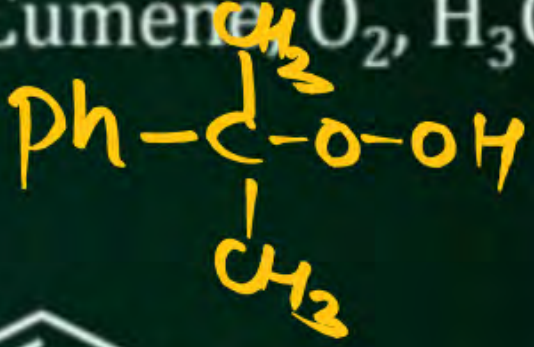
Which one of the following reaction sequence is incorrect method to prepare phenol?

A Aniline, $NaNO_2 + HCl$, H_2O heating

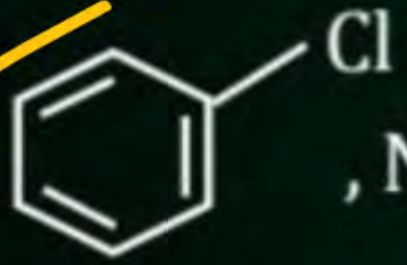
$PhNH_2$ $\quad PhN_2^+Cl^-$ $\quad PhOH$

B Cumene, O_2, H_3O^+

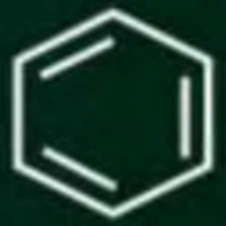
$PhOH +$ 



$Ph-\overset{CH_3}{\underset{CH_3}{C}}-O-OH$

✓ **C** 

, NaOH STP condition

D 

, oleum, NaOH, H_3O^+

$PhSO_3H$ $\quad PhOH$

QUESTION 08

Cumene $\xrightarrow[\text{(ii) } H_2O,\ H^+]{\text{(i) } O_2}$ (X) and (Y);

(X) and (Y) respectively are:

A toluene, propene

B toluene, propyl chloride

C [✓ phenol, acetone]

D phenol, acetaldehyde

ANSWER KEY

1. D
2. B
3. B
4. C
5. A
6. D
7. C
8. C

Home Work

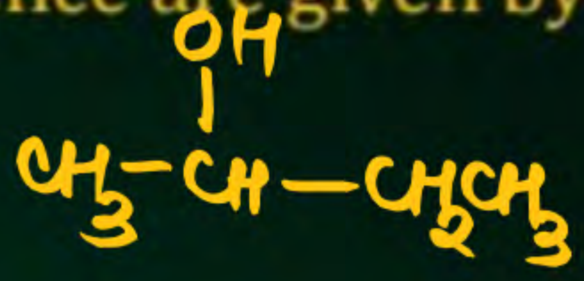
Discussion of L-06

QUESTION 01

The compounds A, B and C in the reaction sequence are given by the set:

$$CH_3CH_2\overset{+}{O}H_2 \xrightarrow[\Delta]{HBr} A \xrightarrow{Mg} \overset{\delta-}{B} \xrightarrow[(ii)\ H_3O^{\oplus}]{(i)\ CH_3CHO} C$$

Et mgBr



$$CH_3-\overset{OH}{\overset{|}{CH}}-CH_2CH_3$$

Ⓐ $CH_3CH_2Br, CH_3CH_2MgBr, (CH_3)_3COH$

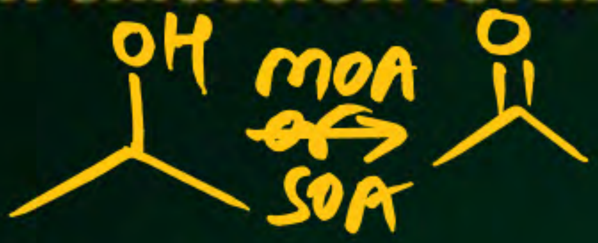
Ⓑ $CH_3CH_2Br, (CH_3CH_2)_2Mg, (CH_3)_2CHCH_2OH$

[✓ Ⓒ] $CH_3CH_2Br, CH_3CH_2MgBr, CH_3CH(OH)CH_2CH_3$

Ⓓ $CH_3CHBr_2, CH_3CH(MgBr)_2, CH_3CH(OH)CH_3$

QUESTION 02

Isopropyl alcohol on oxidation forms:



[✓ A] Acetone

B Ether

C Ethylene

D Acetaldehyde

QUESTION 03

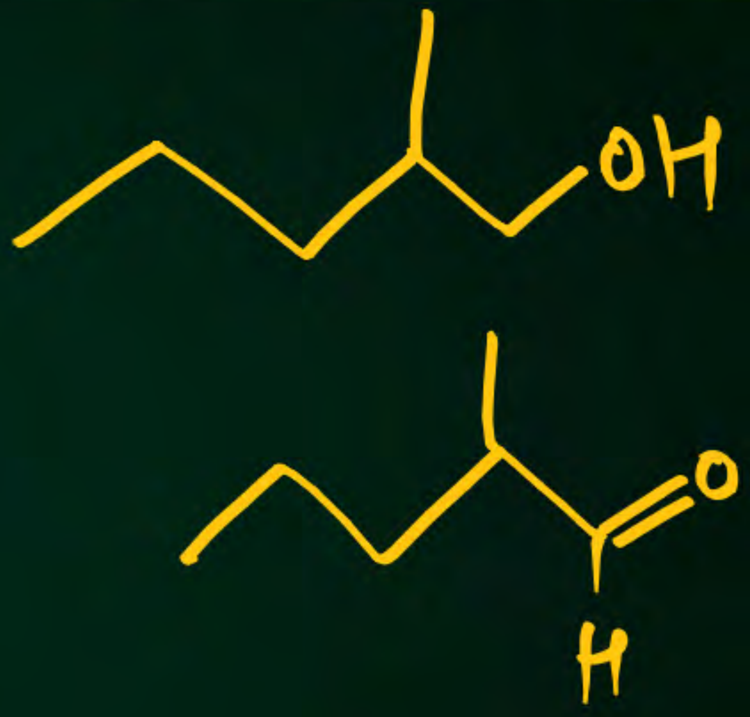
What reagent(s) can be used to convert 2-methyl pentanol into 2-methyl pentanal?

A $Na_2Cr_2O_7$

B $LiAlH_4$

[✓ C CrO_3–pyridine]

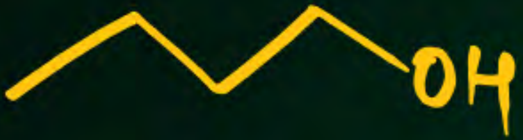
D $KMnO_4$



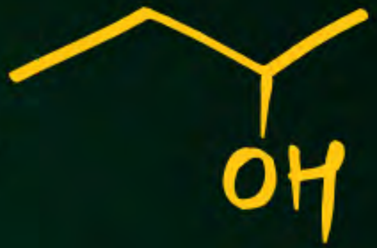
QUESTION 04

The compound which gives turbidity immediately with Lucas reagent at room temperature is:

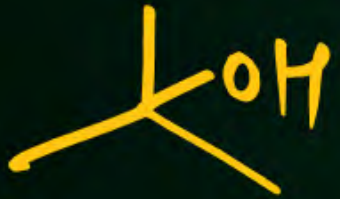
(A) butan-1-ol



(B) butan-2-ol

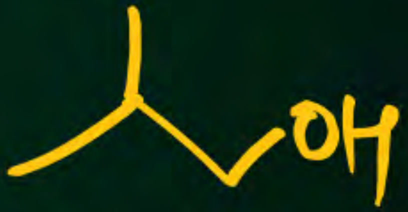


[✓ (C)] 2-methylpropan-2-ol



3° Sec

(D) 2-methylpropan-1-ol



QUESTION 05

$$CH_3CH_2OH \xrightarrow{\text{Alkaline } KMnO_4 + \text{Heat}} \underline{CH_3COOH}$$

In the above given reaction, alkaline $KMnO_4$ acts as:

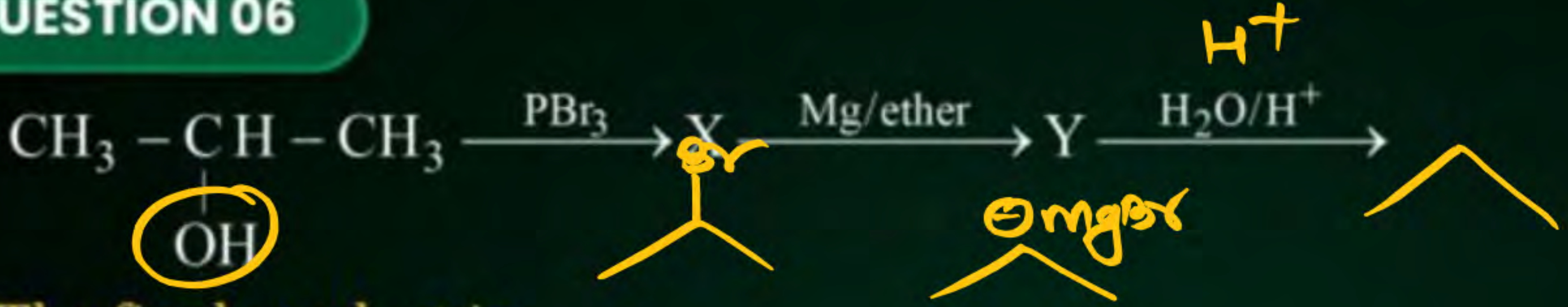
Ⓐ [✓ Oxidising agent]

Ⓑ reducing agent

Ⓒ catalyst

Ⓓ dehydrating agent

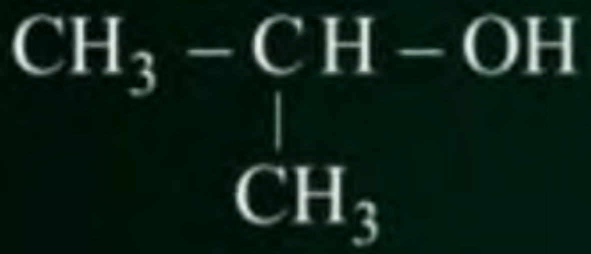
QUESTION 06



$$CH_3-\underset{\displaystyle OH}{\underset{|}{CH}}-CH_3 \xrightarrow{PBr_3} X \xrightarrow{Mg/ether} Y \xrightarrow{H_2O/H^+}$$

The final product is:

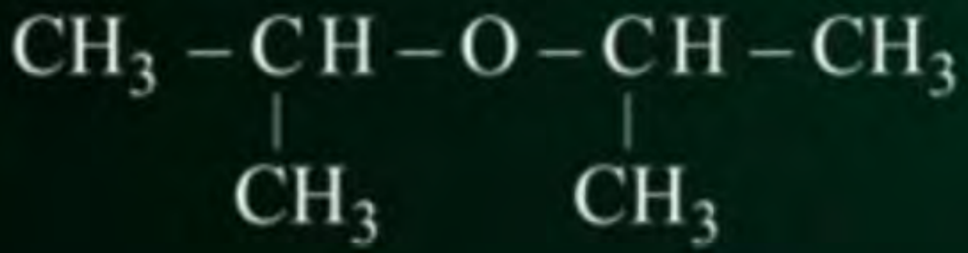
A



$$CH_3-\underset{\displaystyle CH_3}{\underset{|}{CH}}-OH$$

B $CH_3-CH_2-CH_2-OH$

C



$$CH_3-\underset{\displaystyle CH_3}{\underset{|}{CH}}-O-\underset{\displaystyle CH_3}{\underset{|}{CH}}-CH_3$$

[✓ **D**] $CH_3-CH_2-CH_3$

QUESTION 07

When ethyl alcohol (C_2H_5OH) reacts with thionyl chloride, in the presence of pyridine, the product obtained is:

A $CH_3CH_2Cl + HBr$

B $C_2H_6 + HCl + SO_2$

C $CH_3CH_2Cl + H_2O + SO_2$

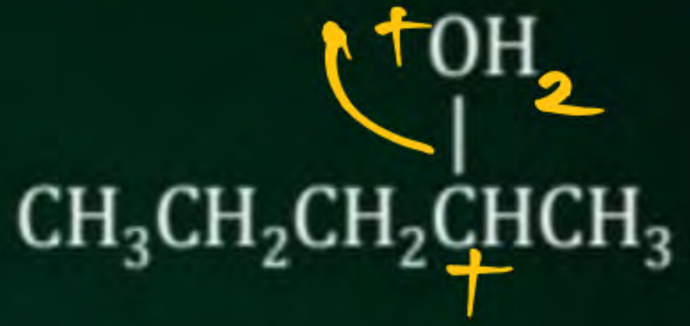
[✓ D] $CH_3CH_2Cl + HCl + SO_2$

QUESTION 08

Among the following compounds which can be dehydrated very easily?

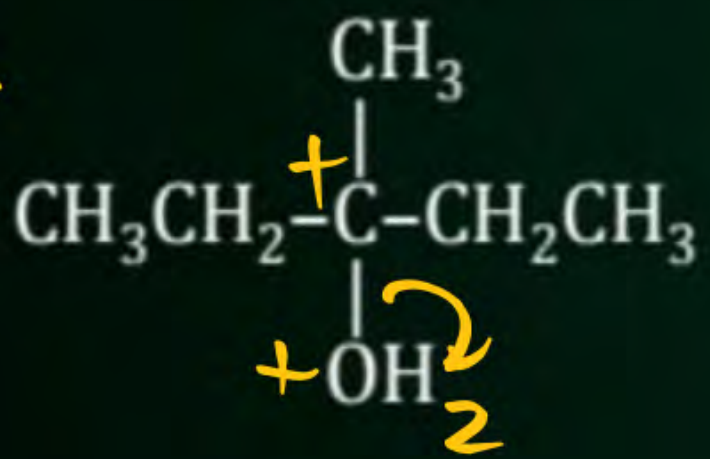
(A) $CH_3CH_2CH_2CH_2\overset{+}{C}H_2\overset{+}{O}H_2$

(B)



$CH_3CH_2CH_2\underset{+}{\overset{\overset{+}{O}H_2}{\overset{|}{C}}}HCH_3$

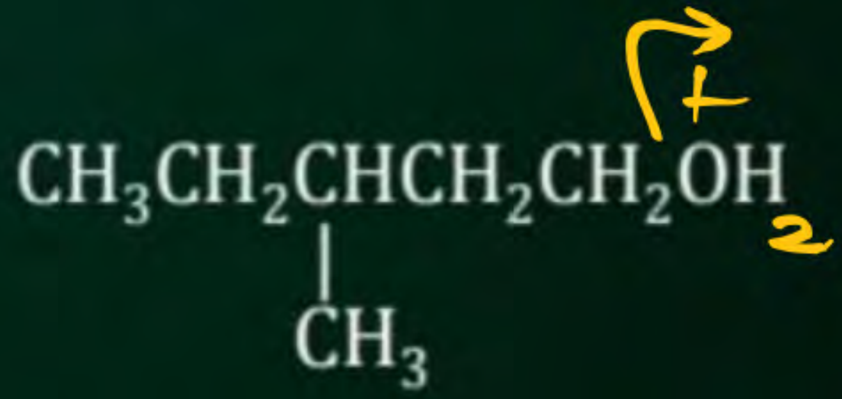
[✓ (C)]



$CH_3CH_2-\overset{\overset{CH_3}{|}}{\underset{\underset{+OH_2}{|}}{\overset{+}{C}}}-CH_2CH_3$

7αH

(D)



$CH_3CH_2\underset{\underset{CH_3}{|}}{C}HCH_2CH_2\overset{+}{O}H_2$

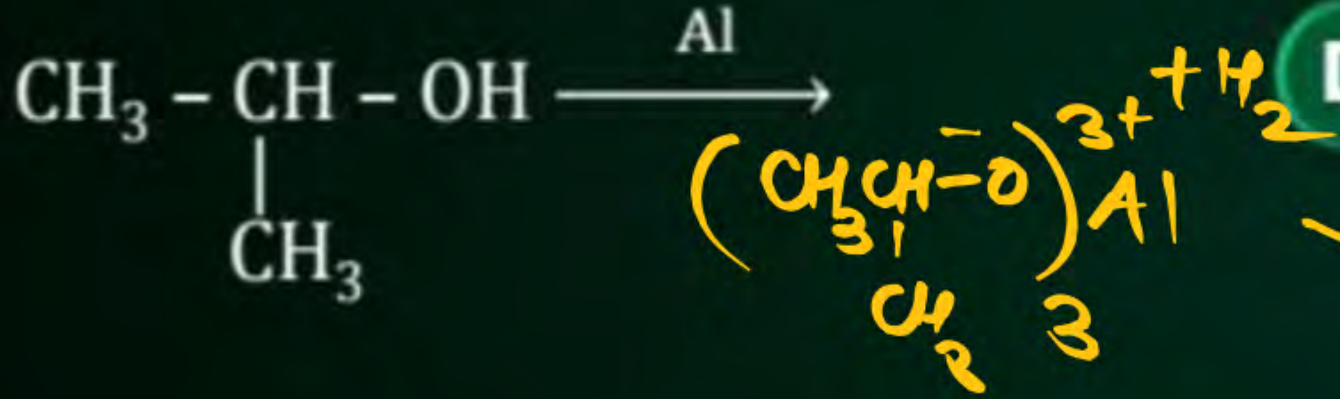
QUESTION 09

In which of the following reactions hydrogen gas will not be evolved?

(A) $CH_3-CH_2-OH \xrightarrow{Na} \wedge\bar{O}\overset{+}{Na} + H_2$

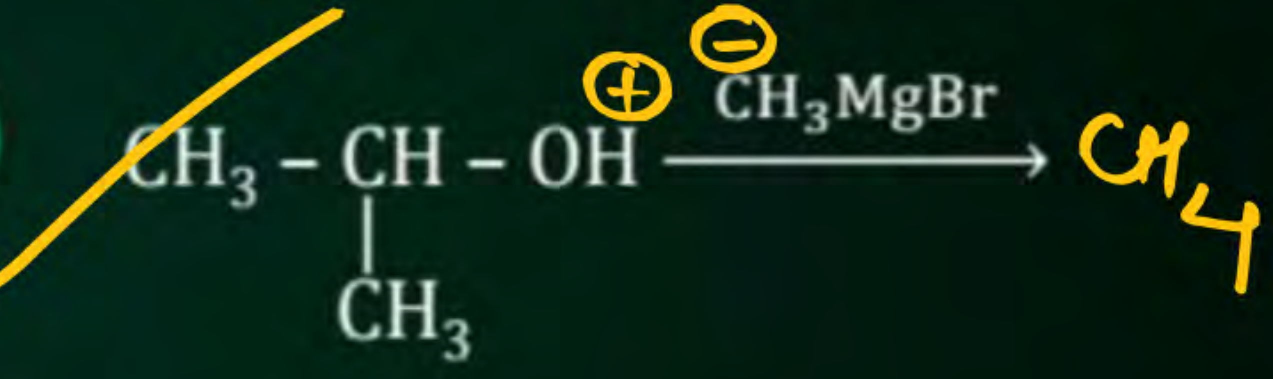
(B) $CH_3-CH_2-OH \xrightarrow{K} \wedge\bar{O}\overset{+}{K} + H_2$

(C)



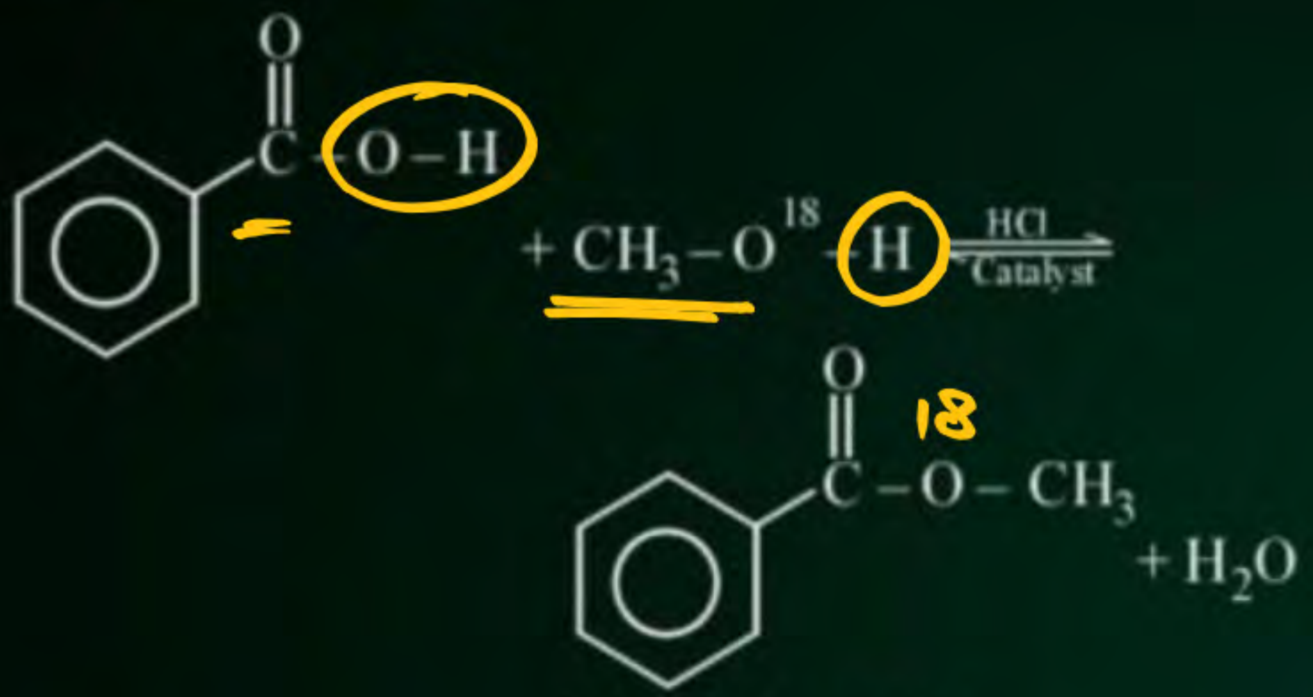
$$CH_3-\underset{\displaystyle CH_3}{\underset{|}{CH}}-OH \xrightarrow{Al} \left(CH_3\underset{CH_2}{\underset{|}{CH}}-\bar{O}\right)_3 Al^{3+} + H_2$$

(D)



$$CH_3-\underset{\displaystyle CH_3}{\underset{|}{CH}}-O\overset{\oplus}{H} \xrightarrow{\overset{\ominus}{CH_3}MgBr} CH_4$$

QUESTION 10


O
C
O – H
+ CH₃ – O¹⁸ – H
HCl
Catalyst
O
18
C – O – CH₃
+ H₂O

Methyl benzoate

The labelled $-O^{18}$ will be in:

- (A) H_2O
- [✓ B] Methyl benzoate
- (C) Both (A) and (B)
- (D) Benzoic acid

ANSWER KEY

1.C
2.A
3.C
4.C
5.A
6.D
7.D
8.C
9.D
10.B

QUESTION 01

Whe phenol is treated with excess of bromine water, it gives:

Ⓐ m-bromophenol

Ⓑ o-and p-bromophenol

Ⓒ 2, 4-dibromophenol

[✓ Ⓓ] 2, 4, 6-tribromophenol

QUESTION 02

When phenol is distilled with zinc dust. the main product is:

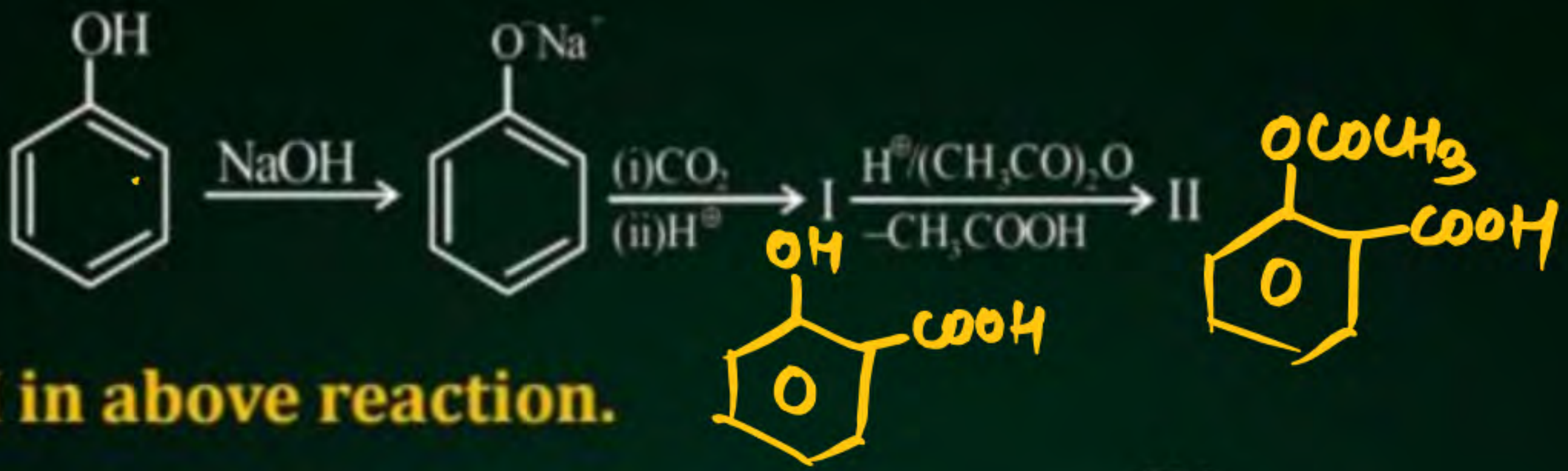
A biphenyl

B [✓ benzene]

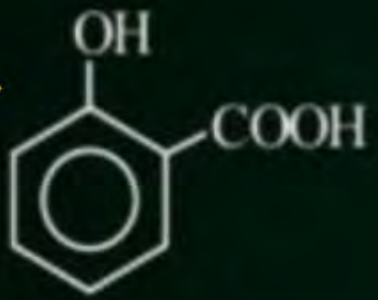
C benzaldehyde

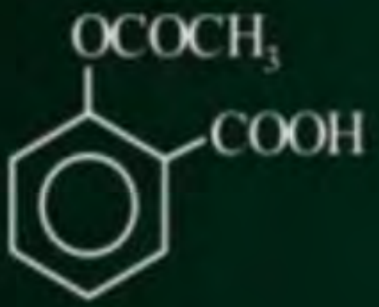
D phenolphthalein

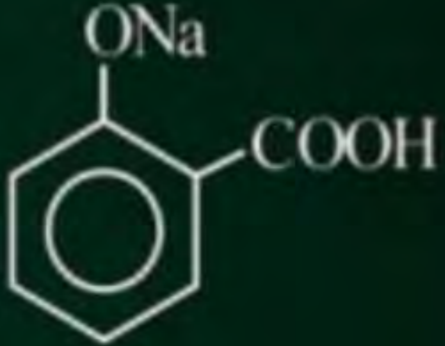
QUESTION 03

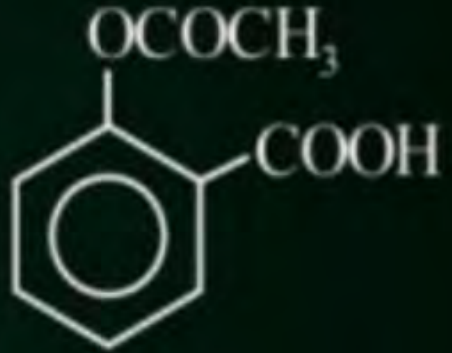

OH
NaOH
O⁻Na⁺
(i)CO₂
(ii)H⊕
I
H⊕/(CH₃CO)₂O
–CH₃COOH
II
OH
COOH
OCOCH₃
COOH

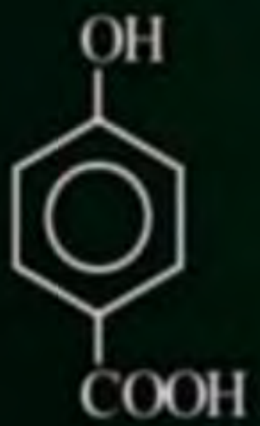
Identify I and II in above reaction.

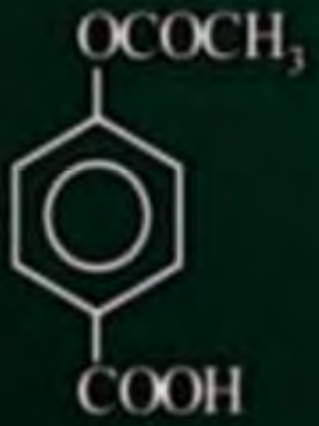
A (I)


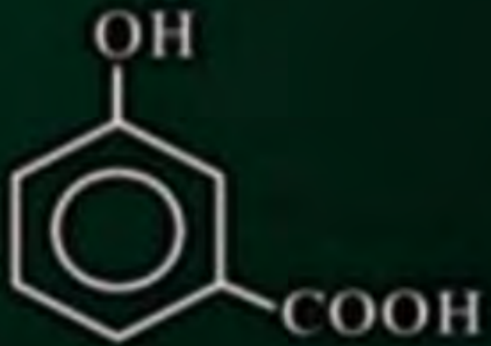
(II)

OCOCH₃
COOH

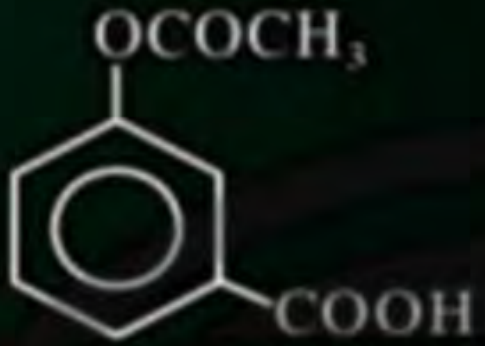
B (I)


(II)

OCOCH₃
COOH

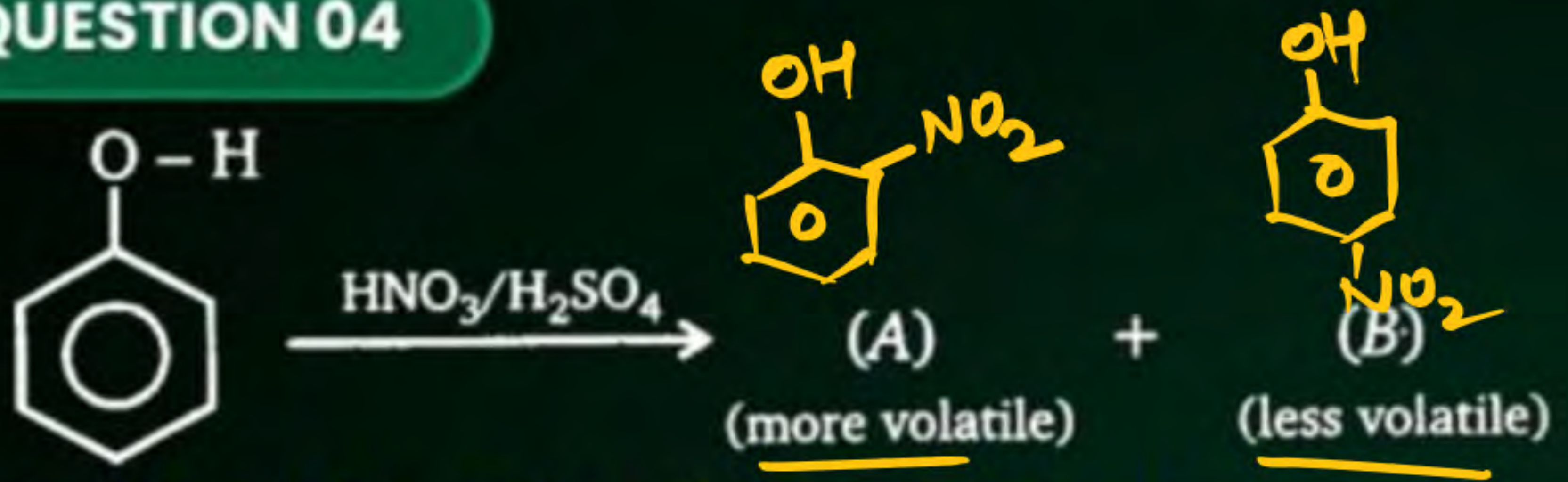
C (I)


(II)

OCOCH₃
COOH

D (I)


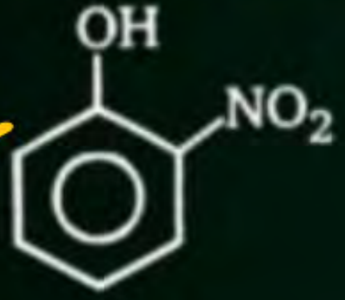
(II)

OCOCH₃
COOH

QUESTION 04

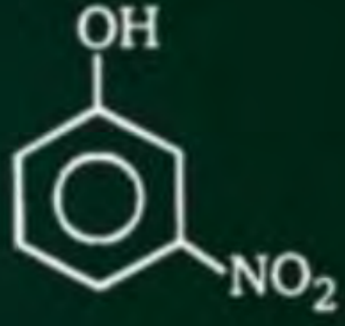

O – H
HNO_3/H_2SO_4
OH
NO_2
OH
NO_2
(A)
+
(B)
(more volatile)
(less volatile)

Product (A) of the above reaction is:

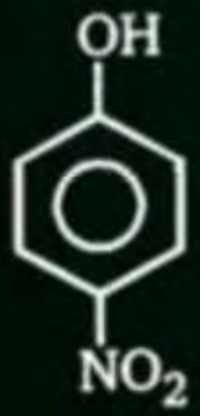
[✓ A]



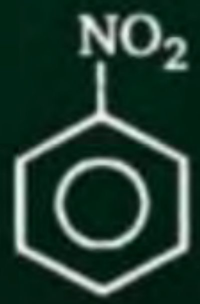
B



C



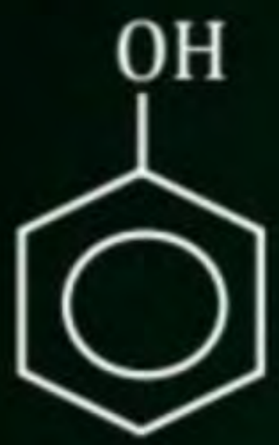
D



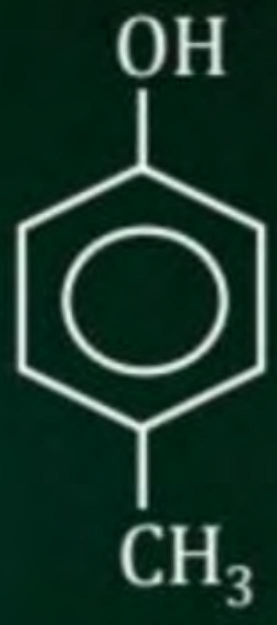
QUESTION 05

Which of the following will not give Reimer-Teimann reaction?

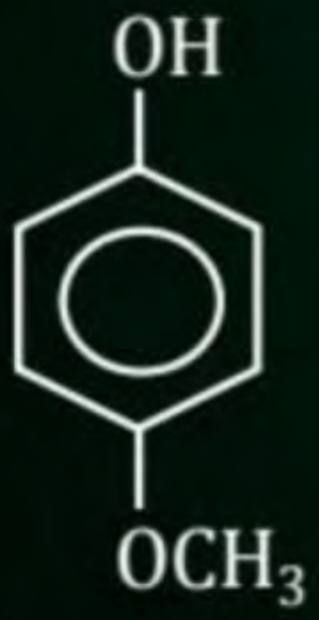
A



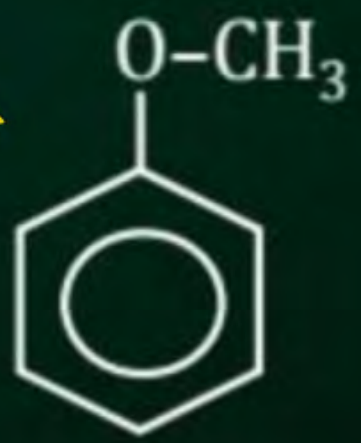
B



C



[✓ D]



QUESTION 06

The product of the Reimer-Tiemann reaction is a mixture of o-hydroxy benzaldehyde (major product) and p-hydroxy benzaldehyde (minor product). The constituents of the mixture are best separated by

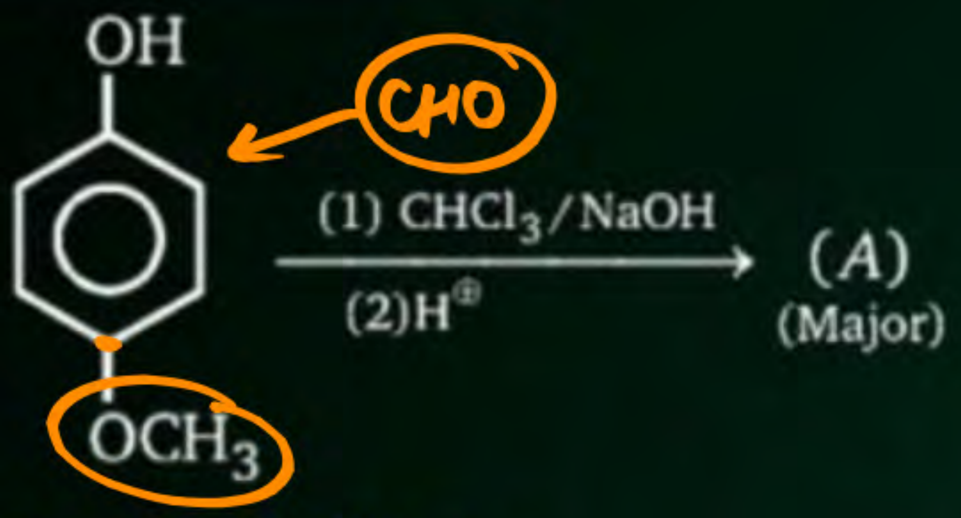
Ⓐ crystallization

Ⓑ distillation

Ⓒ [✓ steam distillation]

Ⓓ sublimation

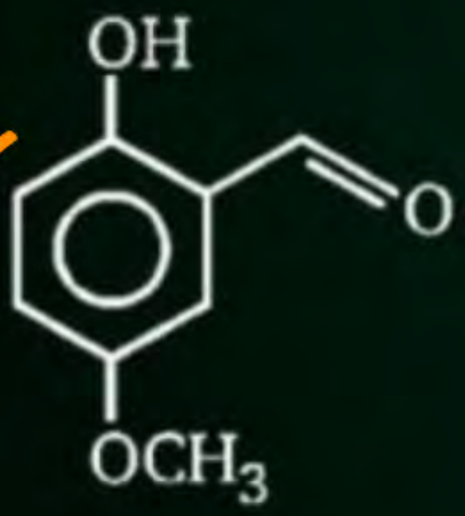
QUESTION 07


OH
CHO
OCH3
(1) CHCl3/NaOH
(2)H⊕
(A)
(Major)

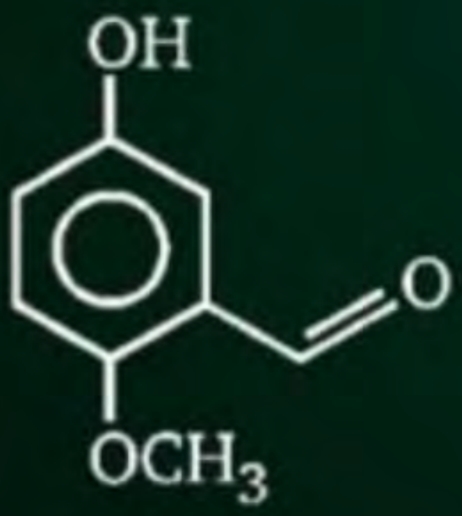
$\xrightarrow[(2)\,H^{\oplus}]{(1)\,CHCl_3/NaOH}$ (A) (Major)

Product (A) is:

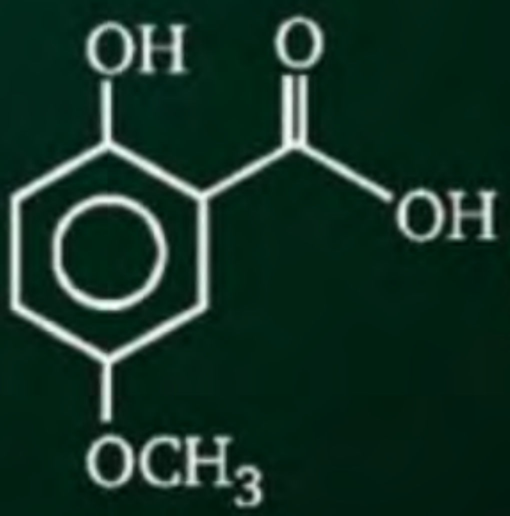
[✓ A]



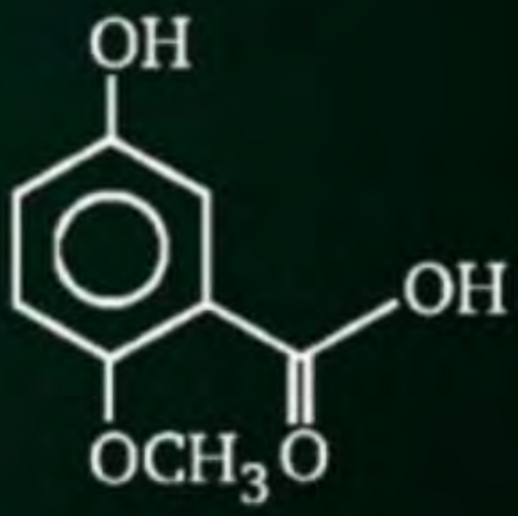
B



C

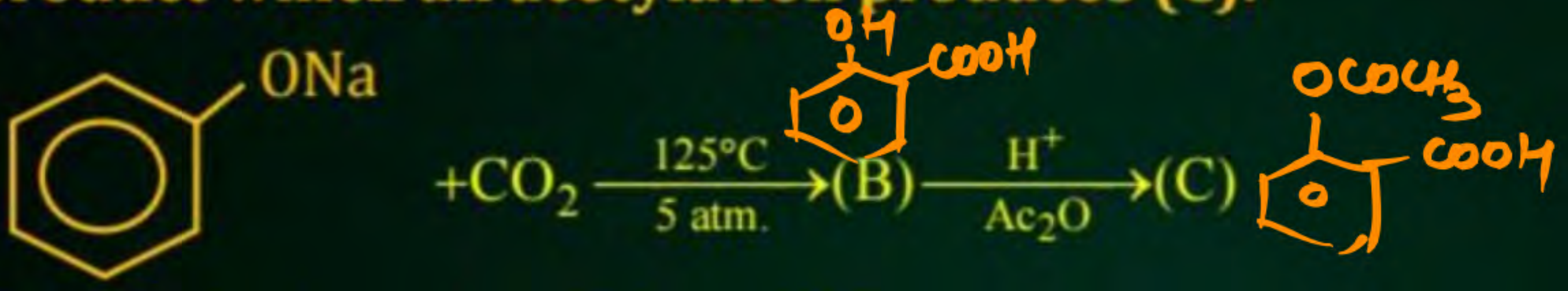


D



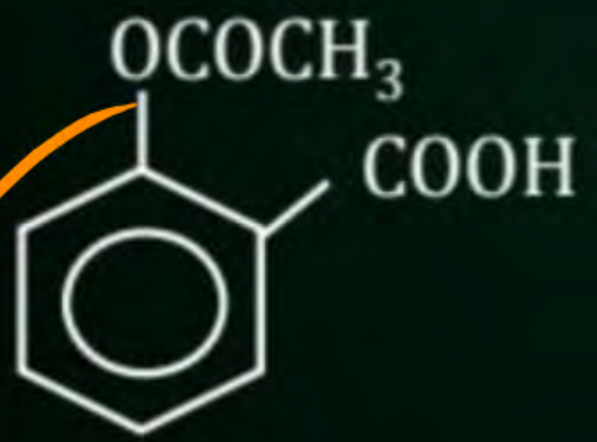
QUESTION 08

Sodium phenoxide when heated with CO_2 under pressure at 125°C yields a product which an acetylation produces (C).

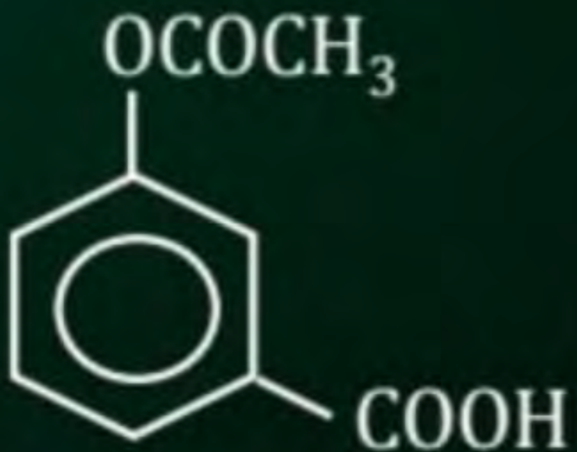

ONa
$+CO_2 \xrightarrow[5\text{ atm.}]{125°C} (B) \xrightarrow[Ac_2O]{H^+} (C)$
OH
COOH
OCOCH3
COOH

The major product (C) would be:

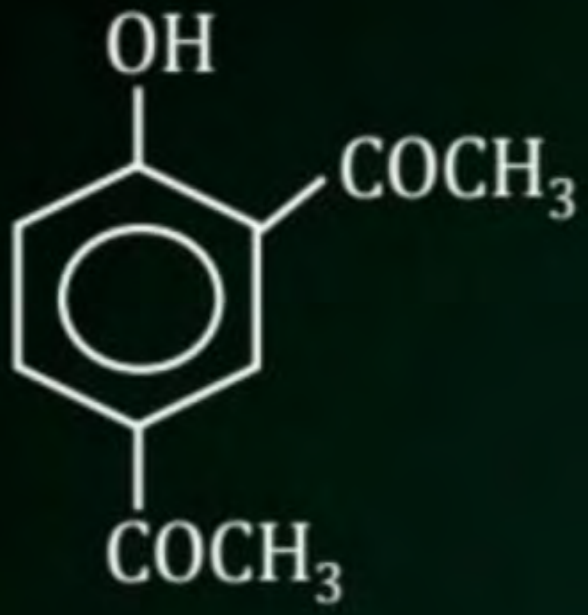
A


OCOCH3
COOH

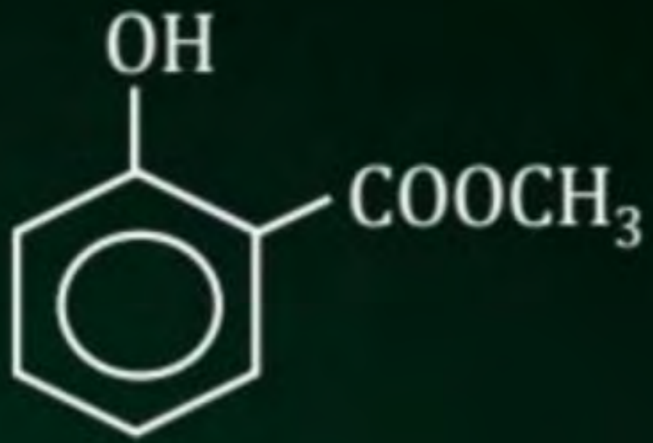
B


OCOCH3
COOH

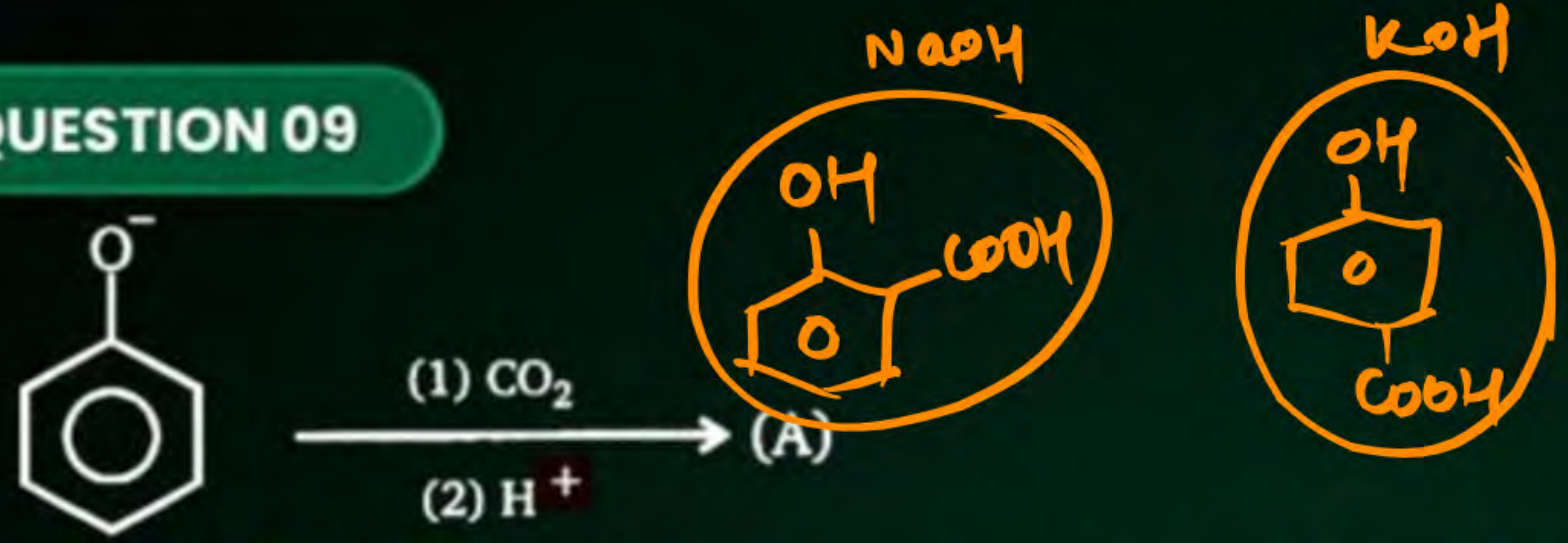
C


OH
COCH$_3$
COCH$_3$

D



QUESTION 09


NaOH
KOH
OH
COOH
OH
COOH
O⁻
(1) CO₂
(2) H⁺
(A)

Which of the following is true statement about the reaction?

A Ortho isomer is major if PhONa is used.

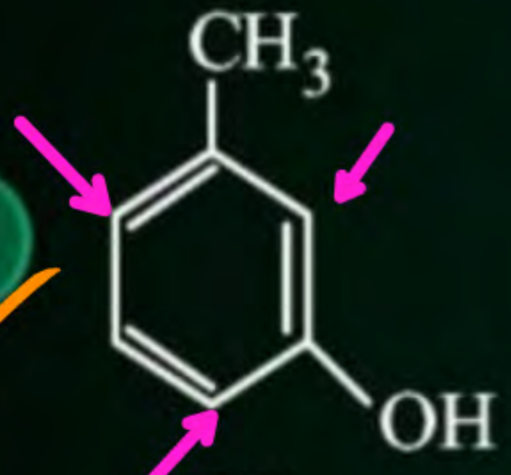
B Para isomer is major if PhOK is used.

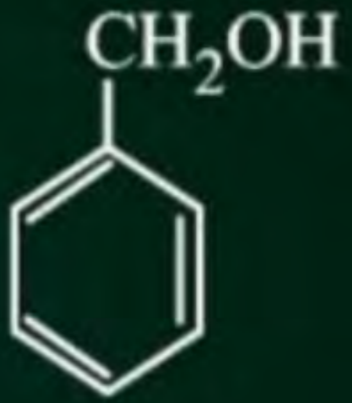
C Product formed is further used for preparation of drug aspirin.

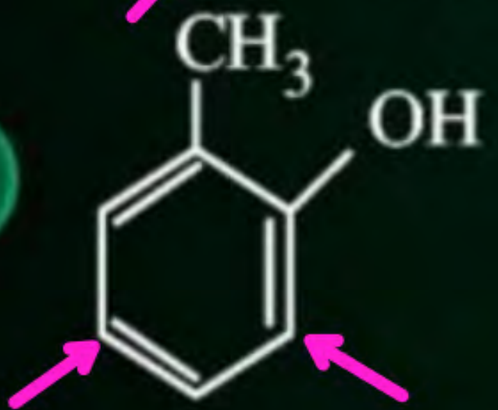
[✓ D] All of these

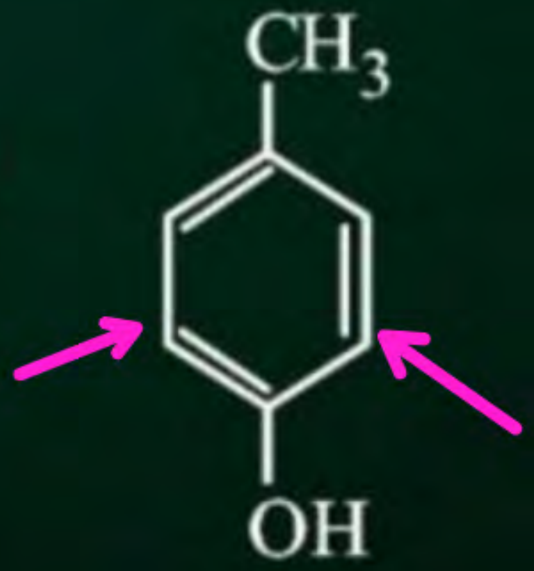
QUESTION 10

The structure of the compound that gives tribromo derivative on treatment with bromine water is:

A


B


C


D


ANSWER KEY

1. D
2. B
3. A
4. A
5. D
6. C
7. A
8. A
9. D
10. A

Thank you!!

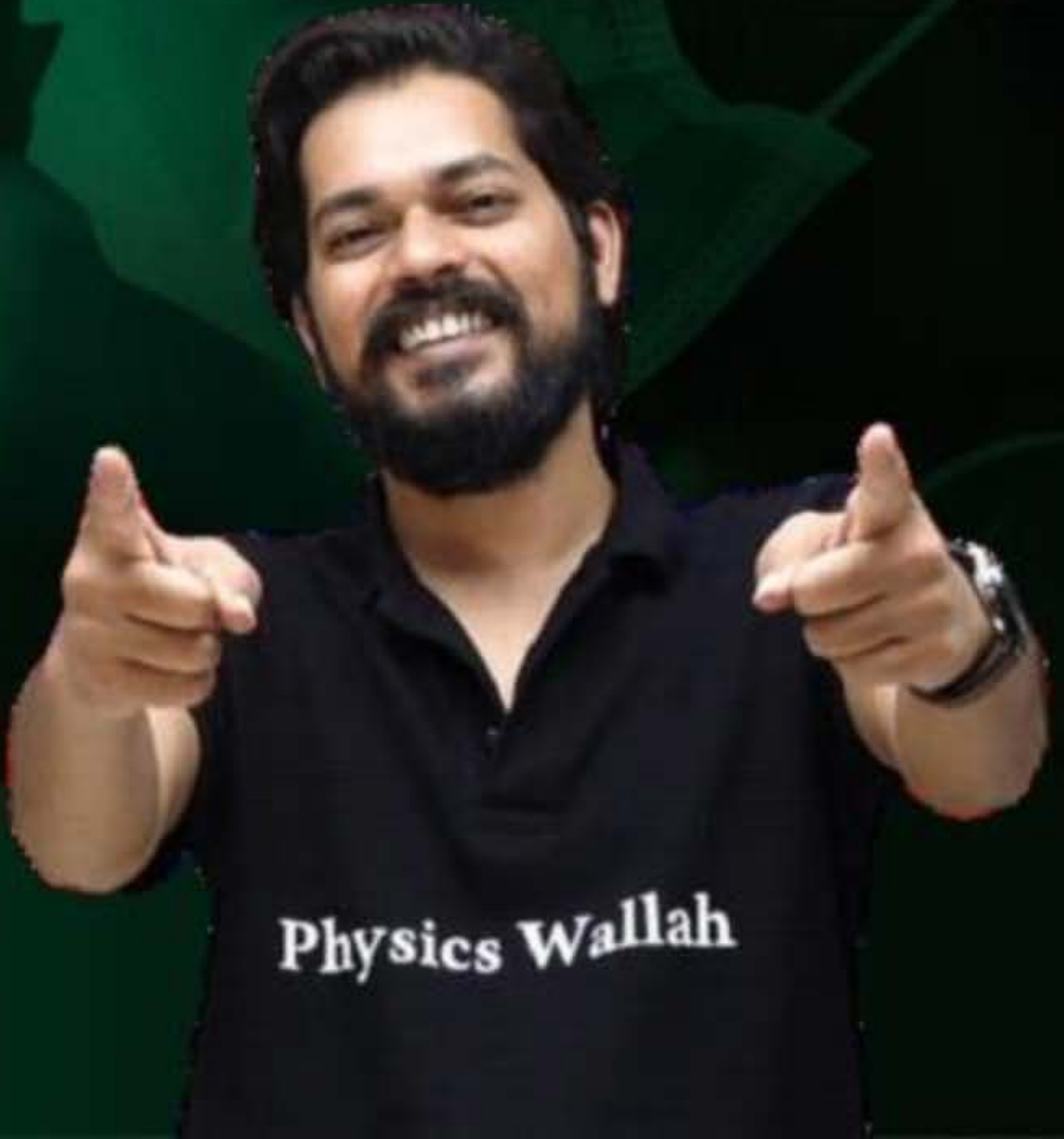
YAKEEN 2.0

FOR NEET 2025

Lecture- 09 | **Organic Chemistry**

Alcohols, Phenols & Ethers

By- Pankaj Sir(POPU MAMA)


Physics Wallah

Topics *to be covered*

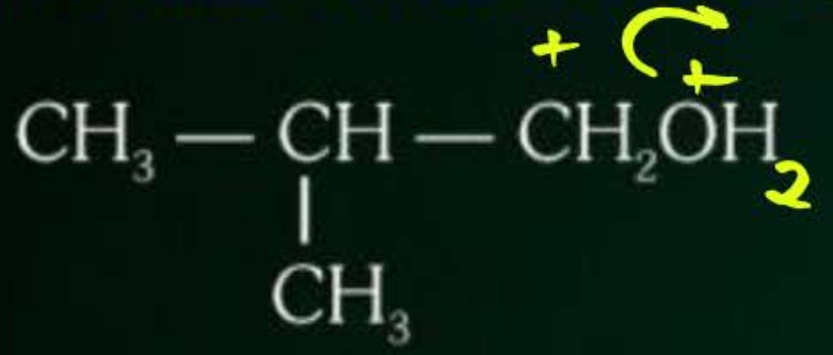
1. NEET/AIPMT & JEE Mains PYQs Discussion

NEET/AIPMT PYQs

QUESTION (NEET 2024)

Which one of the following alcohols reacts instantaneously with Lucas reagent?

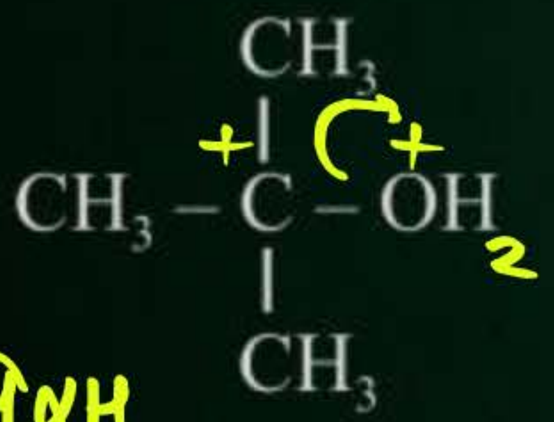
(A)



$CH_3-\underset{\displaystyle CH_3}{\underset{|}{CH}}-\overset{+}{C}H_2\overset{+}{O}H_2$

(B) $CH_3-CH_2-CH_2-\overset{+}{C}H_2\overset{+}{O}H_2$

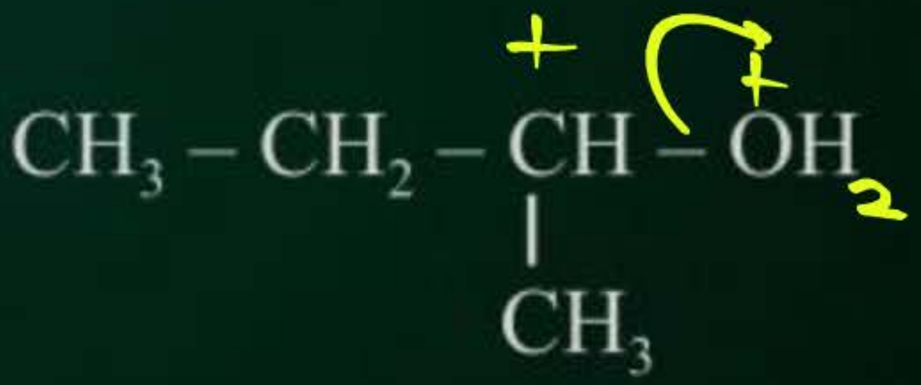
(C) ✓



$CH_3-\overset{\displaystyle CH_3}{\overset{|}{\underset{\displaystyle CH_3}{\underset{|}{\overset{+}{C}}}}}-\overset{+}{O}H_2$

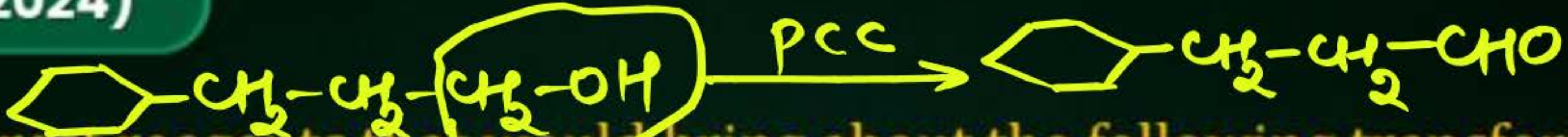
9αH

(D)

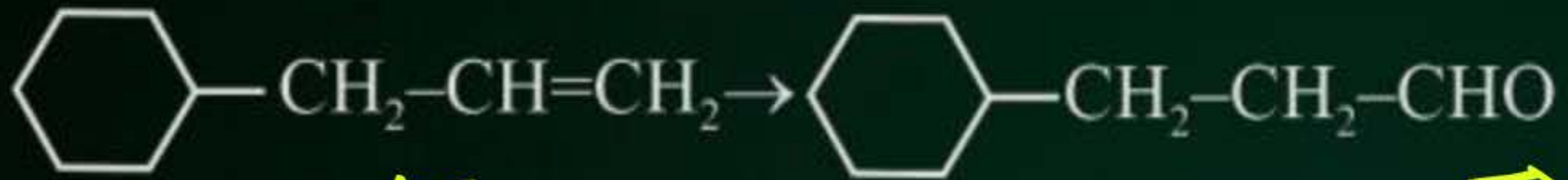


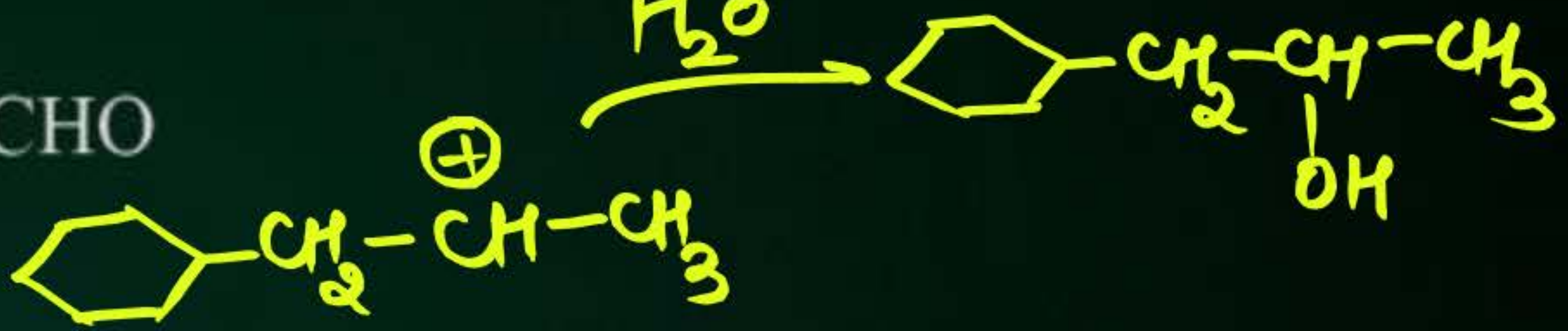
$CH_3-CH_2-\underset{\displaystyle CH_3}{\underset{|}{\overset{+}{C}H}}-\overset{+}{O}H_2$

QUESTION (NEET 2024)



Identify the correct reagents that would bring about the following transformation.





$H^+ \bar{O}H$

A ✗ (i) BH_3 (ii) $H_2O_2/\overset{\ominus}{O}H$

(iii) alk. $KMnO_4$ (iv) $H_3O^{\oplus}$

B ✗ (i) H_2O/H^+ (ii) CrO_3

$\overset{+}{H}\bar{O}H$ Antimar

C ✗ (i) H_2O/H^+ (ii) PCC

✓ **D** (i) BH_3 (ii) $H_2O_2/\overset{\ominus}{O}H$

(iii) PCC

QUESTION (NEET 2024)

The products A and B obtained in the following reactions respectively are:

$3ROH + PCl_3 \rightarrow 3RCl + A$

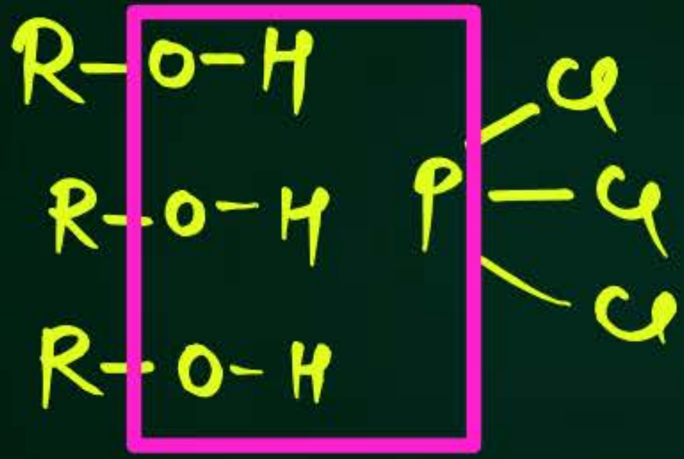
$ROH + PCl_5 \rightarrow RCl + HCl + B$

A H_3PO_4 and $POCl_3$

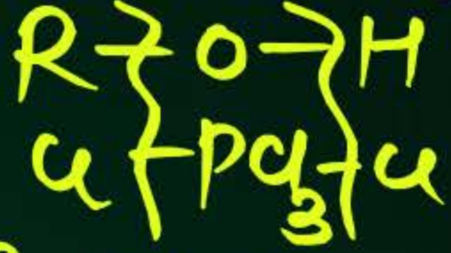
B ✓ $\underline{H_3PO_3}$ and $POCl_3$

C $POCl_3$ and H_3PO_3

D $POCl_3$ and H_3PO_4


R-O-H
R-O-H
R-O-H
P
Cl
Cl
Cl

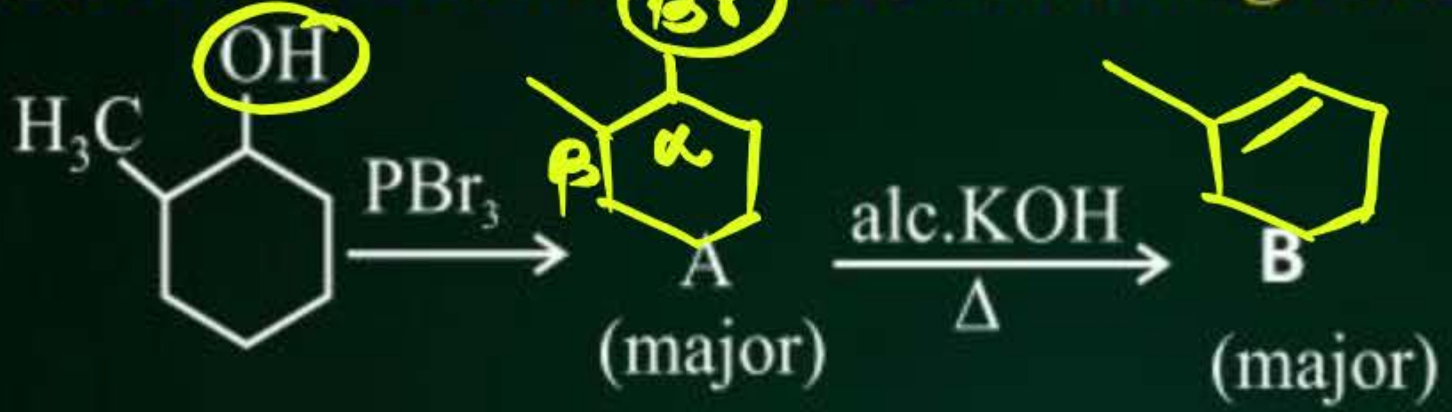
$3R-Cl + H_3PO_3$


R O H
Cl PCl3 Cl

$R-Cl + POCl_3 + HCl$

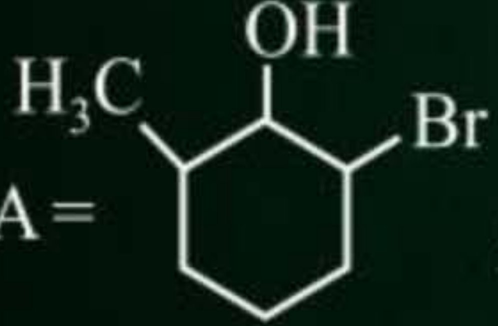
QUESTION (NEET 2024)

Major products A and B formed in the following reaction sequence are:

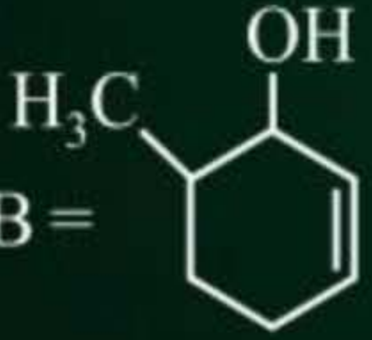

H3C
OH
PBr3
Br
β
α
A
(major)
alc.KOH
Δ
B
(major)

A

A =

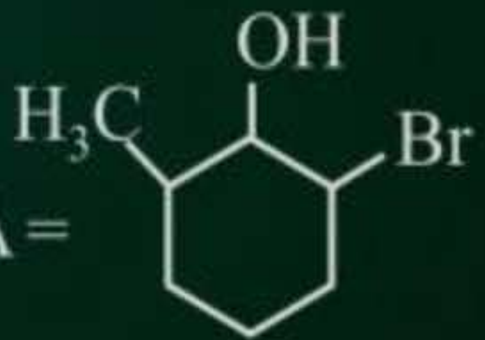


; B =

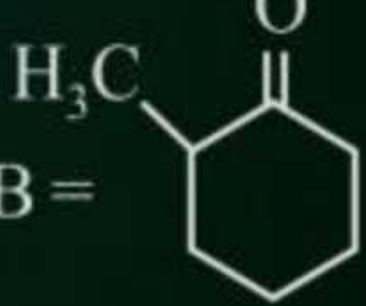


B

A =

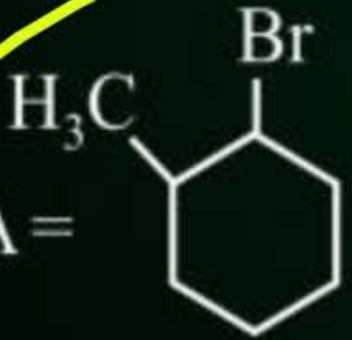


; B =

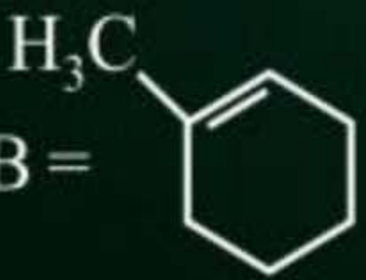


C [✓]

A =

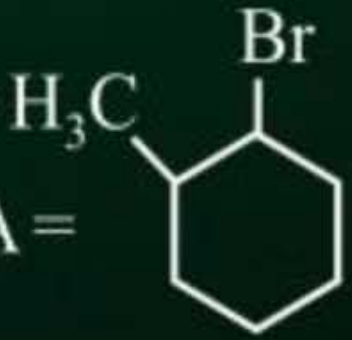


; B =

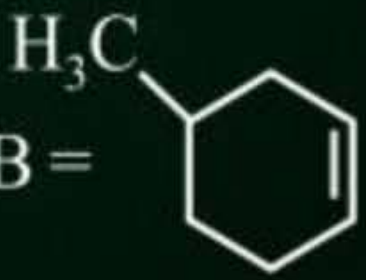


D

A =



; B =

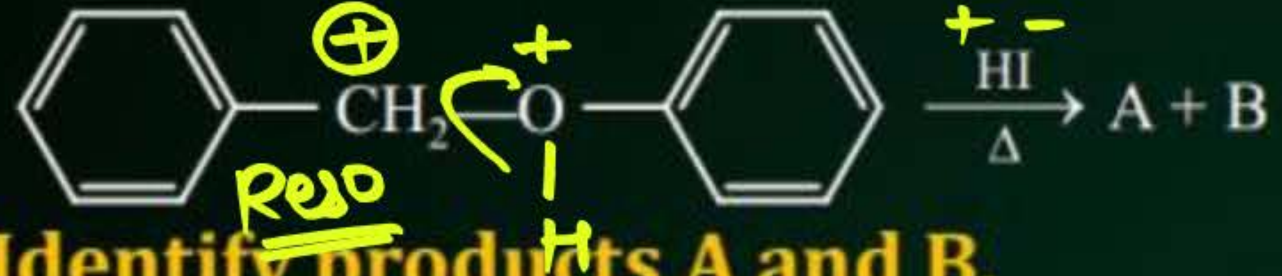


QUESTION (NEET 2023)

$3^\circ R^+$

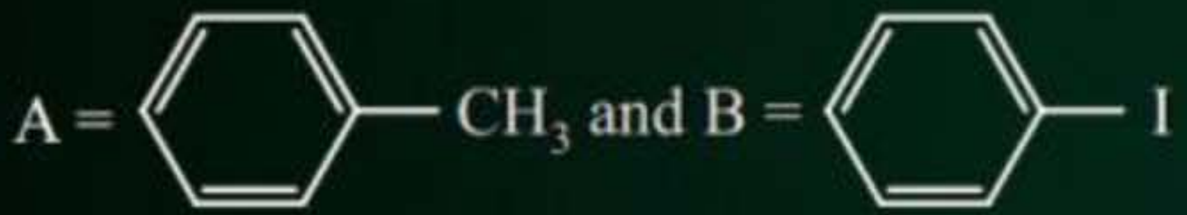
Resostab $1^\circ, 2^\circ, 3^\circ$ $\overset{+}{C}$

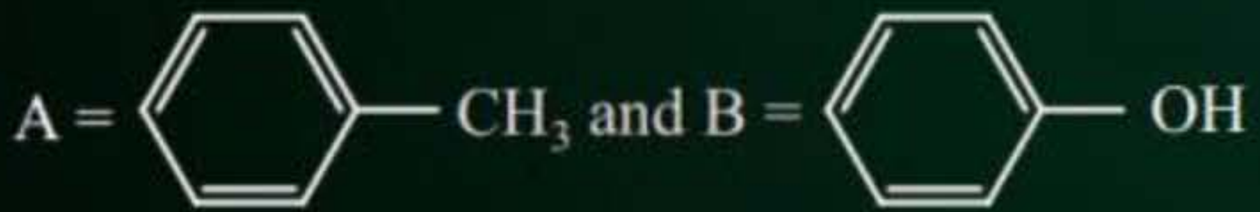
Consider the following reaction



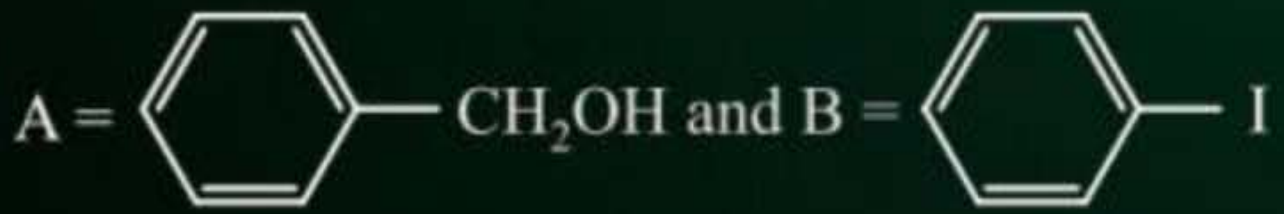
⊕
CH$_2$
O
+
H
Reso
+ −
HI
Δ
A + B

Identify products A and B.

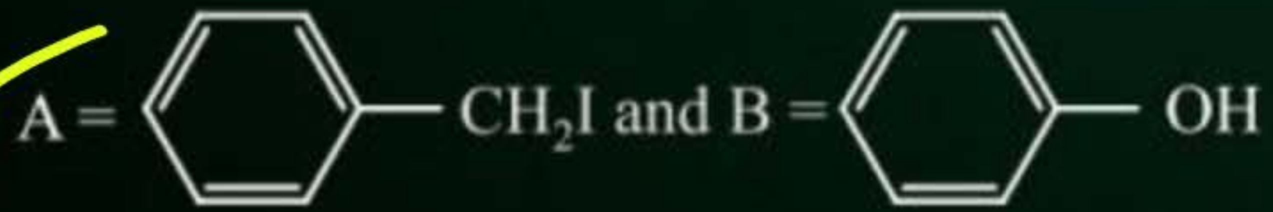
A


B


A =
CH$_3$ and B =
OH

C


A =
CH$_2$OH and B =
I

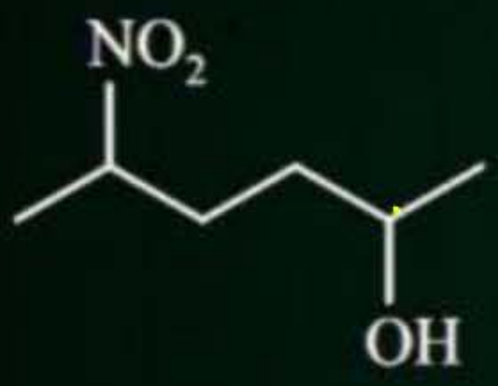
D ✓


A =
CH$_2$I and B =
OH

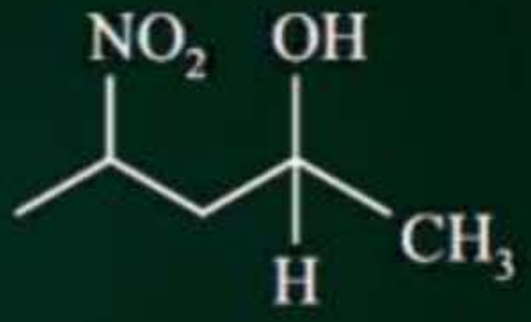
QUESTION (NEET 2023)

Which amongst the following will be most readily dehydrated under acidic conditions?

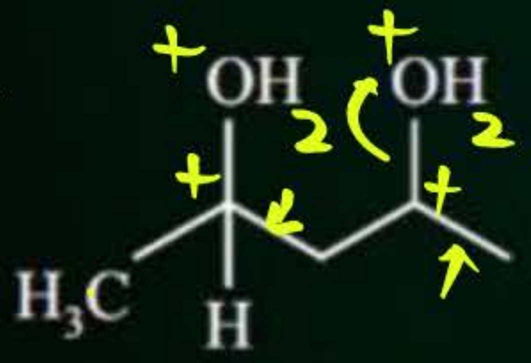
A

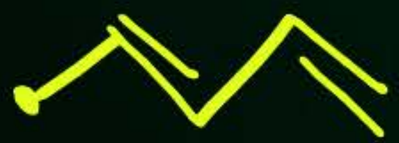


B

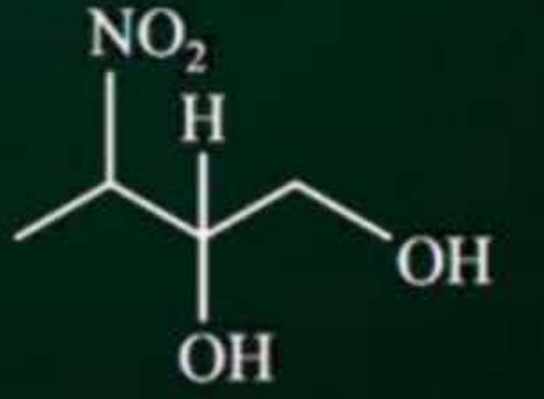


[✓ C]


+
OH
+
OH
2
2
+
+
H$_3$C
H



D



QUESTION (NEET 2022)

Given below are two statements:

Statement I: In Lucas test, primary, secondary and tertiary alcohols are distinguished on the basis of their reactivity with conc. $HCl + ZnCl_2$ ✓, known as Lucas Reagent.

Statement II: Primary alcohols are most reactive and immediately ✗ produce turbidity at room temperature on reaction with Lucas Reagent.

In the light of the above statements, choose the most appropriate answer from the options given below:

A Statement I is incorrect but Statement II is correct.

B Both Statement I and Statement II are correct.

C Both Statement I and Statement II are incorrect.

[✓ D Statement I is correct but Statement II is incorrect.]

QUESTION (NEET 2022)

Given below are two statements:

Statement I: The acidic strength of monosubstituted nitrophenol is higher than phenol because of electron withdrawing nitro group.

Statement II: o-nitrophenol, m-nitrophenol and p-nitrophenol will have same acidic strength as they have one nitro group attached to the phenolic ring.

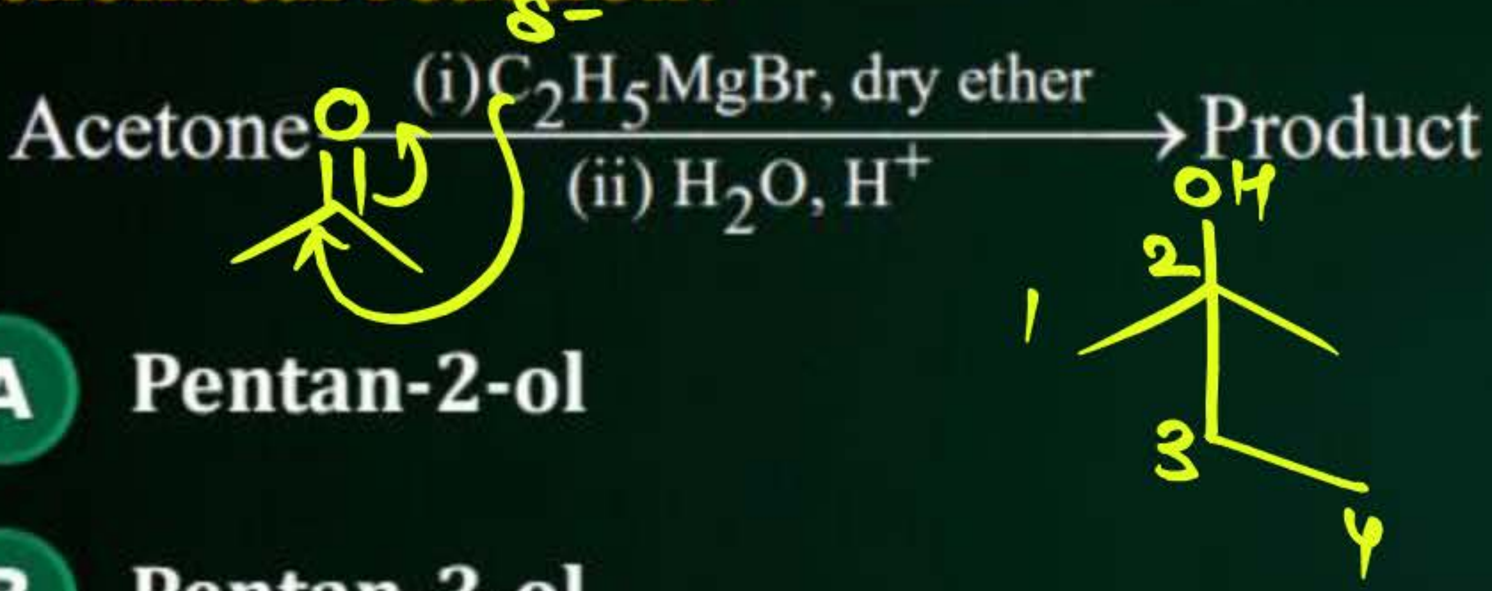
p>o>m

In the light of the above statements, choose the most appropriate answer form the options given below:

- **A** Statement I is incorrect but Statement II is correct.
- **B** Both Statement I and Statement II are correct.
- **C** Both Statement I and Statement II are incorrect.
- **D** [✓ Statement I is correct but Statement II is incorrect.]

QUESTION (NEET 2021)

What is the IUPAC name of the organic compound formed in the following chemical reaction?



$$\text{Acetone} \xrightarrow[\text{(ii) } H_2O,\ H^+]{\text{(i) } C_2H_5MgBr\text{, dry ether}} \text{Product}$$

A Pentan-2-ol

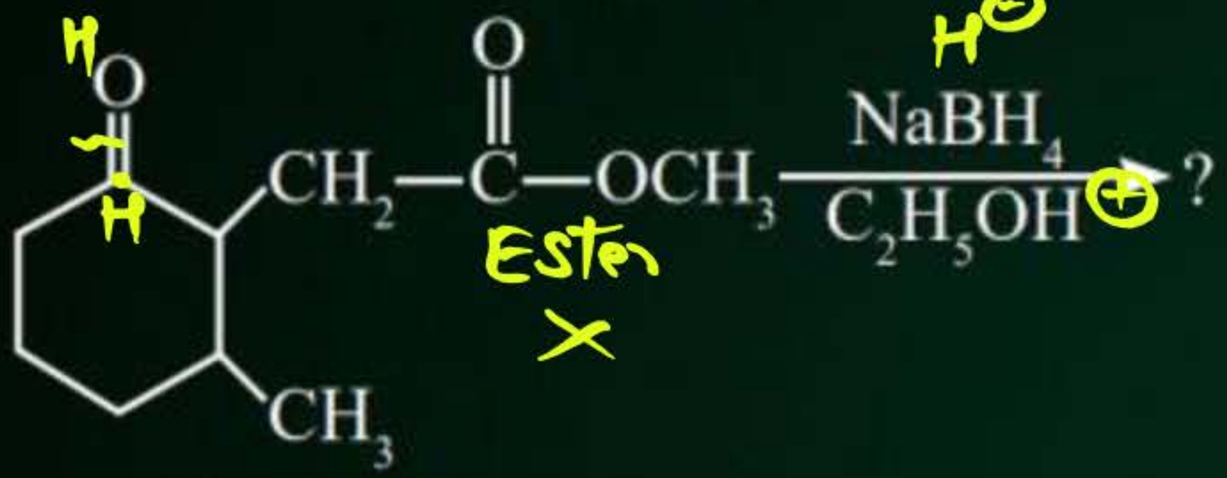
B Pentan-3-ol

[✓ C] 2-methyl butan-2-ol

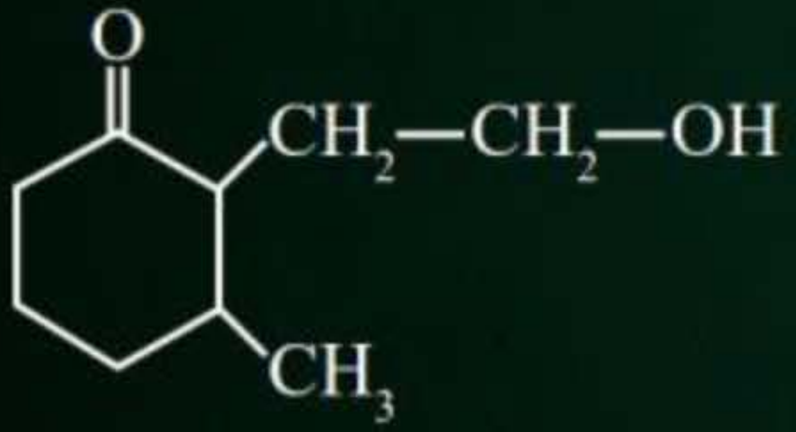
D 2-methyl propan-2-ol

QUESTION (NEET 2021)

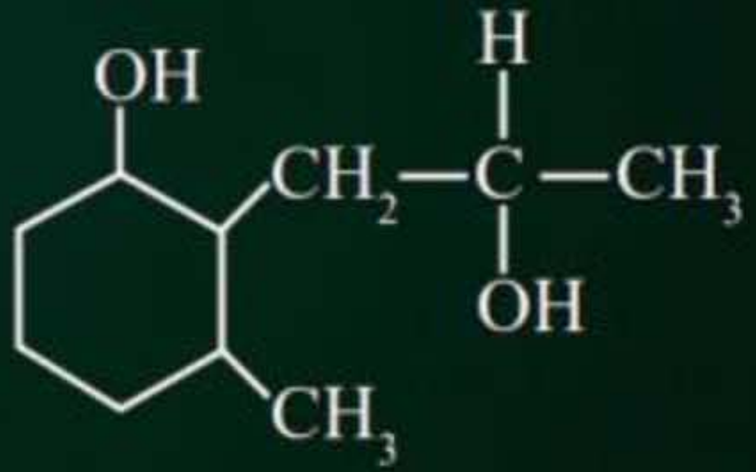
The product formed in the following chemical reaction is:


H
O
H
CH2
O
C
OCH3
CH3
Ester
×
H⊖
NaBH4
C2H5OH
⊕
?

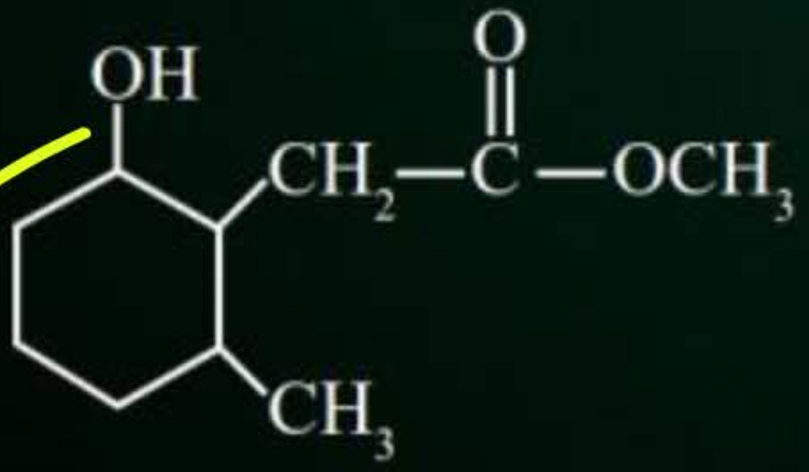
A


O
CH2—CH2—OH
CH3

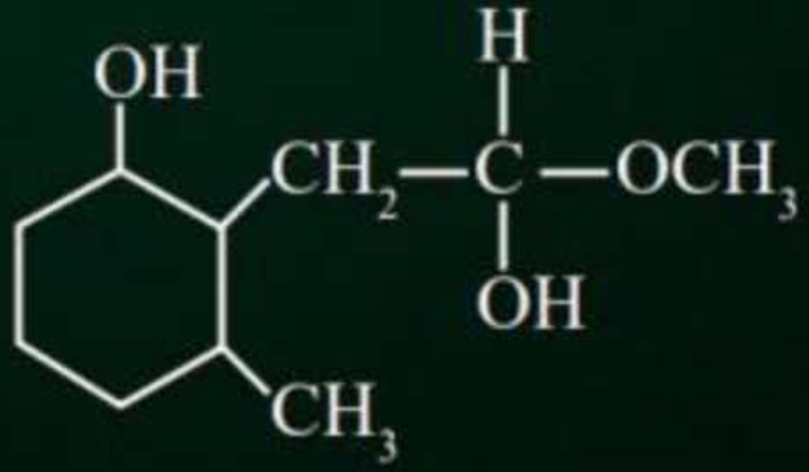
B


OH
H
CH2—C—CH3
OH
CH3

[✓ C]


OH
O
CH2—C—OCH3
CH3

D

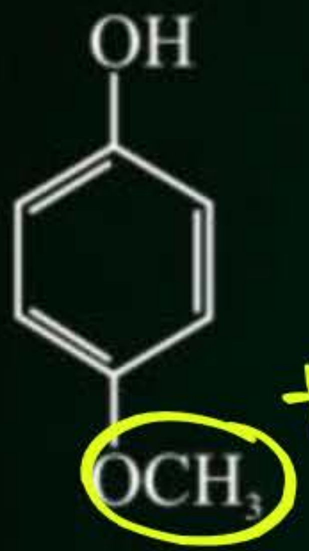

OH
H
CH2—C—OCH3
OH
CH3

QUESTION (NEET 2020-Covid)

Which of the following substituted phenols is the strongest acid?

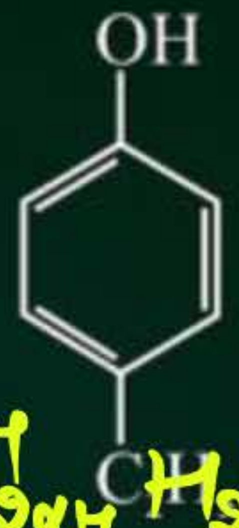
D>B>C>A

A



+M

B

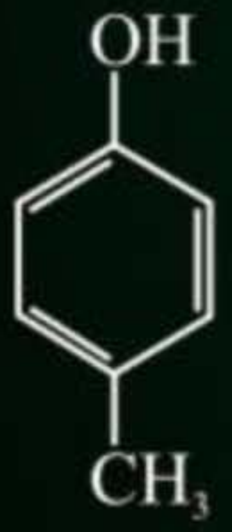


+H

2αH

CH_2-CH_3

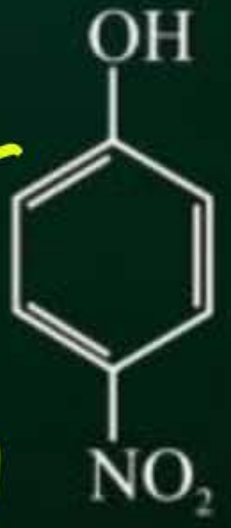
C



+H

3αH

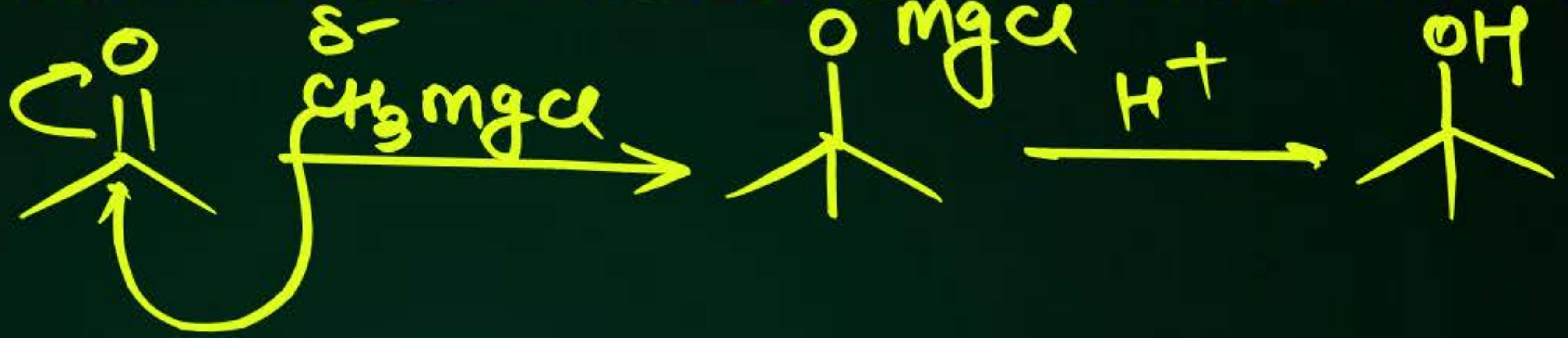
✓ **D**



-M

QUESTION (NEET 2020)

Reaction between acetone and methyl magnesium chloride followed by hydrolysis will give:



A Sec. butyl alcohol

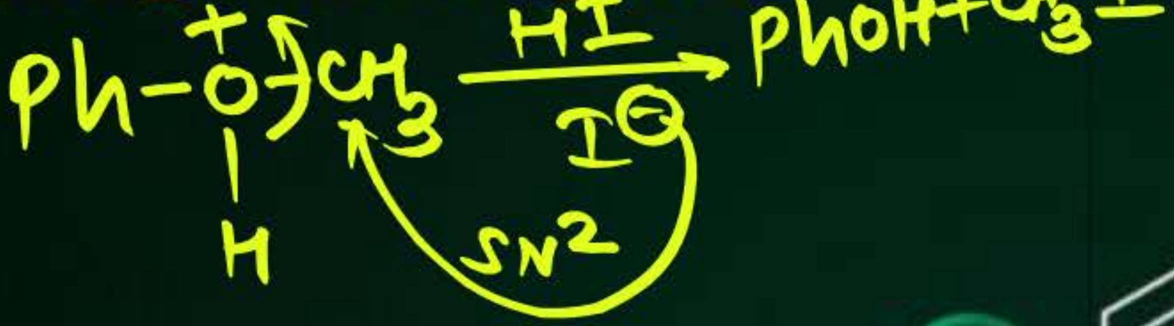
[✓ B] Tert. butyl alcohol

C Isobutyl alcohol

D Isopropyl alcohol

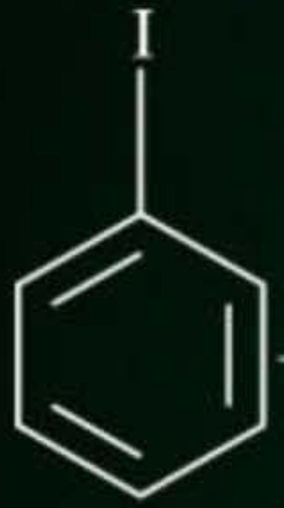
QUESTION (NEET 2020)

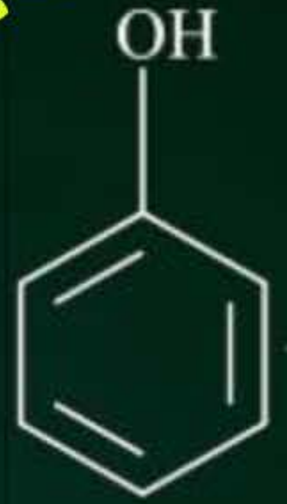
Anisole on cleavage with HI gives:

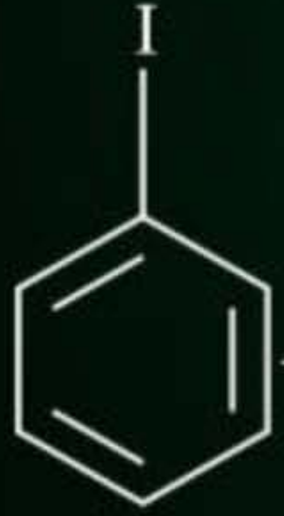


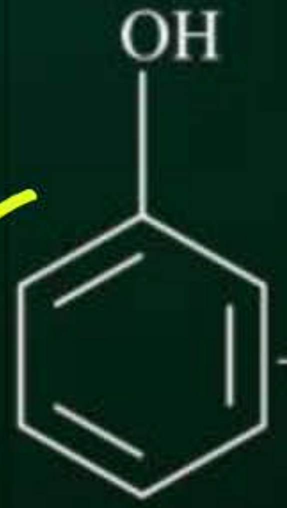
$$Ph-\overset{+}{\underset{H}{O}}-CH_3 \xrightarrow[I^{\ominus}]{HI} PhOH + CH_3I$$

S_N2

(A)  $+ CH_3OH$

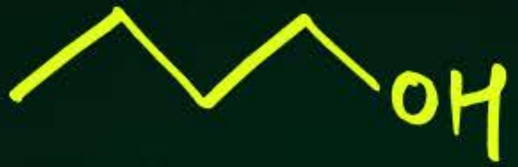
(B)  $+ C_2H_5I$

(C)  $+ C_2H_5OH$

[✓ (D)]  $+ CH_3I$

QUESTION (NEET 2020 Covid)

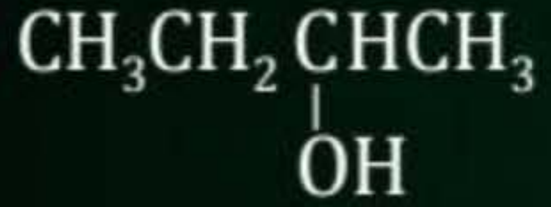
$CH_3CH_2CH=CH_2 \xrightarrow[H_2O, H_2O_2/OH^-]{B_2H_6} Z$



What is Z?

$H^+ \ \bar{O}H$

Antimar

A 

$CH_3CH_2\underset{OH}{\underset{|}{C}}HCH_3$

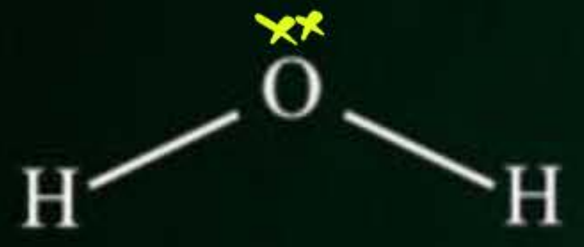
B $CH_3CH_2CH_2CHO$

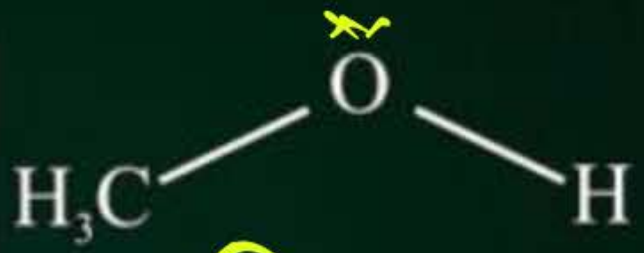
C $CH_3CH_2CH_2CH_3$

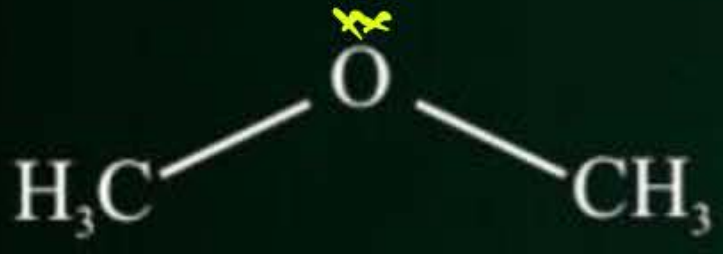
D ✓ $CH_3CH_2CH_2CH_2OH$

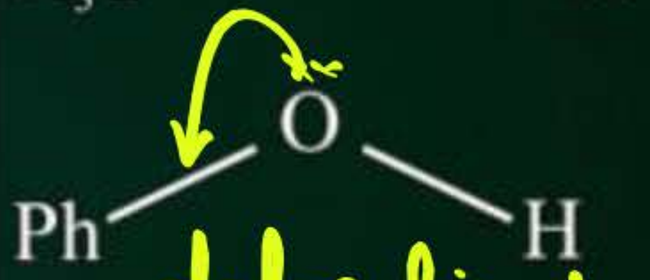
QUESTION (NEET 2019)

The compound that is most difficult to protonate is:

(A)


(B)


(C)


[✓ (D)]


delocalised

QUESTION (NEET Odisha 2019)

The major products C and D formed in the following reaction respectively are:

$$H_3C-CH_2-\underset{I}{CH_2}\{-\underset{H\ H}{O}-\}\underset{I}{C}(CH_3)_3 \xrightarrow[\Delta]{\boxed{\text{excess}}\ HI} C+D$$

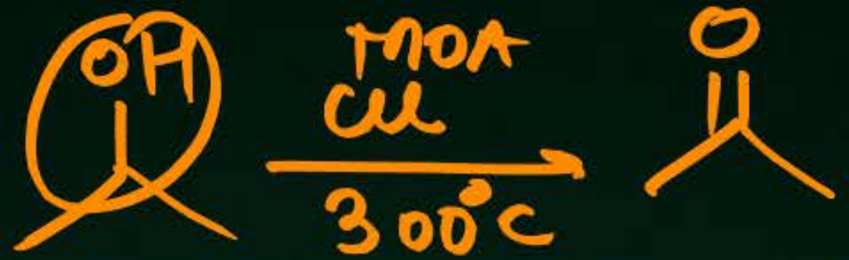
A $H_3CCH_2CH_2OH$ and $HOC(CH_3)_3$

[✓ B] $H_3CCH_2CH_2I$ and $IC(CH_3)_3$

C $H_3CCH_2CH_2OH$ and $IC(CH_3)_3$

D $H_3CCH_2CH_2I$ and $HOC(CH_3)_3$

QUESTION (NEET Odisha 2019)



When vapours of a secondary alcohol is passed over heated copper at 573 K, the product formed is:

A an alkene

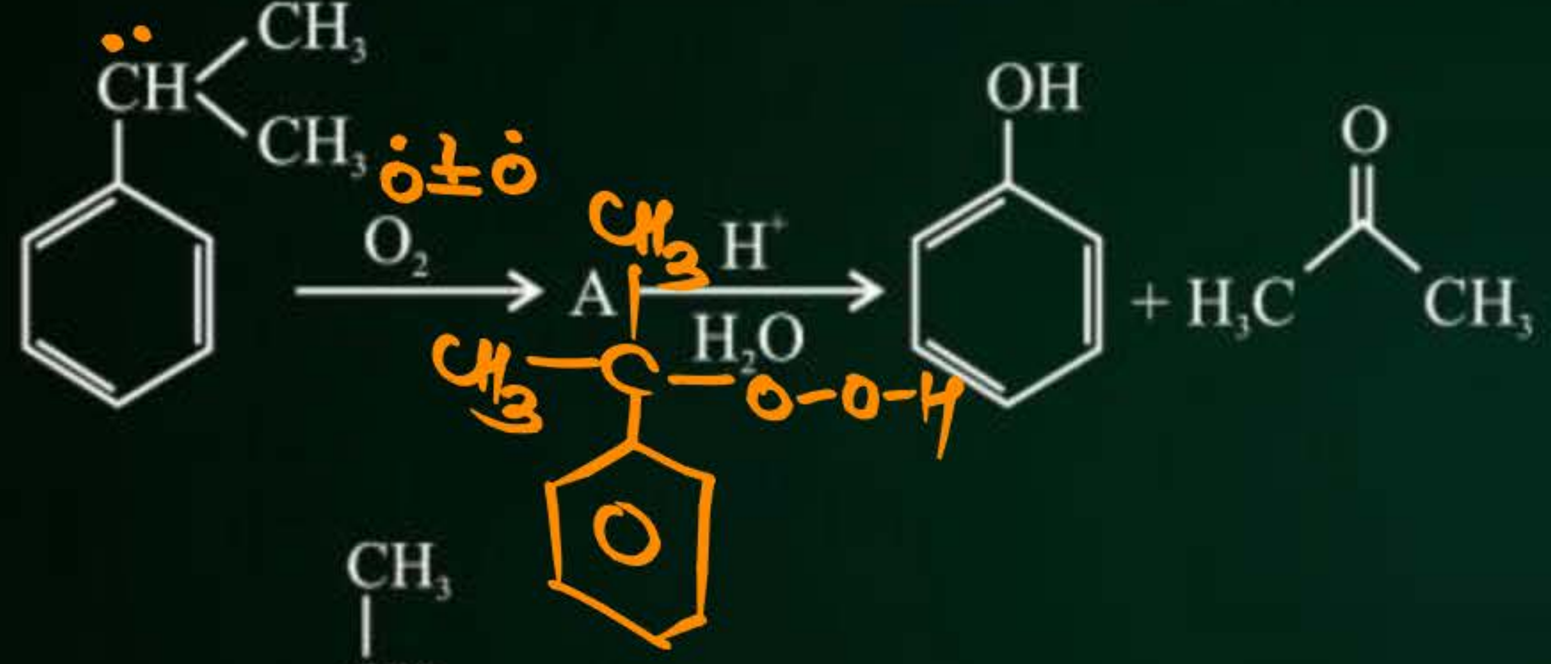
B a carboxylic acid

C an aldehyde

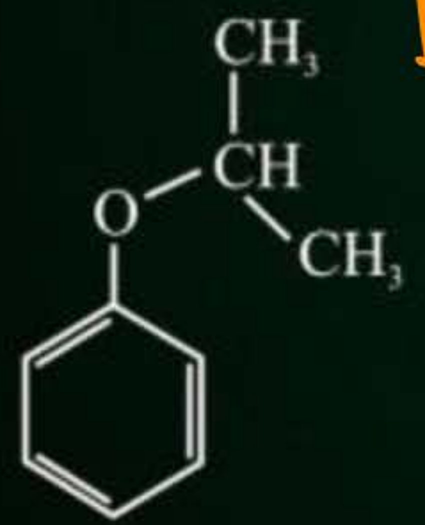
[✓ **D** a ketone]

QUESTION (NEET 2019)

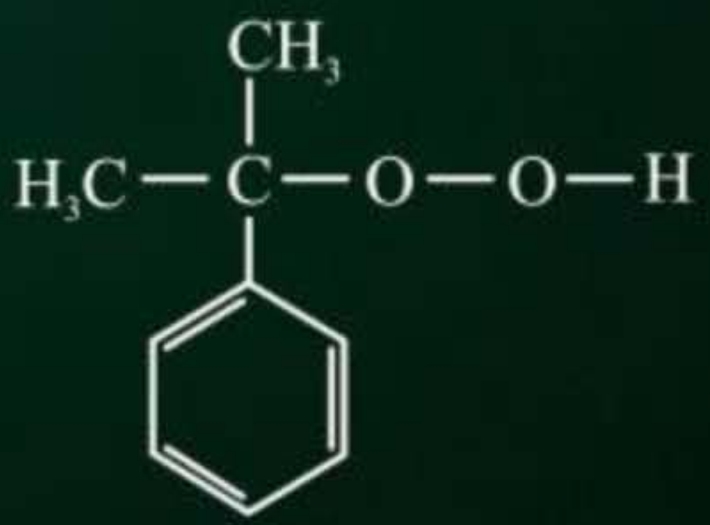
The structure of intermediate A in the following reaction is:


CH
CH$_3$
CH$_3$
O$_2$
A
H$^+$
H$_2$O
OH
O
H$_3$C
CH$_3$
O = O
CH$_3$
CH$_3$ — C — O-O-H

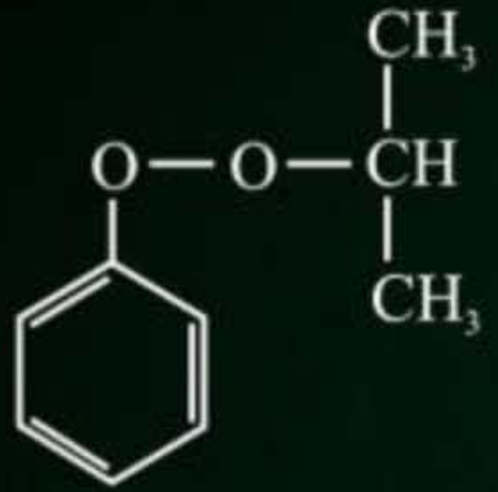
A



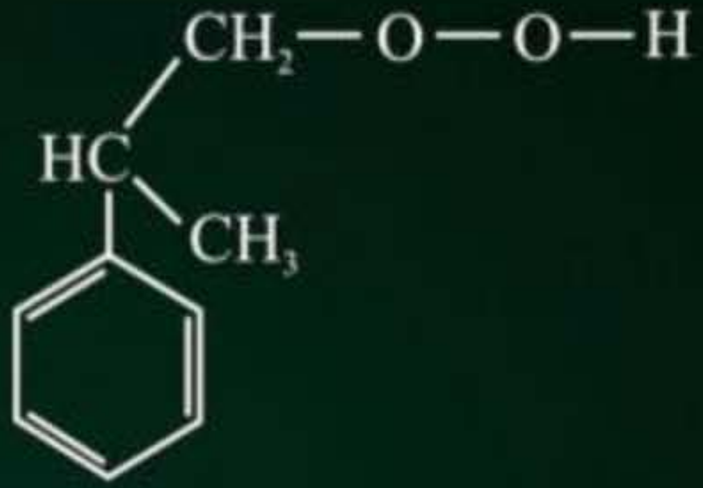
[✓ **B**]


CH$_3$
H$_3$C — C — O — O — H

C

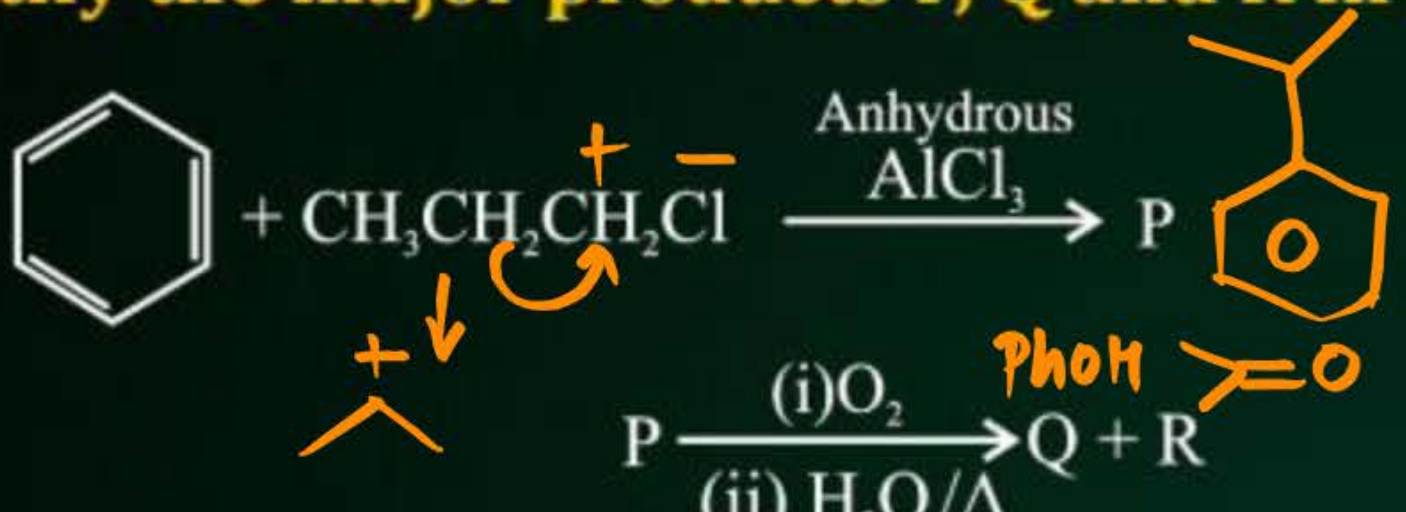

CH3
O—O—CH
CH3

D


CH2—O—O—H
HC
CH3

QUESTION (NEET 2018)

Identify the major products P, Q and R in the following sequence of reactions:

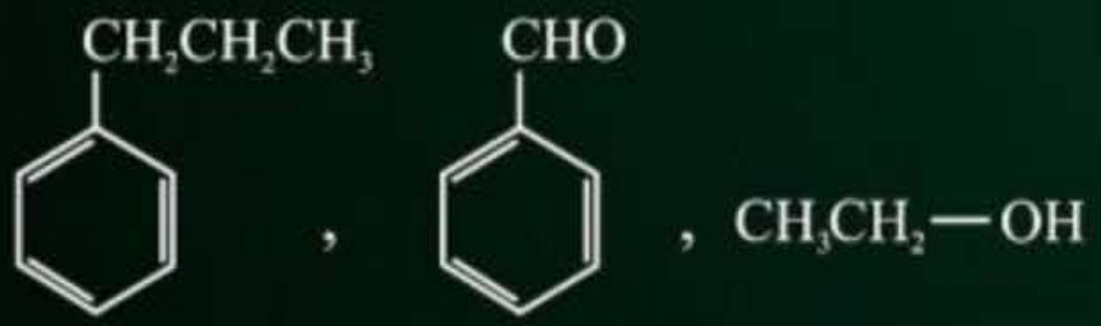


$$+ CH_3CH_2CH_2Cl \xrightarrow[AlCl_3]{Anhydrous} P$$

$$P \xrightarrow[(ii)\ H_3O/\Delta]{(i) O_2} Q + R$$

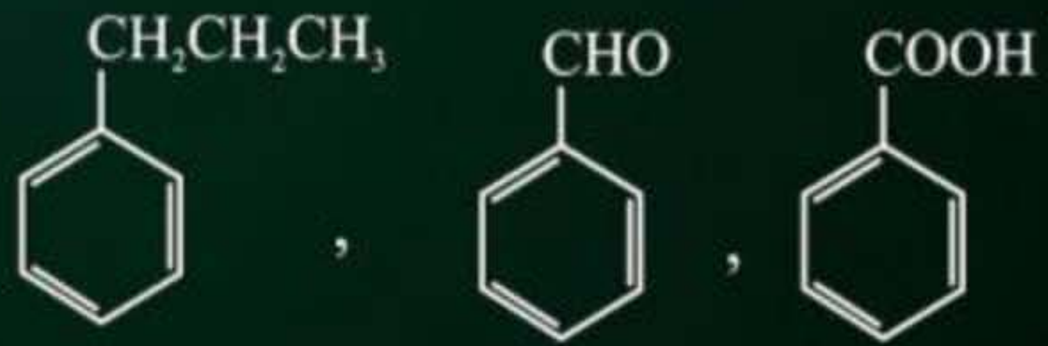
P Q R

A



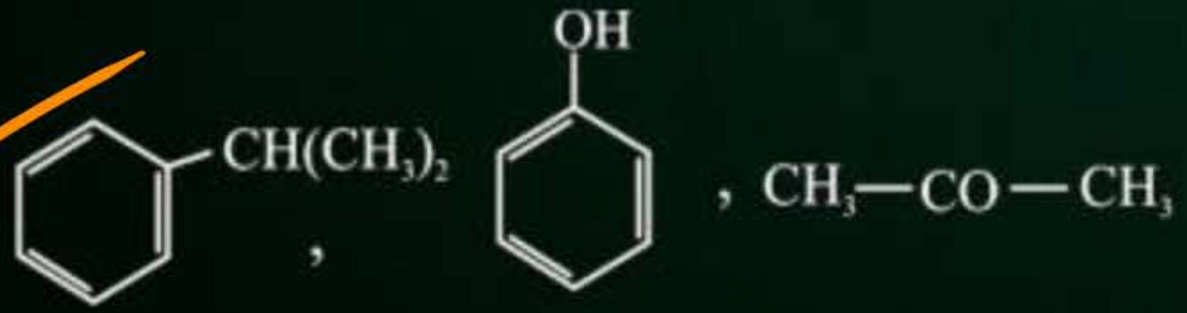
CH₂CH₂CH₃
CHO
CH₃CH₂—OH

B



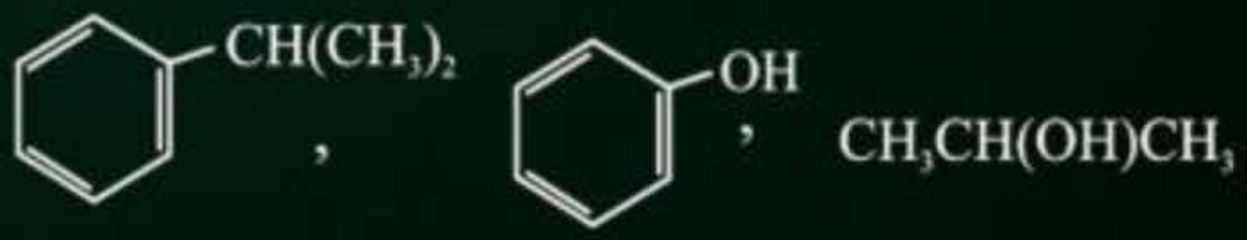
CH₂CH₂CH₃
CHO
COOH

C



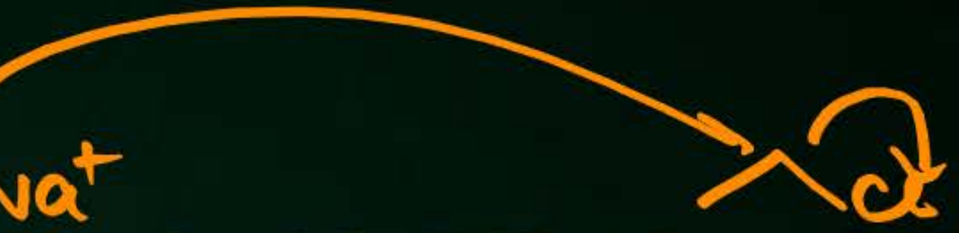
CH(CH₃)₂
OH
CH₃—CO—CH₃

D



CH(CH₃)₂
OH
CH₃CH(OH)CH₃

QUESTION (NEET 2018)



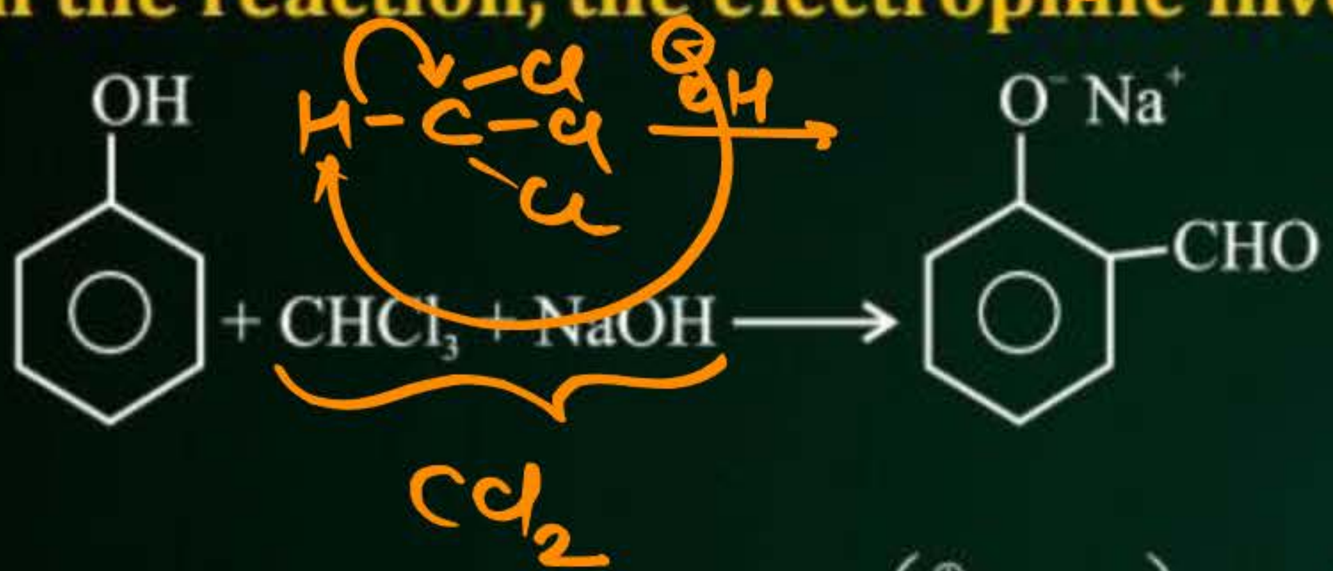
The compound A on treatment with Na gives B, and with PCl_5 gives C. B and C react together to give diethyl ether. A, B and C are in the order:

- **A** $C_2H_5OH, C_2H_6, C_2H_5Cl$
- **B** $\overset{A}{C_2H_5OH}, \overset{C}{C_2H_5Cl}, \underbrace{\overset{B}{C_2H_5ONa}}$
- [✓ **C**] $C_2H_5OH, C_2H_5ONa, C_2H_5Cl$
- **D** $C_2H_5Cl, C_2H_6, C_2H_5OH$

QUESTION (NEET 2018)

$\overset{\ominus}{C}Cl_3 \longrightarrow \overset{\boxed{\times\times}}{\square C}Cl_2$

In the reaction, the electrophile involved is:


OH
H−C−Cl
OH⊖
+ CHCl3 + NaOH
CCl2
O⁻ Na⁺
CHO

A Dichloromethyl cation $(\overset{\oplus}{C}HCl_2)$

B Formyl cation $(\overset{\oplus}{C}HO)$

[✓ **C**] Dichlorocarbene $(:CCl_2)$

D Dichloromethyl anion $(\overset{\oplus}{C}HCl_2)$

QUESTION (2017-Delhi)

The heating of phenyl-methyl ethers with HI produces.

$$\mathrm{Ph{-}\underset{H}{O}{-}\underset{I}{CH_3}}$$

$$\Big\downarrow \mathrm{HI}$$

$$\mathrm{PhOH + CH_3I}$$

A Benzene

B Ethyl chlorides

C Iodobenzene

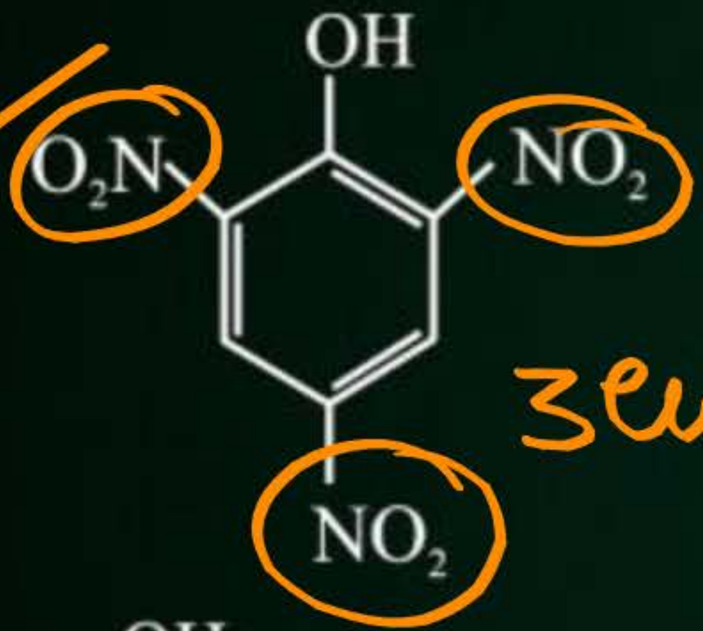
[✓ **D**] Phenol

QUESTION (2017-Delhi)

A > D > C > B

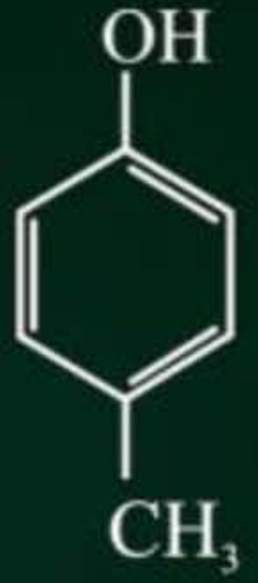
Which one is the most acidic compound?

(A) ✓

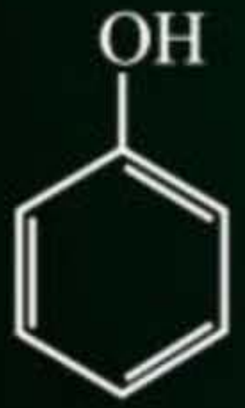


3ewg o/p

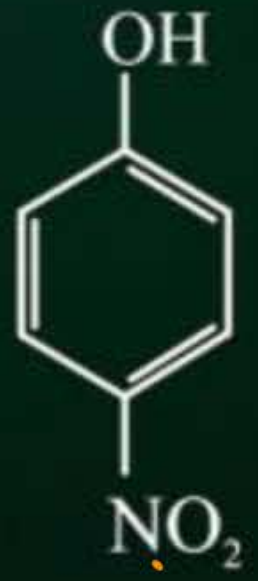
(B)



(C)

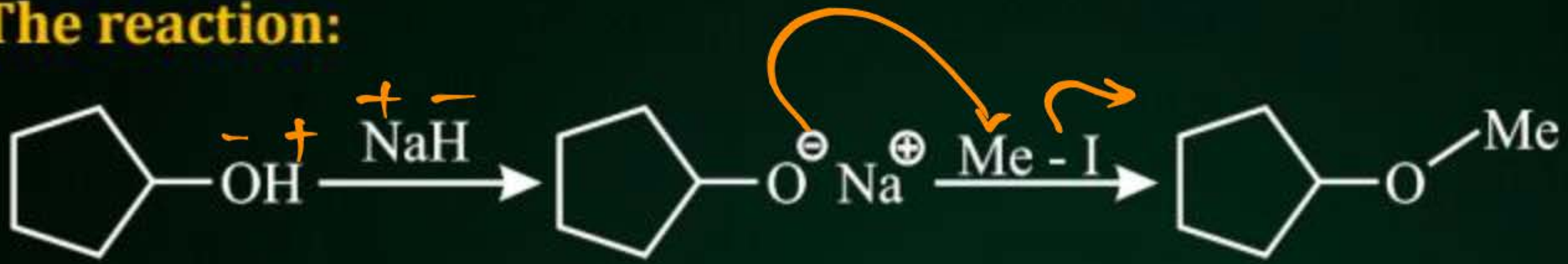


(D)



QUESTION (2016 - I)

The reaction:



can be classified as?

A Williamson alcohol synthesis reaction

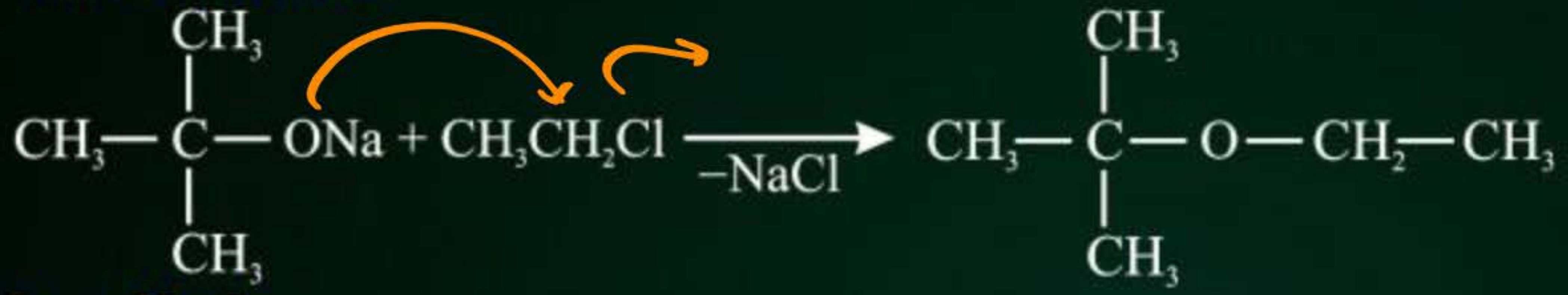
[✓ B] Williamson ether synthesis reaction

C Alcohol formation reaction

D Dehydration reaction

QUESTION (NEET 2015)

The reaction



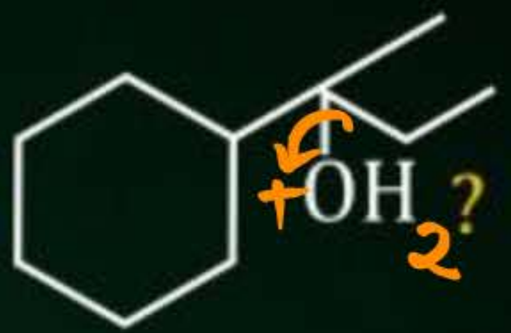
$$CH_3-\underset{CH_3}{\overset{CH_3}{C}}-ONa + CH_3CH_2Cl \xrightarrow[-NaCl]{} CH_3-\underset{CH_3}{\overset{CH_3}{C}}-O-CH_2-CH_3$$

is called:

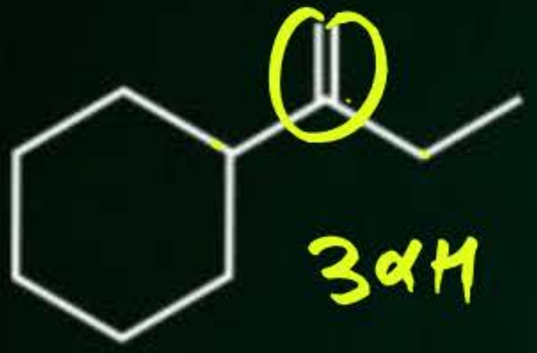
- (A) Williamson continuous esterification process
- (B) Etard reaction
- (C) Gatterman - Koch reaction
- (D) Williamson synthesis

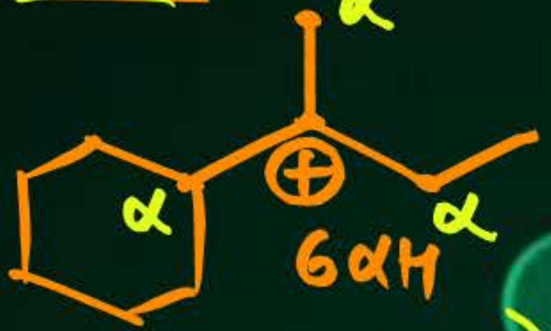
QUESTION (NEET 2015)

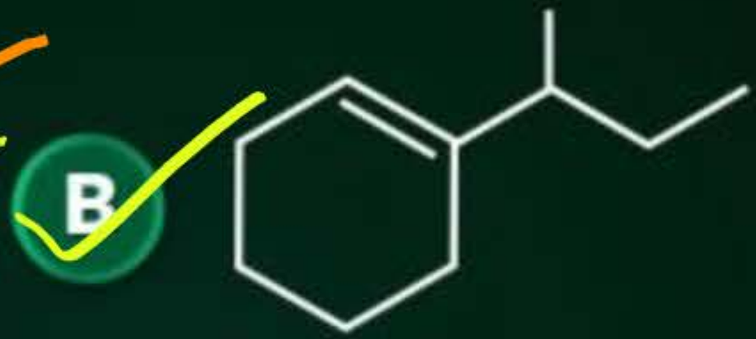
Which of the following is not the product of dehydration of

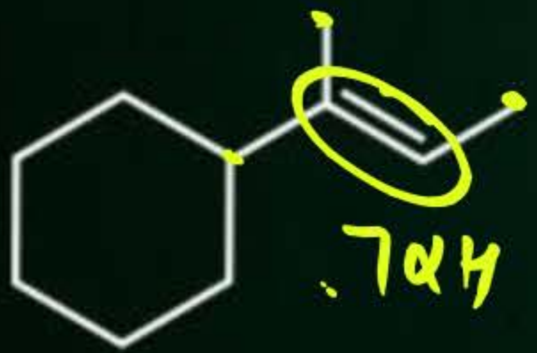


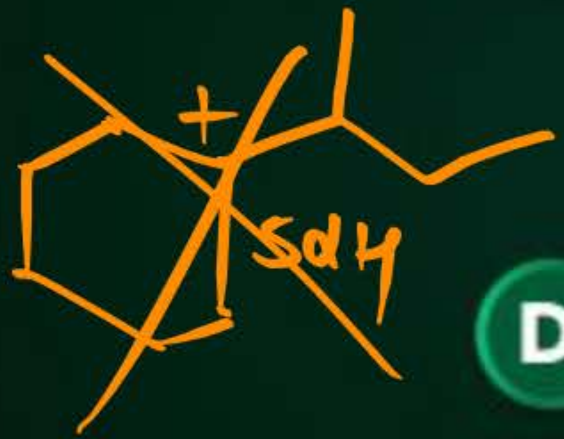
?

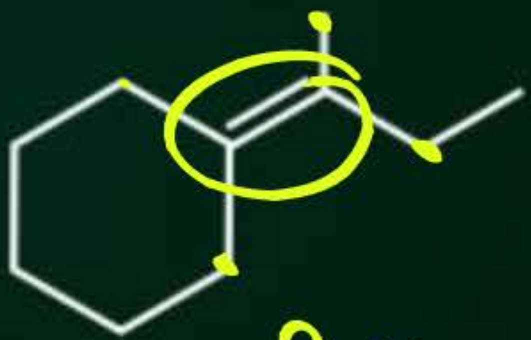
A 



B 

C 



D 

Major 9αH

QUESTION (NEET 2015 Re)

Reaction of phenol with chloroform in presence of dilute sodium hydroxide finally introduces which one of the following functional group?

RTR

[✓ A] $-\text{CHO}$

B $-\text{CH}_2\text{Cl}$

C $-\text{COOH}$

D $-\text{CHCl}_2$

QUESTION (NEET 2014)

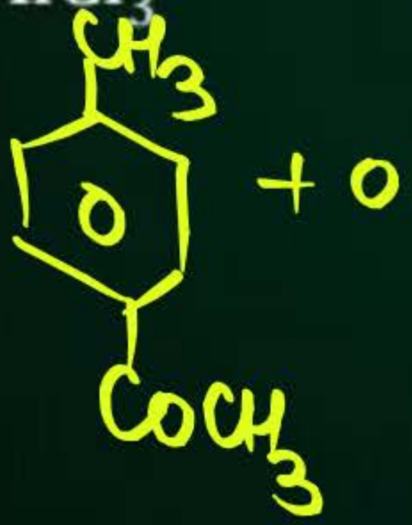
Among the following sets of reactants which one produces anisole?

$\rightarrow Ph\overset{-}{O}\overset{+}{Na} + H_2O$

(A) ✓ C_6H_5OH; NaOH; CH_3I

(B) C_6H_5OH; neutral $FeCl_3$ $[Fe(OPh)_6]^{3-}$

(C) $C_6H_5CH_3$; $CH_3\overset{+}{C}O\overset{-}{Cl}$; $AlCl_3$

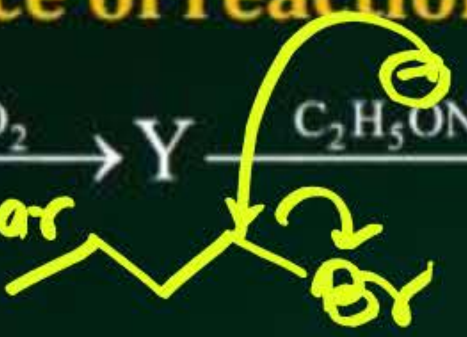


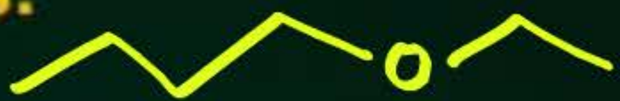
(D) CH_3CHO; $\overset{\delta-}{R}MgX$

QUESTION (NEET 2014)

Identify Z in the sequence of reactions:

$$CH_3CH_2CH=CH_2 \xrightarrow[\text{Antimar}]{\overset{+\ -}{HBr}/H_2O_2} Y \xrightarrow{C_2H_5\overset{\ominus}{O}Na} Z$$





A $(CH_3)_2CH{-}O{-}CH_2CH_3$

B $CH_3(CH_2)_4{-}O{-}CH_3$

C $CH_3CH_2{-}CH(CH_3){-}O{-}CH_2CH_3$

[✓ D] $\underline{CH_3}{-}(CH_2\underline{)_3}{-}O{-}CH_2CH_3$

JEE Mains PYQs

QUESTION (JEE Mains 1st Feb 2024, Evening Shift)

Match List-I with List-II.

	List-I (Reactants)		List-II Products
(A)	Phenol, Zn/Δ (III)	(I)	Salicylaldehyde
(B)	Phenol, $CHCl_3$, NaOH, HCl (I)	(II)	Salicylic acid
(C)	Phenol, CO_2, NaOH, HCl (II)	(III)	Benzene
(D)	Phenol, Conc. HNO_3 (IV)	(IV)	Picric acid

Choose the correct answer from the optins given below.

A (A)-(IV), (B)-(II), (C)-(I), (D)-(III)

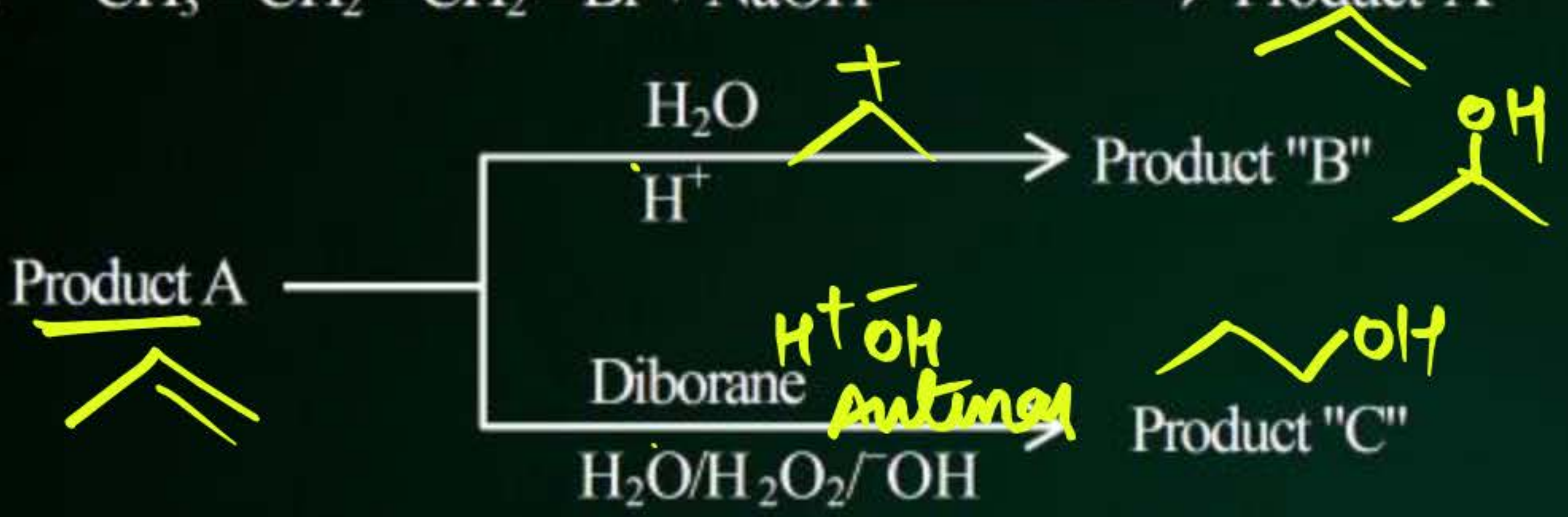
B (A)-(IV), (B)-(I), (C)-(II), (D)-(III)

[✓ **C**] (A)-(III), (B)-(I), (C)-(II), (D)-(IV)

D (A)-(III), (B)-(IV), (C)-(I), (D)-(II)

QUESTION (JEE Mains 4th April 2024, Evening Shift)

$CH_3-CH_2-CH_2-Br + NaOH \xrightarrow{C_2H_5OH} \text{Product 'A'}$



H_2O
H^+
+
Product "B"
OH
Product A
Diborane
$H^+ \bar{O}H$
Antimar
OH
$H_2O/H_2O_2/^-OH$
Product "C"

Consider the above reactions, identify product B and product C.

(A) B = C = 2-Propanol

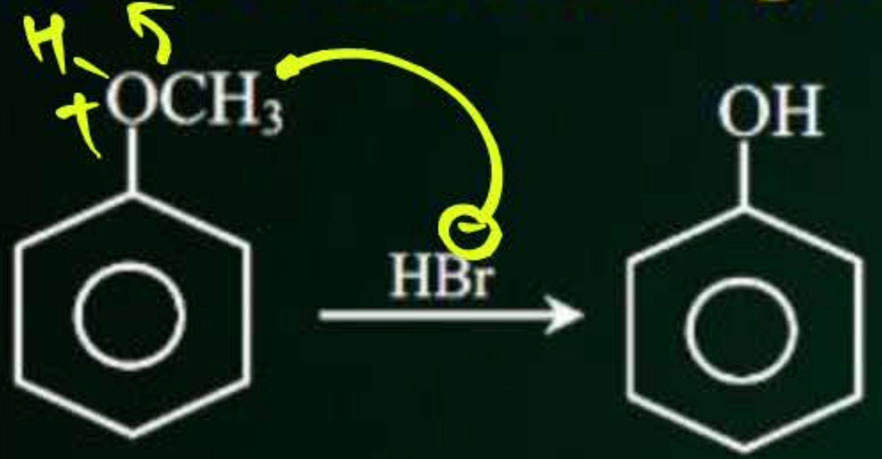
[✓ (B)] B = 2-Propanol, C = 1-Propanol

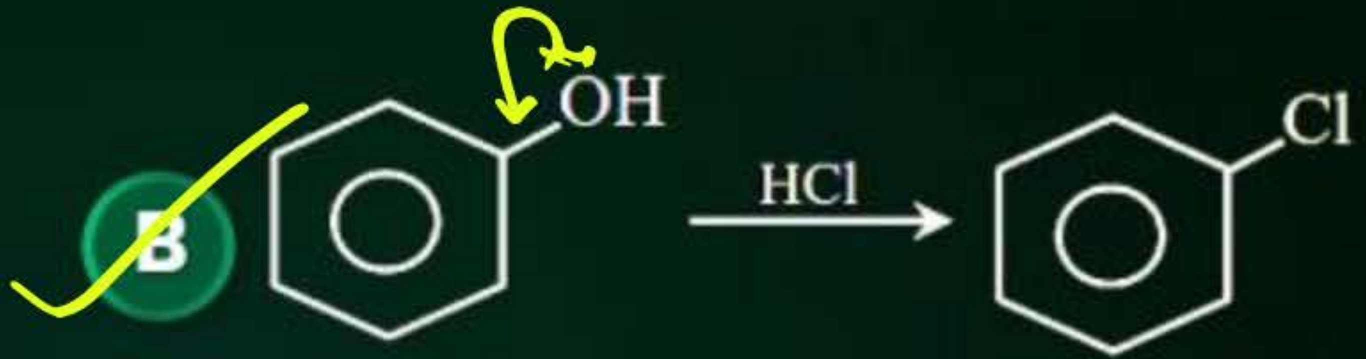
(C) B = 1-Propanol, C = 2-Propanol

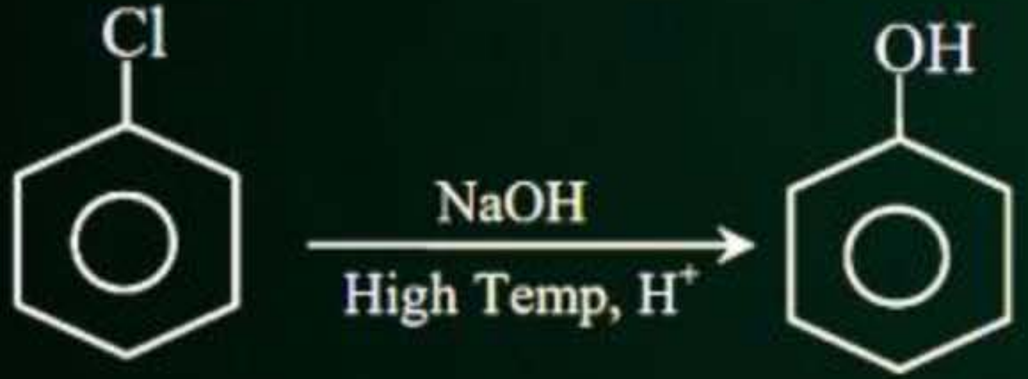
(D) B = C = 1-Propanol

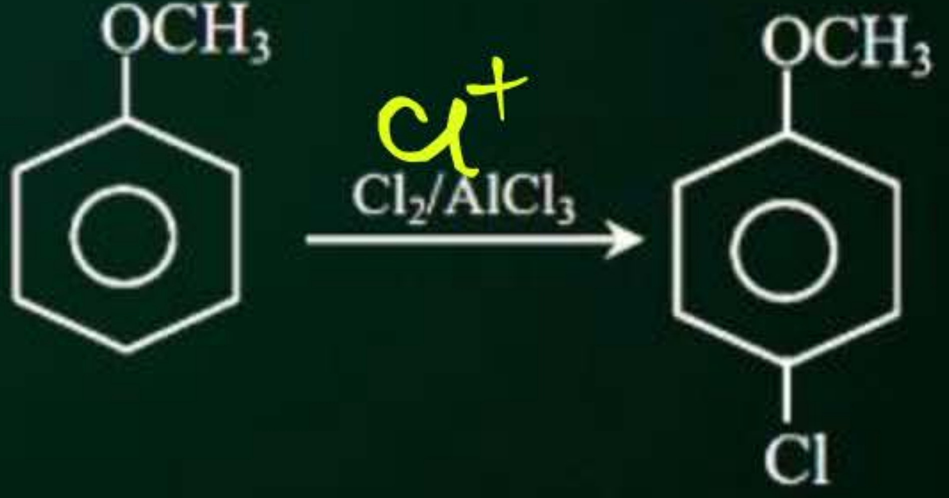
QUESTION (JEE Mains 5th April 2024, Evening Shift)

Which one of the following reactions is NOT possible?

A

H
+
OCH₃
HBr
OH

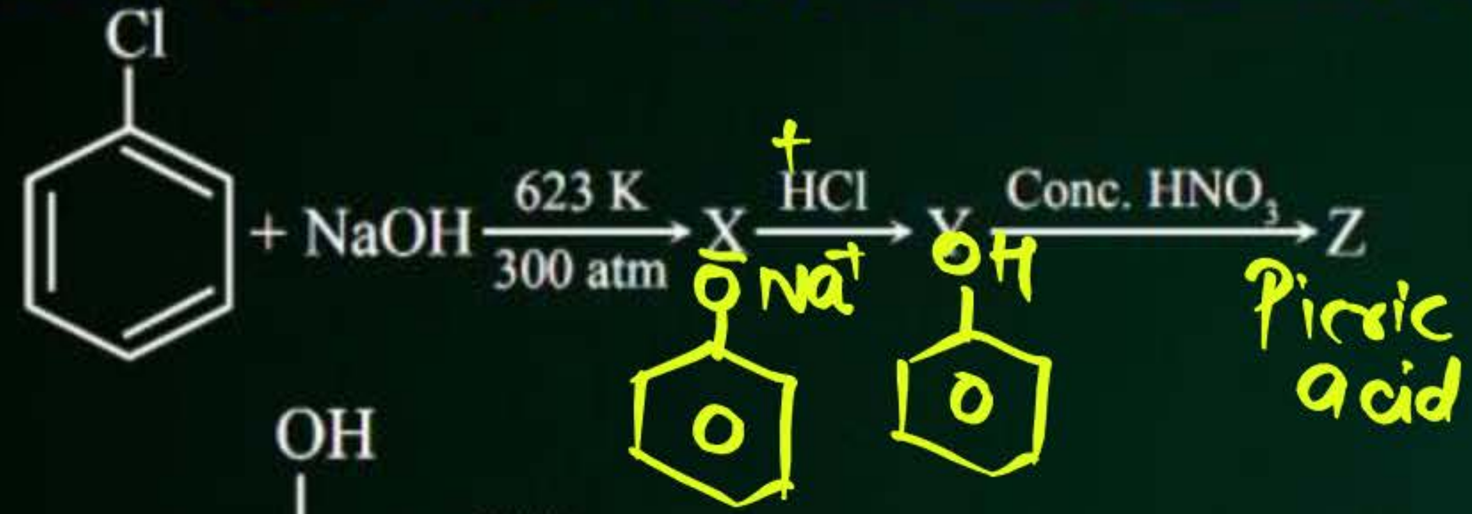
B


C

Cl
NaOH
High Temp, H⁺
OH

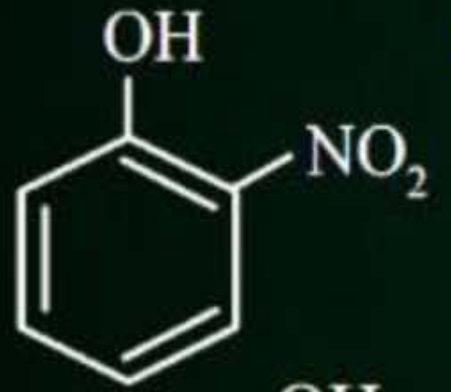
D

OCH₃
Cl⁺
Cl₂/AlCl₃
OCH₃
Cl

QUESTION (JEE Mains 5th April 2024, Morning Shift)

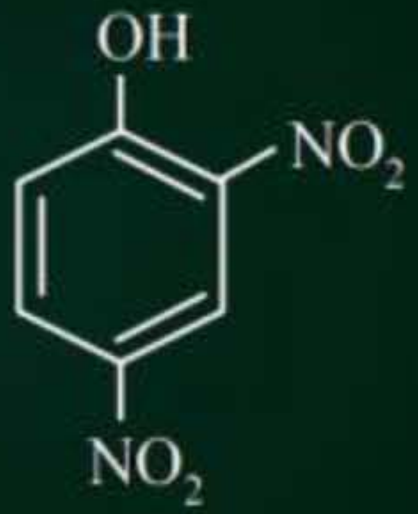
Identify compound (Z) in the following reaction sequence.


Cl
+ NaOH
623 K
300 atm
X
HCl
Y
Conc. HNO$_3$
Z
+
$\bar{O}$Na$^+$
OH
Picric acid

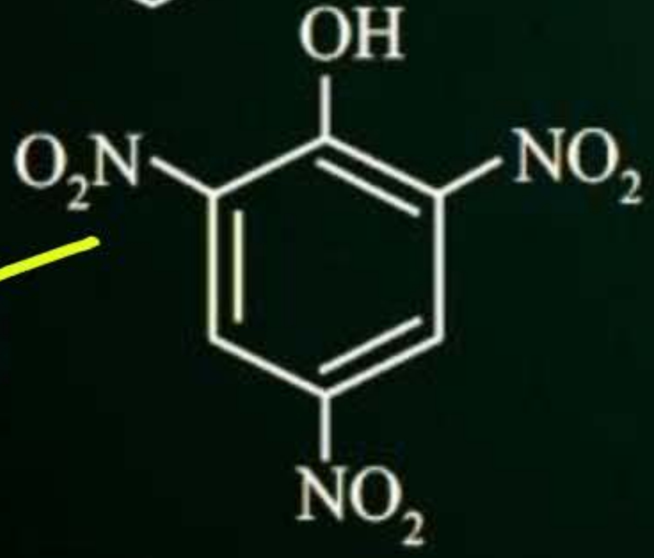
A



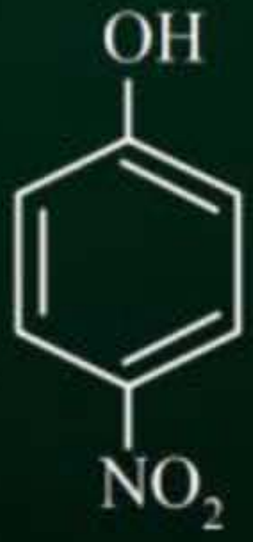
B



C


OH
O$_2$N
NO$_2$
NO$_2$

D



QUESTION (JEE Mains 5th April 2024, Morning Shift)

Given below are two statement: $Ph\ddot{O}H$

$\boxed{+M}$

Statement I: Bromination of phenol in solvent with low polarity such as $CHCl_3$ or CS_2 requires Lewis acid catalyst. ✗

$$Br-Br \xrightarrow{FeBr_3} Br^{\oplus} + FeBr_4^{\ominus}$$

Statement II: The Lewis acid catalyst polarises the bromine to generate Br^+. ✓

In the light of the above statements, choose the correct answer from the options given below:

A Statement I is true but Statement II is false.

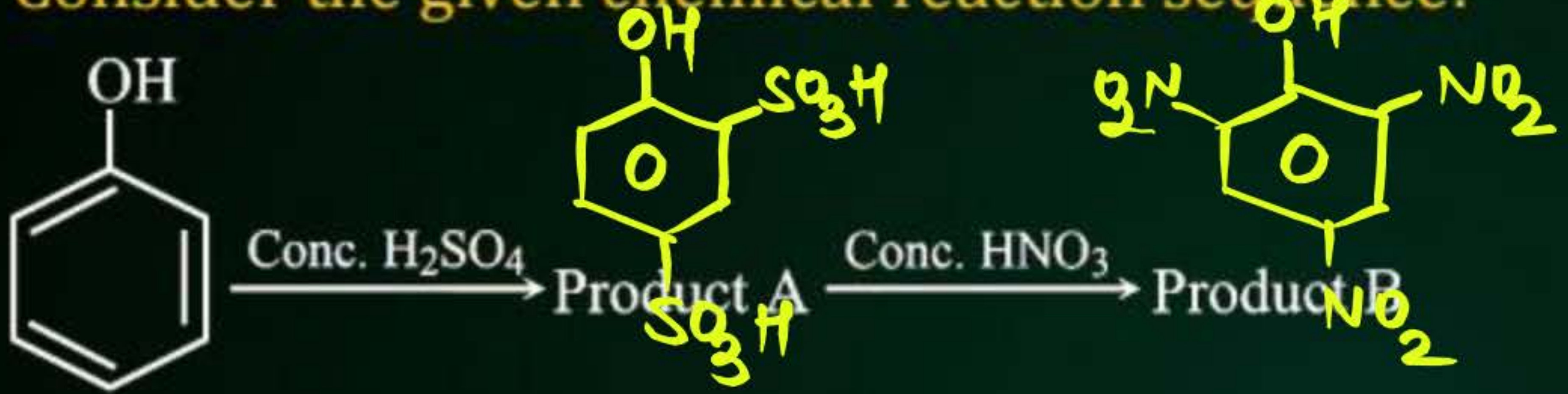
B Both Statement I and Statement II are true

C Both Statement I and Statement II are false.

[✓ **D** Statement I is false but Statement II is true]

QUESTION (JEE Mains 5th April 2024, Morning Shift)

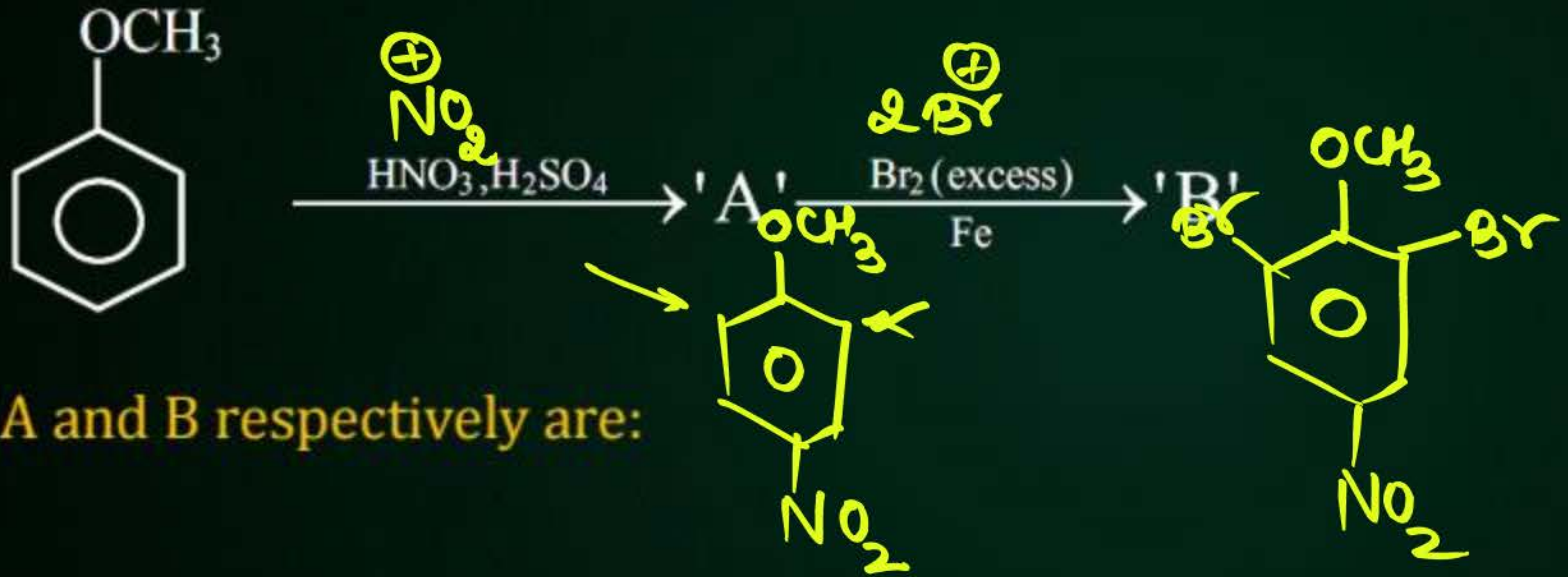
Consider the given chemical reaction sequence:


OH
Conc. H_2SO_4
Product A
Conc. HNO_3
Product B
OH
SO_3H
SO_3H
OH
O_2N
NO_2
NO_2

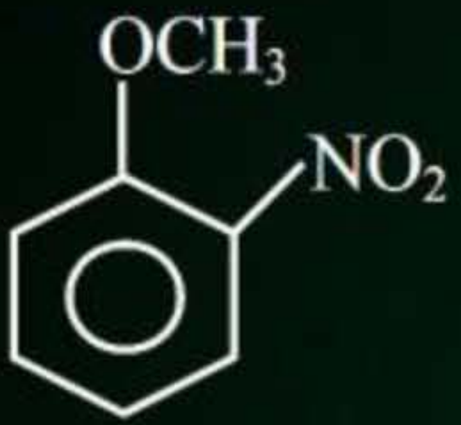
Total sum of oxygen atoms in Product A and Product B are ..14...

QUESTION (JEE Mains 6th April 2024, Evening Shift)

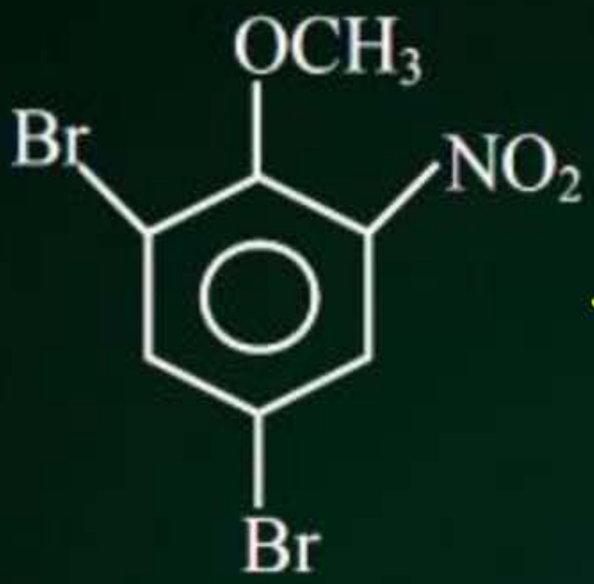
The major products formed:

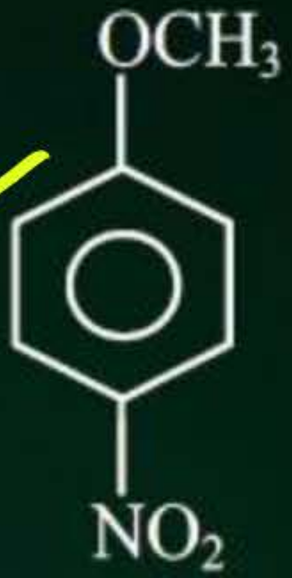

OCH3
⊕
NO2
HNO3,H2SO4
'A'
2 Br⊕
Br2 (excess)
Fe
'B'
OCH3
NO2
OCH3
Br
Br
NO2

A and B respectively are:

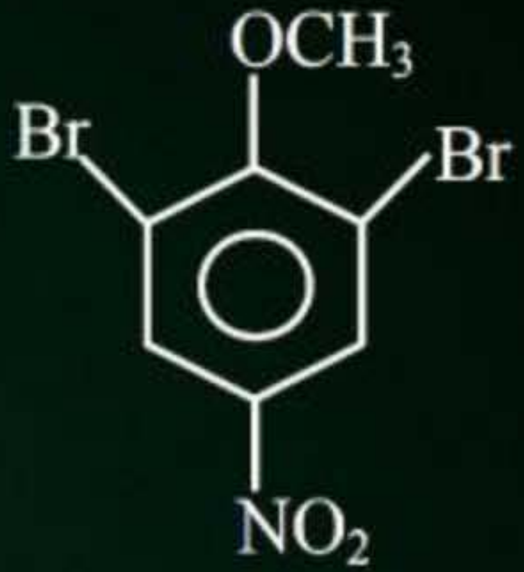
A 

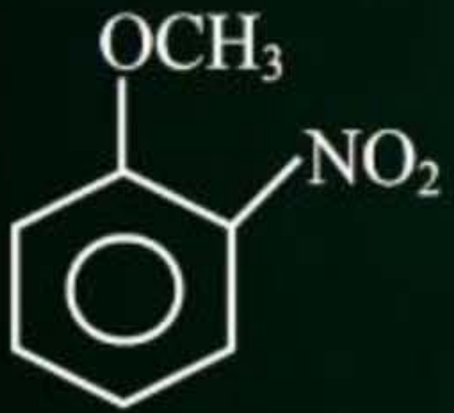
and


OCH$_3$
Br
NO$_2$
Br

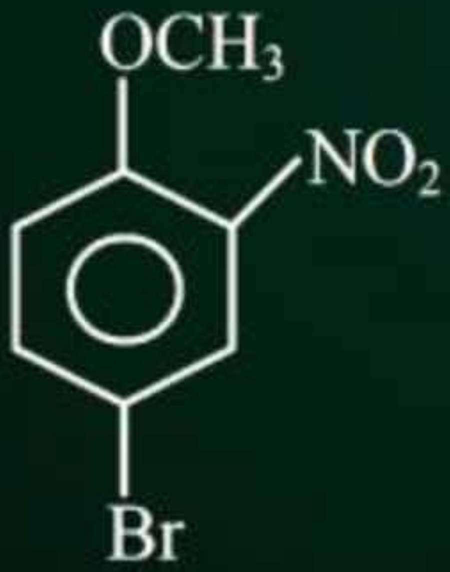
B 

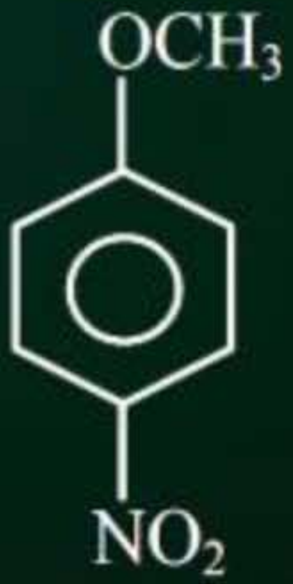
and


OCH$_3$
Br
Br
NO$_2$

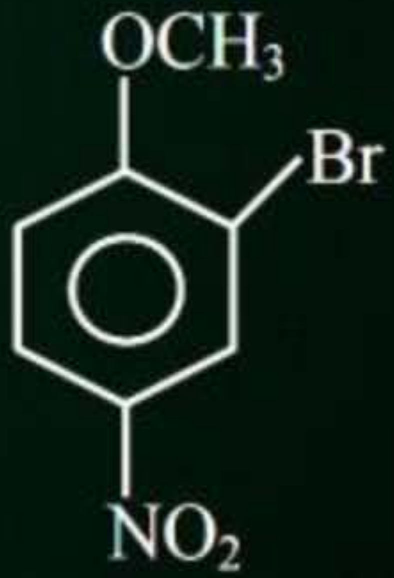
C 

and

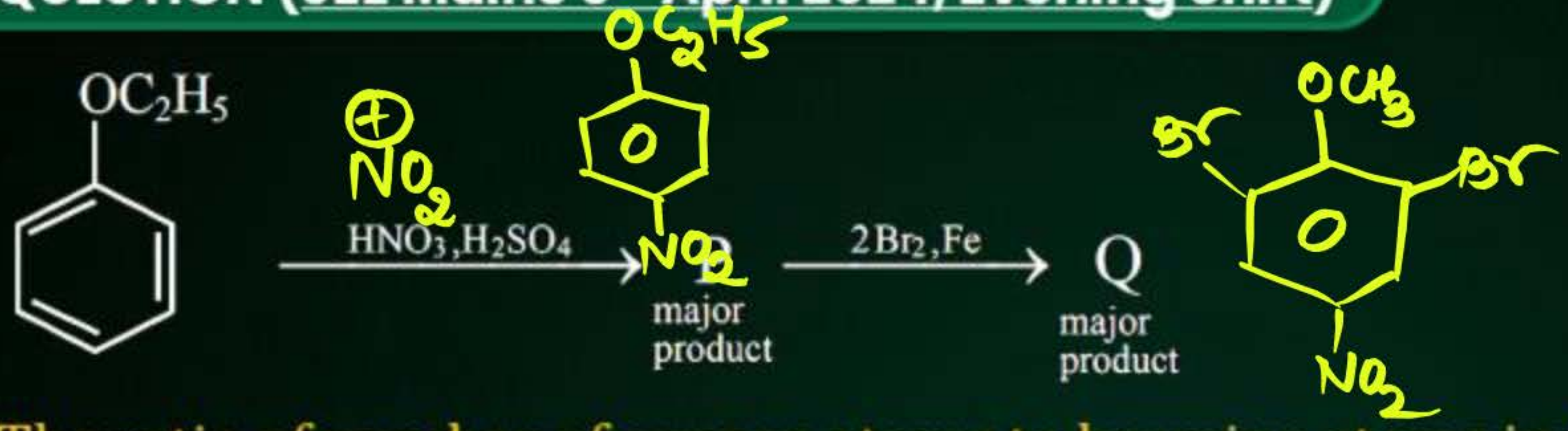


D 

and



QUESTION (JEE Mains 6th April 2024, Evening Shift)


OC_2H_5
$\overset{+}{NO_2}$
HNO_3, H_2SO_4
OC_2H_5
NO_2
P
major product
$2Br_2$, Fe
Q
major product
OCH_3
Br
Br
NO_2

The ratio of number of oxygen atoms to bromine atoms in the product Q is 15 $\times 10^{-1}$

$$\frac{3}{2} = 1.5$$

$$= 15 \times 10^{-1}$$

QUESTION (JEE Mains 6th April 2024, Morning Shift)

Given below are two statements:

Statement I: Picric acid is 2, 4, 6-trinitrotoluene. ✗

good yield

Statement II: Phenol-2, 4-disulphuric acid is treated with conc. HNO_3 to get picric acid.

In the light of the above statement, choose the most appropriate answer from the options given below:

[✓ **A**] Statement I is incorrect but Statement II is correct.

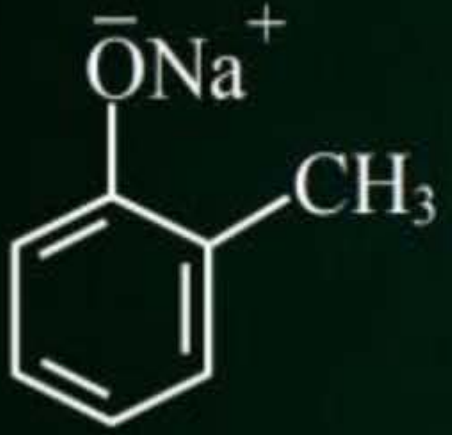
B Both Statement I and Statement II are incorrect.

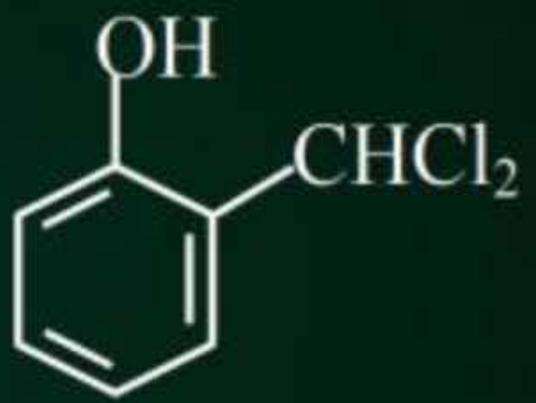
C Statement I is correct but Statement II is incorrect.

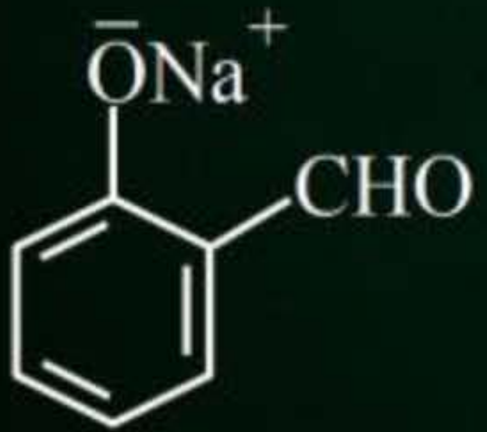
D Both Statement I and Statement II are correct.

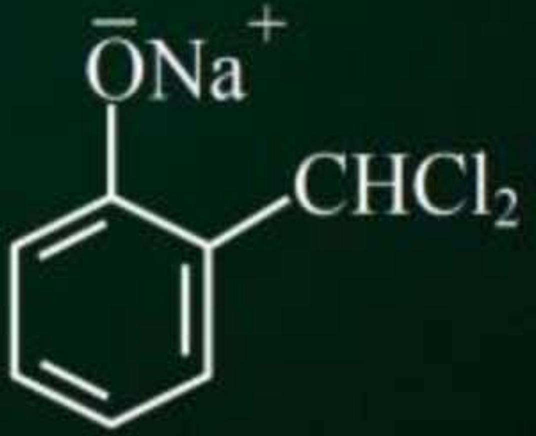
QUESTION (JEE Mains 6th April 2024, Morning Shift)

In Reimer-Tiemann reaction, phenol is converted into salicylaldehyde through an intermediate. The structure of intermediate is _____.

A


B


C


[✓ D]

$\bar{O}Na^+$
$CHCl_2$

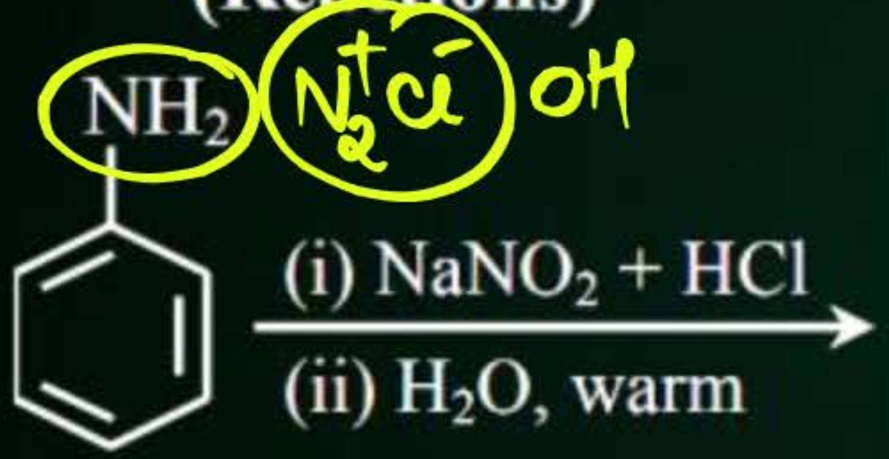
QUESTION (JEE Mains 8th April 2024, Evening Shift)

Match List-I with List-II.

List-I
(Reactions)

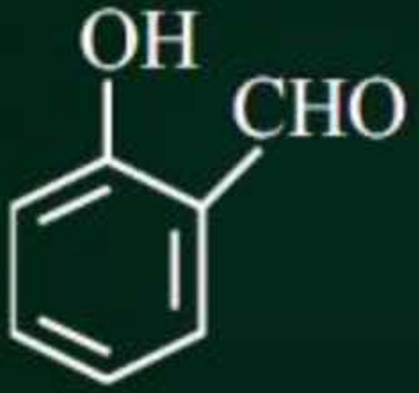
List-II
(Products)

(A)

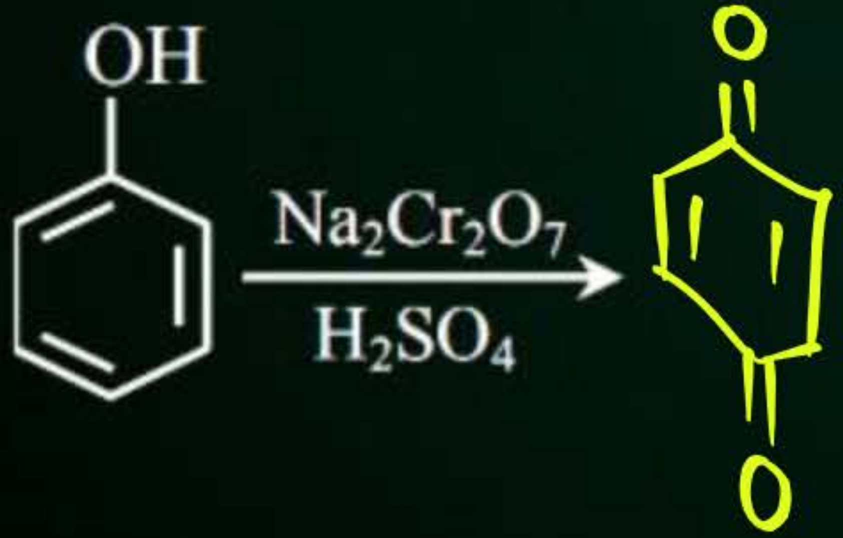


$\xrightarrow[\text{(ii) } H_2O\text{, warm}]{\text{(i) } NaNO_2 + HCl}$

(I)

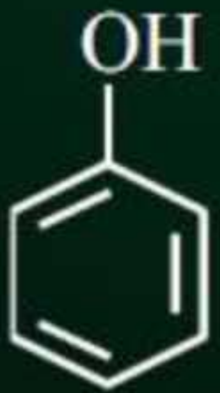


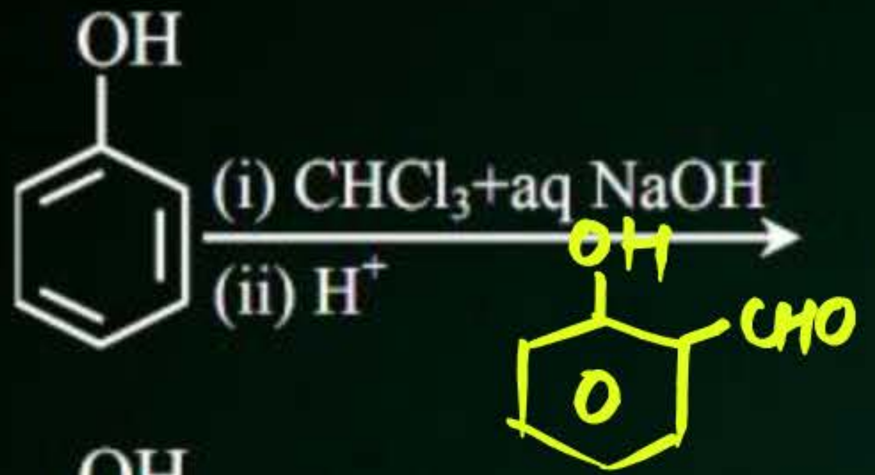
(B)

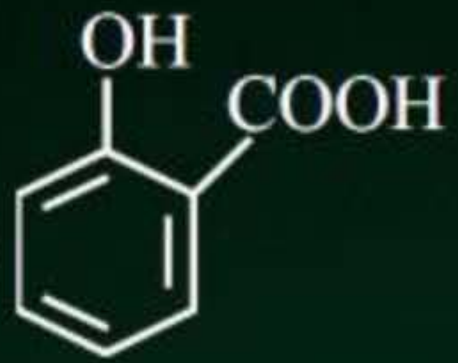


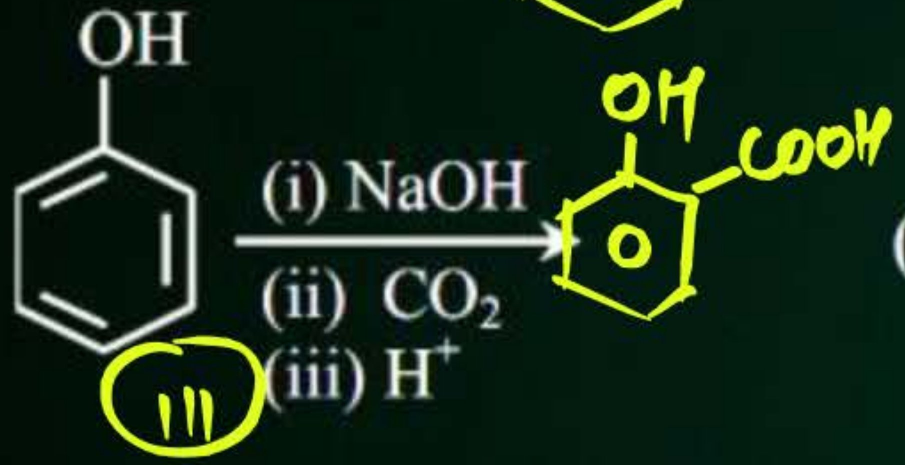
$\xrightarrow[H_2SO_4]{Na_2Cr_2O_7}$

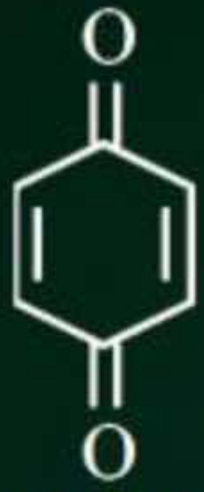
(II)



(C) 
OH
(i) CHCl$_3$+aq NaOH
(ii) H$^+$
OH
CHO
O

(III) 

(D) 
OH
(i) NaOH
(ii) CO$_2$
(iii) H$^+$
OH
COOH
O
III

(IV) 

Choose the **correct** answer from the options given below:

A (A)-(III), (B)-(II), (C)-(I), (D)-(IV)

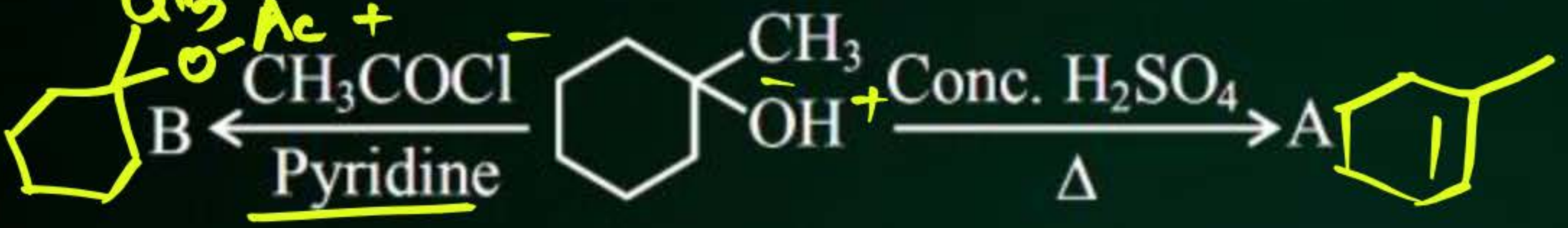
~~B~~ (A)-(IV), (B)-(II), (C)-(III), (D)-(I)

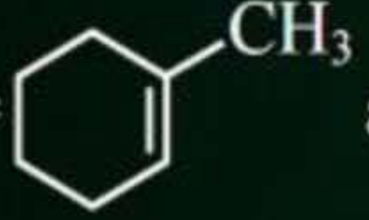
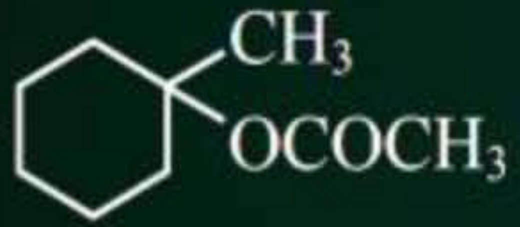
C (A)-(I), (B)-(IV), (C)-(II), (D)-(III)

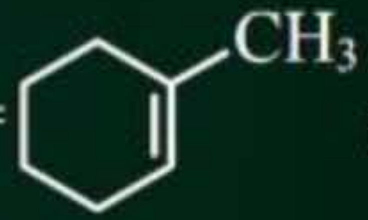
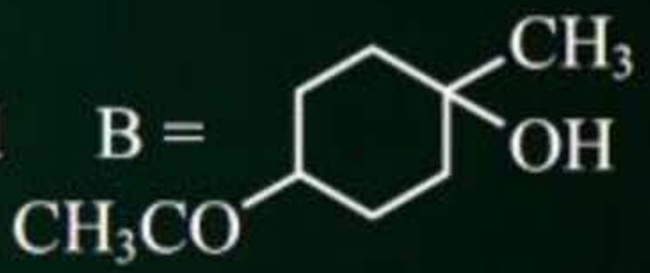
[✓ D] (A)-(II), (B)-(IV), (C)-(I), (D)-(III)

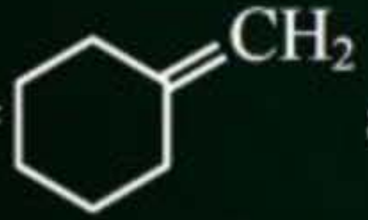
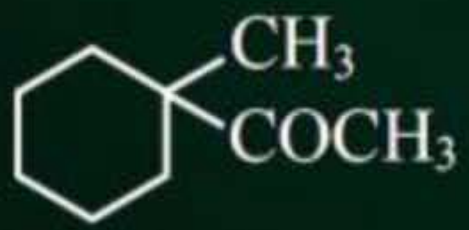
QUESTION (JEE Mains 8th April 2024, Morning Shift)

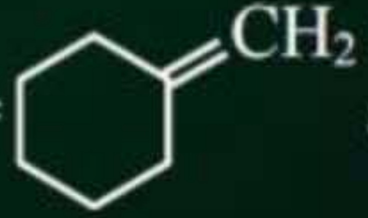
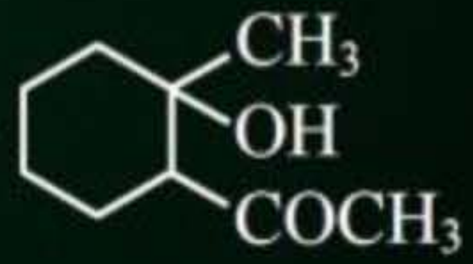
Identify the major products A and B respectively in the following set of reactions.


CH3
O-Ac +
B
CH$_3$COCl
Pyridine
CH$_3$
OH
+
Conc. H$_2$SO$_4$
Δ
A

(A) A=  and B= 
CH$_3$
CH$_3$
OCOCH$_3$

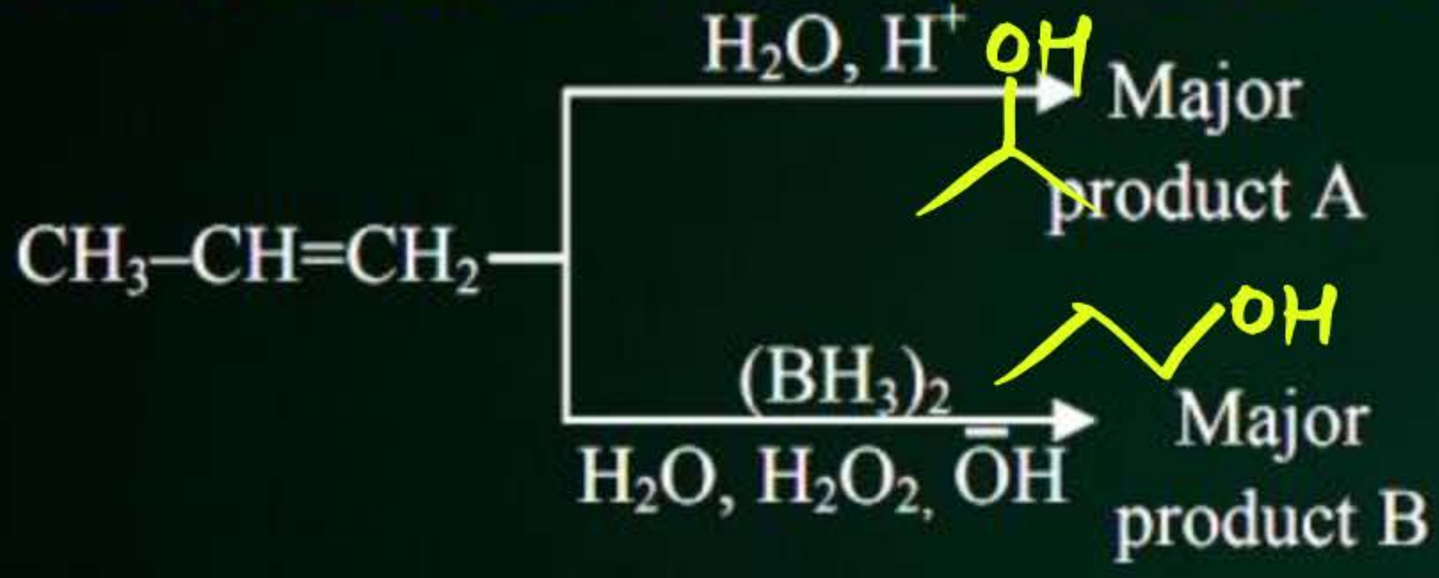
(B) A=  and B = 
CH$_3$
CH$_3$
OH
CH$_3$CO

(C) A=  and B = 
CH$_2$
CH$_3$
COCH$_3$

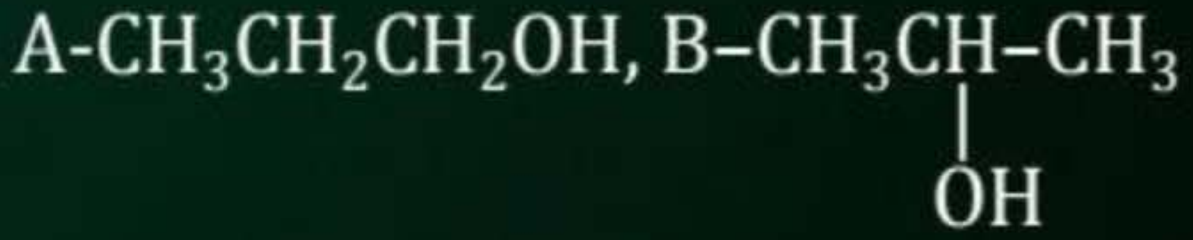
(D) A=  and B = 
CH$_2$
CH$_3$
OH
COCH$_3$

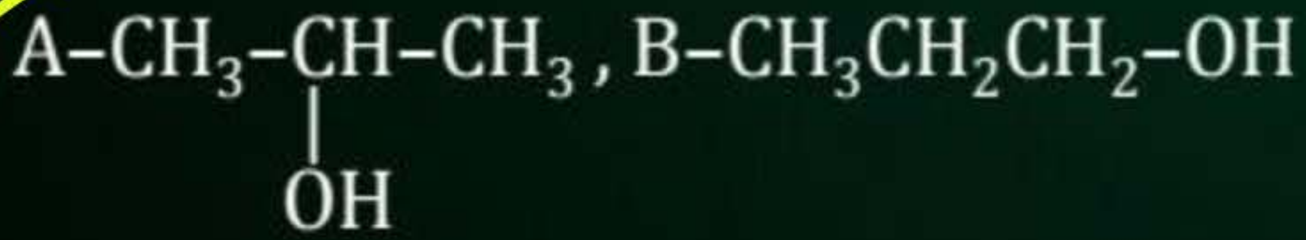
QUESTION (JEE Mains 9th April 2024, Morning Shift)

Identify the product A and product B in the following set of reactions.


$CH_3–CH=CH_2$
H_2O, H^+
OH
Major product A
$(BH_3)_2$
OH
$H_2O, H_2O_2, \bar{O}H$
Major product B

A A-$CH_3CH_2CH_2OH$, B-$CH_3CH_2CH_2OH$

B 
A-$CH_3CH_2CH_2OH$, B–$CH_3\underset{\displaystyle OH}{\underset{|}{C}H}–CH_3$

[✓ **C**] 
A–$CH_3–\underset{\displaystyle OH}{\underset{|}{C}H}–CH_3$, B–$CH_3CH_2CH_2–OH$

D A-$CH_3CH_2CH_3$, B-$CH_3CH_2CH_3$

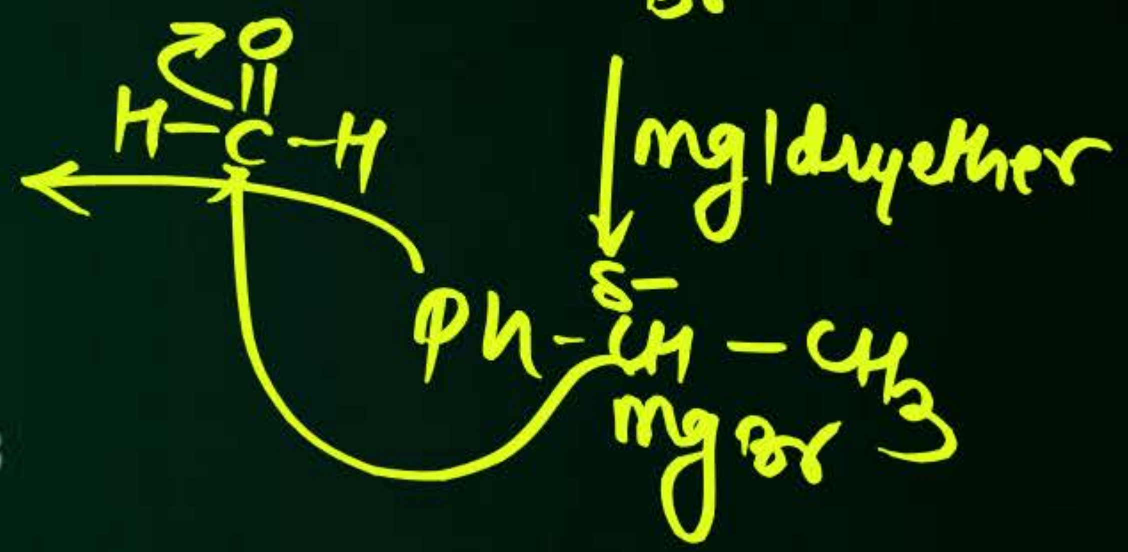
QUESTION (JEE Mains 27th January 2024, Evening Shift)

The final product A, formed in the following reaction sequence is:

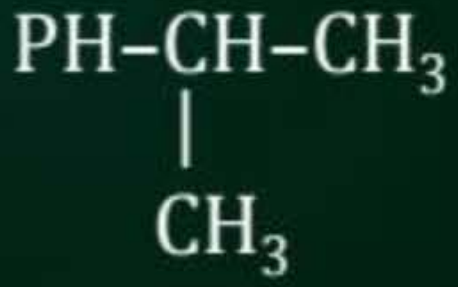
$\text{Ph CH}_2\text{-CH}_2\text{-OH} \longrightarrow \text{Ph-CH}_2\text{-CH}_2\text{-}\overset{+}{\text{O}}\text{H}_2 \longrightarrow \text{Ph-}\overset{+}{\text{C}}\text{H-CH}_3 \longrightarrow \text{Ph-}\underset{\text{Br}}{\text{CH}}\text{-CH}_3$

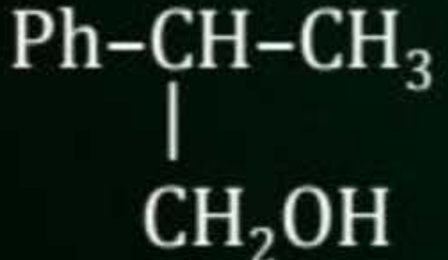
$$\text{Ph–CH=CH}_2 \xrightarrow[\text{(iii) HBr}]{\text{(i) BH}_3 \quad \text{(ii) H}_2\text{O}_2,\ ^{\ominus}\text{OH}} \text{A}$$

(iv) Mg, ether, then $\text{HCHO/H}_3\text{O}^+$



Ⓐ $\text{Ph–CH}_2\text{–CH}_2\text{–CH}_3$

Ⓑ 
$\text{PH–}\underset{\text{CH}_3}{\text{CH}}\text{–CH}_3$

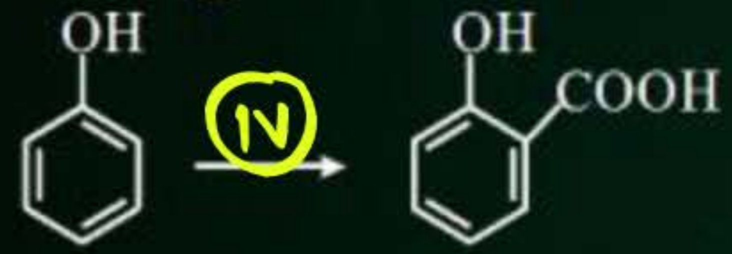
Ⓒ 
$\text{Ph–}\underset{\text{CH}_2\text{OH}}{\text{CH}}\text{–CH}_3$

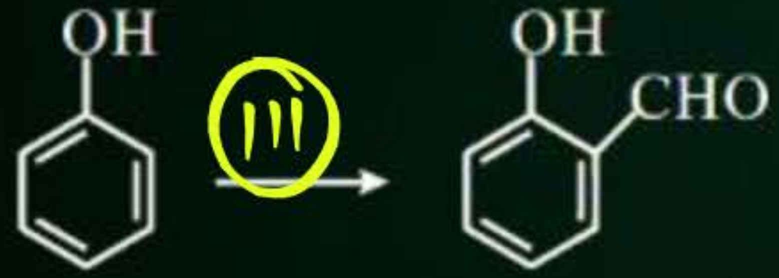
Ⓓ $\text{Ph–CH}_2\text{–CH}_2\text{–CH}_2\text{–OH}$

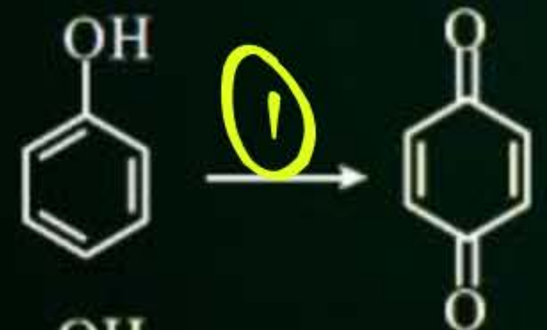
QUESTION (JEE Mains 27th January 2024, Evening Shift)

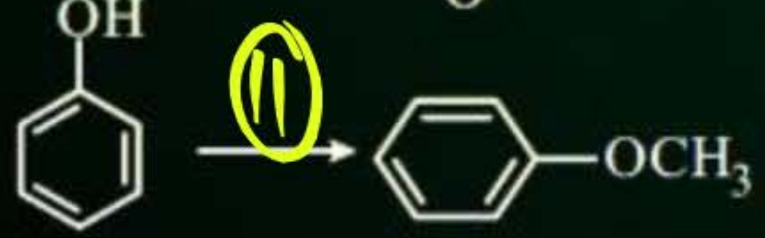
Match List-I with List-II.

List – I
(Reaction)

(A)

OH
IV
OH
COOH

(B)

OH
III
OH
CHO

(C)


(D)


List – II
(Reagent(s))

(I) $Na_2Cr_2O_7, H_2SO_4$

(II) (i) NaOH (ii) CH_3Cl

(III) (i) NaOH, $CHCl_3$ (ii) NaOH (iii) HCl

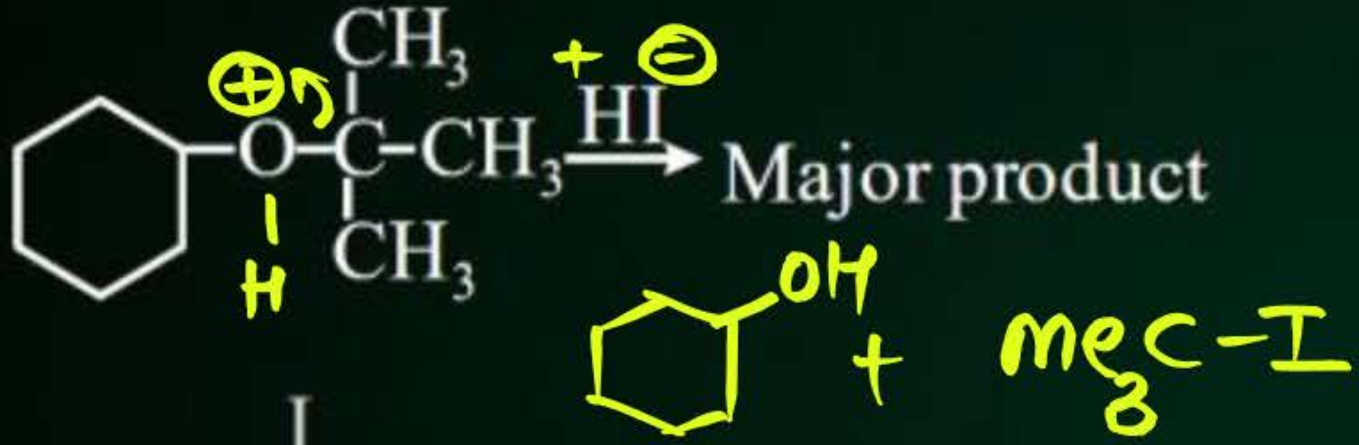
(IV) (i) NaOH (ii) CO_2 (iii) HCl

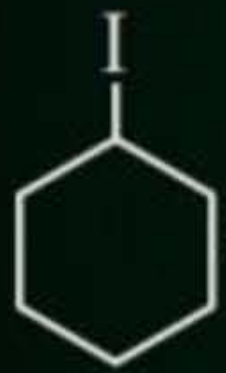
Choose the correct answer from the options given below:

- A (A)-(IV), (B)-(I), (C)-(III), (D)-(II)
- B (A)-(II), (B)-(III), (C)-(I), (D)-(IV)
- C (A)-(II), (B)-(I), (C)-(III), (D)-(IV)
- [✓ D] (A)-(IV), (B)-(III), (C)-(I), (D)-(II)

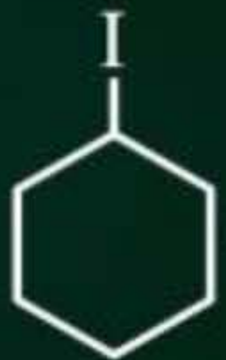
QUESTION (JEE Mains 27th January 2024, Evening Shift)

Major product formed in the following reaction is a mixture of:

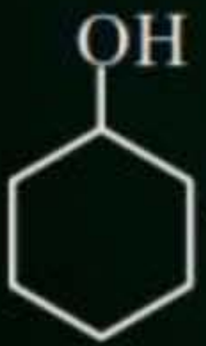

CH$_3$
O
C–CH$_3$
CH$_3$
⊕
H
+ ⊖
HI
Major product
OH
+
Me$_3$C–I

Ⓐ


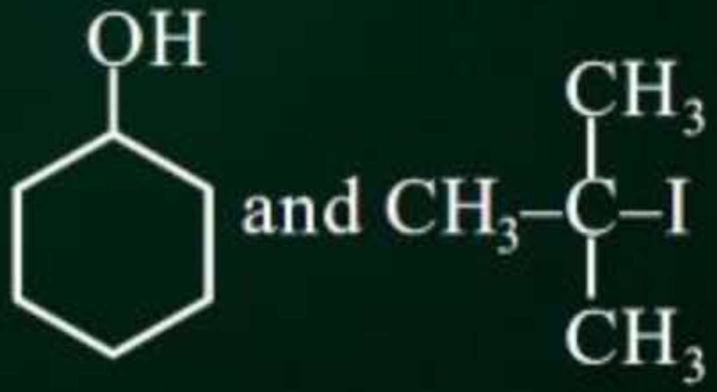
and $(CH_3)_3CI$

Ⓑ


and $(CH_3)_3COH$

Ⓒ


and $(CH_3)_3COH$

✓ Ⓓ


and $CH_3-\underset{CH_3}{\overset{CH_3}{C}}-I$

QUESTION (JEE Mains 27th January 2024, Morning Shift)

P>O>M

Given below are two statements:

Statement (I): p-nitrophenol is more acidic than m-nitrophenol and o-nitrophenol. ✓

Statement (II): Ethanol will give immediate turbidity with Lucas ✗ reagent.

In the light of the above statements, choose the correct answer from the options given below:

- (A) Statement I is true but Statement II is false. ✓
- (B) Both Statement I and Statement II are true.
- (C) Both Statement I and Statement II are false.
- (D) Statement I is false but Statement II is true.

QUESTION (JEE Mains 29th January 2024, Evening Shift)

Phenol treated with chloroform in presence of sodium hydroxide which further hydrolyzed in presence of an acid results

A Salicyclic acid

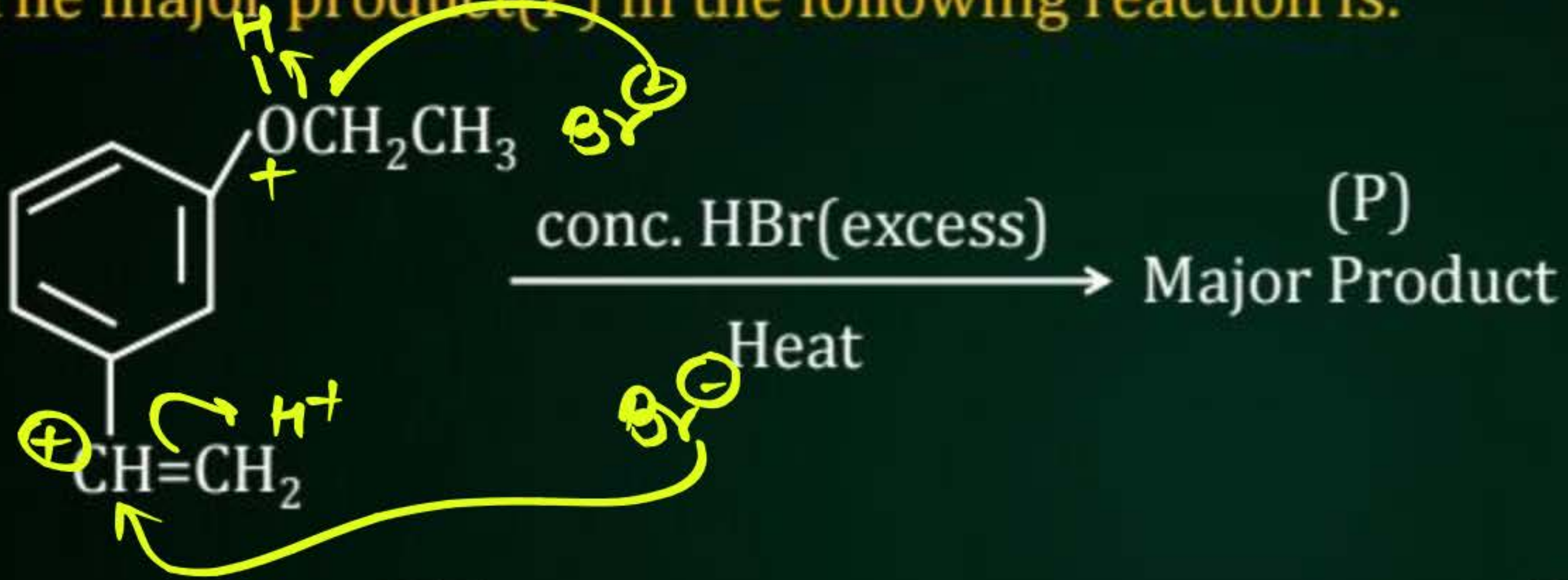
B Benzene-1, 2-diol

C Benzene-1, 3-diol

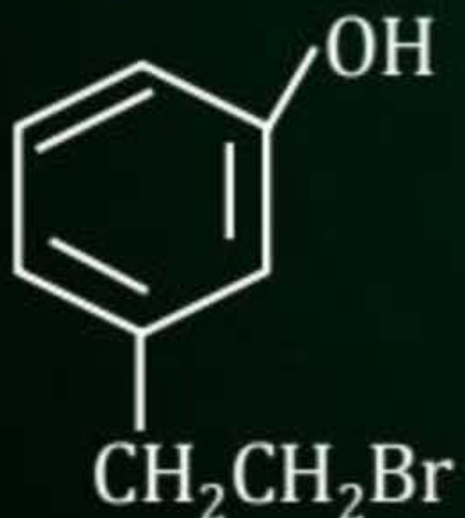
[✓ D 2-Hydroxybenzaldehyde]

QUESTION (JEE Mains 29th January 2024, Morning Shift)

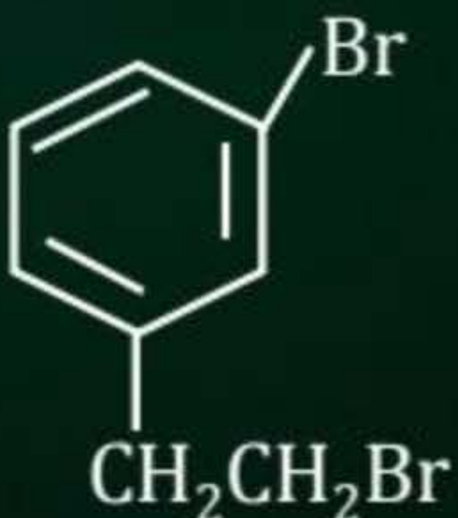
The major product(P) in the following reaction is:


H
OCH_2CH_3
+
Br⊖
conc. HBr(excess)
Heat
(P)
Major Product
⊕
H+
$CH=CH_2$
Br⊖

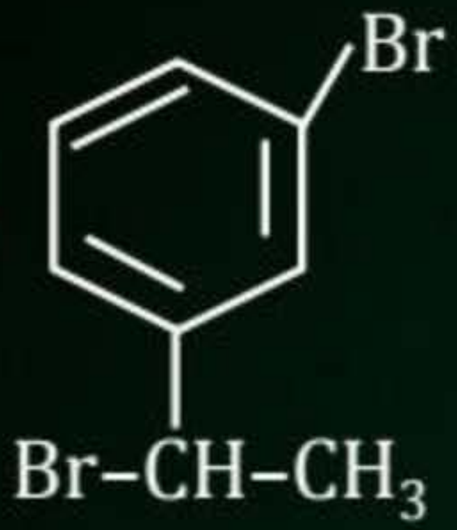
A


OH
CH_2CH_2Br

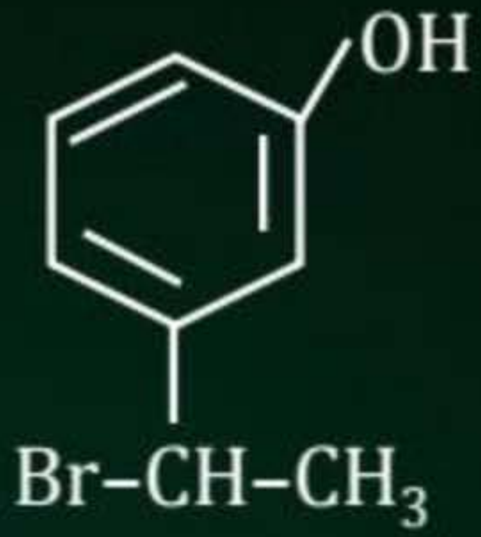
B


Br
CH_2CH_2Br

C



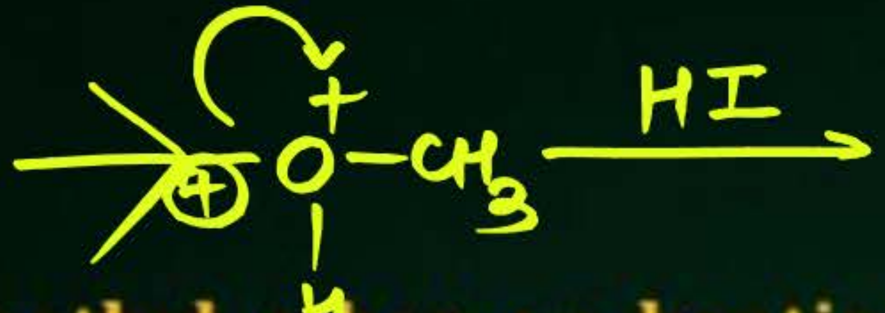
[✓ D]



Home Work

Discussion of L-08

QUESTION 01



Tertiary butyl methyl ether on heating with HI of one molar concentration gives:

[✓ A] $CH_3OH + (CH_3)_3C{-}I$

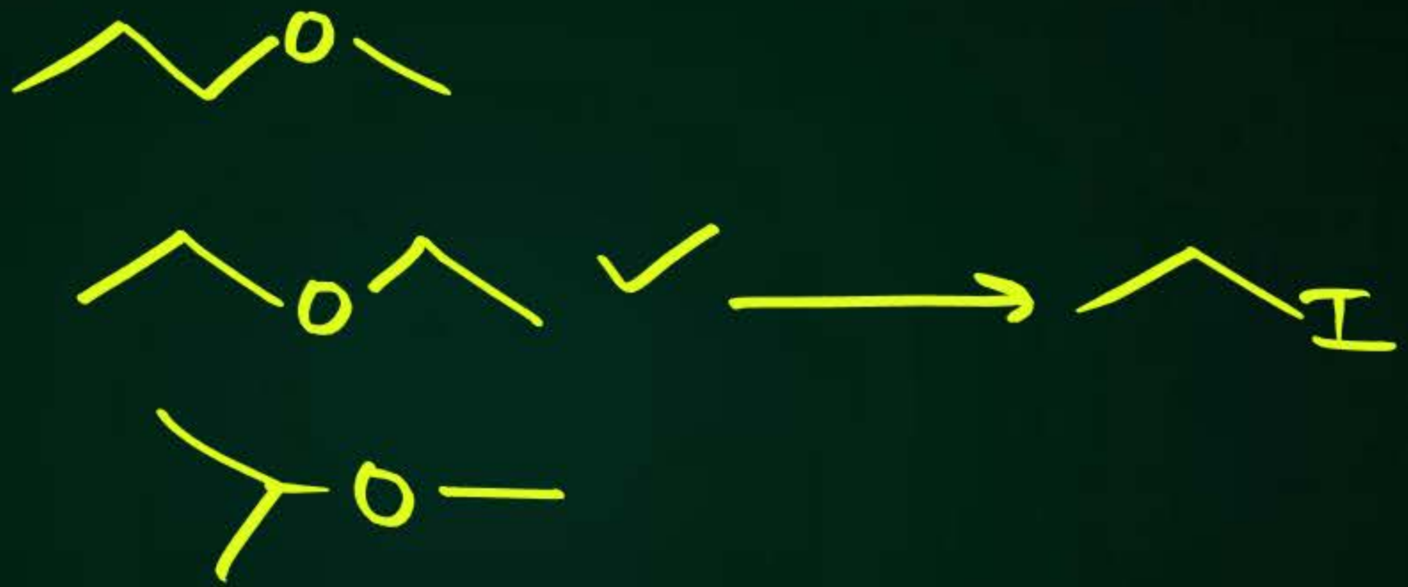
B $CH_3I + (CH_3)_3C{-}OH$

C $CH_3I + (CH_3)_3C{-}Cl$

D None of the above

QUESTION 02

An organic compound of molecular formula $C_4H_{10}O$ does not react with sodium. With excess of HI, it gives only one type of alkyl iodide. The compound is:



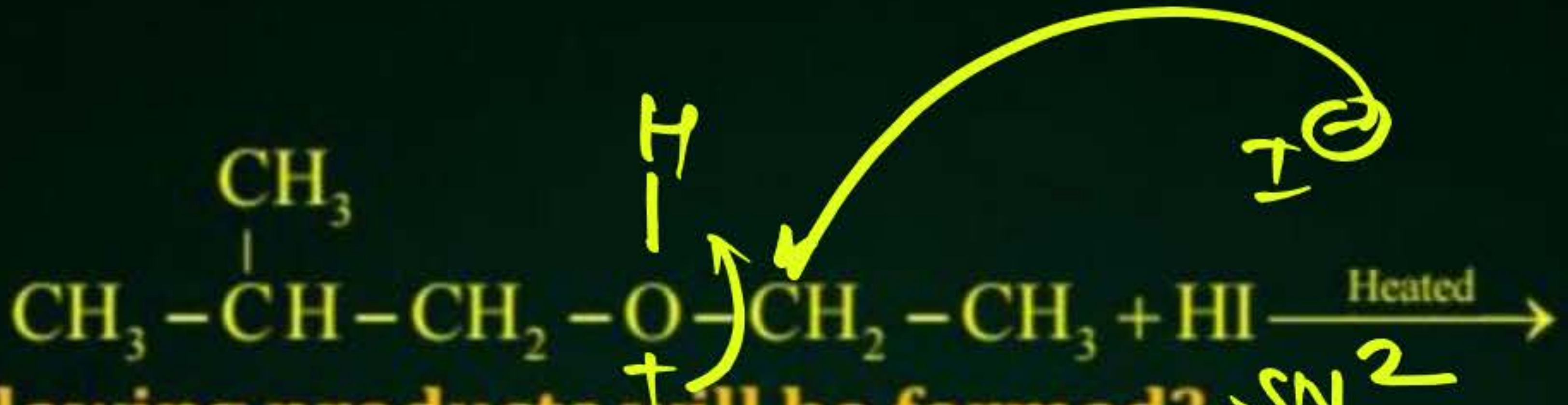
[✓ A] ethoxy ethane

(B) 2-methoxy propane

(C) 1-methoxy propane

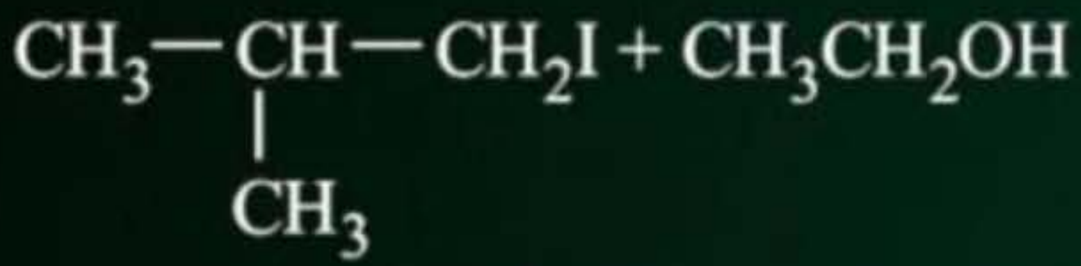
(D) 1-butanol

QUESTION 03

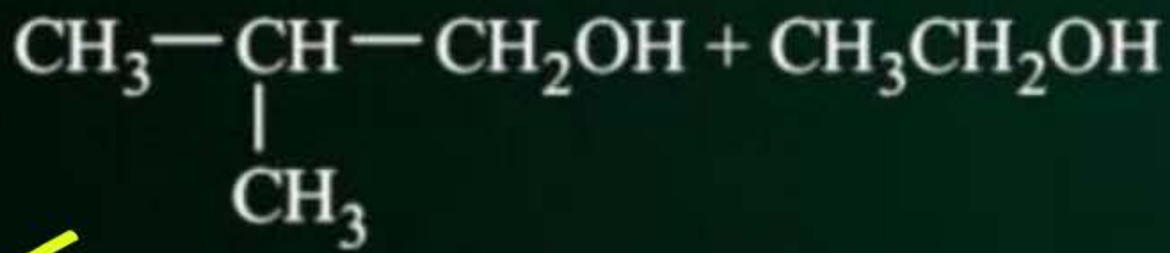
In the reaction: 

$CH_3-\overset{CH_3}{\overset{|}{C}}H-CH_2-O-CH_2-CH_3+HI\xrightarrow{\text{Heated}}$

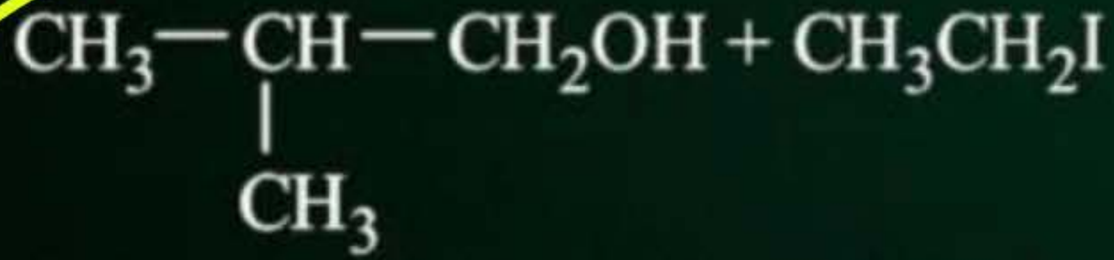
Which of the following products will be formed?

A 

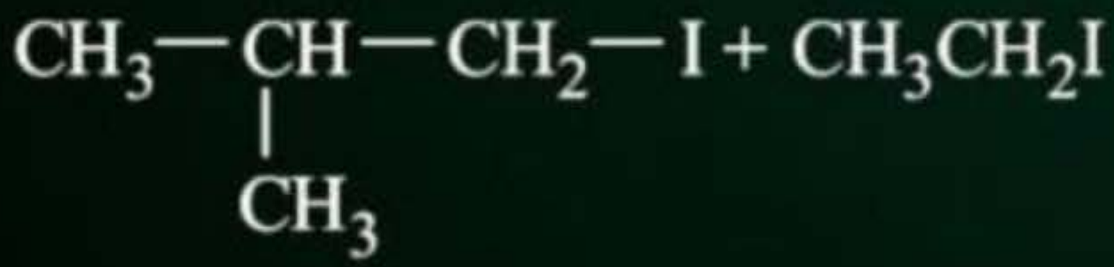
$CH_3-\underset{CH_3}{\underset{|}{C}}H-CH_2I+CH_3CH_2OH$

B 

$CH_3-\underset{CH_3}{\underset{|}{C}}H-CH_2OH+CH_3CH_2OH$

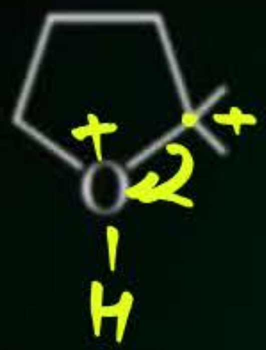
[✓ C] 

$CH_3-\underset{CH_3}{\underset{|}{C}}H-CH_2OH+CH_3CH_2I$

D 

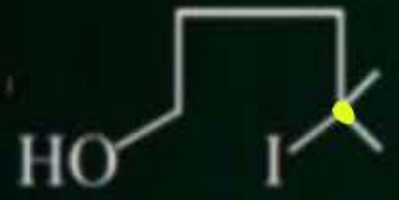
$CH_3-\underset{CH_3}{\underset{|}{C}}H-CH_2-I+CH_3CH_2I$

QUESTION 04

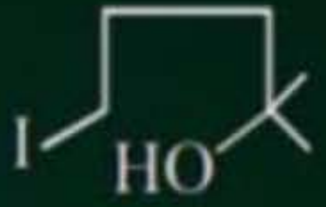


+ $\underset{\text{(1 eq.)}}{\text{HI}}$ ⟶ Product, Product is :

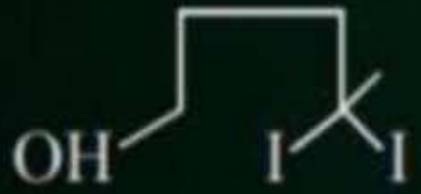
(A)



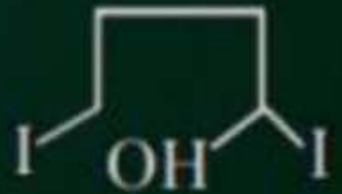
(B)



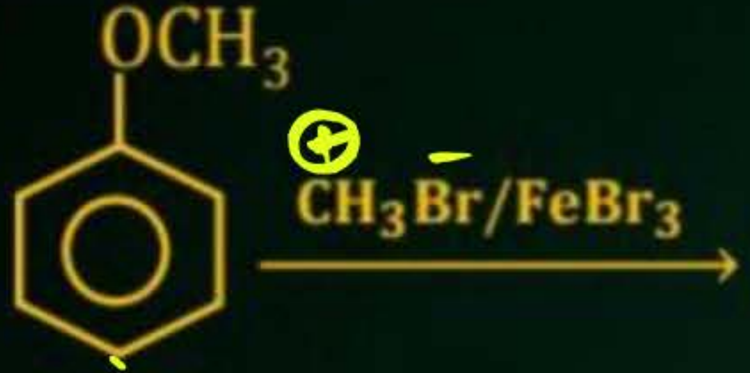
(C)



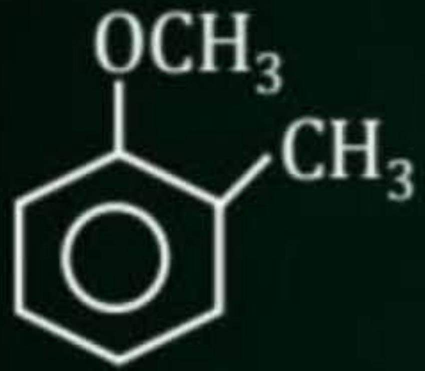
(D)

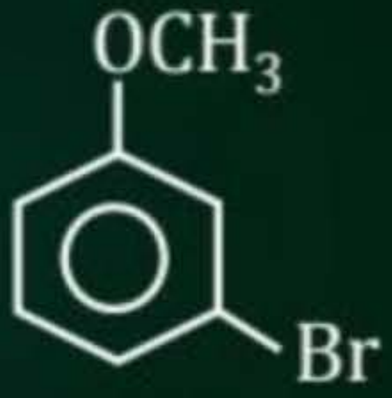


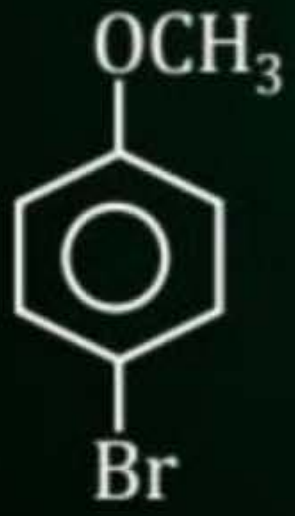
QUESTION 05

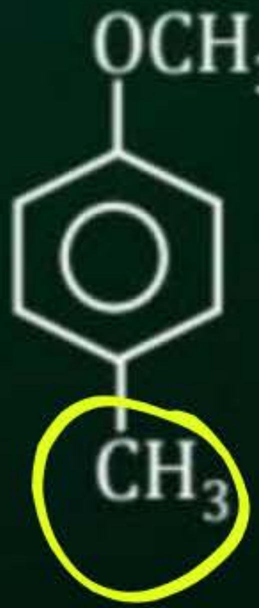

OCH3
$\overset{\oplus}{CH_3}\overset{-}{Br}/FeBr_3$

? Major product is:

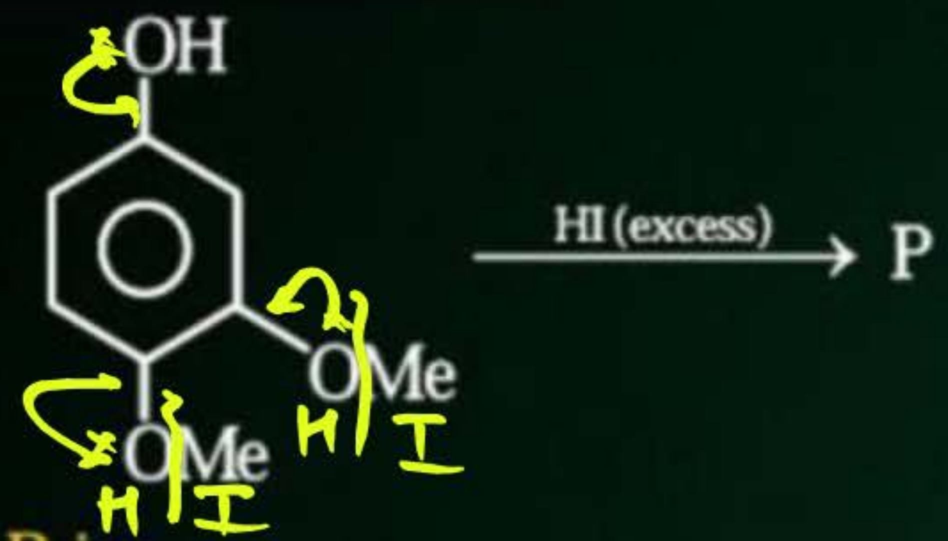
A


B


C


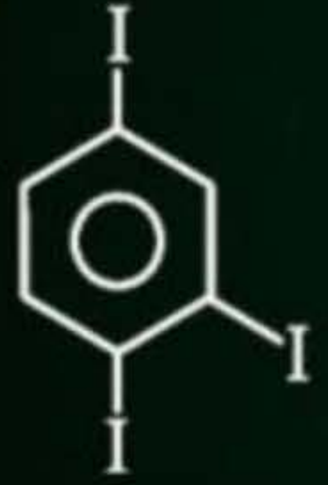
[✓ D]


QUESTION 06

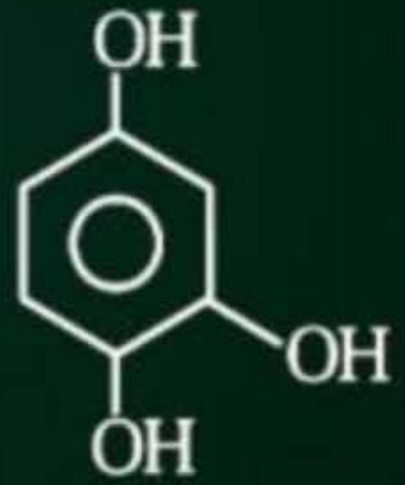

OH
OMe
OMe
HI (excess)
P
H
I
H
I

P is:

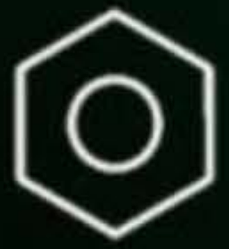
(A)



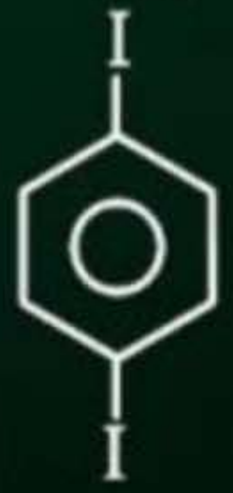
[✓ (B)]



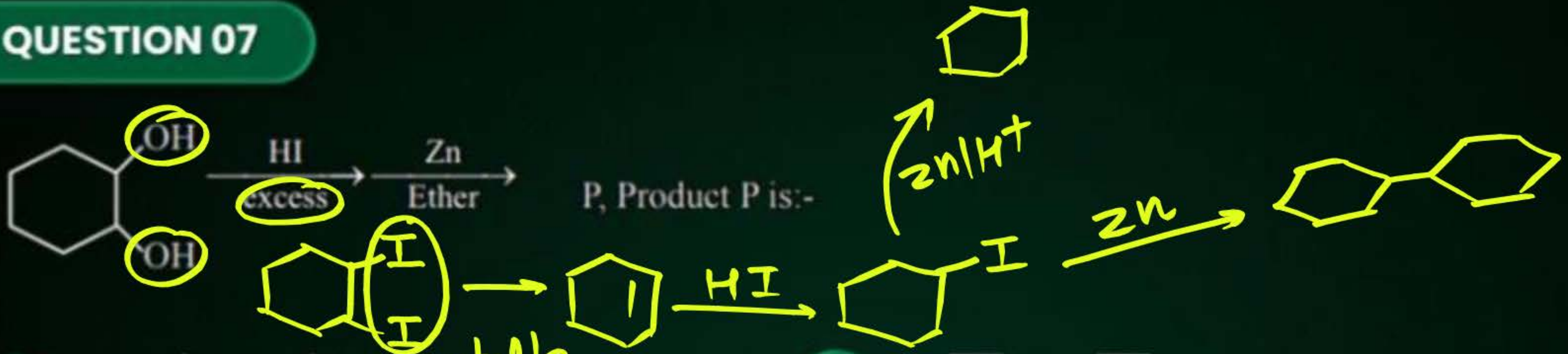
(C)



(D)

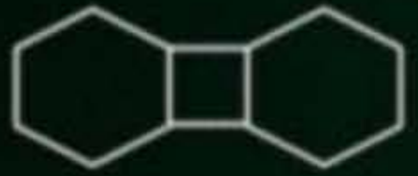


QUESTION 07

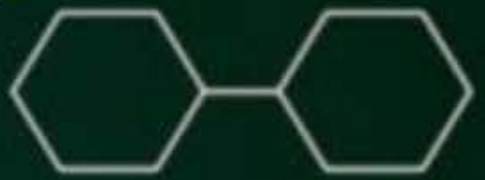

OH
OH
HI
excess
Zn
Ether
I
I
Unstable
HI
I
Zn/H+
Zn

P, Product P is:-

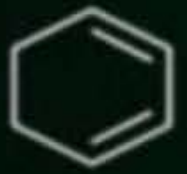
A



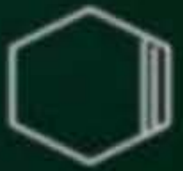
B ✓



C

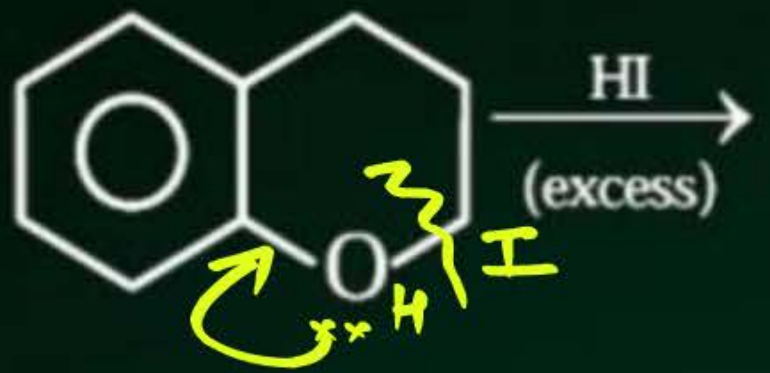


D



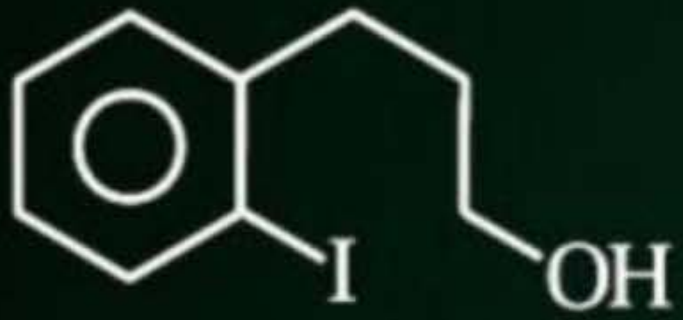
QUESTION 08

For the give reaction:

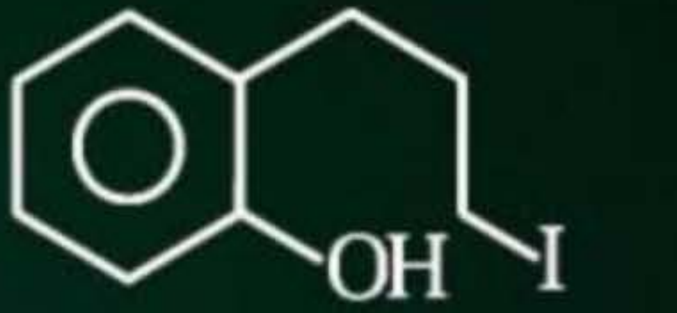

HI
(excess)
H
I

the major product of reaction is:

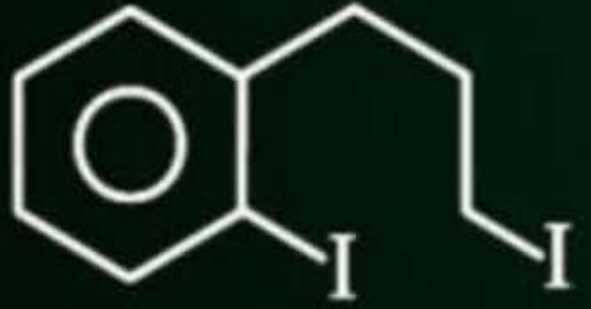
A



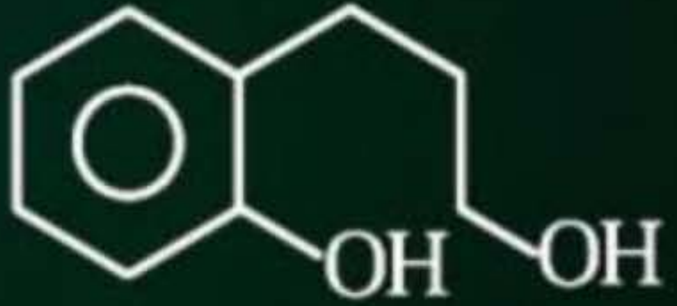
[✓ B]



C



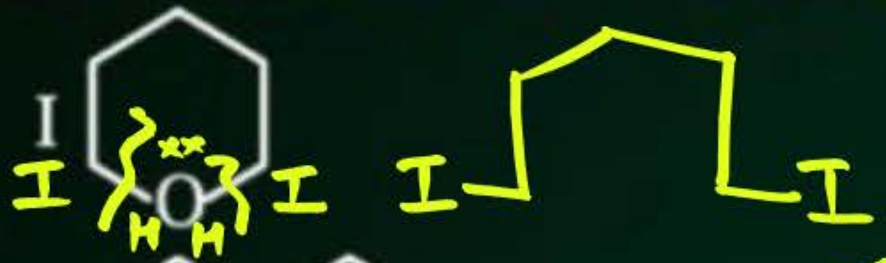
D



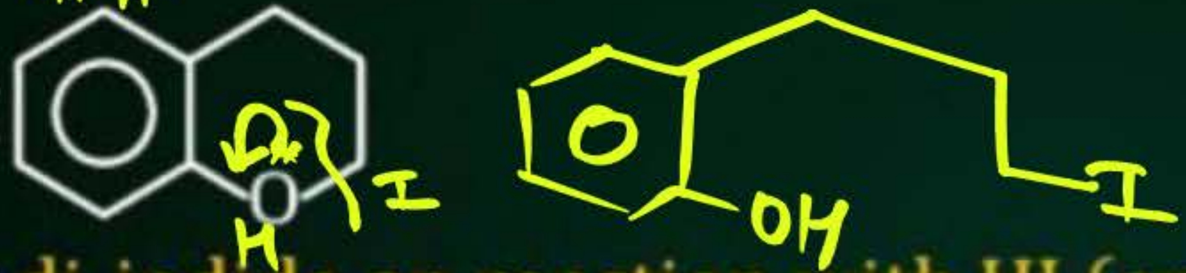
QUESTION 09

Consider the reaction of HI with the following:

I



II



Which forms di-iodide on reaction with HI (excess)?

A I and II both

B II only

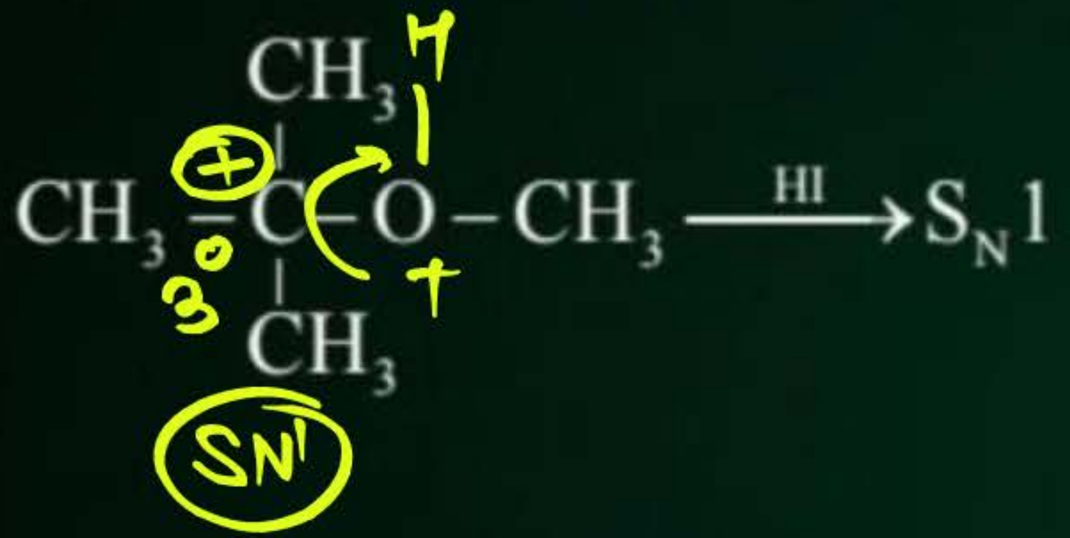
[✓ **C** I only]

D None of these

QUESTION 10

Which of the following reactions are not correctly matched?

A

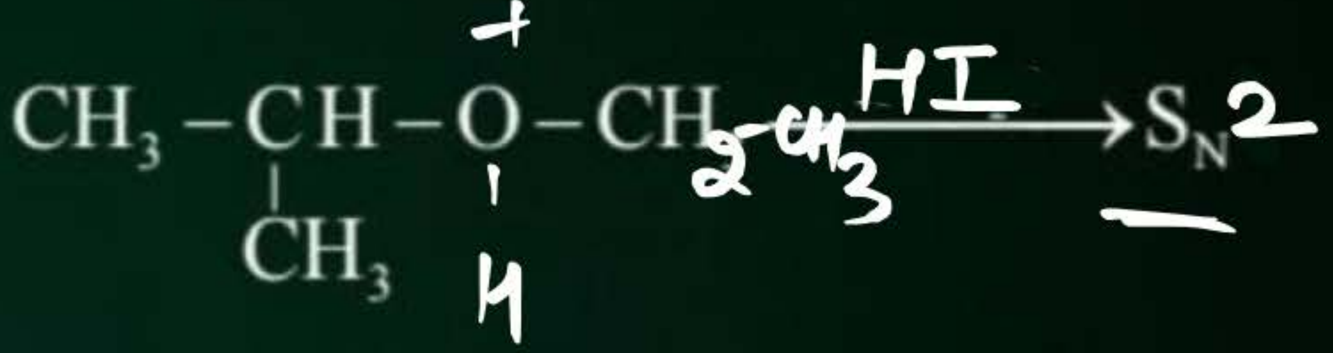


$CH_3-\underset{CH_3}{\overset{CH_3}{\overset{\oplus}{C}}}-\underset{+}{\overset{H}{O}}-CH_3 \xrightarrow{HI} S_N1$

3°

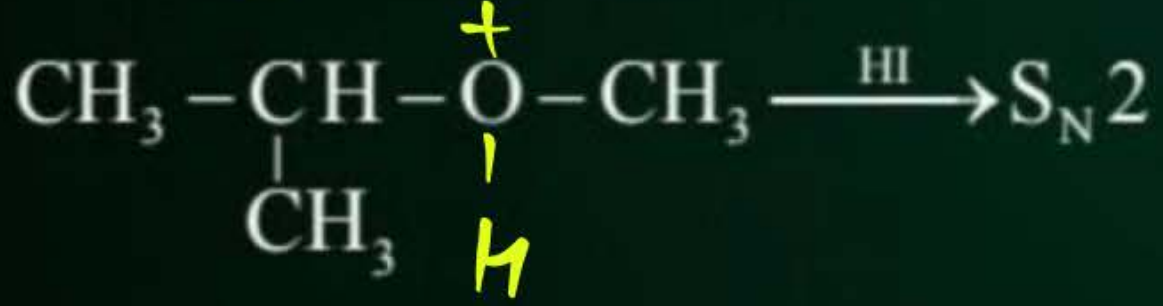
$\boxed{S_N1}$

B



$CH_3-\underset{CH_3}{CH}-\underset{H}{\overset{+}{O}}-CH_2-CH_3 \xrightarrow{HI} S_N2$

C



$CH_3-\underset{CH_3}{CH}-\underset{H}{\overset{+}{O}}-CH_3 \xrightarrow{HI} S_N2$

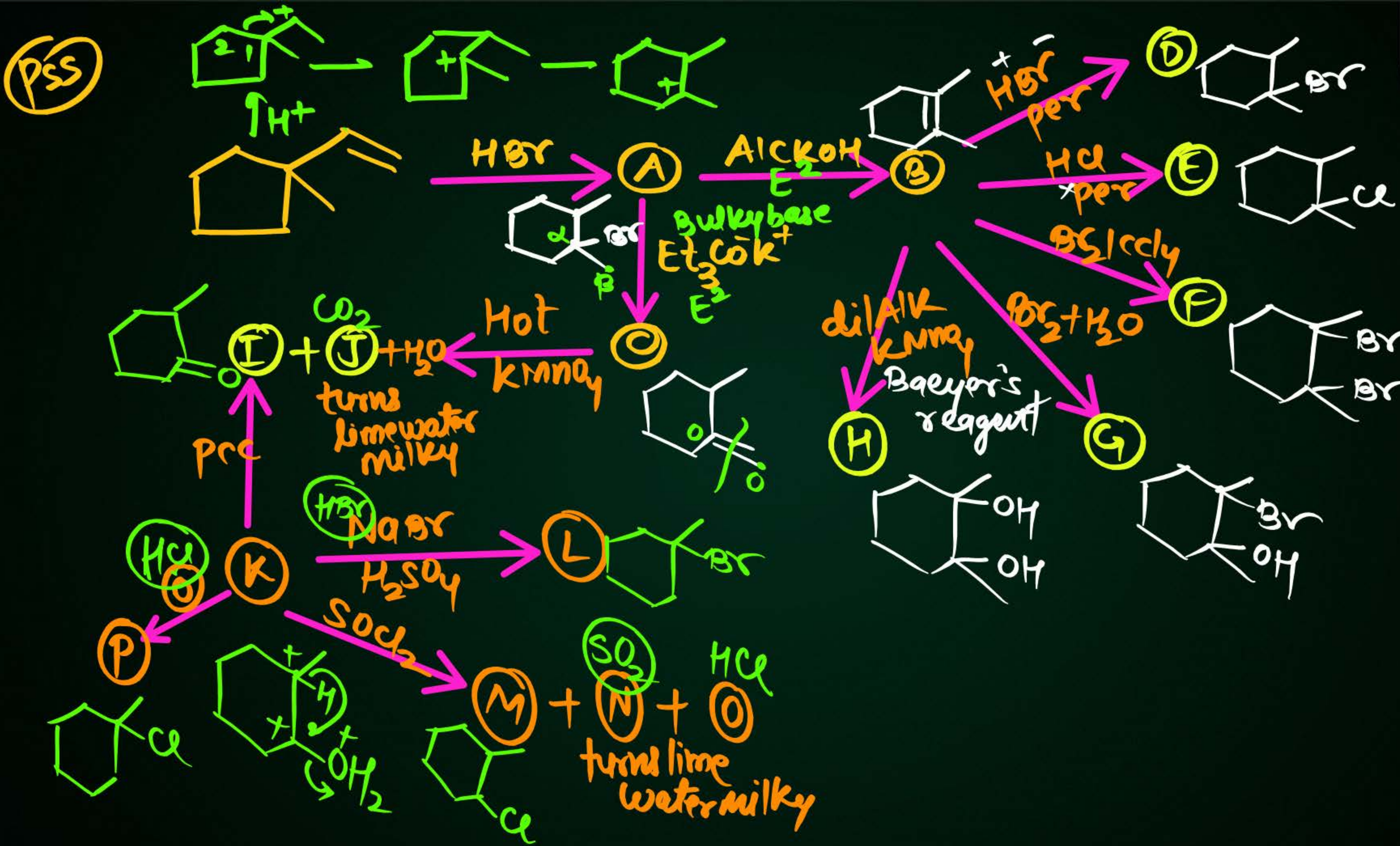
✓ **D**

$CH_3-\underset{H}{\overset{+}{O}}-CH_2CH_3 \xrightarrow{HI} \boxed{S_N1}$

$\boxed{S_N2}$

ANSWER KEY

1. A
2. A
3. C
4. A
5. D
6. B
7. B
8. B
9. C
10. D


PSS
H+
HBr
A
Alc KOH
E2
B
Bulky base
Et3CO⁻K⁺
E2
α
β
Br
H⁺Br⁻
per
D
Br
HCl
per
E
Cl
Br2/CCl4
F
Br
Br
Br2+H2O
G
Br
OH
dil Alk KMnO4
Baeyer's reagent
H
OH
OH
Hot
KMnO4
C
O
O
I
+
J
+H2O
CO2
turns limewater milky
O
PCC
K
HBr
NaBr
H2SO4
L
Br
HCl
O
P
Cl
SOCl2
M
+
N
+
O
SO2
HCl
turns lime water milky
Cl
+
H
+
OH2
+

Home Work From PW Module (Yakeen NEET)

Prarambh: Q 61, 62, 63, 64, 65

Parikshit: Q 03, 30, 31, 33

Thank you!

YAKEEN 2.0

FOR NEET 2025

Lecture- 01 Organic Chemistry

Aldehydes, Ketones and Carboxylic Acids

By- Pankaj Sir(POPU MAMA)

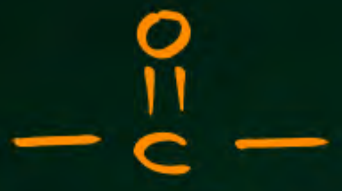
Physics Wallah

Topics *to be covered*

1. Introduction

$-CHO$

al

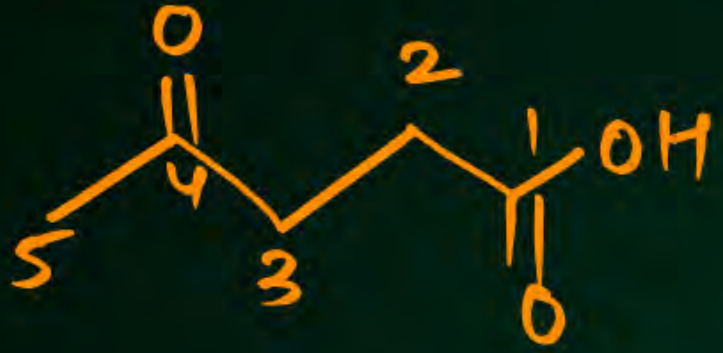


$-\overset{O}{\overset{\|}{C}}-$

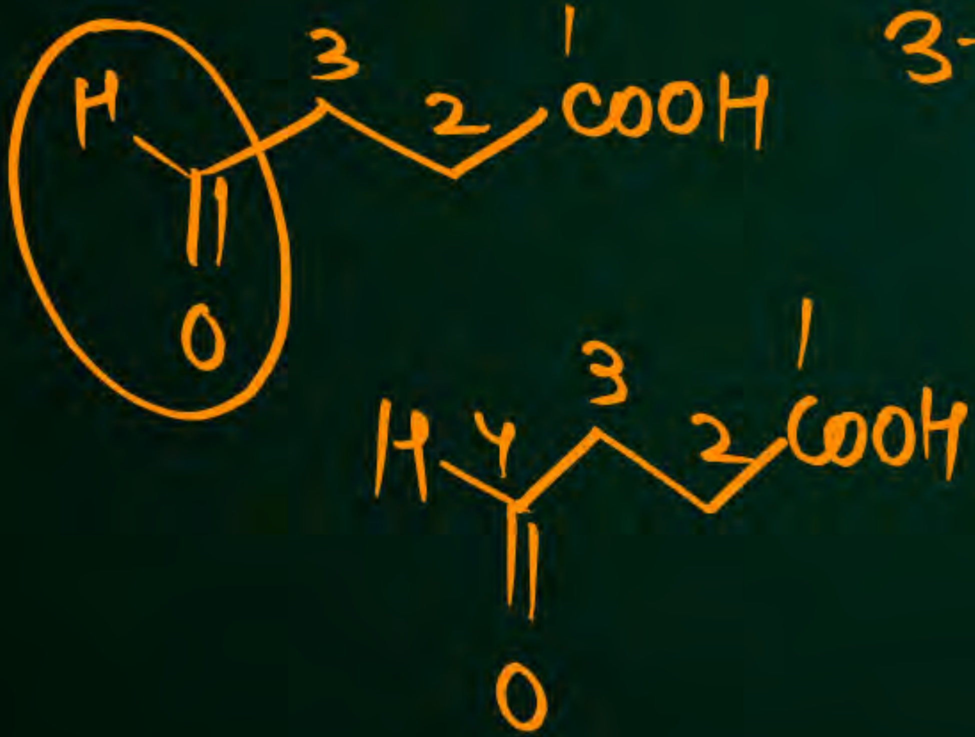
one

2. Methods of Preparation of Aldehydes & Ketones ✓
3. Practice

Basics



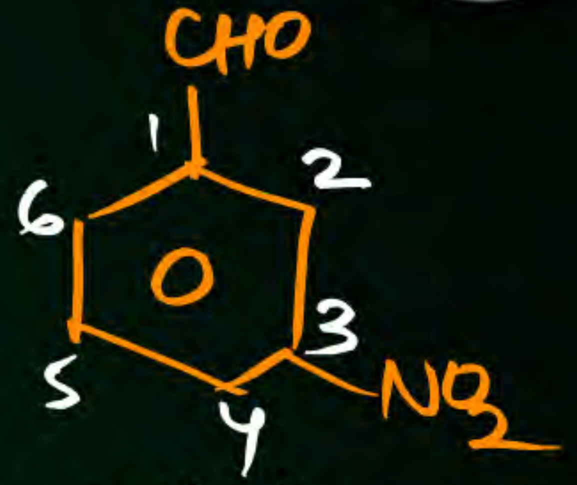
4-oxo pentanoic acid
keto


H
3
2
1
COOH
O
H
4
3
2
1
COOH
O

3-formyl propanoic acid

4-Aldo butanoic acid

oxo


CHO
1
2
6
3
5
4
NO2

3-Nitrobenzaldelyde
or
Benzene
Carbaldelyde

Methods of Preparation of Aldehydes & Ketones

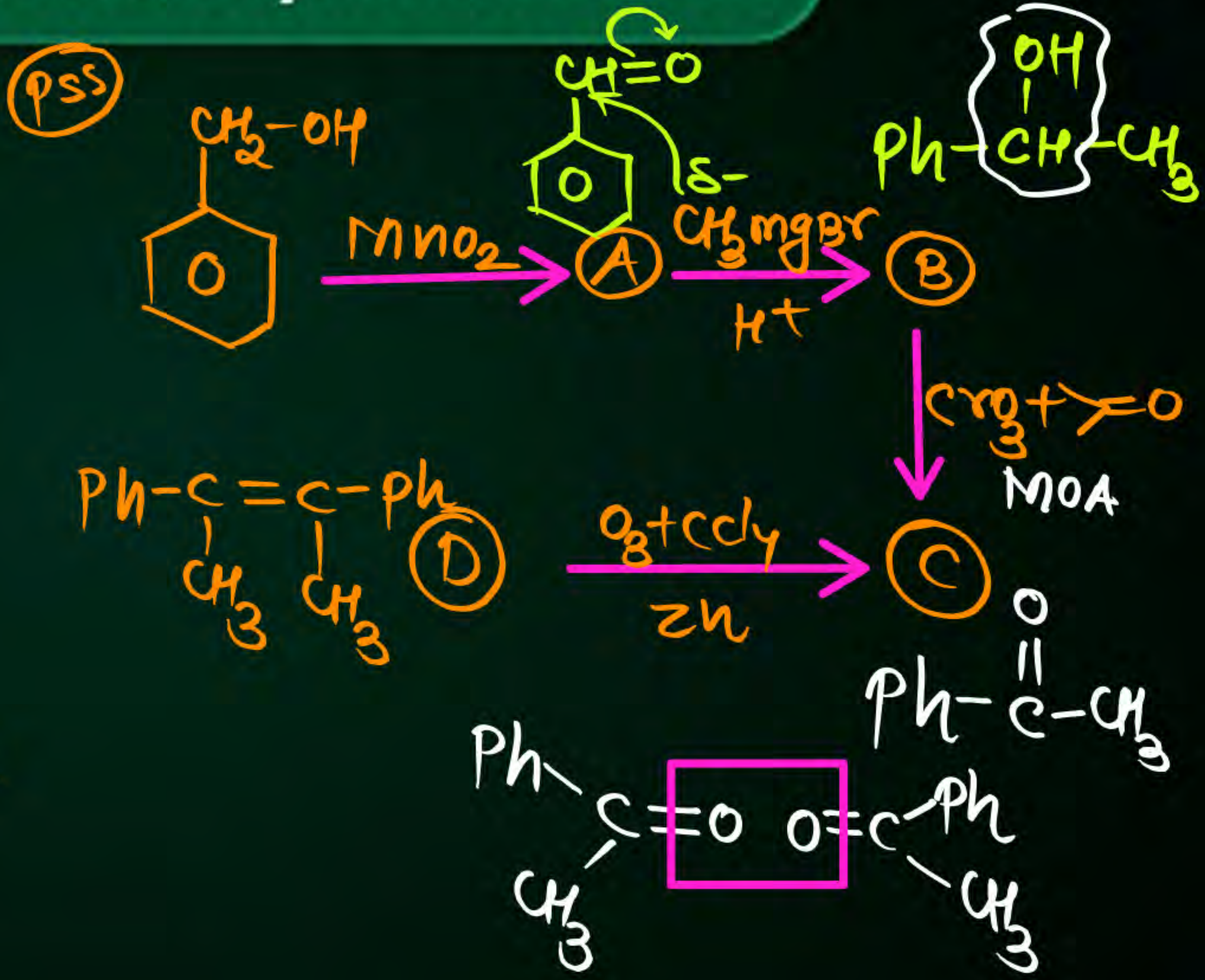
1. By oxidation of alcohols:

$$R-CH_2OH \xrightarrow{MOA} R-CHO$$

$$R-\underset{R}{\underset{|}{CH}}-OH \xrightarrow{''} R-\underset{R}{\underset{|}{C}}=O$$

$3°$ Alco ⟶ NO oxi

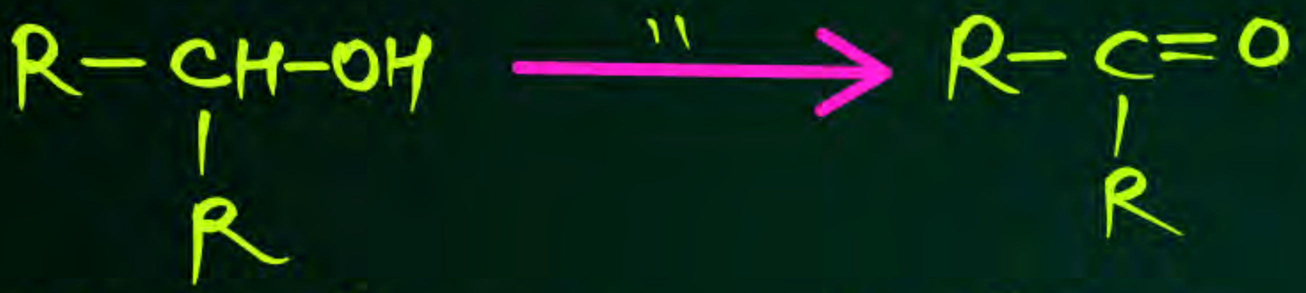
MnO_2 for Allylic & benzylic Alcohol
MOA


PSS
CH_2-OH
MnO_2
A
$CH=O$
δ-
CH_3MgBr
H^+
B
OH
$Ph-CH-CH_3$
$CrO_3 + $ ⟩=O
MOA
C
$Ph-C=C-Ph$
CH_3 CH_3
D
$O_3 + CCl_4$
Zn
O
$Ph-C-CH_3$
Ph
C=O O=C
Ph
CH_3
CH_3

2. By dehydrogenation of alcohols:

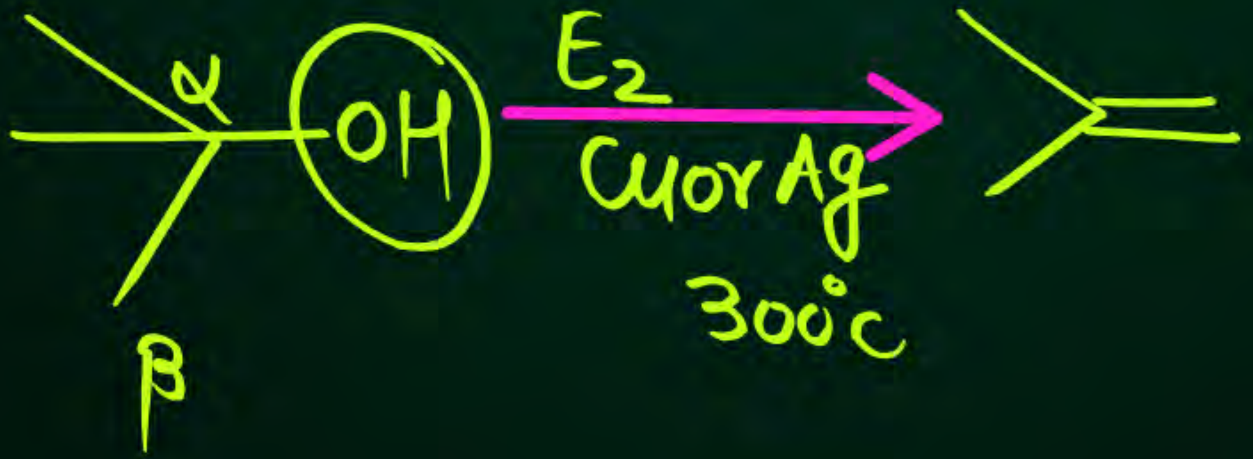
oxi

$$R-CH_2-OH \xrightarrow[300^\circ C]{Cu\ or\ Ag} R-CHO$$

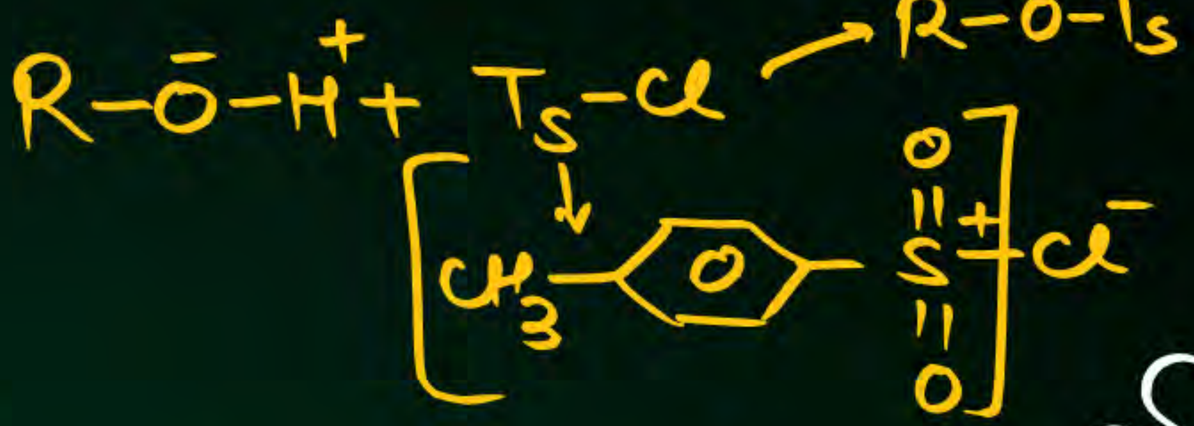


$$R-\underset{\displaystyle R}{\underset{|}{C}}H-OH \xrightarrow{''} R-\underset{\displaystyle R}{\underset{|}{C}}=O$$

But dehydration occurs in 3° ROH

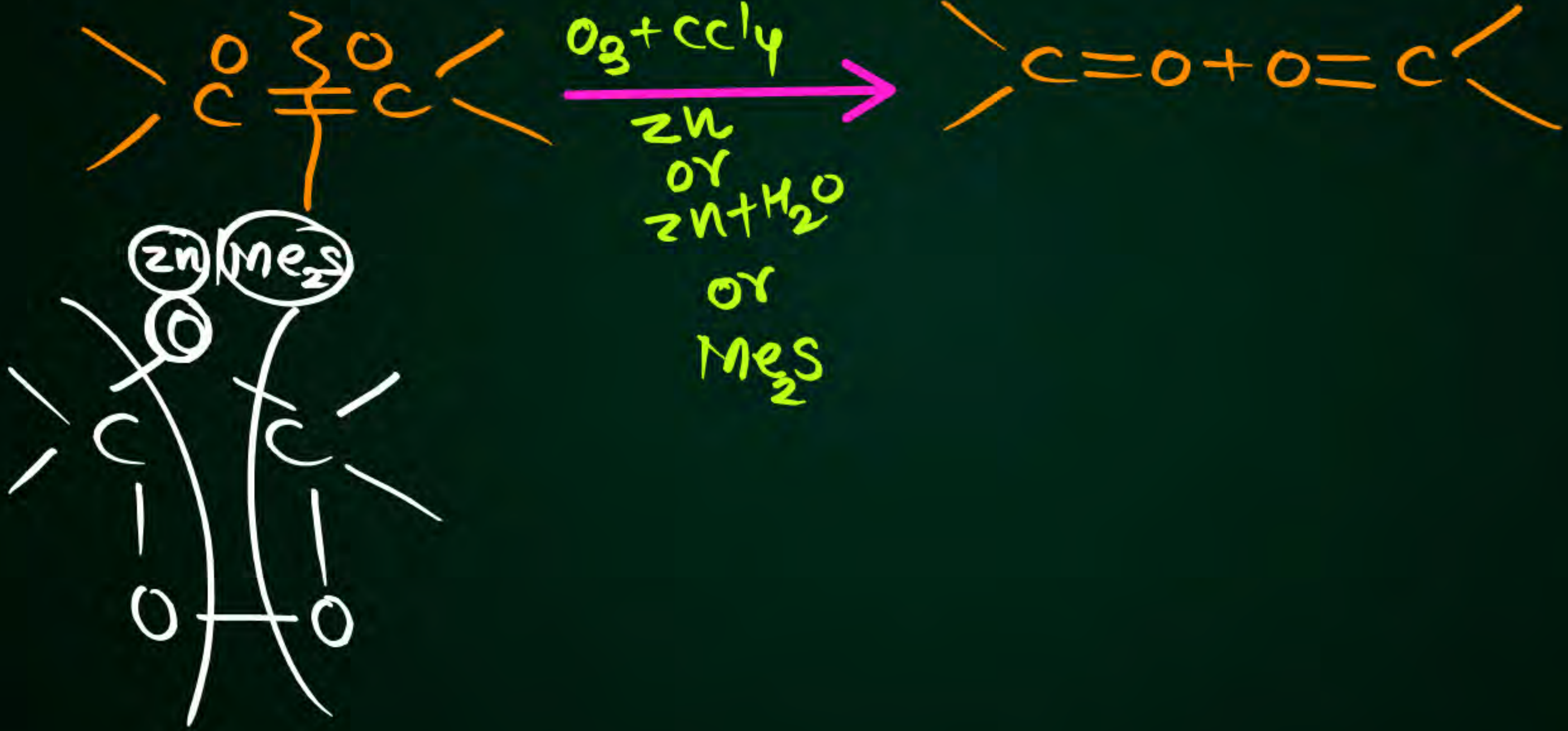


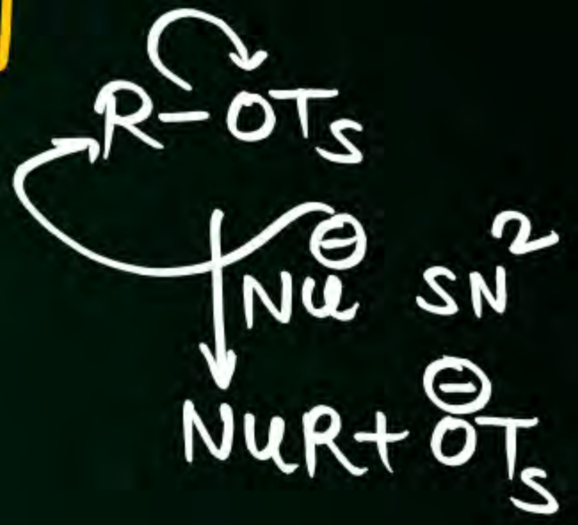
3. From hydrocarbons:

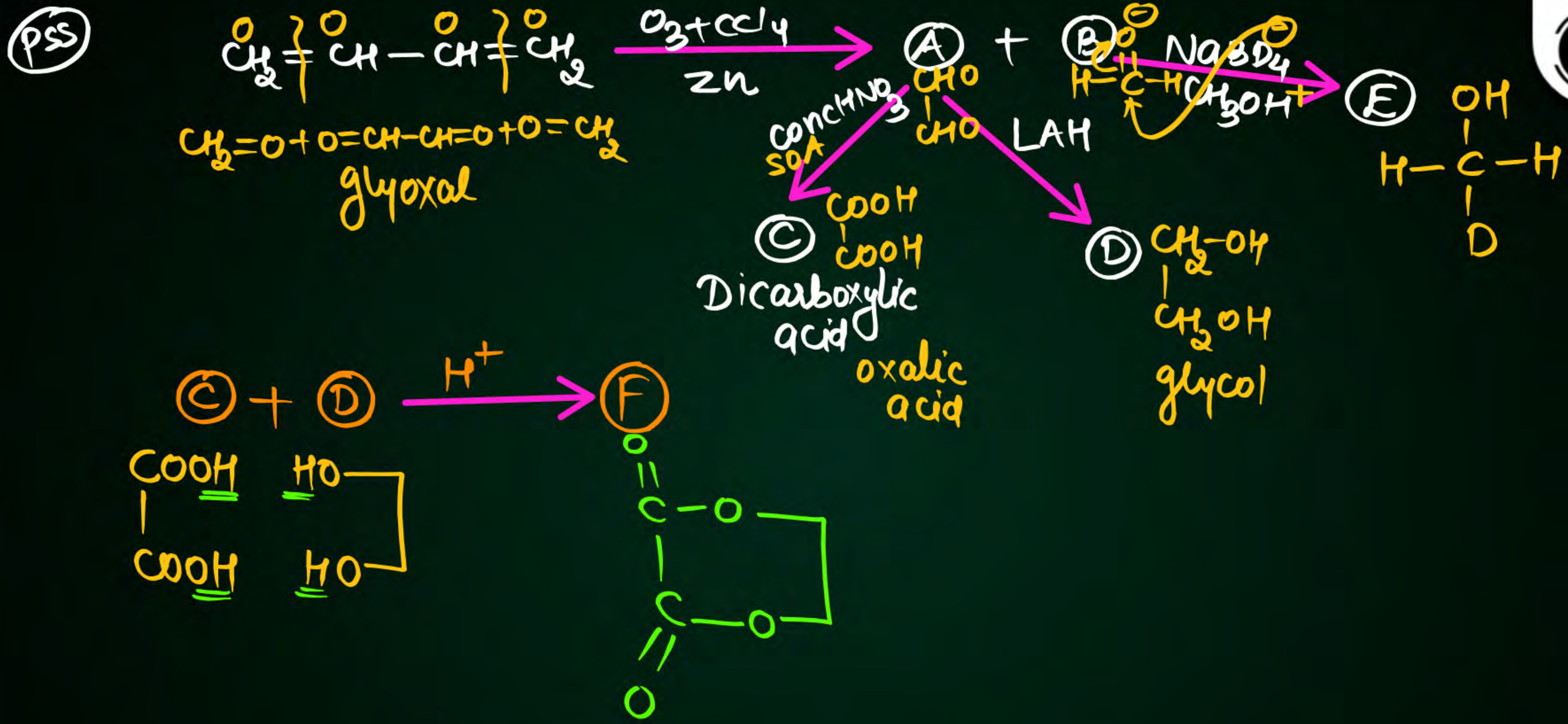

R–Ö–H + Ts–Cl → R–O–Ts
CH_3
O
S
O
+
Cl⁻

A. By ozonolysis of alkenes:

Reductive ozono


O
O
C
C
O_3 + CCl_4
Zn
or
Zn + H_2O
or
Me_2S
C=O + O=C
Zn
Me_2S
O
C
C
O
O

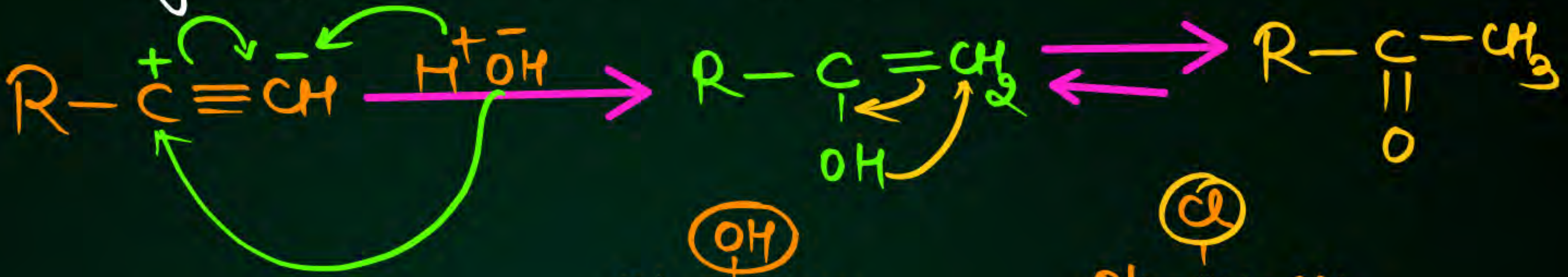

R–OTs
Nu⊖
S_N2
NuR + ⊖OTs


PSS
CH2=CH–CH=CH2
O3+CCl4
Zn
A + B
CH2=O+O=CH–CH=O+O=CH2
glyoxal
CHO
CHO
H–C–H
NaBD4
CH3OH
E
OH
H–C–H
D
conc HNO3
SOA
LAH
C
COOH
COOH
Dicarboxylic acid
oxalic acid
D
CH2–OH
CH2OH
glycol
C + D
H+
F
COOH
COOH
HO
HO
O
C–O
C–O
O

B. By hydration of alkynes:

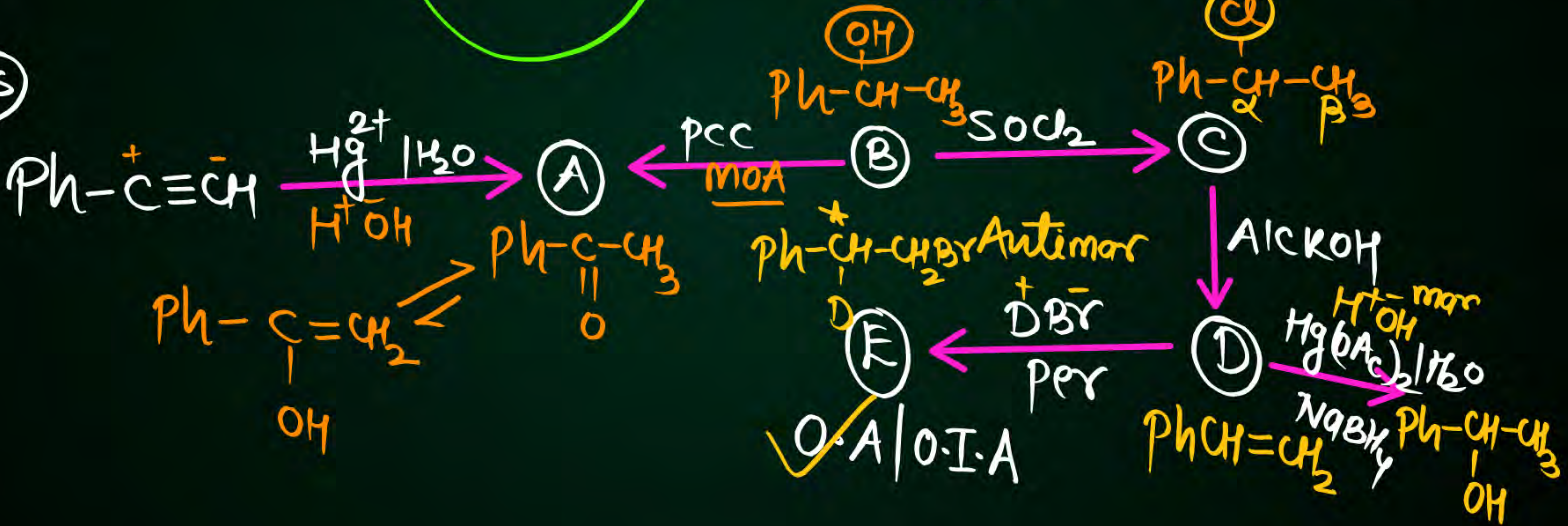
Kucherov rxn

$Hg^{2+}|H_2O$ or dil H_2SO_4 | dil $HgSO_4$



$$R-\overset{+}{C}\equiv\overset{-}{C}H \xrightarrow{H^+\,\overset{-}{O}H} R-\underset{OH}{\underset{|}{C}}=CH_2 \rightleftharpoons R-\underset{O}{\underset{||}{C}}-CH_3$$

PSS



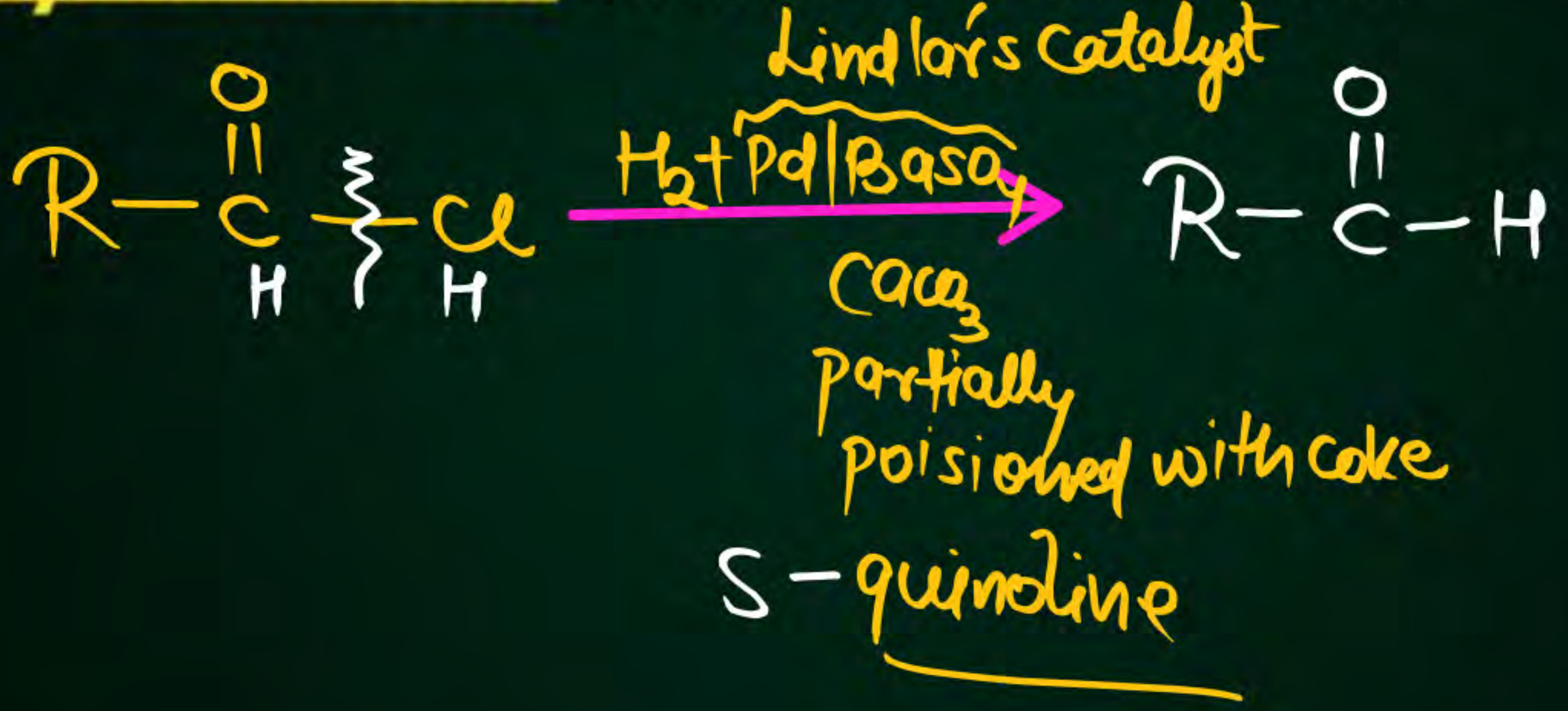
$$Ph-\overset{+}{C}\equiv\overset{-}{C}H \xrightarrow[H^+\,\overset{-}{O}H]{Hg^{2+}|H_2O} Ⓐ \xleftarrow[MOA]{PCC} Ⓑ \xrightarrow{SOCl_2} Ⓒ$$

$$Ph-\underset{OH}{\underset{|}{C}}=CH_2 \rightleftharpoons Ph-\underset{O}{\underset{||}{C}}-CH_3$$

Ⓑ $Ph-\overset{OH}{\overset{|}{C}H}-CH_3$
Ⓒ $Ph-\overset{Cl}{\overset{|}{C}H}-CH_3$
α
β
Alc KOH
Ⓓ $PhCH=CH_2$
$\overset{+}{D}\overset{-}{Br}$
Per
Ⓔ $Ph-\overset{*}{\underset{D}{\underset{|}{C}H}}-CH_2Br$
Antimar
✓ O.A | O.I.A
$H^+\,\overset{-}{O}H$ mar
$Hg(OAc)_2|H_2O$
$NaBH_4$
$Ph-\underset{OH}{\underset{|}{C}H}-CH_3$

Methods of Preparation of Aldehydes

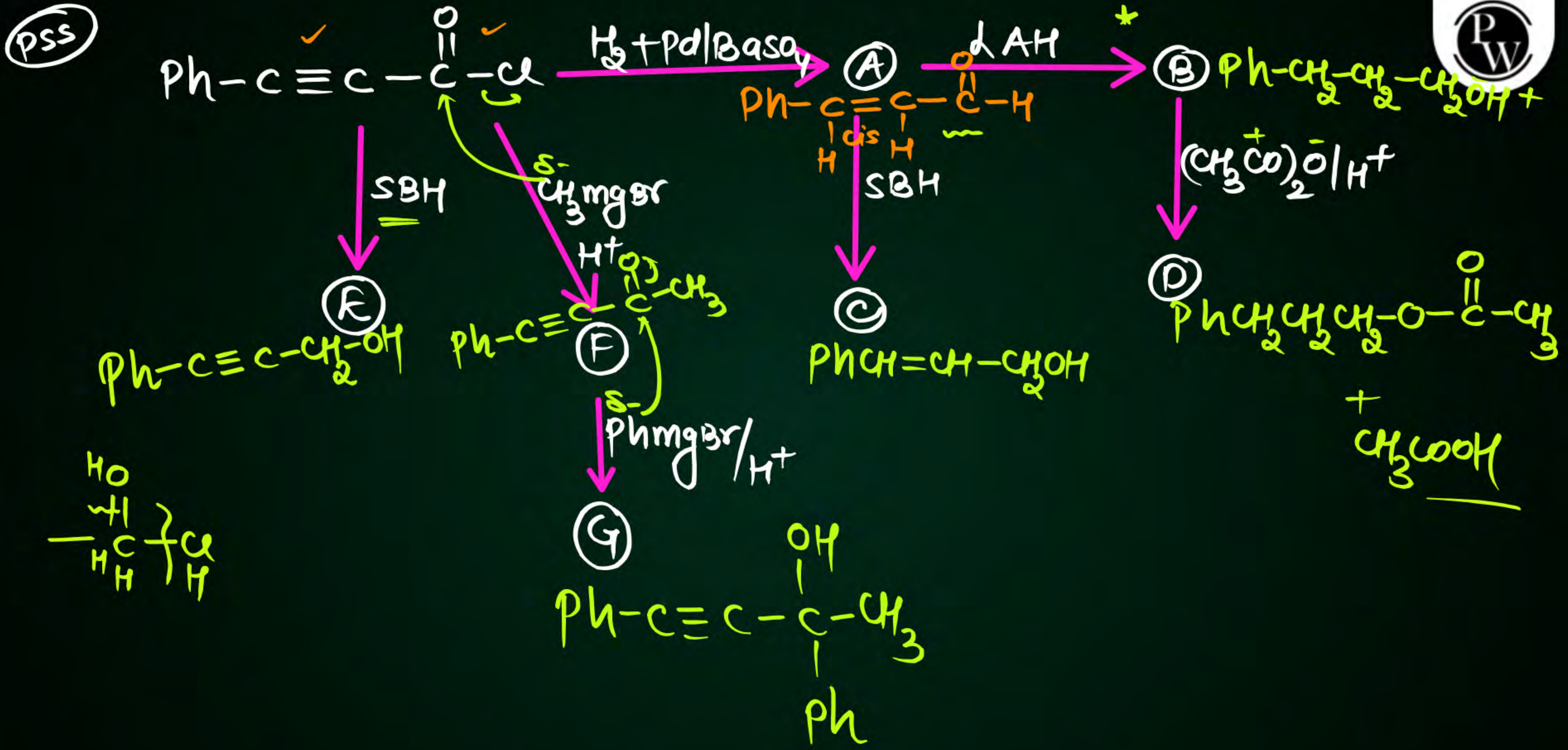
1. **From acyl chlorides:** Rosenmund Reduction



$$R-\overset{\overset{O}{\|}}{\underset{H}{C}}\wr\underset{H}{Cl}\xrightarrow[CaCO_3]{\overbrace{H_2+Pd|BaSO_4}^{\text{Lindlar's catalyst}}}R-\overset{\overset{O}{\|}}{C}-H$$

partially poisioned with coke

S - quinoline


PSS
Ph–C≡C–C(=O)–Cl
H2+Pd|BaSO4
A
Ph–C=C–C(=O)–H
H cis H
LAH
*
B Ph–CH2–CH2–CH2OH +
SBH
δ-
CH3MgBr
H+
E
Ph–C≡C–CH2–OH
Ph–C≡C–C(=O)–CH3
F
δ-
PhMgBr/H+
G
Ph–C≡C–C(OH)(Ph)–CH3
SBH
C
PhCH=CH–CH2OH
(CH3CO)2O/H+
D
PhCH2CH2CH2–O–C(=O)–CH3
+
CH3COOH
HO
H C Cl
H H

2. From nitriles and esters:

① from Nitrile ÷ stephen's reduction → Reagent ÷ 1. $SnCl_2 + HCl$

2. H_3O^+ or steam

$SnCl_2 + 2HCl \longrightarrow SnCl_4 + 2[H]$

(imine)

$$R-\overset{H}{C}\equiv\overset{H}{N} \xrightarrow{2[H]} R-\underset{\delta+}{CH}=\underset{\delta-}{NH}$$

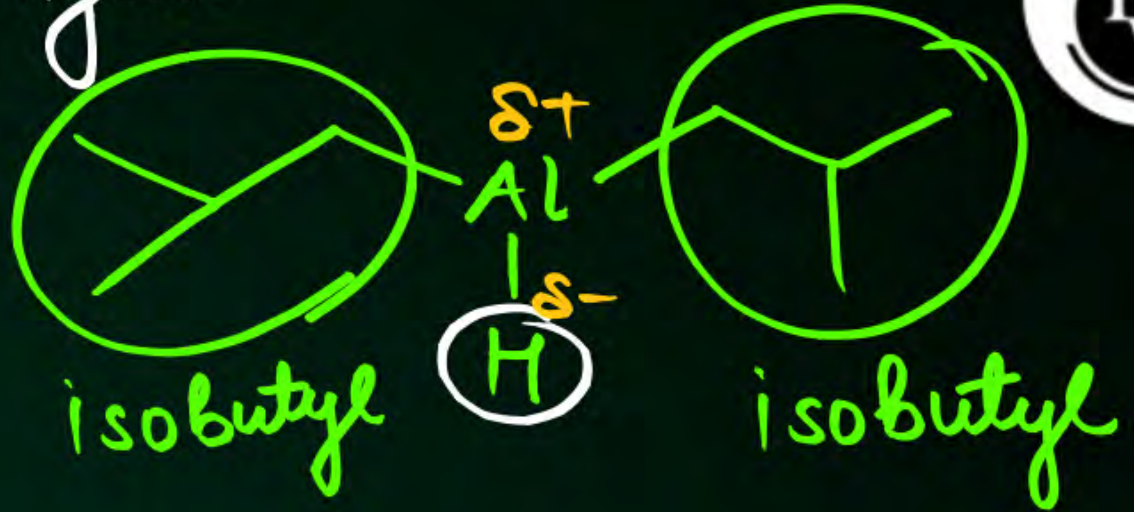
$$\Big\downarrow 2\,\overset{+}{H}\,\overset{-}{OH}$$

$$R-CHO \longleftarrow R-CH\begin{matrix}-O\boxed{H}\\ -\boxed{OH}\end{matrix} + NH_3$$

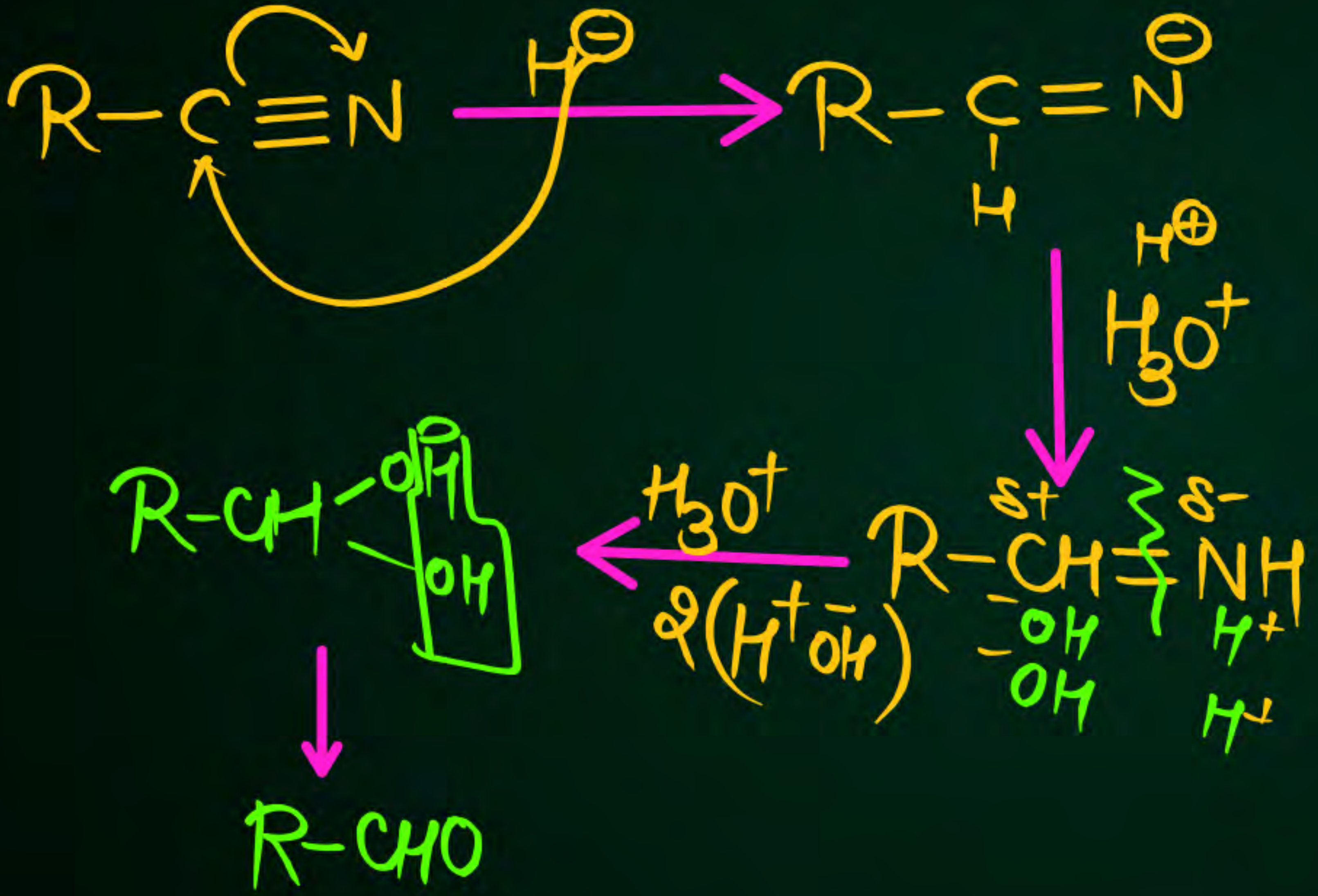
$$R-\text{(CN)} \longrightarrow R-\text{(CHO)}$$

we can also use DIBAL-H Mild reducing agent

Di isobutyl aluminium hydride



δ+
Al
δ-
H
isobutyl
isobutyl

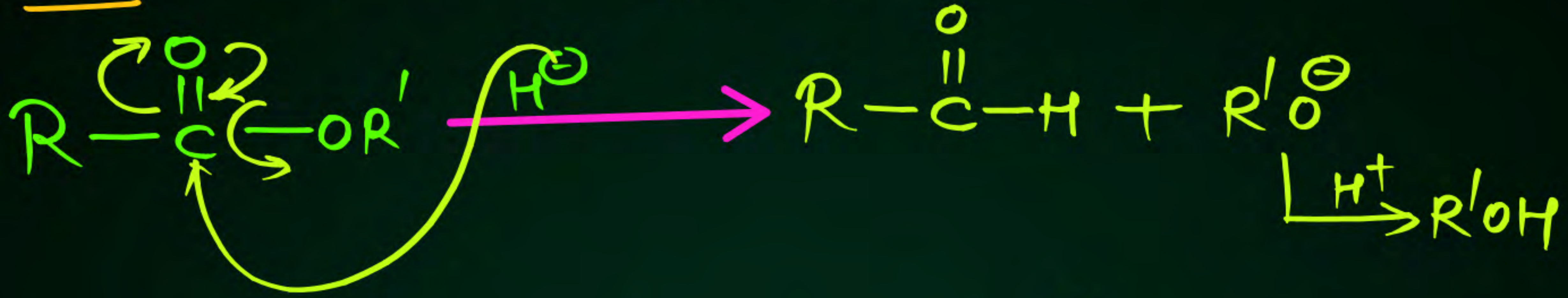


R−C≡N
H⊖
R−C=N⊖
H
H⊕
H3O+
R−CH=NH
δ+
δ-
OH
OH
H+
H+
H3O+
2(H+ OH−)
R−CH−OH
OH
R−CHO

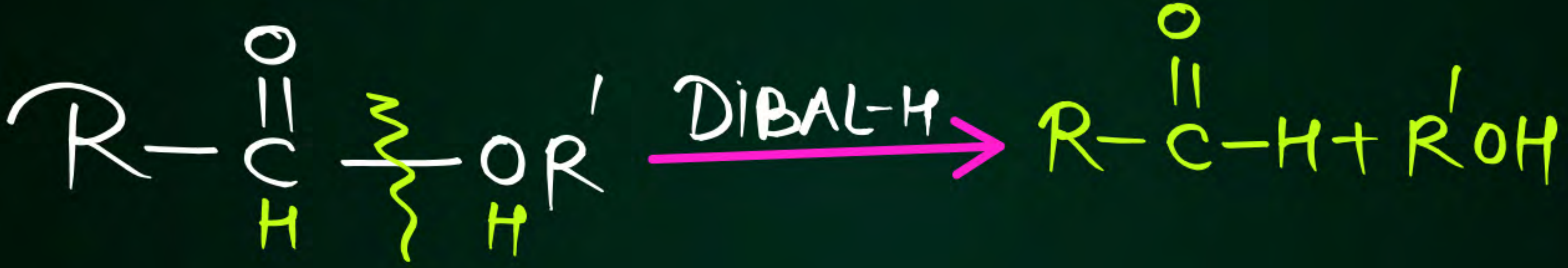
$$R-\boxed{CN} \longrightarrow R-\boxed{CHO}$$

② from Ester (DIBAL-H | H_2O or H_3O^+)

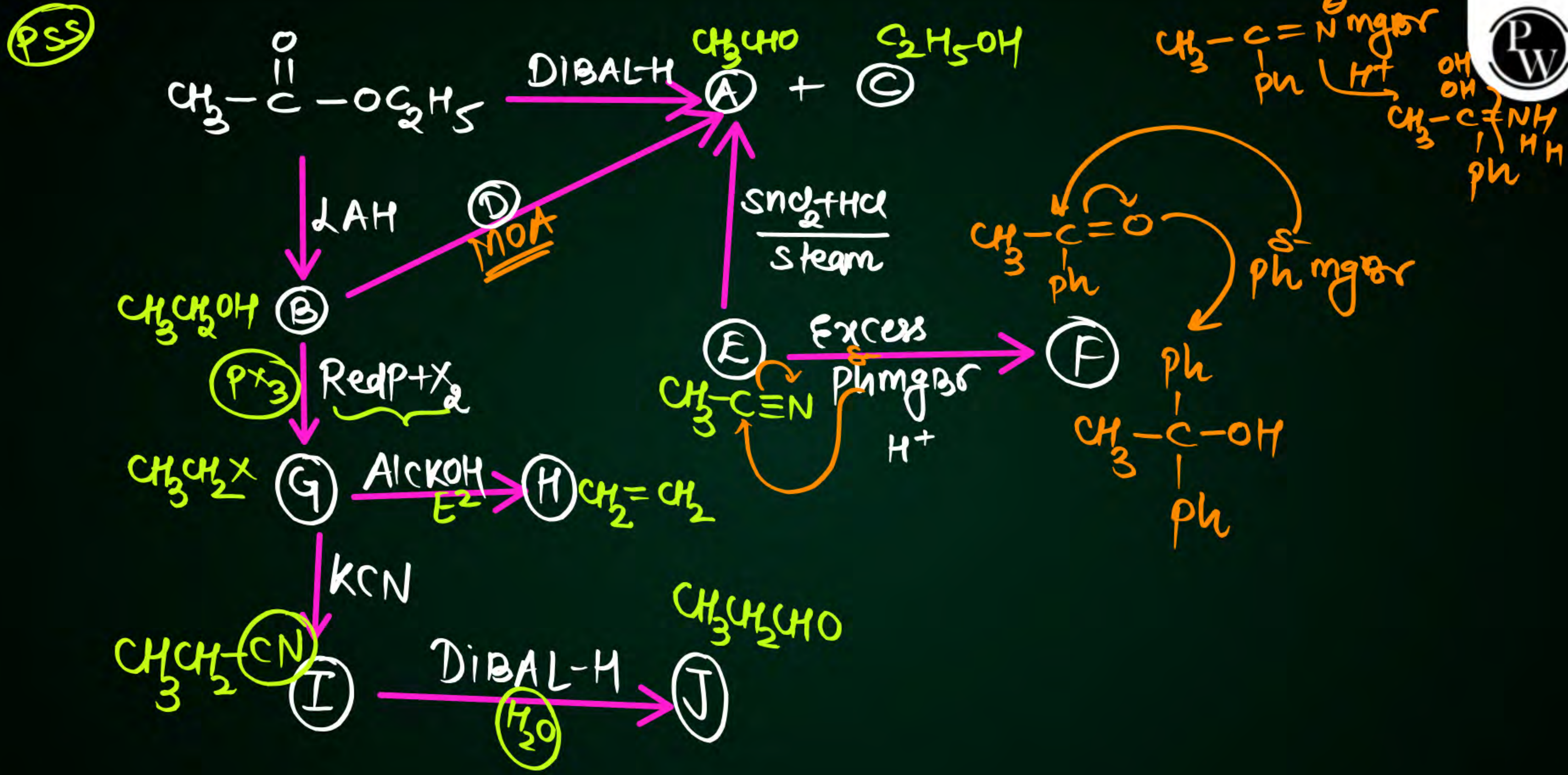
Mech



$$R-\overset{O}{\overset{\|}{C}}-OR' \xrightarrow{H^{\ominus}} R-\overset{O}{\overset{\|}{C}}-H + R'O^{\ominus} \xrightarrow{H^+} R'OH$$



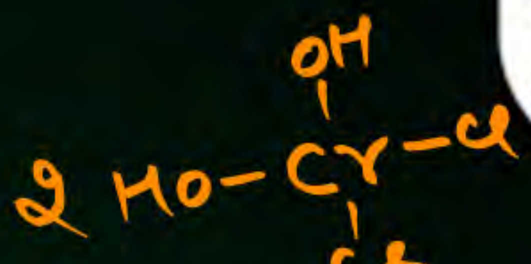
$$R-\underset{H}{\overset{O}{\overset{\|}{C}}}-\underset{H}{O}R' \xrightarrow{\text{DIBAL-H}} R-\overset{O}{\overset{\|}{C}}-H + R'OH$$

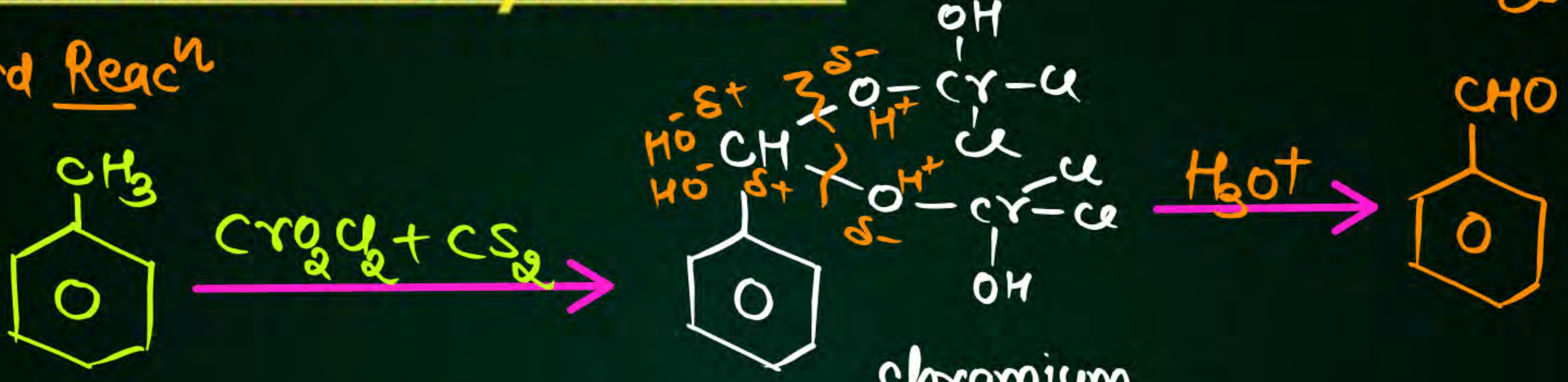
PSS
$CH_3-\overset{O}{\overset{\|}{C}}-OC_2H_5$
DIBAL-H
CH_3CHO
A
+
C
C_2H_5-OH
LAH
D
MOA
CH_3CH_2OH
B
PX_3
Red P + X_2
CH_3CH_2X
G
Alc KOH
E2
H
$CH_2=CH_2$
KCN
CH_3CH_2-CN
I
DIBAL-H
H_2O
J
CH_3CH_2CHO
$SnCl_2 + HCl$
steam
E
$CH_3-C\equiv N$
Excess
δ
PhMgBr
H^+
F
$CH_3-C=O$
Ph
δ-
PhMgBr
$CH_3-\underset{Ph}{\overset{Ph}{C}}-OH$
$CH_3-\underset{Ph}{C}=\overset{\ominus}{N}MgBr$
H^+
OH
OH
$CH_3-\underset{Ph}{C}=NH$
H H

3. From hydrocarbons:

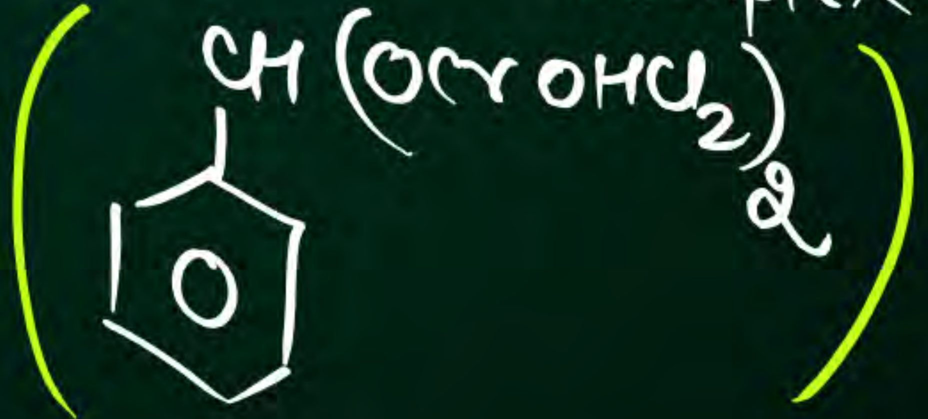
A. By oxidation of methyl benzene:

① Etard Reacⁿ

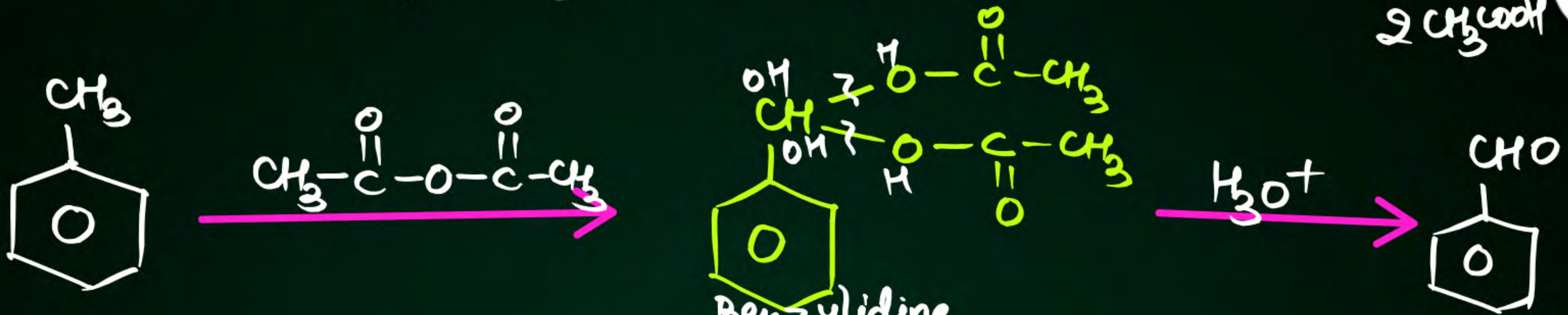

2 HO–Cr–Cl
OH
Cl


CH3
CrO2Cl2 + CS2
HO⁻ δ+
HO⁻ δ+
CH
δ-
O–Cr–Cl
H+
OH
Cl
OH+
O–Cr–Cl
Cl
δ-
OH
H3O+
CHO
chromium complex

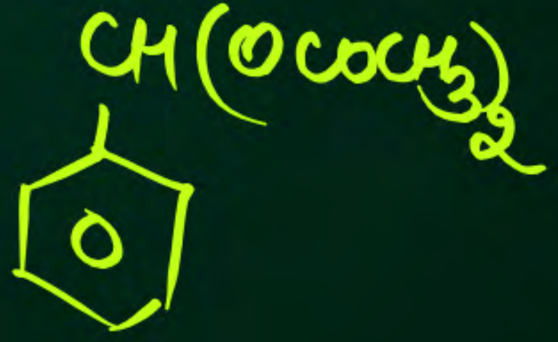
$$Ph\text{-}\boxed{CH_3} \longrightarrow Ph\text{-}\boxed{CHO}$$


CH(OCrOHCl2)2

we can also use $CrO_3 + CH_3-\overset{O}{\overset{\|}{C}}-O-\overset{O}{\overset{\|}{C}}-CH_3$ | H_3O^+

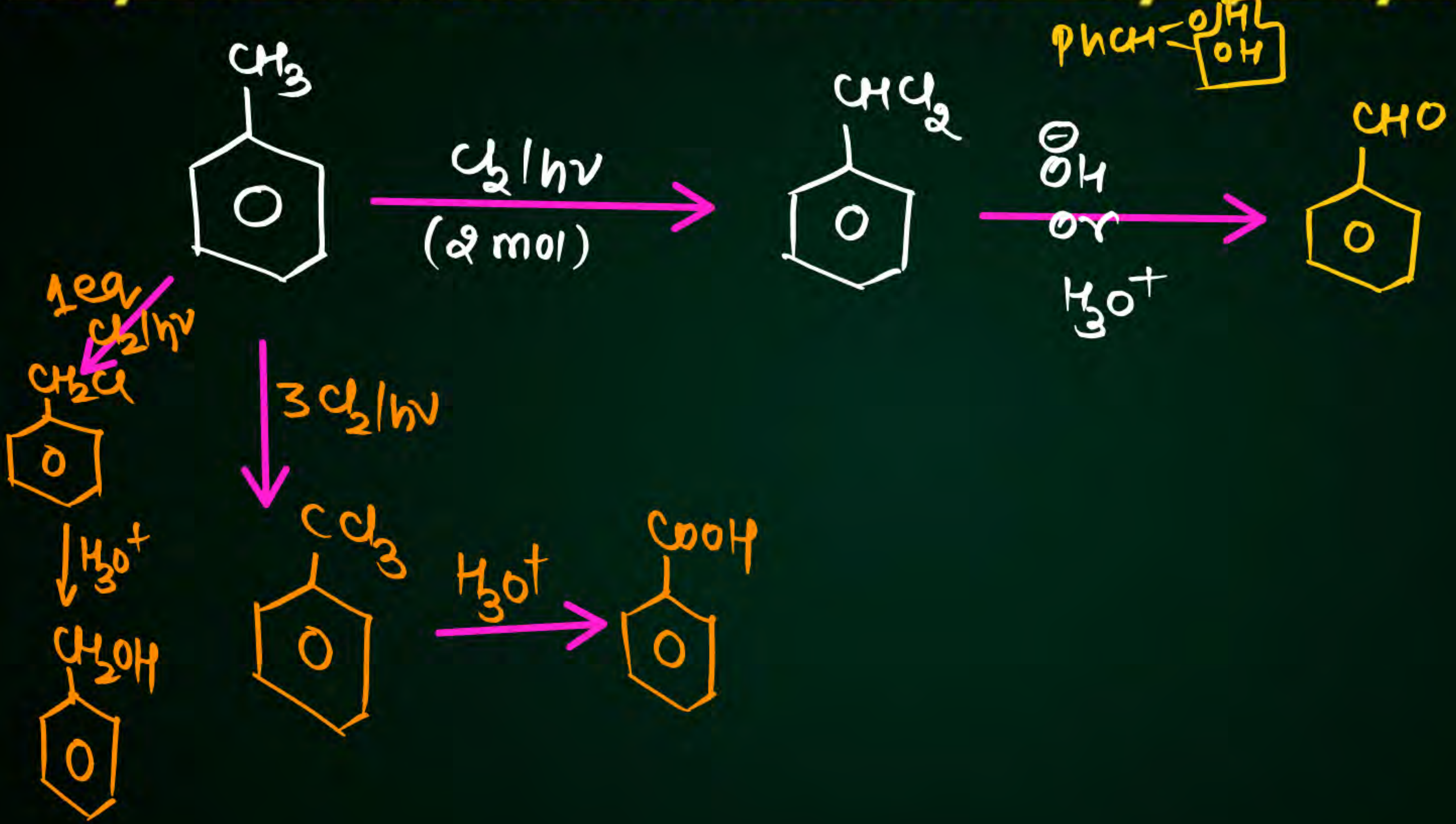

CH_3
$CH_3-\overset{O}{\overset{\|}{C}}-O-\overset{O}{\overset{\|}{C}}-CH_3$
OH
CH
OH
H
$O-\overset{O}{\overset{\|}{C}}-CH_3$
H
$O-\underset{O}{\underset{\|}{C}}-CH_3$
H_3O^+
CHO
$2\,CH_3COOH$

Benzylidine
or
Benzal diacetate

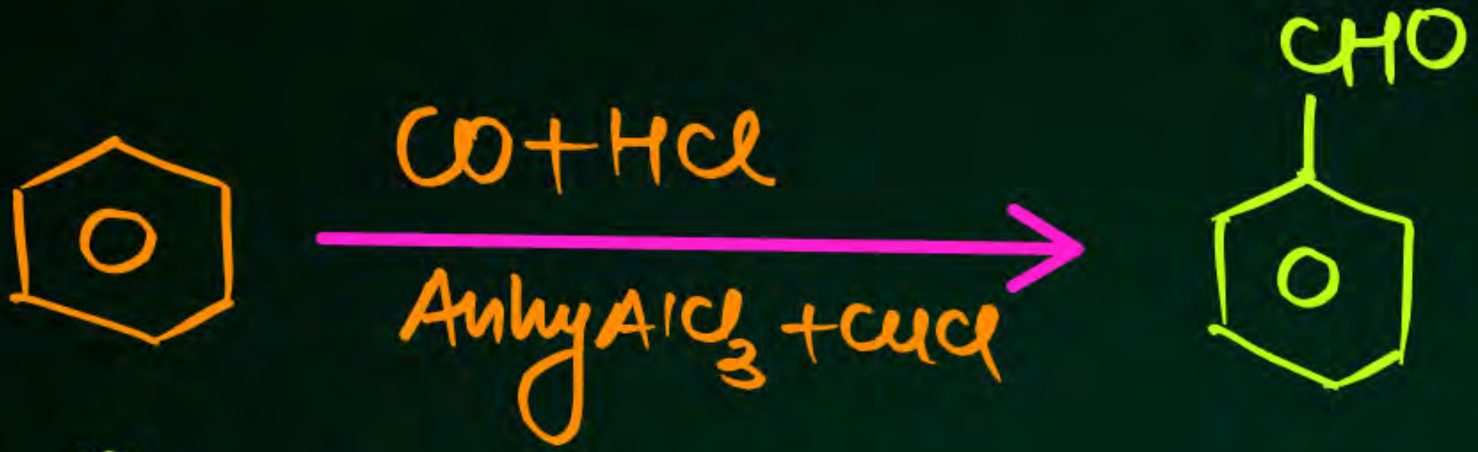


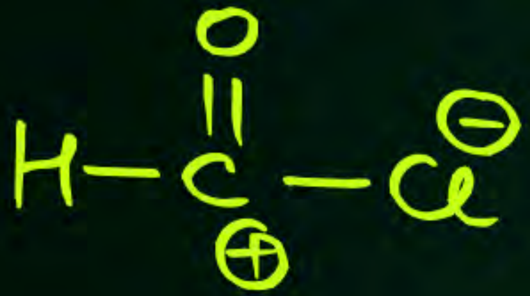
$CH(OCOCH_3)_2$

B. By side chain chlorination followed by hydrolysis:


CH3
Cl2/hν
(2 mol)
CHCl2
PhCH<OH OH
OH⁻
or
H3O+
CHO
1eq
Cl2/hν
CH2Cl
H3O+
CH2OH
3Cl2/hν
CCl3
H3O+
COOH

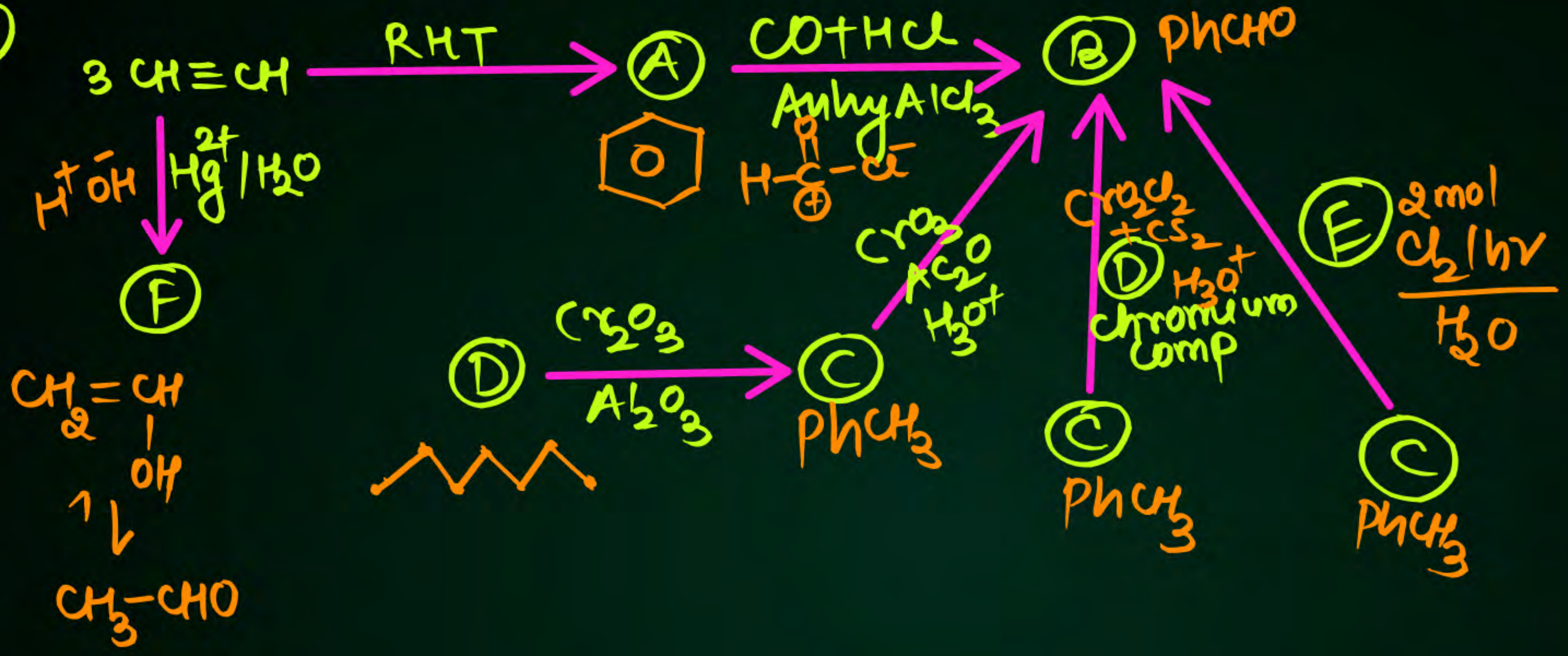
C. By Gatterman-Koch Reaction:


CO+HCl
Anhy AlCl3 + CuCl
CHO



$$H-\underset{\oplus}{\overset{\overset{O}{\|}}{C}}-\overset{\ominus}{Cl}$$

PSS

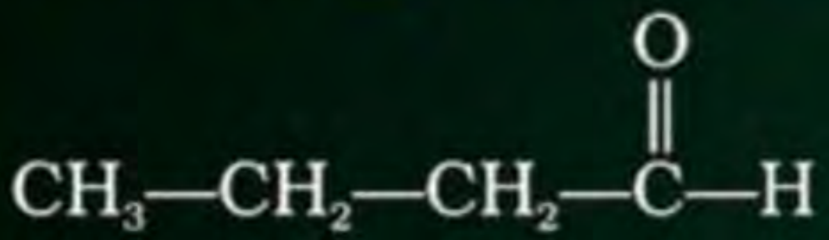


3 CH≡CH
RHT
A
CO+HCl
Anhy AlCl3
B
PhCHO
H–C(=O)–Cl
⊕
H⁺ OH⁻
Hg²⁺/H2O
F
CH2=CH–OH
CH3–CHO
D
Cr2O3
Al2O3
C
PhCH3
CrO3
Ac2O
H3O⁺
CrO2Cl2
+CS2
D
H3O⁺
Chromium comp
C
PhCH3
E
2mol
Cl2/hν
H2O
C
PhCH3

QUESTION (NCERT Exemplar)

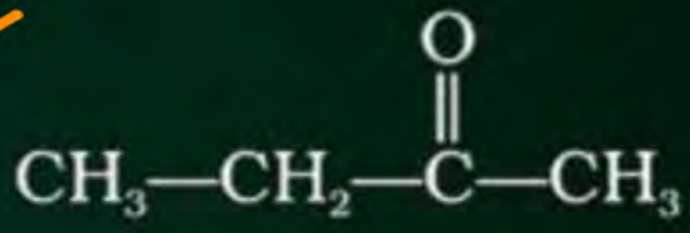
Addition of water to alkynes occurs in acidic medium and in the presence of Hg^{2+} ions as a catalyst. Which of the following products will be formed on addition of water to but-1-yne under these conditions.

(A)



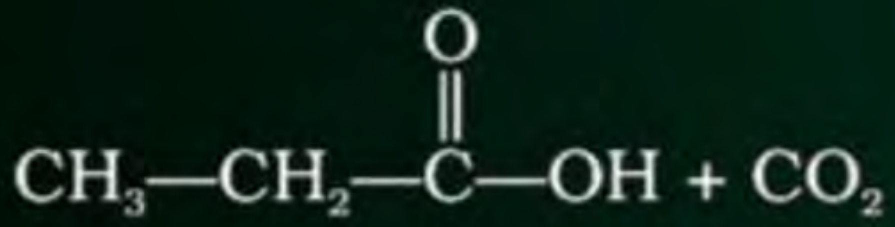
$CH_3-CH_2-CH_2-\overset{\overset{O}{\|}}{C}-H$

[✓ (B)]



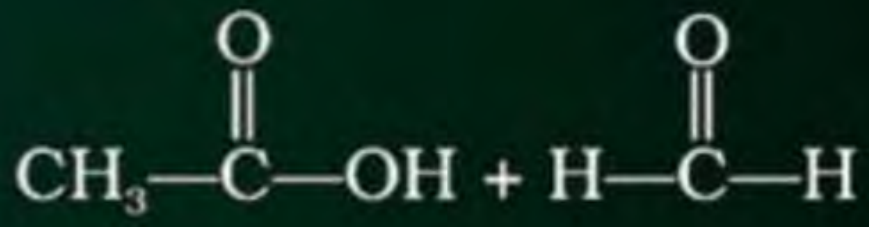
$CH_3-CH_2-\overset{\overset{O}{\|}}{C}-CH_3$

(C)

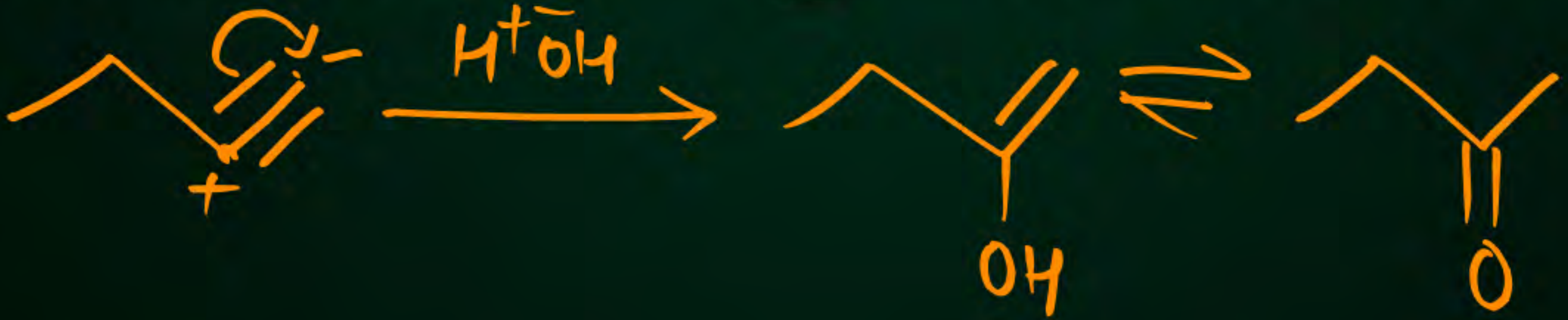


$CH_3-CH_2-\overset{\overset{O}{\|}}{C}-OH + CO_2$

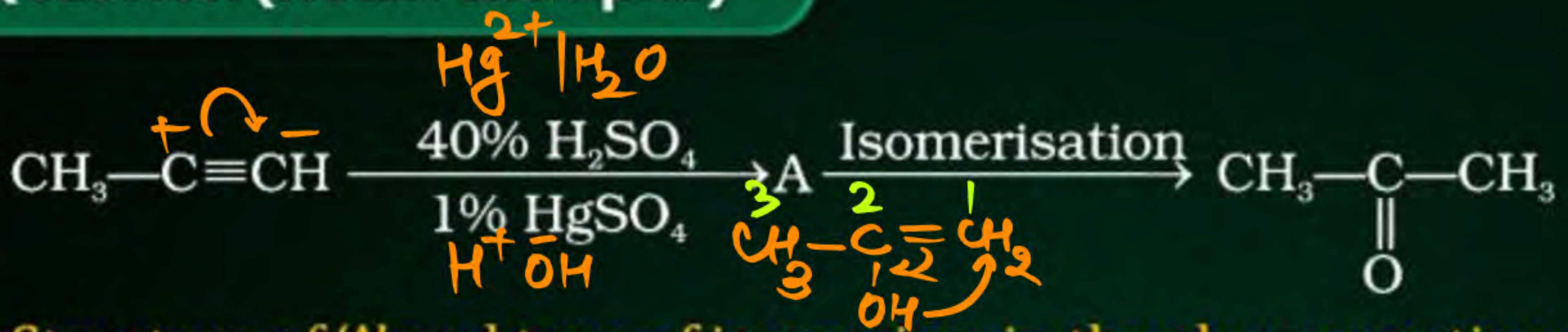
(D)



$CH_3-\overset{\overset{O}{\|}}{C}-OH + H-\overset{\overset{O}{\|}}{C}-H$



QUESTION (NCERT Exemplar)



$$CH_3-C\equiv CH \xrightarrow[1\%\ HgSO_4]{40\%\ H_2SO_4} A \xrightarrow{\text{Isomerisation}} CH_3-\underset{\underset{O}{\|}}{C}-CH_3$$

Hg^{2+}/H_2O
$H^+\ \bar{O}H$
$\overset{3}{CH_3}-\overset{2}{\underset{OH}{C}}=\overset{1}{CH_2}$

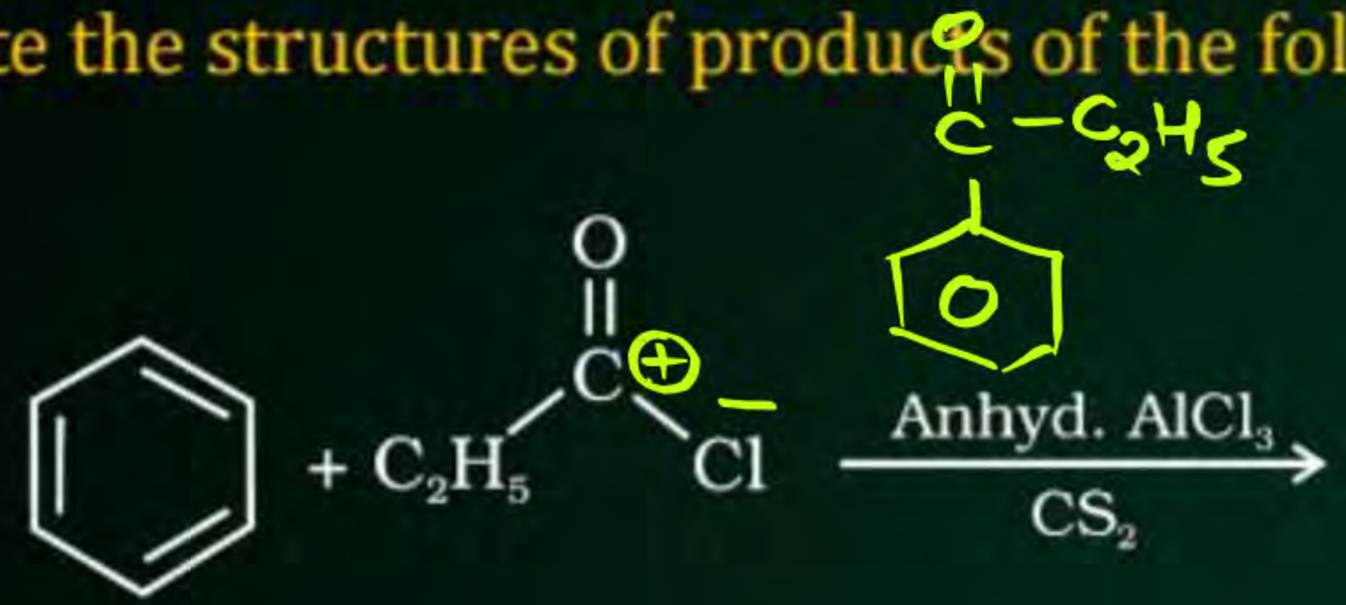
Structure of ‘A’ and type of isomerism in the above reaction are respectively.

- **A** Prop–1–en–2–ol, metamerism
- **B** Prop-1-en-1-ol, tautomerism
- **C** Prop-2-en-2-ol, geometrical isomerism
- [✓ **D**] Prop-1-en-2-ol, tautomerism

QUESTION (NCERT Example)

Write the structures of products of the following reactions:

(i)



O
C
+ C_2H_5
Cl
Anhyd. $AlCl_3$
CS_2
O
C $-C_2H_5$

(ii) $(C_6H_5CH_2)_2Cd + 2\,CH_3COCl \rightarrow$

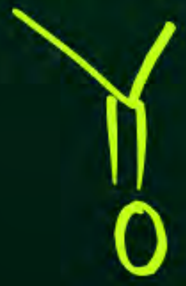
Next turn

$CH_3-\overset{O}{\overset{\|}{C}}-CH_2-Ph$

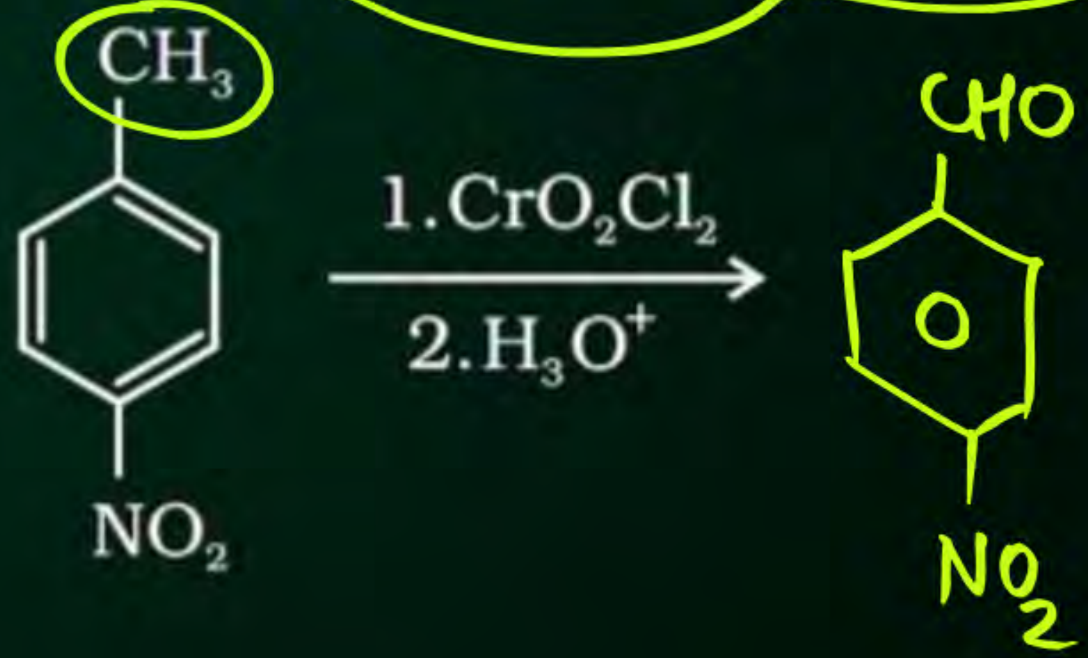
(iii) $H_3C-C\equiv C-H \xrightarrow{Hg^{2+},\ H_2SO_4}$

$\downarrow H^+\ \overline{O}H$

$CH_3-\underset{OH}{C}=CH_2$

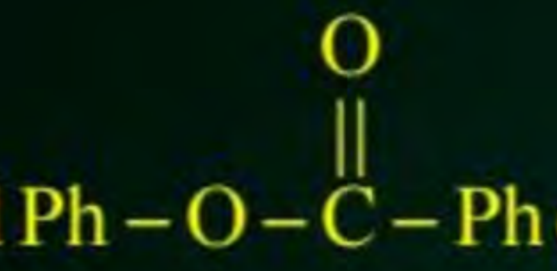


(iv)



CH_3
NO_2
1. CrO_2Cl_2
2. H_3O^+
CHO
NO_2

QUESTION (NCERT Exemplar)

Compound  $Ph-O-\overset{\overset{O}{\|}}{C}-Ph$ can be prepared by the reaction of ________.

PhOH   PhCOOH   ×

Ⓐ ✗ Phenol and benzoic acid in the presence of NaOH

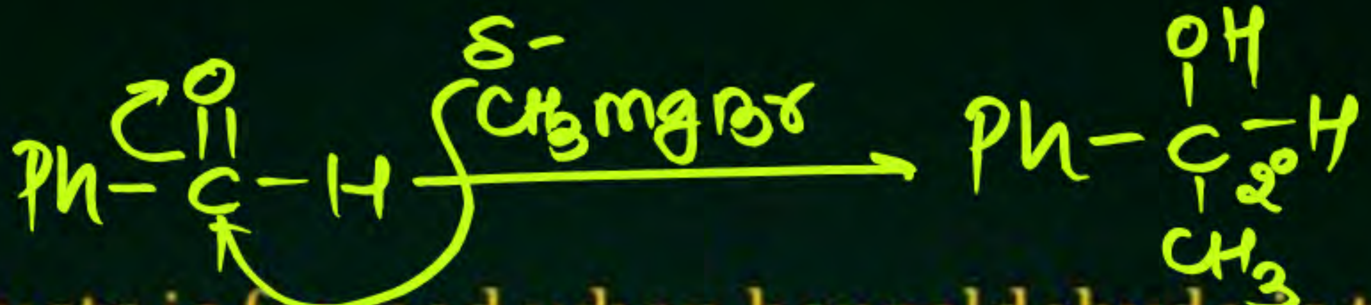
$Ph\overset{-}{O}H^{+}$ $Ph-\overset{+}{\overset{\overset{O}{\|}}{C}}-\overset{-}{Cl}$ Py

Ⓑ ✓ Phenol and benzoyl chloride in the presence of pyridine

Ⓒ Phenol and benzoyl chloride in the presence of $ZnCl_2$

Ⓓ Phenol and benzaldehyde in the presence of palladium

QUESTION (AIIMS 2013)



$$Ph-\overset{O}{\overset{\|}{C}}-H \xrightarrow{\overset{\delta-}{CH_3}MgBr} Ph-\underset{CH_3}{\overset{OH}{\underset{2^\circ}{C}}}-H$$

Which of the following products is formed when benzaldehyde is treated with CH_3MgBr and the addition product so obtained in subjected to acid hydrolysis?

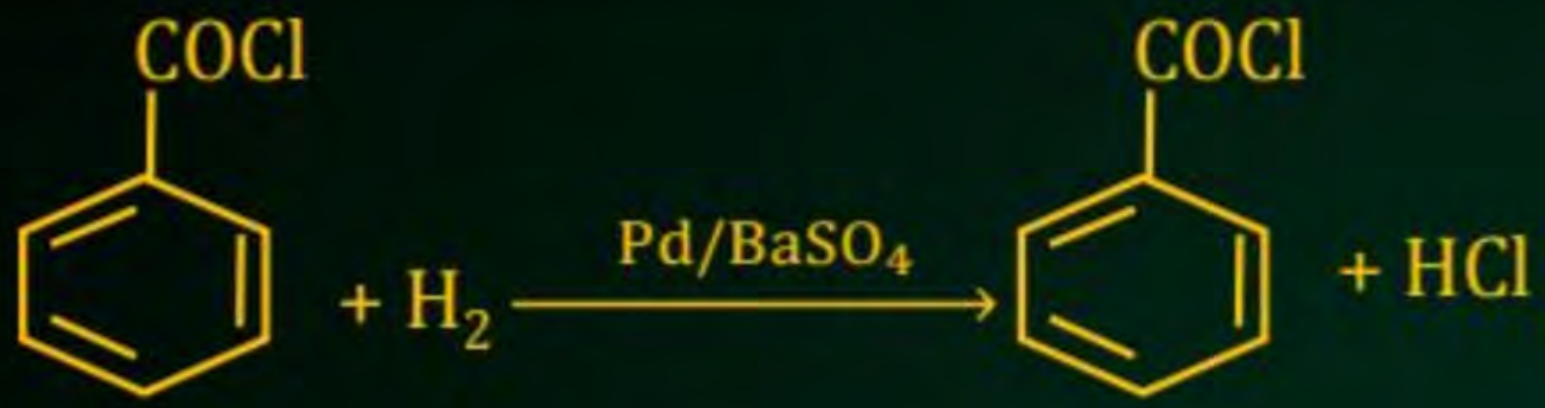
[✓ A] A secondary alcohol

B A primary alcohol

C Phenol

D tert-butyl alcohol

QUESTION (AIIMS 2001)


COCl
+ H_2
Pd/$BaSO_4$
COCl
+ HCl

The above reaction is:

- A Clemmensen reduction
- [✓ B Rosenmund reduction]
- C Birch reduction
- D Wolff-Kishner reduction

QUESTION

The olefin which on ozonolysis gives CH_3CH_2CHO and CH_3CHO is:

- A 1-butene

$$\overset{5}{CH_3}\overset{4}{CH_2}\overset{3}{CH}=\overset{2}{CH}\overset{1}{CH_3} \longrightarrow CH_3CH_2CH=\boxed{O \quad O}=CHCH_3$$

- B 2-butene
- C 1-pentene
- [✓ D] 2-pentene

QUESTION

$R-CHO$

Aldehydes are first oxidation products of:

$\uparrow$

RCH_2OH

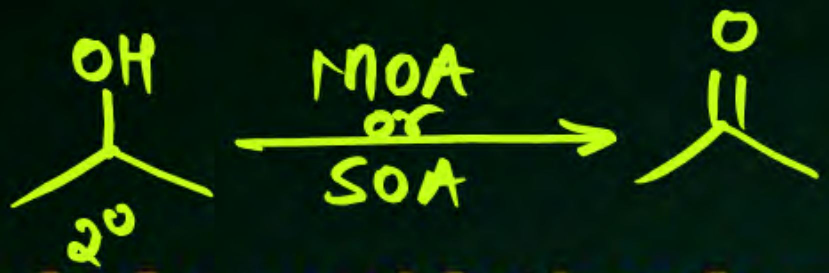
[✓ A] primary alcohols

B secondary alcohols

C tertiary alcohols

D monohydric alcohols

QUESTION


OH
MOA
or
SOA
2°
O

Isopropyl alcohol on oxidation forms:

[✓ A] acetone

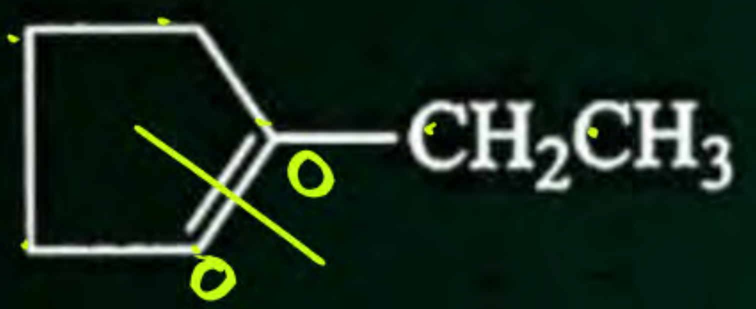
B ether

C acetaldehyde

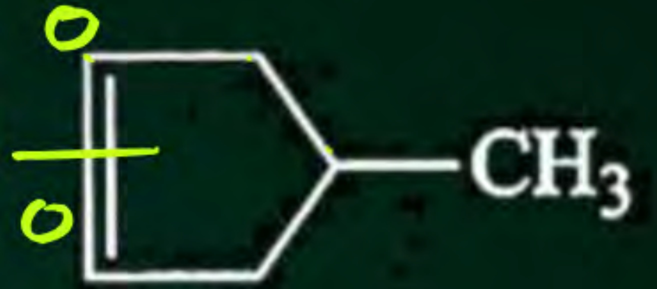
D ethylene

QUESTION

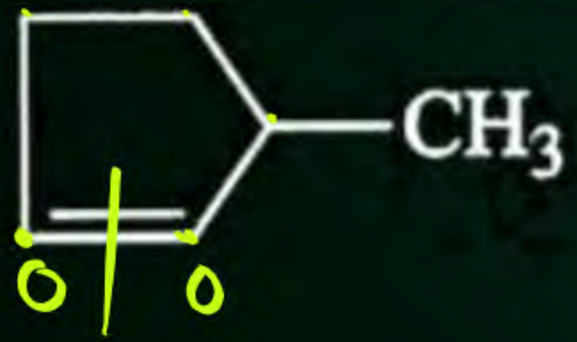
5-Oxohexanal is obtained by ozonolysis of:

A


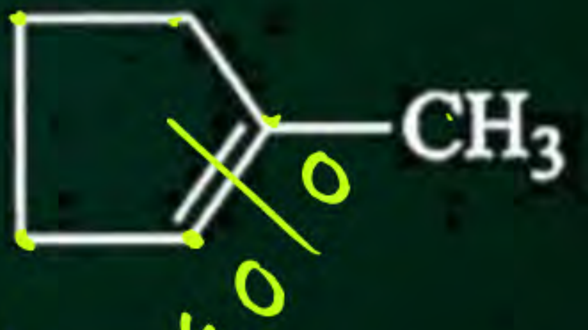
☐

B


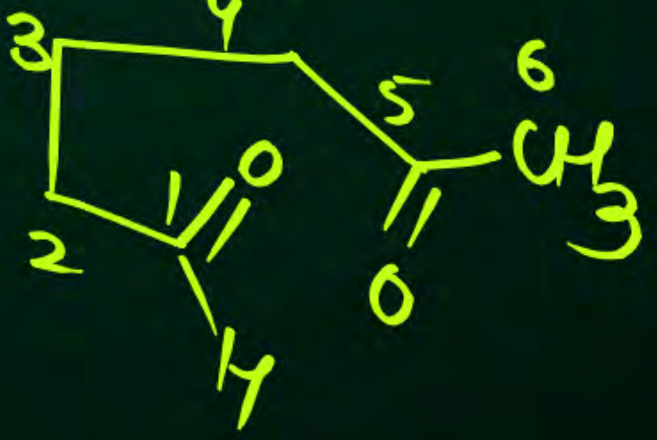
☐

C


☐

[✓ D]


☐



3
4
5
6
CH$_3$
O
1
2
O
H

QUESTION

$$\underset{\text{acid chloride}}{\mathrm{RCOCl}} + \mathrm{H_2} \xrightarrow{\mathrm{Pd/BaSO_4}} \underset{\text{alkanal}}{\mathrm{RCHO}} + \mathrm{HCl}$$

The reaction is known as:

[✓ A Rosenmund's reduction]

B Stephen's reaction

C Clemmensen's reduction

D None of these

QUESTION

$RCN \xrightarrow[H_2O]{SnCl_2/HCl} RCHO$. This reaction is known as

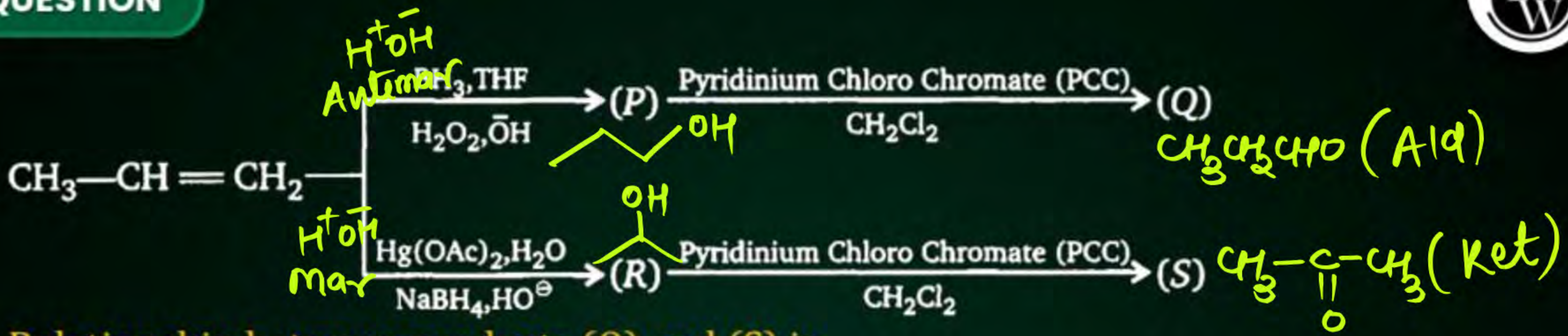
A Rosenmund's reduction

[✓ B Stephens reaction]

C LAH reduction

D Clemmensens reduction

QUESTION



$$CH_3-CH=CH_2 \begin{cases} \xrightarrow[H_2O_2,\bar{O}H]{BH_3,\ THF} (P) \xrightarrow[CH_2Cl_2]{\text{Pyridinium Chloro Chromate (PCC)}} (Q) \\ \xrightarrow[NaBH_4,\ HO^{\ominus}]{Hg(OAc)_2,\ H_2O} (R) \xrightarrow[CH_2Cl_2]{\text{Pyridinium Chloro Chromate (PCC)}} (S) \end{cases}$$

$H^+\bar{O}H$
Antimar
OH
CH_3CH_2CHO (Ald)
$H^+\bar{O}H$
Mar
OH
$CH_3-\overset{}{\underset{\underset{O}{\|}}{C}}-CH_3$ (Ket)

Relationship between products (Q) and (S) is:

- (A) Positional isomer
- (B) Chain isomer
- (C) Stereoisomer
- [✓ (D) Functional isomer]

QUESTION 01

Products of the following reaction, $Me_2C = CHCH_3 \xrightarrow[\text{(ii) } (CH_3)_2S]{\text{(i)} O_3}$? are:

A $Me_2CO + CH_3CHO$

B $CH_3CHO + CH_3COOH$

C $Me_2CO + CH_3COOH$

D $2Me_2CO$

QUESTION 02

Identify the product in the reaction

$Ph - C \equiv C - Me \xrightarrow{H_3O^+, Hg^{2+}} ?$

(A) $PhCH_2CH_2CHO$

(B) $PhCOCH_2CH_3$

(C) $PhCH_2COCH_3$

(D) PhCOCOMe

QUESTION 03

Dialkyl cadmium reacts with a compound to form a ketone. The compound is:

Ⓐ an acid

Ⓑ an acid chloride

Ⓒ an ester

Ⓓ carbon monoxide

QUESTION 04

In the reaction sequence:

Cyclohexane $\xrightarrow{hv/Cl_2}$ (X) $\xrightarrow{\text{alc. KOH}/\Delta}$ (Y) $\xrightarrow[\text{(ii) } H_2O/Zn]{\text{(i)} O_3}$ (Z)

(Z) will be:

- Ⓐ Hexanal
- Ⓑ 2-Hexanone
- Ⓒ 3-Hexanone
- Ⓓ Hexanedial

QUESTION 05

$CH_3CH_2C{\equiv}N \xrightarrow{X} CH_3CH_2CHO$

the compound X is:

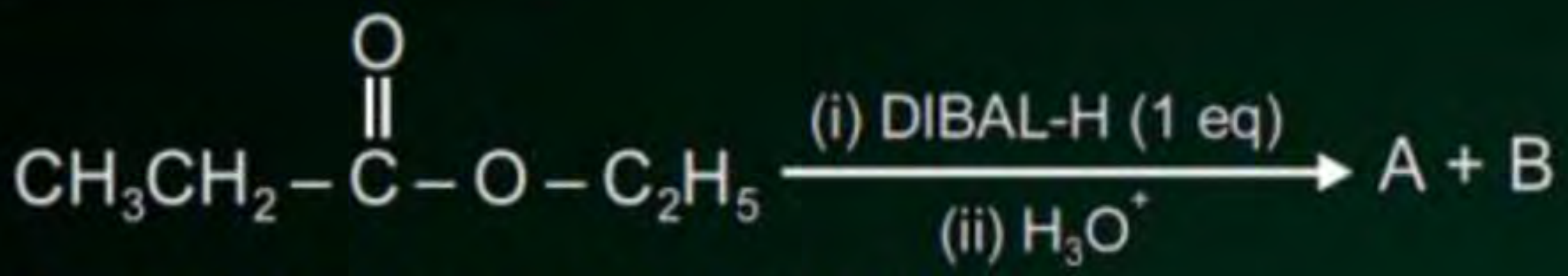
(A) $H_2/Pd\text{-}BaSO_4$

(B) $SnCl_2/HCl/H_2O$, boil

(C) $LiAlH_4$/ether

(D) $NaBH_4/\text{ether}/H_3O^+$

QUESTION 06



$$CH_3CH_2-\overset{\overset{O}{\parallel}}{C}-O-C_2H_5 \xrightarrow[\text{(ii) } H_3O^+]{\text{(i) DIBAL-H (1 eq)}} A + B$$

A and B are respectively:

(A) $CH_3CH_2CH_2OH + C_2H_5OH$

(B) $CH_3CH_2CHO + C_2H_5OH$

(C) $CH_3CH_2CHO + CH_3CHO$

(D) $CH_3CH_2CH_2OH + CH_3CHO$

QUESTION 07

Reduction of acetonitrile in presence of $SnCl_2/HCl$, followed by hydrolysis gives:

A $HCHO$

B CH_3CHO

C CH_3CH_2CHO

D CH_3COCH_3

QUESTION 08

Acetylene on treatment with dil. H_2SO_4 having $HgSO_4$ gives:

(A) acetaldehyde

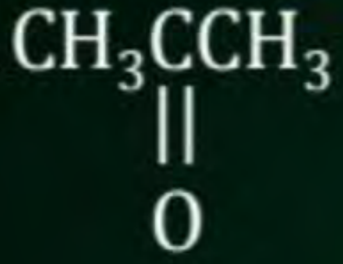
(B) acetic acid

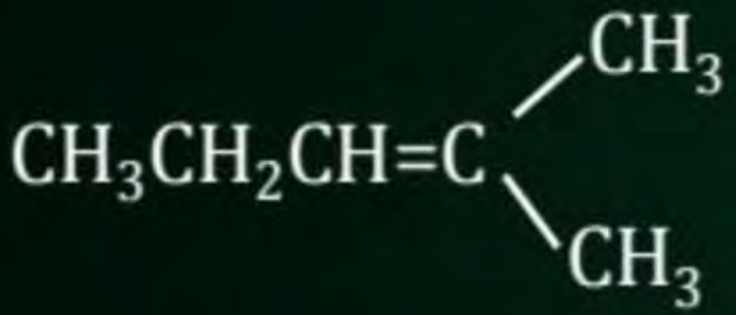
(C) ethanol

(D) ethylene

QUESTION 09

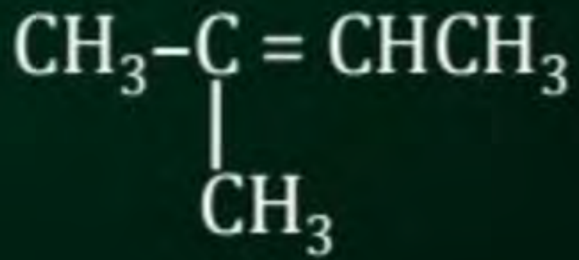
Which alkene on ozonolysis gives?

CH_3CH_2CHO and 
$CH_3\underset{\underset{O}{\|}}{C}CH_3$

(A) 

(B) $CH_3CH_2CH = CHCH_2CH_3$

(C) $CH_3CH_2CH = CHCH_3$

(D) 
$CH_3-\underset{\underset{CH_3}{|}}{C} = CHCH_3$

QUESTION 10

Ozonolysis of buta-1, 3-diene gives:

(A) HCHO and glyoxal

(B) CH_3CHO and glyoxal

(C) CO_2 and glyoxal

(D) HCHO + glyoxal + CH_3CHO

ANSWER KEY

1. A
2. B
3. B
4. D
5. B
6. B
7. B
8. A
9. A
10. A

Home Work From PW Module (Yakeen NEET)

Prarambh: Q 01, 02, 03, 04, 05, 06, 07, 08, 09, 10, 11, 12, 13, 14, 15

Prabal: Q 02

Thankyou!!

YAKEEN 2.0

FOR NEET 2025

Lecture- 02 | **Organic Chemistry**

Aldehydes, Ketones and Carboxylic Acids

By- Pankaj Sir(POPU MAMA)

Physics Wallah

Topics *to be covered*

1. Methods of Preparation of Ketones ✓
2. Practice

Methods of Preparation of Ketones

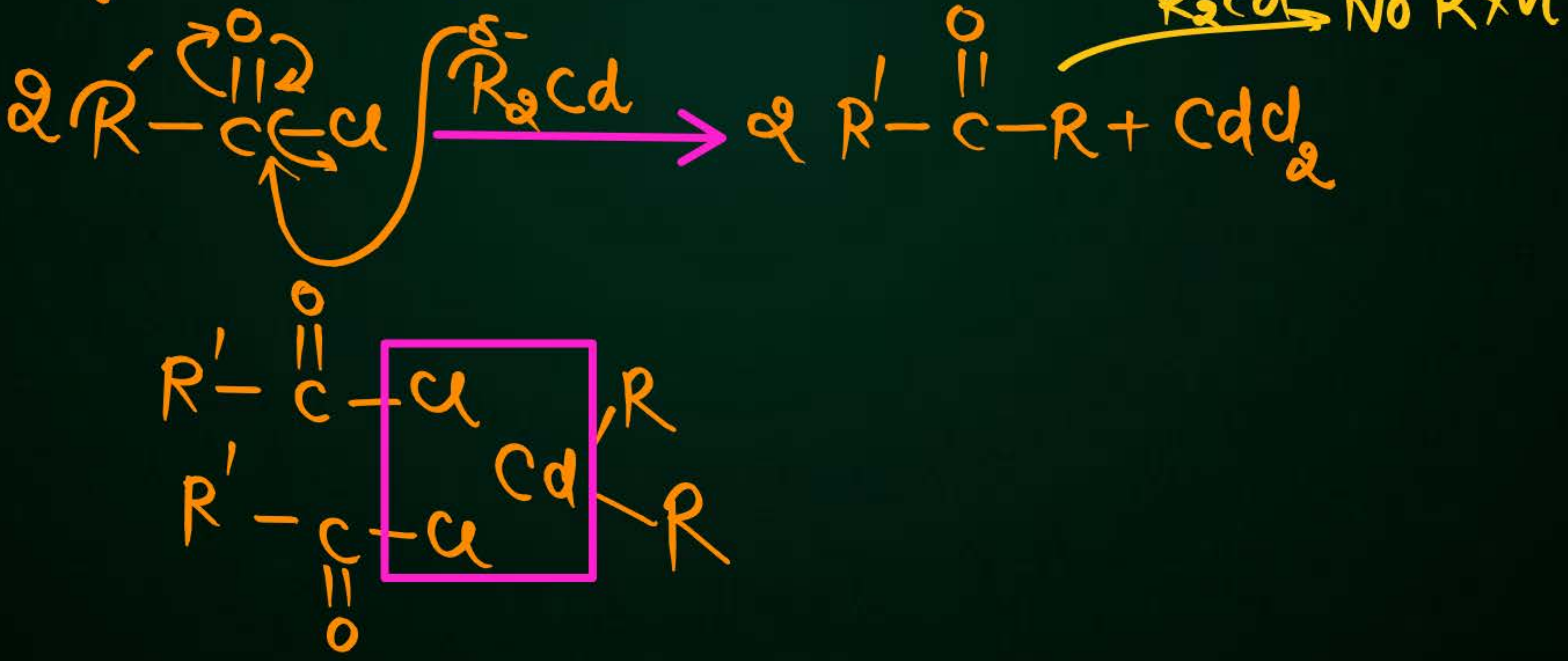
Reactivity

$RMgX > R_2Cd$

1. From acyl chlorides:

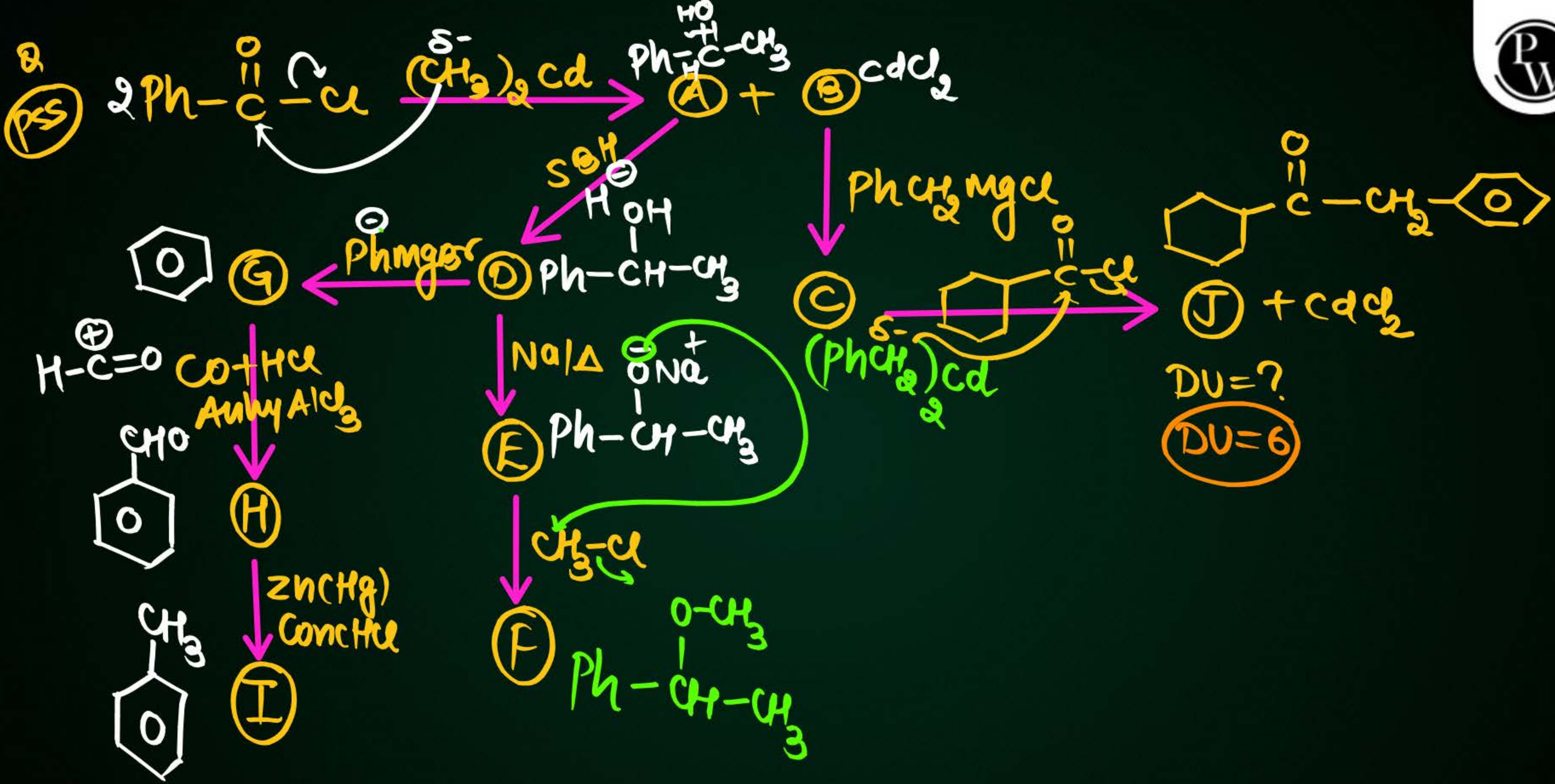
Dialkyl Cadmium

$$2\overset{\delta-}{R}MgCl + CdCl_2 \longrightarrow R_2Cd + 2MgCl_2$$

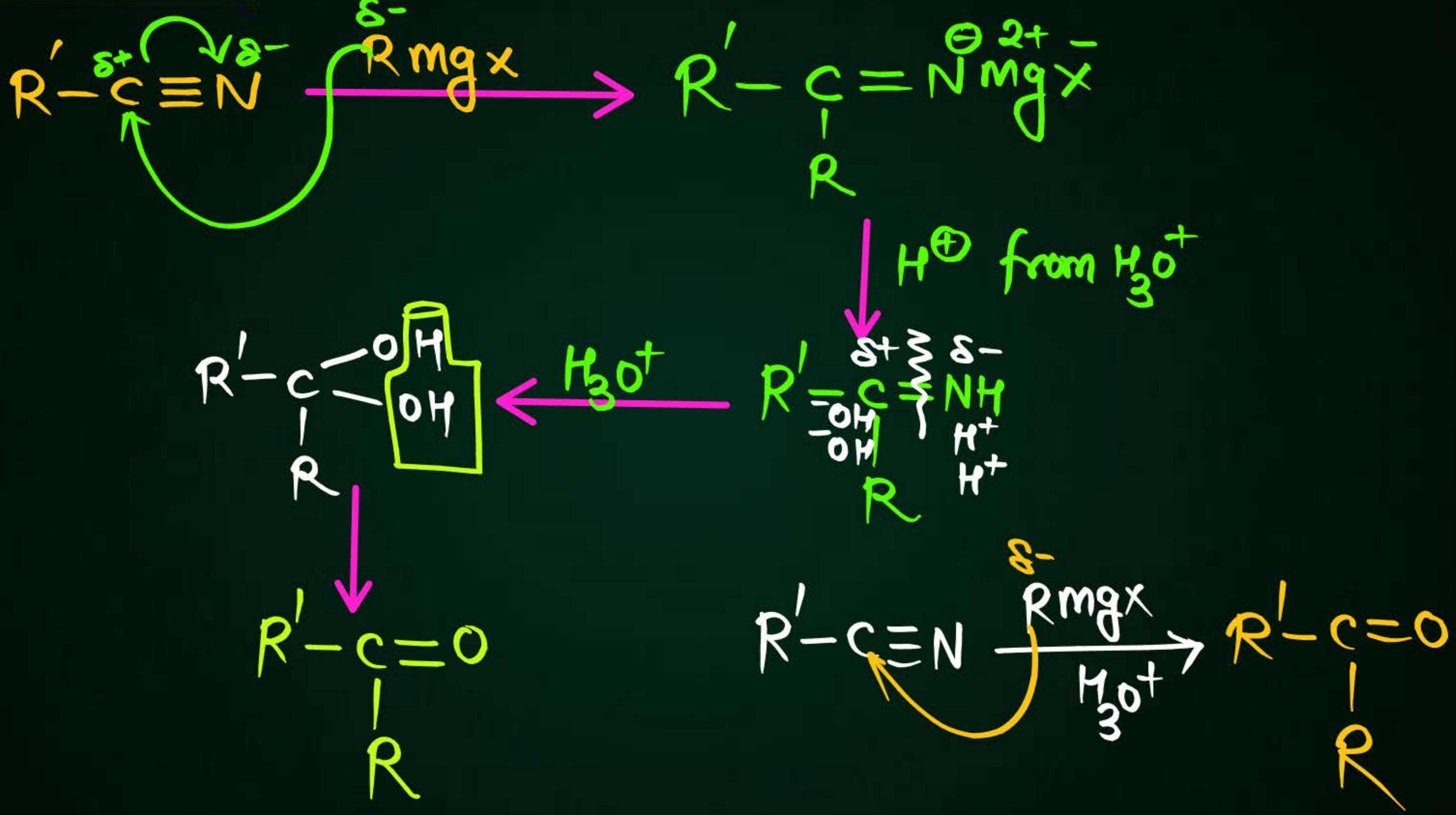


$$2R'-\overset{\overset{O}{||}}{C}-Cl \xrightarrow{\overset{\delta-}{R}_2Cd} 2R'-\overset{\overset{O}{||}}{C}-R + CdCl_2$$

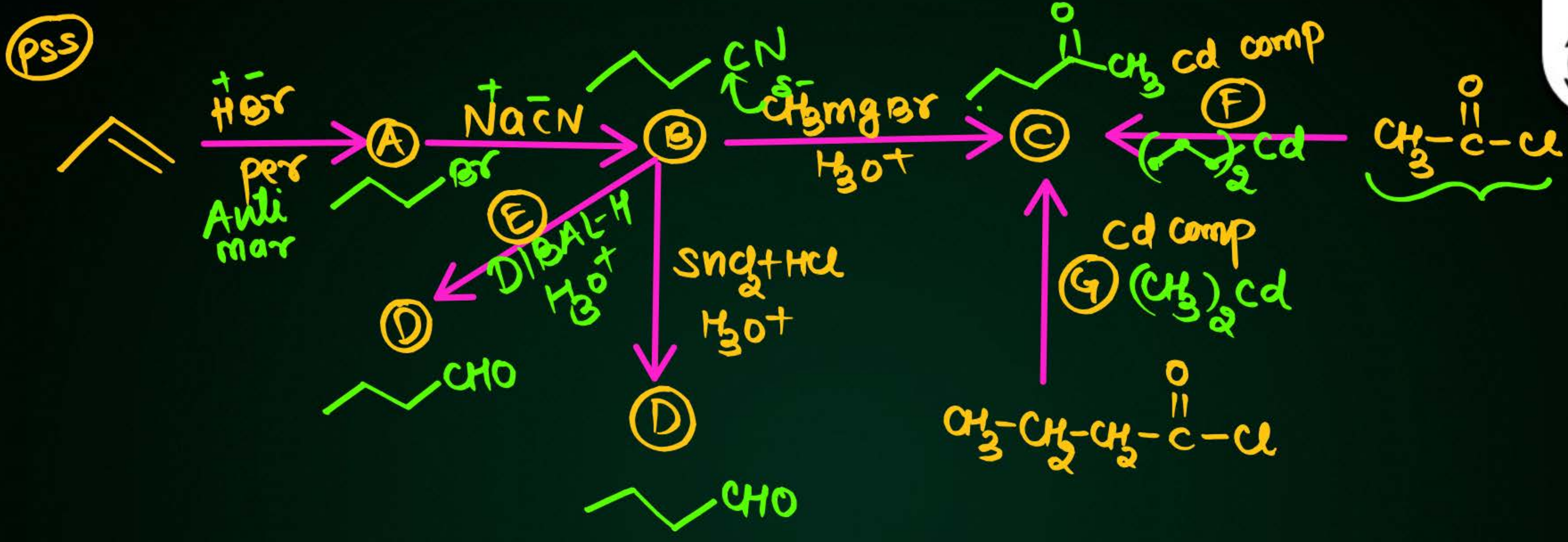
$R'-\overset{\overset{O}{||}}{C}-R \xrightarrow{R_2Cd}$ No Rxn


Q
PS
2Ph–C(=O)–Cl
δ-
(CH3)2Cd
HO
Ph–C(H)(H)–CH3
A
+
B
CdCl2
SOH
H⊖
PhCH2MgCl
OH
Ph–CH–CH3
D
PhMgBr
⊖
G
C
H–C⊕=O
CO+HCl
Anhy AlCl3
CHO
H
Zn(Hg)
Conc HCl
CH3
I
NaI Δ
O⊖Na+
Ph–CH–CH3
E
CH3–Cl
F
O–CH3
Ph–CH–CH3
C(=O)–Cl
δ-
(PhCH2)2Cd
J
+CdCl2
C(=O)–CH2
DU=?
DU=6

2. From nitriles:

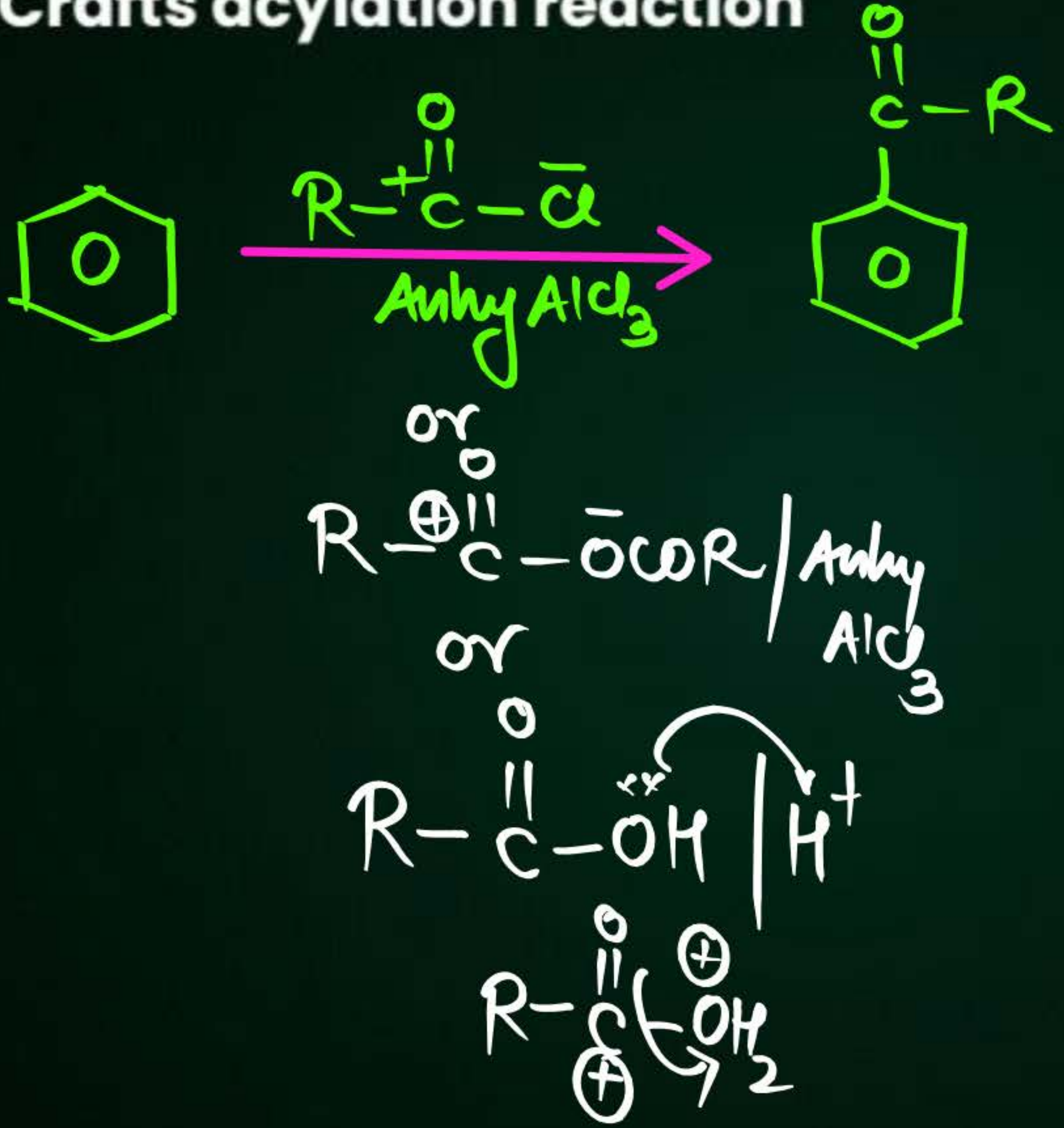


$R'-\overset{\delta+}{C}\equiv \overset{\delta-}{N}$
$\overset{\delta-}{R}mgx$
$R'-C(R)=\overset{\ominus}{N}\overset{2+}{mg}\overset{-}{x}$
$H^{\oplus}$ from H_3O^+
$R'-\overset{\delta+}{C}(R)=\overset{\delta-}{NH}$
$-OH$
$-OH$
H^+
H^+
H_3O^+
$R'-C(R)(OH)OH$
$R'-C(R)=O$
$R'-C\equiv N \xrightarrow[H_3O^+]{\overset{\delta-}{R}mgx} R'-C(R)=O$

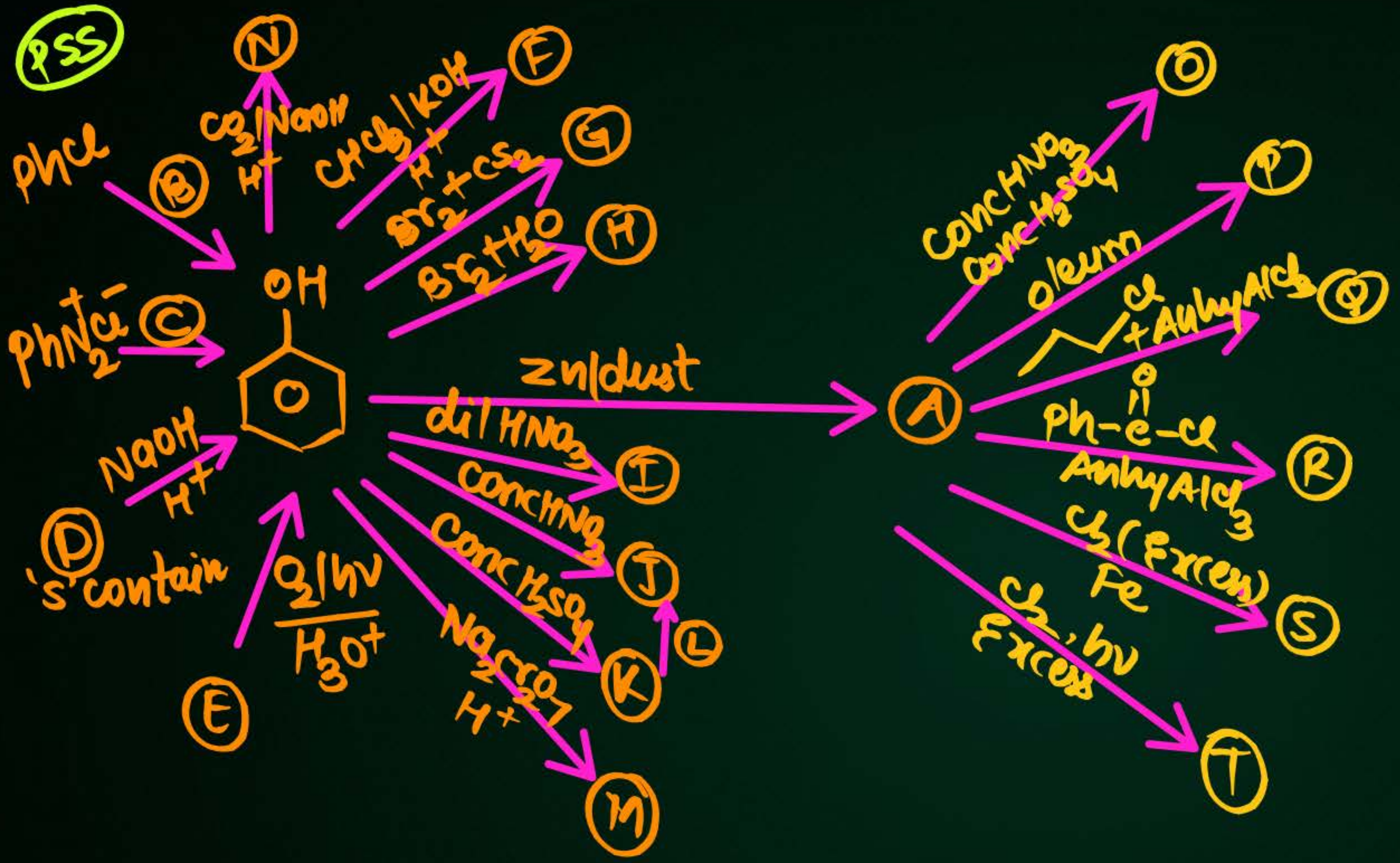

PSS
$\overset{+}{H}\overset{-}{Br}$
per
Anti mar
A
$\overset{+}{Na}\overset{-}{CN}$
B
Br
CN
$\overset{\delta-}{CH_3}MgBr$
H_3O^+
C
CH_3 cd comp
F
$(\ )_2Cd$
$CH_3-\overset{O}{\overset{||}{C}}-Cl$
E
DIBAL-H
H_3O^+
D
CHO
$SnCl_2+HCl$
H_3O^+
D
CHO
cd comp
G
$(CH_3)_2Cd$
$CH_3-CH_2-CH_2-\overset{O}{\overset{||}{C}}-Cl$

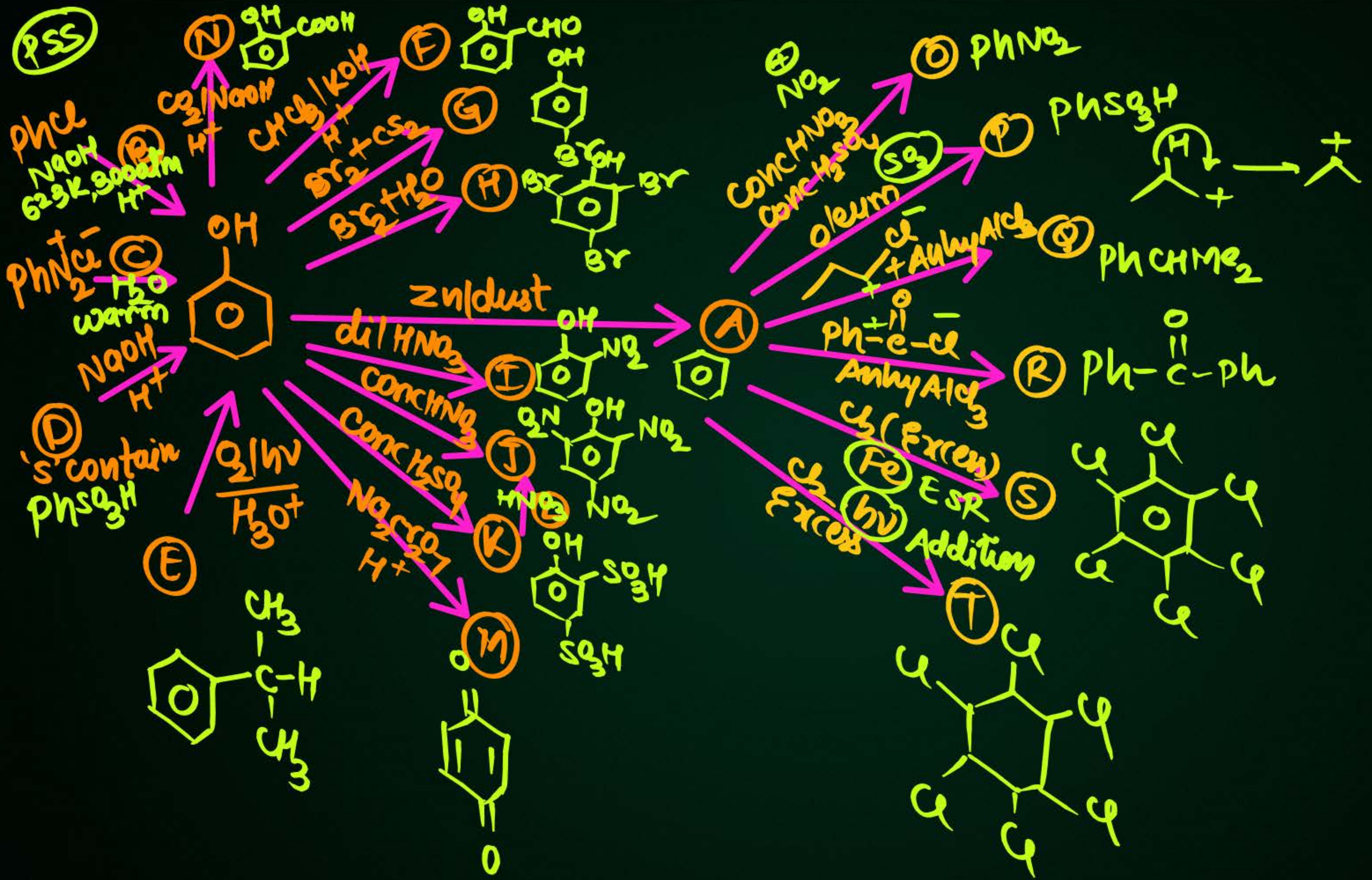
3. From benzene or substituted benzenes:

Friedel-Crafts acylation reaction



$R-\overset{O}{\overset{\|}{C}}-Cl$
Anhy AlCl$_3$
$C-R$
or
$R-\overset{O}{\overset{\|}{C}}-OCOR$
Anhy AlCl$_3$
or
$R-\overset{O}{\overset{\|}{C}}-OH$
H$^+$
$R-\overset{O}{\overset{\|}{C}}-\overset{\oplus}{OH_2}$


PSS
PhCl
B
CO2/NaOH
H+
N
CHCl3/KOH
H+
F
Br2+CS2
G
Br2+H2O
H
OH
PhN2+Cl-
C
NaOH
H+
D
'S' contain
O2/hv
H3O+
E
Zn dust
dil HNO3
I
conc HNO3
J
conc H2SO4
K
L
Na2Cr2O7
H+
M
A
conc HNO3
conc H2SO4
O
oleum
P
Cl
+ Anhy AlCl3
Q
Ph-C(=O)-Cl
Anhy AlCl3
R
Cl2 (Excess)
Fe
S
Cl2, hv
Excess
T


PSS
PhCl
NaOH
623K, 300atm
H⁺
B
PhN₂⁺Cl⁻
C
H₂O
warm
NaOH
H⁺
D
'S' contain
PhSO₃H
O₂/hv
H₃O⁺
E
CH₃
C–H
CH₃
CO₂/NaOH
H⁺
N
OH
COOH
CHCl₃/KOH
H⁺
F
OH
CHO
Br₂+CS₂
G
OH
Br
Br₂+H₂O
H
OH
Br
Br
Br
OH
Zn/dust
A
dil HNO₃
I
OH
NO₂
conc HNO₃
J
O₂N
OH
NO₂
NO₂
conc H₂SO₄
K
HNO₃
OH
SO₃H
SO₃H
Na₂Cr₂O₇
H⁺
M
O
O
⊕NO₂
conc HNO₃
conc H₂SO₄
O
PhNO₂
SO₃
oleum
P
PhSO₃H
H
+
+
Cl⁻
+ Anhy AlCl₃
Q
PhCHMe₂
Ph–C(=O)–Cl
Anhy AlCl₃
R
Ph–C(=O)–Ph
Cl₂ (Excess)
Fe
ESR
S
Cl
Cl
Cl
Cl
Cl
Cl
Cl₂
Excess
hv
Addition
T
Cl
Cl
Cl
Cl
Cl
Cl

QUESTION (NCERT Exemplar)

Benzophenone can be obtained by ________.

$Ph-\overset{O}{\overset{\|}{\underset{+}{C}}}-\bar{Cl}$ $Ph-H$ $PhCOPh$

A Benzoyl chloride + Benzene + $AlCl_3$

$Ph-\overset{O}{\overset{\|}{C}}-Cl$ $(\overset{\delta-}{Ph})_2Cd$

B Benzoyl chloride + Diphenyl cadmium

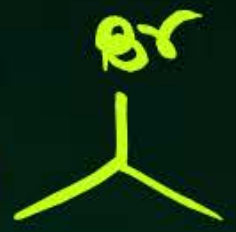
[✓ C] Both (A) & (B)

D Benzene + Carbon monoxide + $ZnCl_2$

QUESTION

$H^+\bar{O}H$ $\quad \overset{CH=CH_2}{OH}$ $\quad CH_3-\overset{O}{\overset{\|}{C}}-H$ $\quad CH_3-\overset{OH}{\overset{|}{CH}}-CH_3$

$$HC\equiv CH \xrightarrow[H_2SO_4]{HgSO_4} (A) \xrightarrow[2.\ HOH]{1.\ \overset{\delta-}{CH_3}MgBr} (B) \xrightarrow{\underline{P/Br_2}} (C)$$



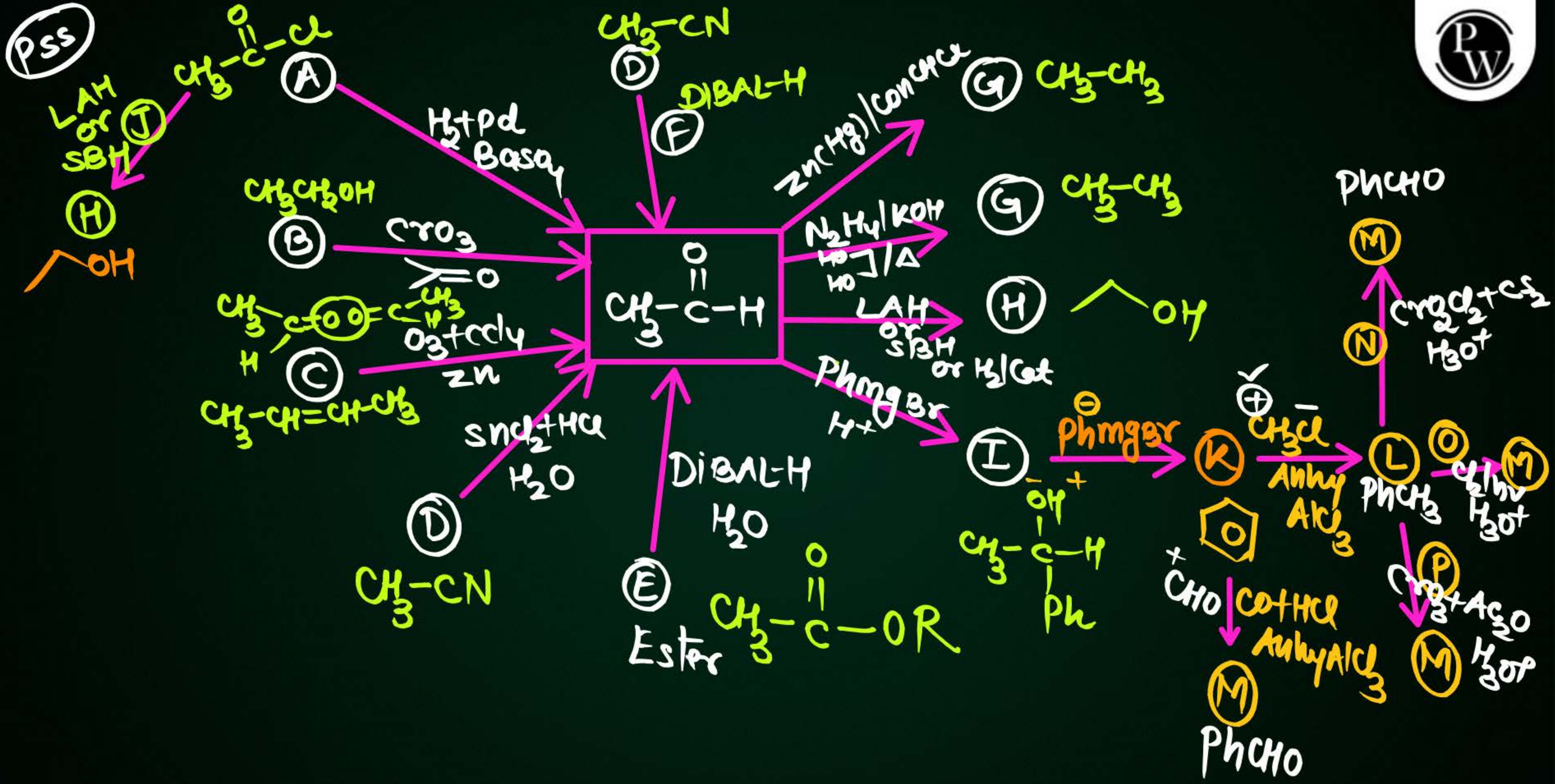
In this reaction, the final product (C) is:

A $CH_3CH(Br)CH_3$ ✓

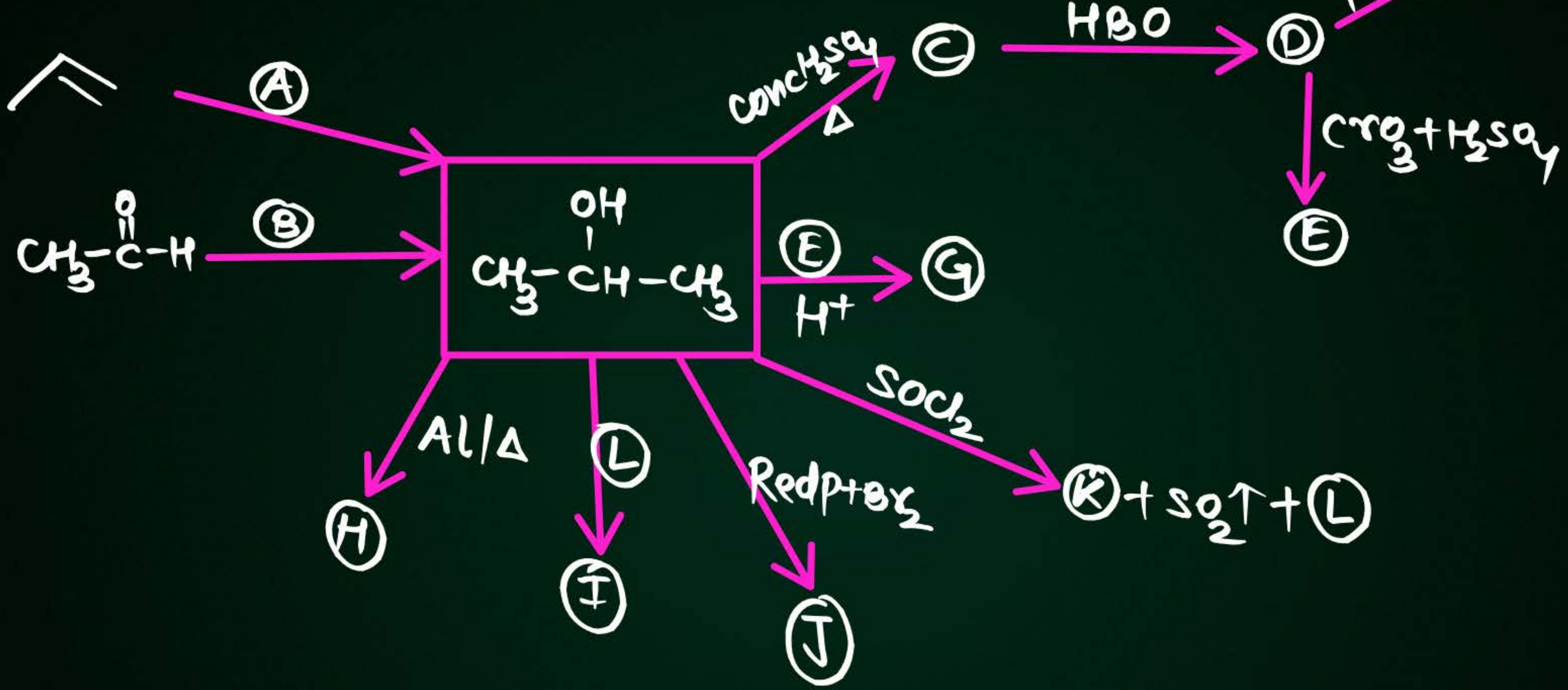
B $CH_3CH_2CH_2Br$

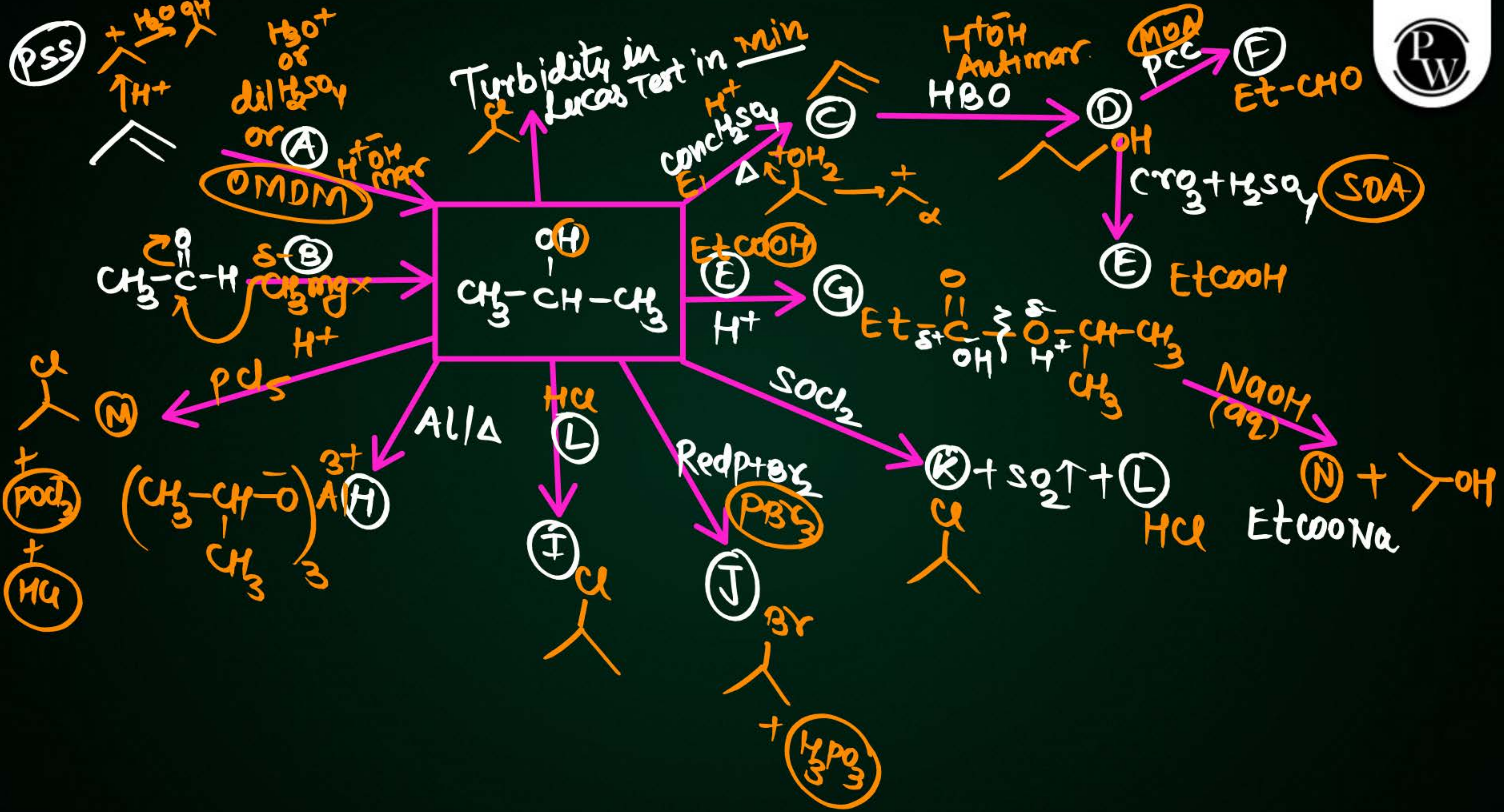
C $CH_2 = CHBr$

D $BrHC = CH - CH_3$

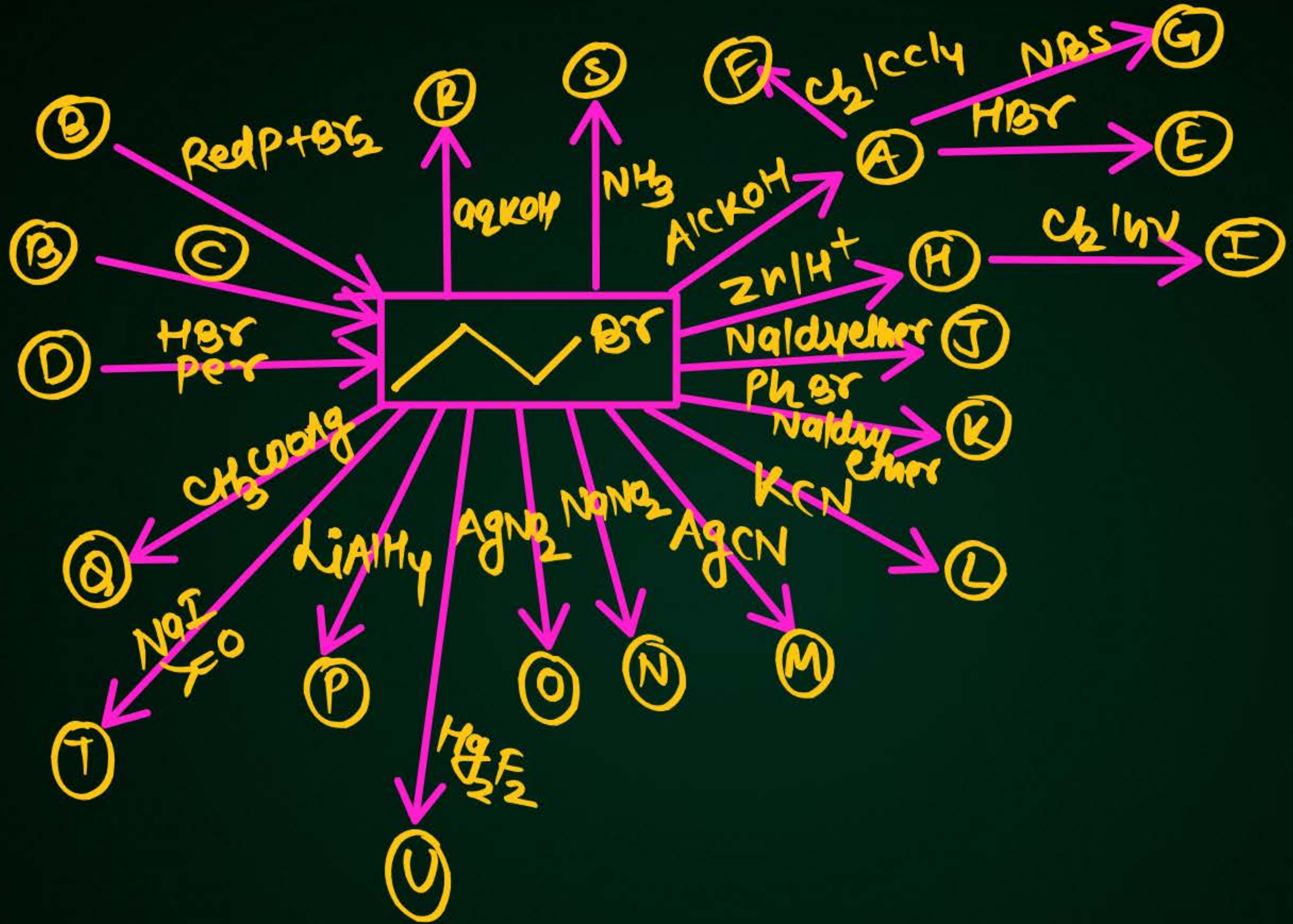
PSS
CH3-C(=O)-Cl
A
H2+Pd BaSO4
CH3-CN
D
F
DIBAL-H
LAH or SBH
J
H
OH
CH3CH2OH
B
CrO3
>=O
CH3-C=O O=C-CH3
H
O3+CCl4
Zn
C
CH3-CH=CH-CH3
SnCl2+HCl
H2O
D
CH3-CN
DIBAL-H
H2O
E
Ester CH3-C(=O)-OR
CH3-C(=O)-H
Zn(Hg)/conc HCl
G
CH3-CH3
N2H4/KOH
HO-/Δ
G
CH3-CH3
LAH or SBH or H2/Cat
H
OH
PhMgBr
H+
I
OH
CH3-C-H
Ph
PhMgBr
K
CH3Cl
Anhy AlCl3
L
PhCH3
N
CrO2Cl2+CS2
H3O+
M
PhCHO
O
Cl2/hν
H3O+
M
P
CrO3+Ac2O
H3O+
M
CHO
CO+HCl
Anhy AlCl3
M
PhCHO

PSS

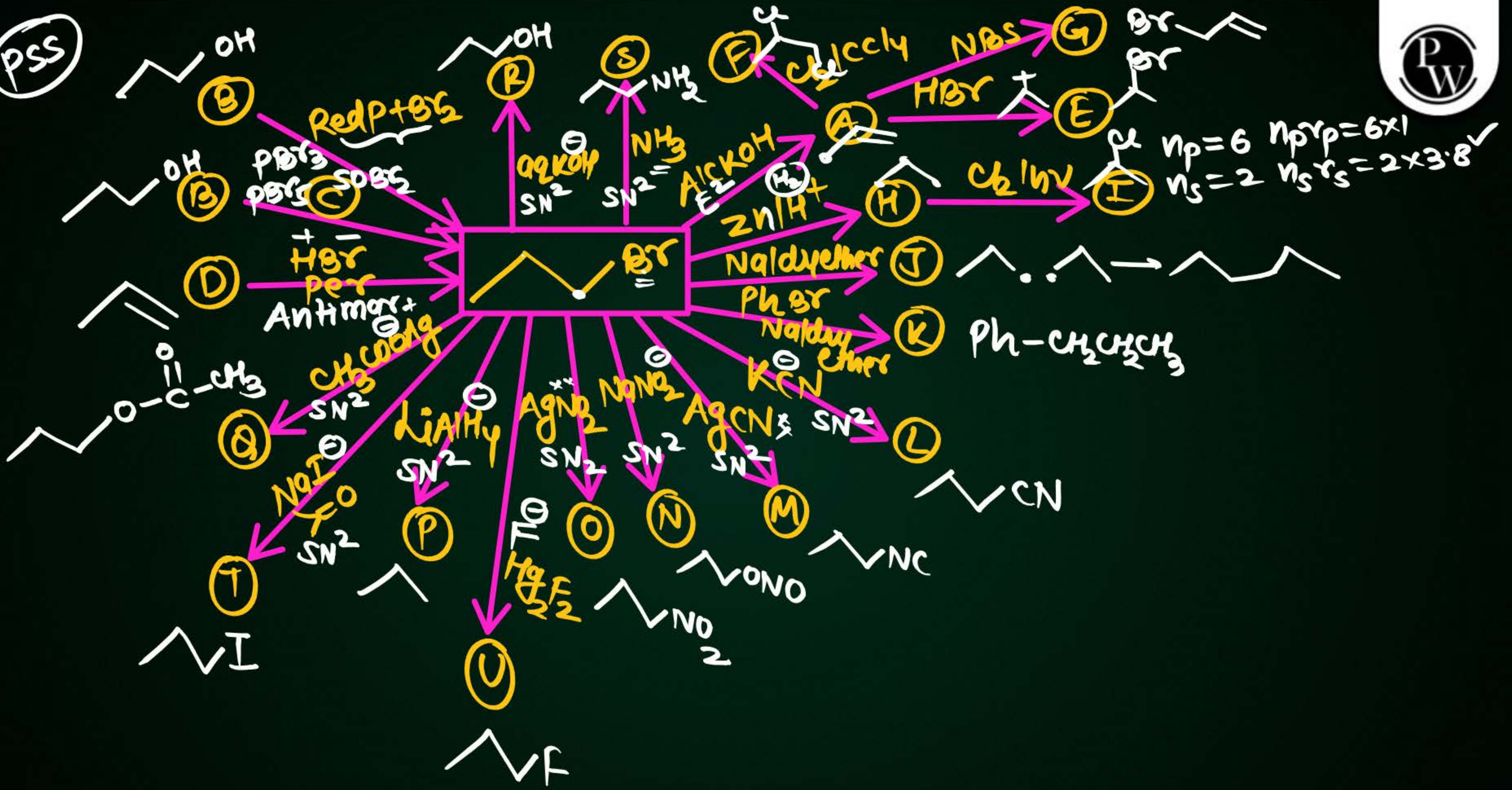

A
B
$CH_3-\overset{O}{\overset{\|}{C}}-H$
$\overset{OH}{CH_3-CH-CH_3}$
conc H_2SO_4
Δ
C
HBO
D
PCC
F
$CrO_3+H_2SO_4$
E
E
H^+
G
$SOCl_2$
K + SO_2↑ + L
Al/Δ
H
L
I
Red P + Br_2
J


PSS
H^+
H_2O OH
H_3O^+ or dil H_2SO_4 or
A
H^+OH^- mar
OMDM
B
$CH_3-\overset{O}{\overset{\|}{C}}-H$
δ− CH_3MgX
H^+
Turbidity in Lucas Test in min
Cl
H^+ conc H_2SO_4
E_1 Δ
$\overset{+}{O}H_2$
α
C
H^+OH^- Antimar
HBO
D
OH
MOA PCC
F
Et-CHO
$CrO_3+H_2SO_4$ SOA
E
EtCOOH
$CH_3-\overset{OH}{CH}-CH_3$
EtCOOH
E
H^+
G
$Et-\overset{O}{\overset{\|}{C}}-OH$ δ+ δ− $O-CH-CH_3$ H^+ CH_3
NaOH (aq)
N + OH
EtCOONa
$SOCl_2$
K + SO_2↑ + L
Cl
HCl
Redp+Br_2
PBr_3
J
Br
+ H_3PO_3
HCl
L
I
Cl
Al/Δ
$(CH_3-CH(CH_3)-O^-)_3Al^{3+}$ H
PCl_5
M
Cl
+ $POCl_3$
+ HCl

PSS


B
Red P + Br2
B
C
D
HBr
Per
R
aq KOH
S
NH3
Br
Alc KOH
A
F
Cl2/CCl4
NBS
G
HBr
E
Zn/H+
H
Cl2/hν
I
NaI/dry ether
J
PhBr
Na/dry ether
K
KCN
L
AgCN
M
NaNO2
N
AgNO2
O
LiAlH4
P
CH3COOAg
Q
NaI
T
Hg2F2
U

PSS


B
Red P + Br2
B
PBr3
PBr5
C
SOBr2
D
HBr
Per
Antimar
CH3COOAg
SN2
Q
NaI
F⊖
SN2
T
I
LiAlH4
SN2
P
F⊖
Hg2F2
U
F
AgNO2
SN2
O
NO2
NaNO2
SN2
N
ONO
AgCN
SN2
M
NC
KCN
SN2
L
CN
Br
aq KOH
SN2
R
OH
NH3
SN2
S
NH2
Alc KOH
E2
A
Cl2 / CCl4
F
Cl
NBS
G
Br
HBr
E
Br
Zn/H+
H
Cl2/hv
I
Cl
Na/dry ether
J
PhBr
Na/dry ether
K
Ph–CH2CH2CH3
np = 6 np rp = 6×1
ns = 2 ns rs = 2×3.8

Thank you!

Revision ✓ Bharpoor

YAKEEN 2.0

FOR NEET 2025

Lecture- 03 Organic Chemistry

Aldehydes, Ketones and Carboxylic Acids

Physics Wallah

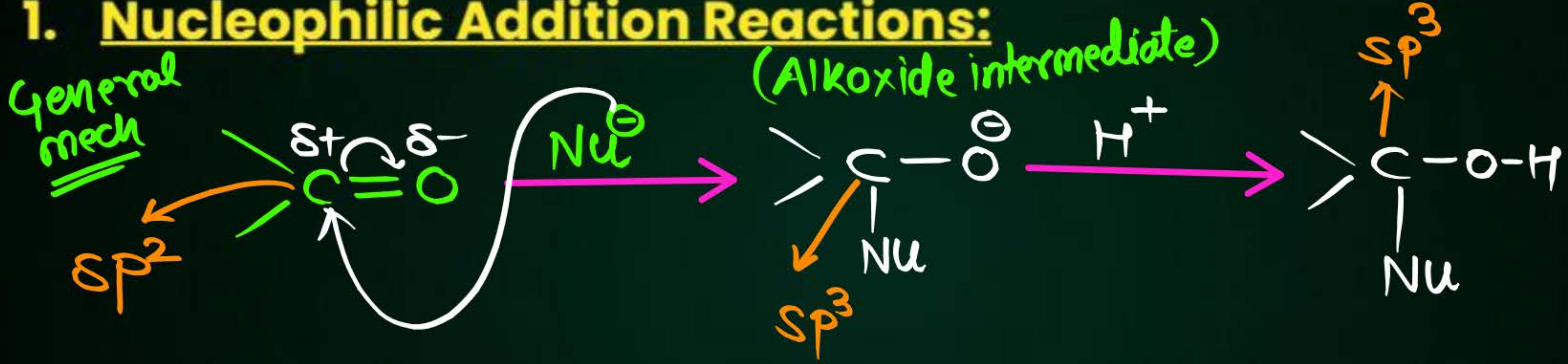
By- Pankaj Sir(POPU MAMA)

Topics *to be covered*

1. Chemical Properties of Aldehydes & Ketones ✓
2. Nucleophilic Addition Reactions ✓
3. Practice

Chemical Properties of Aldehydes & Ketones

1. Nucleophilic Addition Reactions:


General mech
δ+
δ−
C=O
sp²
$Nu^{\ominus}$
(Alkoxide intermediate)
$C-O^{\ominus}$
Nu
sp³
H^{+}
sp³
C−O−H
Nu

OP Points

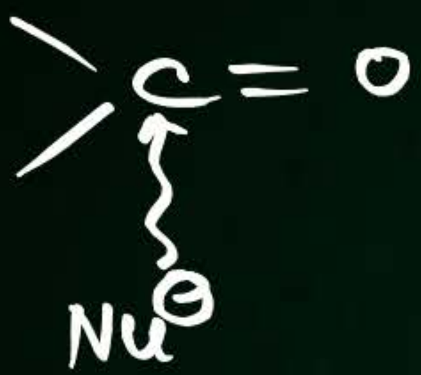
1. A nucleophile attacks the electrophilic carbon atom of the polar carbonyl group from a direction approximately perpendicular to the plane of sp^2 hybridized orbitals of carbonyl carbon.

2. The hybridization of carbon changes from sp^2 to sp^3 in this process and a tetrahedral alkoxide intermediate is produced.

3. This intermediate captures a proton from the reaction medium to give the electrically neutral product.

4. The net result is addition of Nu^- and H^+ across the carbon oxygen double bond.

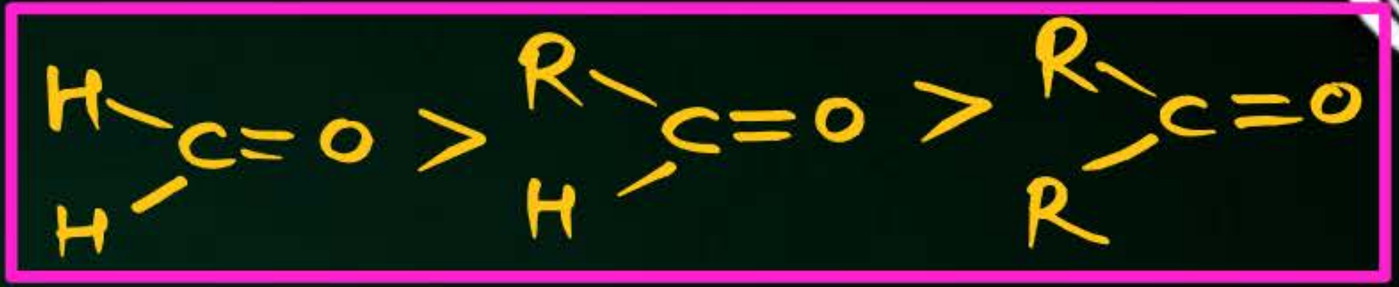
Reactivity:



① Steric hinderence

$$\left[R.O.R \propto \frac{1}{S.H} \right]$$

(Ald > Ket)

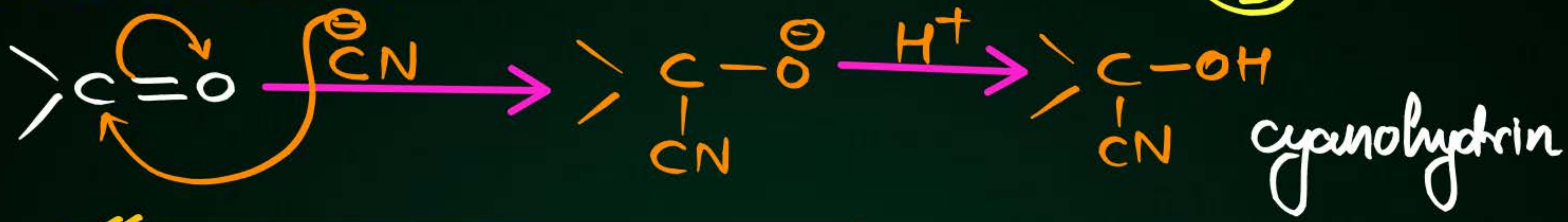


② Electronic factor

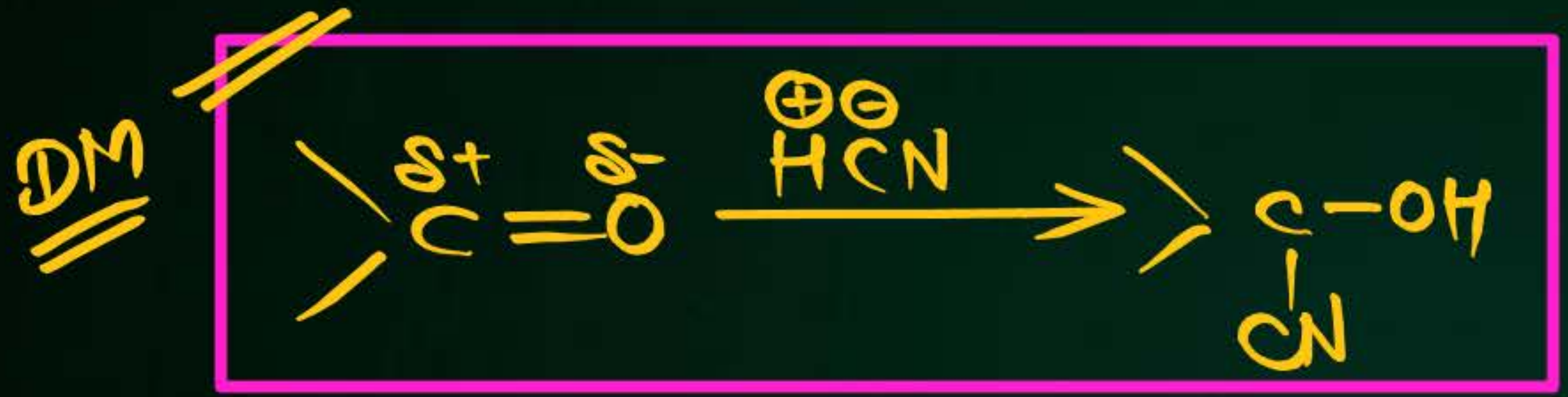
$$R.O.R \propto \text{Electrophilicity} \propto \overset{(-M,-H,-I)}{\text{ewg}} \propto \frac{1}{\underset{(+M,+H,+I)}{\text{edg}}}$$

A. Addition of HCN:

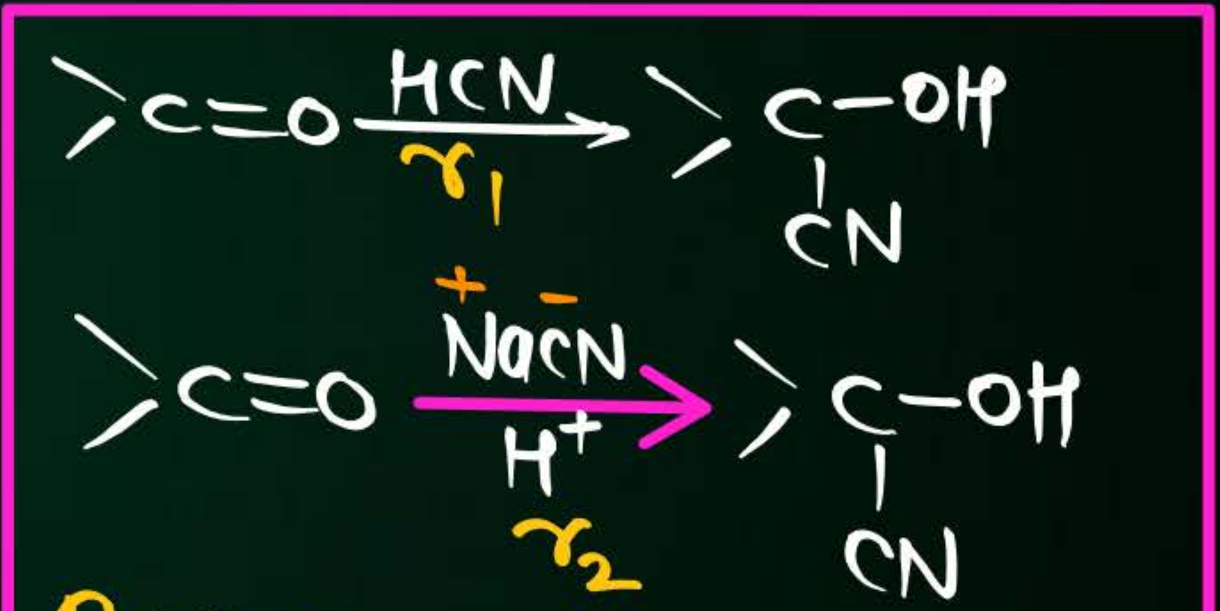
Reagent $\overset{+}{H}\overset{-}{C}N$ or $\overset{+}{Na}\overset{-}{C}N \mid H^+$ (H_2O)



C=O
⊖CN
C–O⊖
CN
H+
C–OH
CN
cyanohydrin



DM
δ+ δ−
C=O
⊕⊖
HCN
C–OH
CN



C=O
HCN
r1
C–OH
CN
C=O
+ −
NaCN
H+
r2
C–OH
CN

R.OR $r_2 > r_1$ b'coz HCN is a weak acid

OP Points

1. **Aldehydes and ketones react with hydrogen cyanide (HCN) to yield cyanohydrins.**

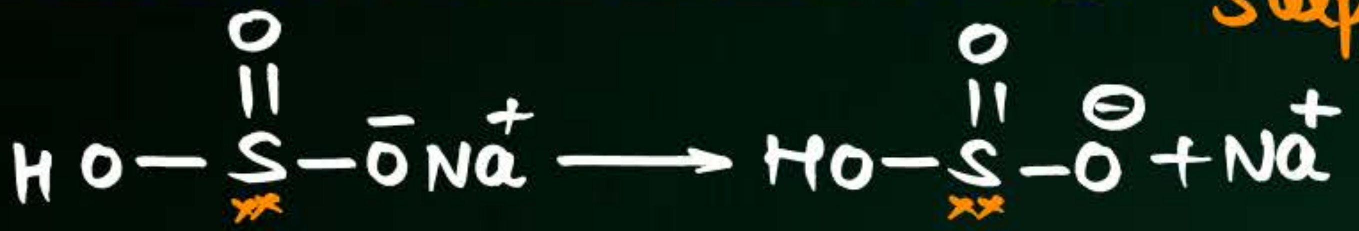
$HCN + NaOH \longrightarrow \overset{+}{Na}\overset{\ominus}{CN}$

2. **This reaction occurs very slowly with pure HCN. Therefore, it is catalyzed by a base and the generated cyanide ion (CN^-) being a stronger nucleophile readily adds to carbonyl compounds to yield corresponding cyanohydrin.**

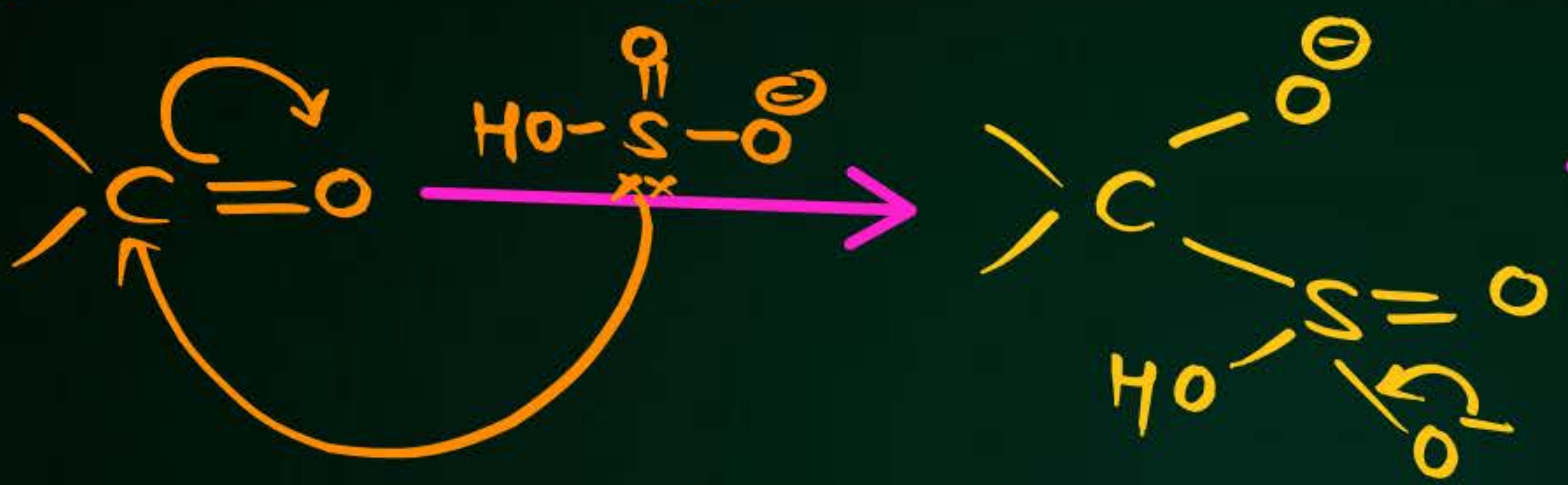
B. Addition of $NaHSO_3$: sodium hydrogen sulphite (Bisulphite)

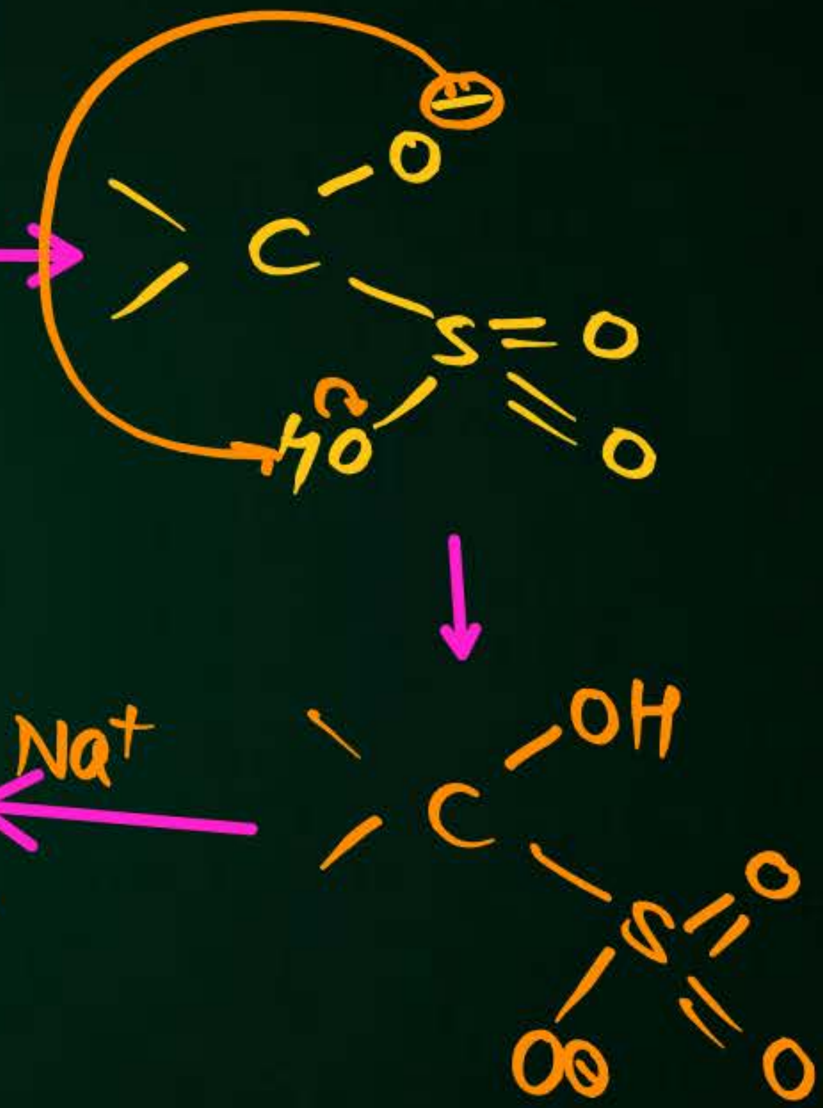
All Ald ✓ HCHO RCHO

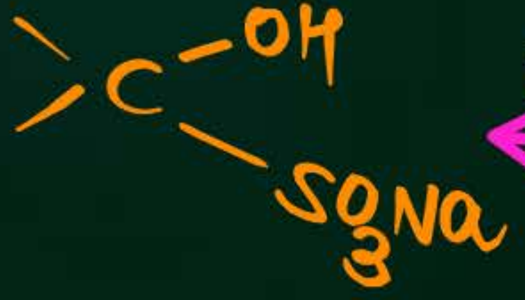
Methyl Ketone ✓ $R-\overset{O}{\overset{\|}{C}}-CH_3$



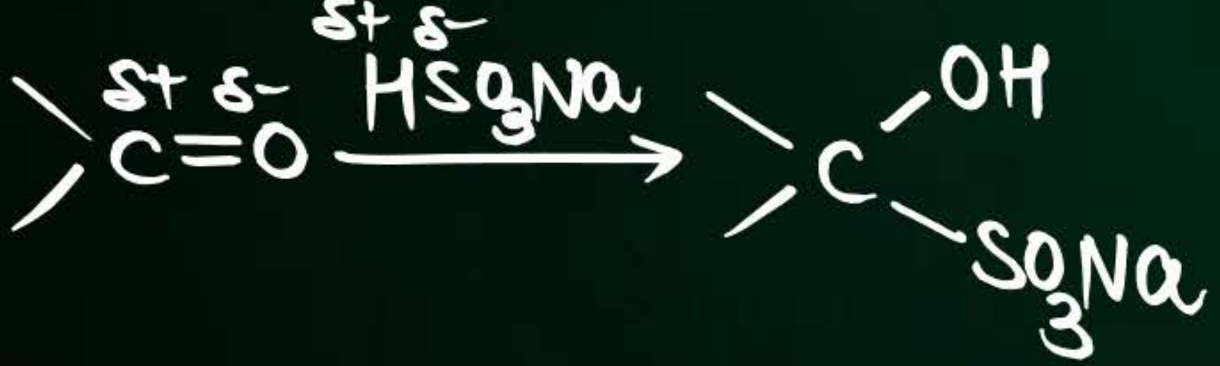
$HO-\overset{O}{\overset{\|}{S}}-\overset{-}{O}N\overset{+}{a} \longrightarrow HO-\overset{O}{\overset{\|}{S}}-\overset{\ominus}{O}+N\overset{+}{a}$







D·M



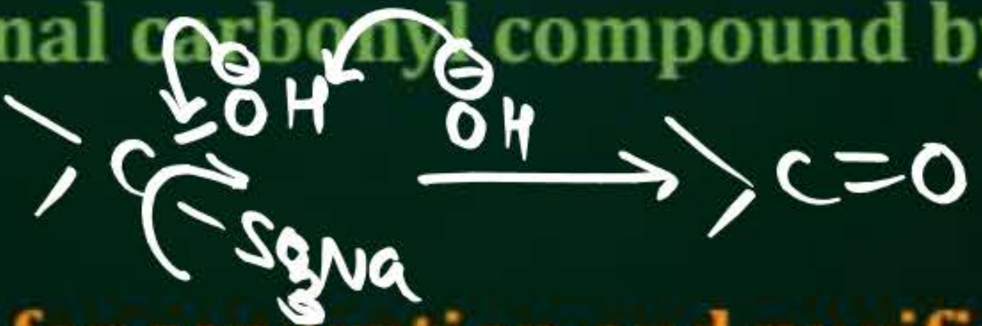
$$\overset{\delta+\ \delta-}{>C=O} \xrightarrow{\overset{\delta+\ \delta-}{HSO_3Na}} >C\genfrac{}{}{0pt}{}{OH}{SO_3Na}$$

OP Points

1. Sodium hydrogen Sulphite adds to aldehydes and ketones to form the addition products and All aldehydes & methyl ketones give this test.

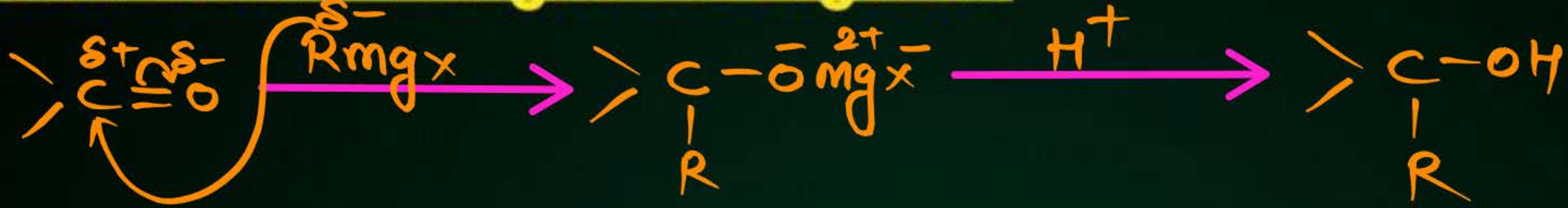
2. The position of the equilibrium lies largely to the right hand side for most aldehydes and to the left for most ketones due to steric reasons.

3. The hydrogen Sulphite addition compound is water soluble and can be converted back to the original carbonyl compound by treating it with dilute mineral acid or alkali.

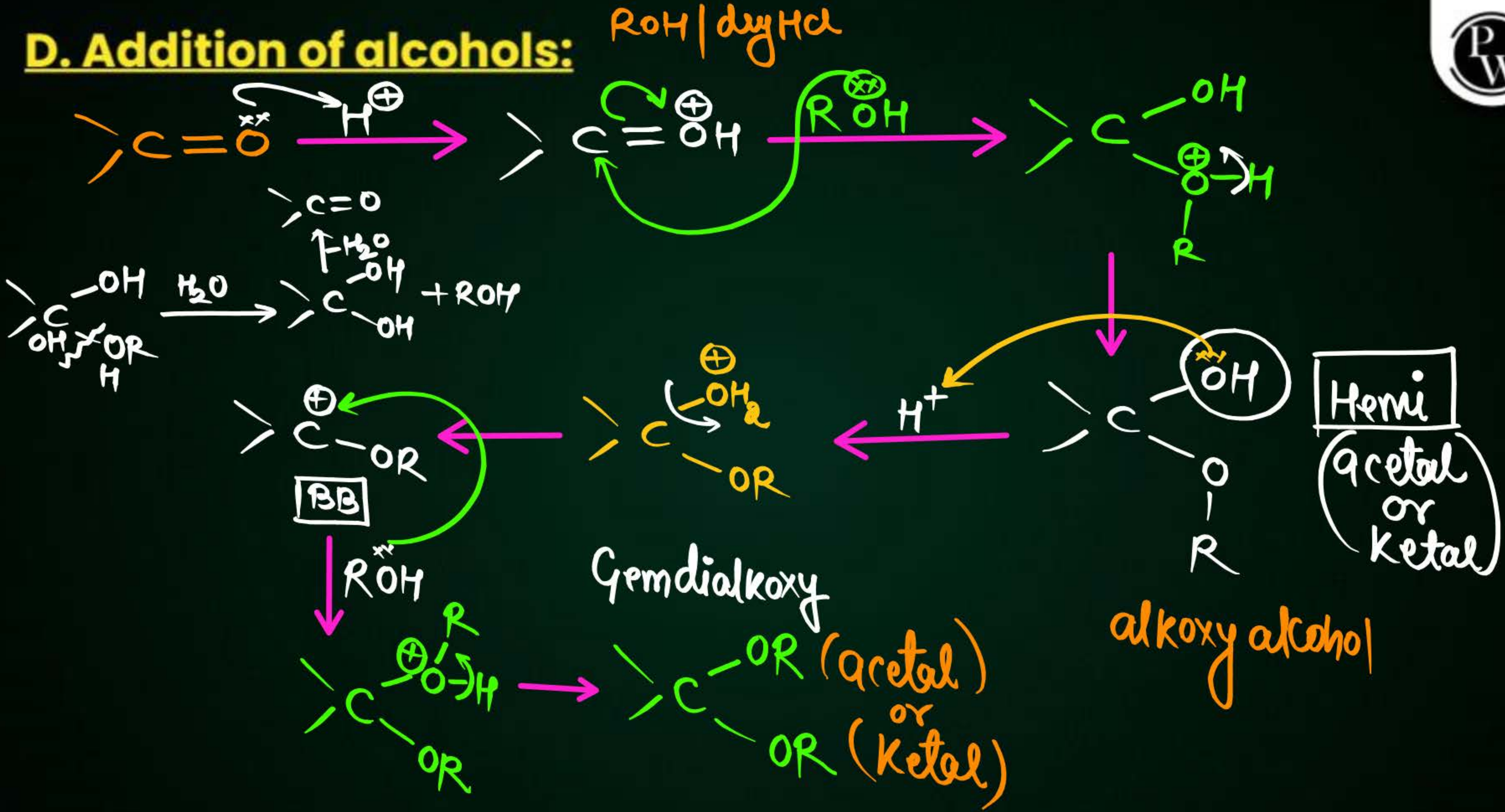


4. Therefore, these are useful for separation and purification of aldehydes.

C. Addition of Grignard reagents:

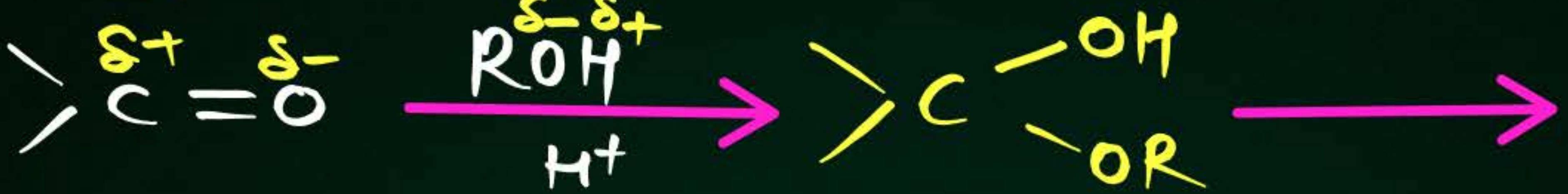

δ+ δ-
C = O
δ-
RmgX
C - O⁻ mg²⁺ X⁻
R
H+
C - OH
R

D. Addition of alcohols:


RoH | dry HCl
H⊕
ROH
OH
H
R
H+
OH2
OR
BB
ROH
Gemdialkoxy
OR (acetal or Ketal)
alkoxy alcohol
Hemi (acetal or Ketal)
C=O
-H2O
H2O
OH
+ROH
OR

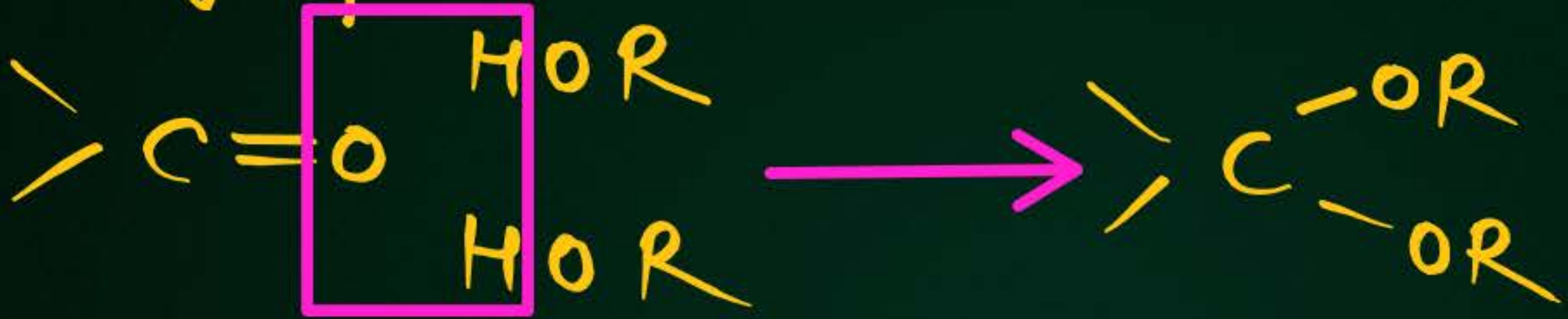
D.M

1) 1 'OH' group



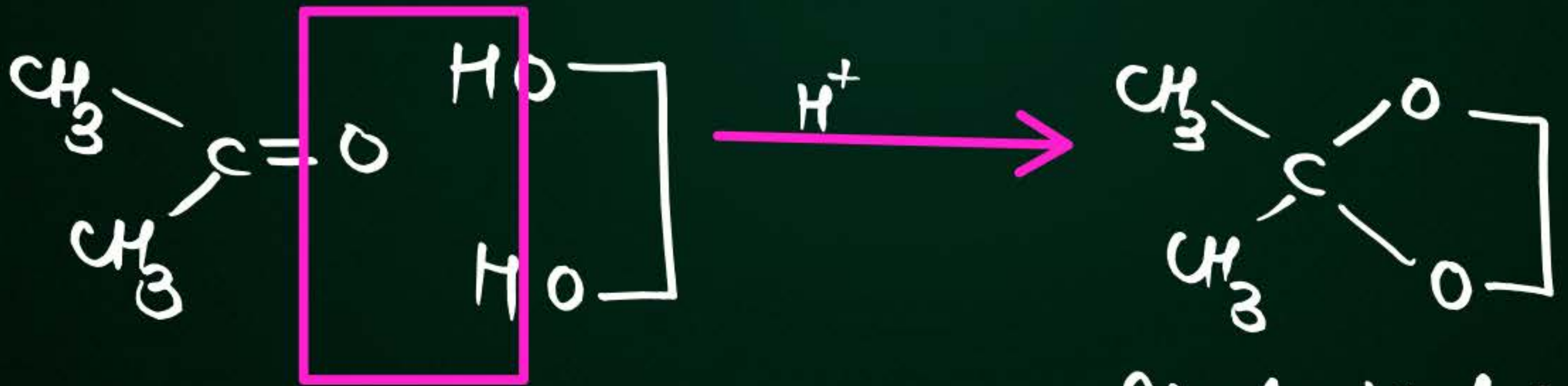
δ+
δ−
C=O
δ− δ+
ROH
H+
C
OH
OR

2) 2 'OH' group



C=O
HOR
HOR
C
OR
OR

Q



CH3
CH3
C=O
HO
HO
H+
CH3
CH3
C
O
O

cyclic Ketal

[Test marks $\propto$ Focus]

Focus

① ② ③ ④

OP Points

1° OH

1. Aldehydes react with one equivalent of monohydric alcohol in the presence of dry hydrogen chloride to yield alkoxyalcohol intermediate, known as hemiacetals, which further react with one more molecule of alcohol to give a gem-dialkoxy compound known as acetal as shown in the reaction.

2. Ald/Ketones react with ethylene glycol under similar conditions to form cyclic products known as ethylene glycol ketals.

3. Dry hydrogen chloride protonates the oxygen of the carbonyl compounds and therefore, increases the electrophilicity of the carbonyl carbon facilitating the nucleophilic attack of ethylene glycol.

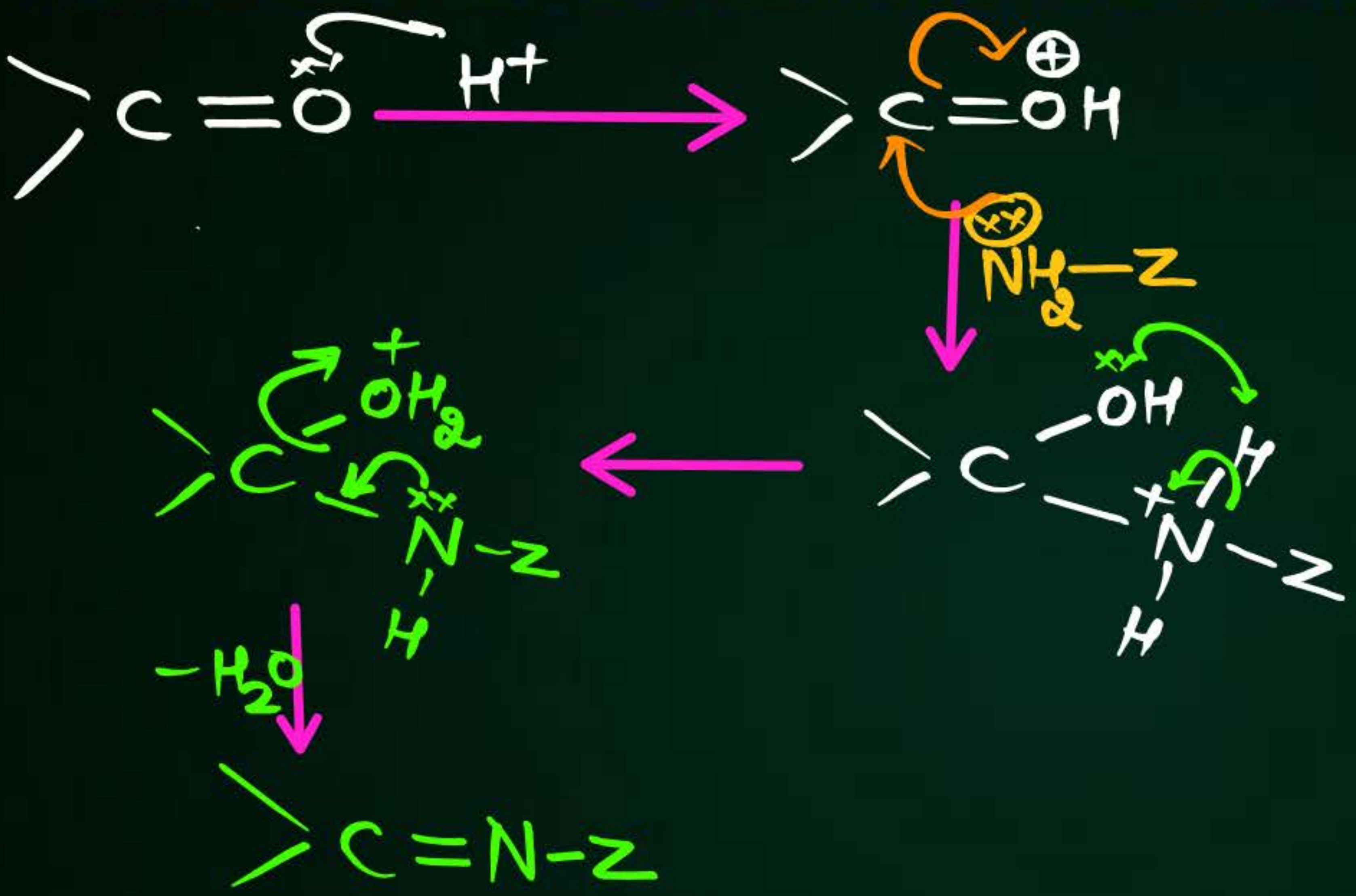
4. Acetals and ketals are hydrolyzed with aqueous mineral acids to yield corresponding aldehydes and ketones respectively.

E. Addition of ammonia and its derivatives:

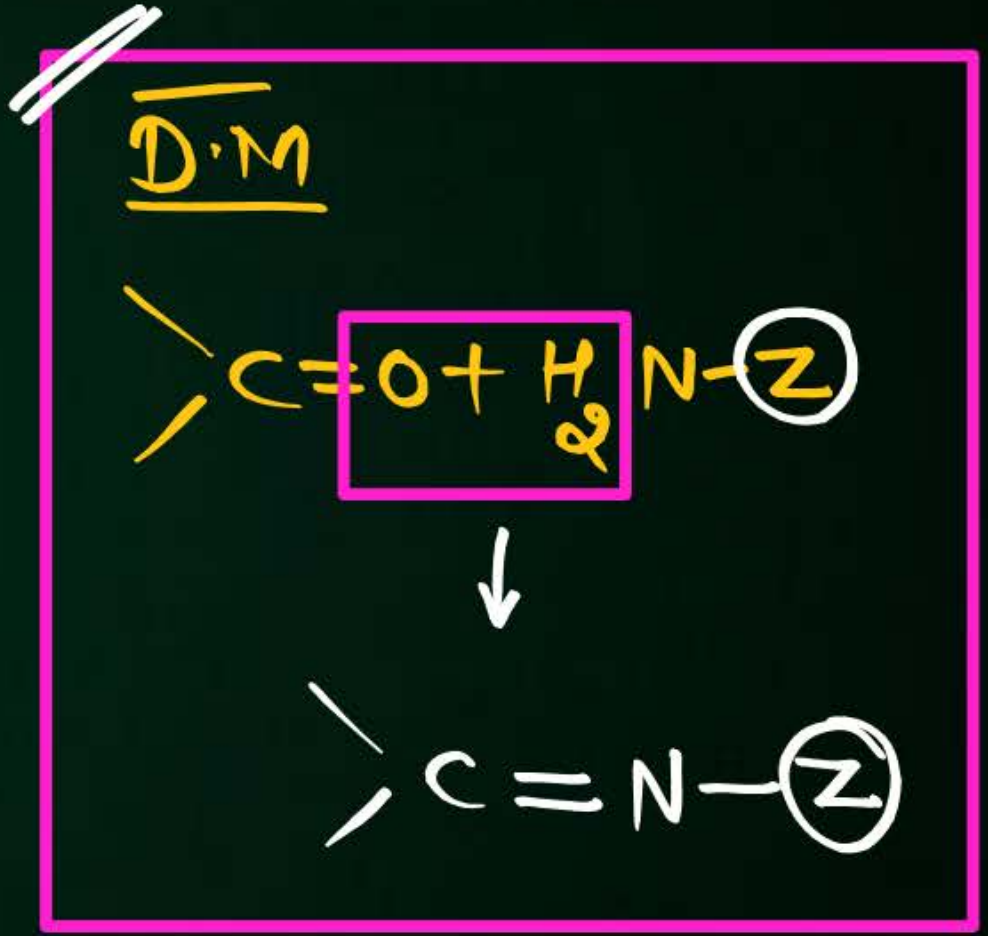
$[\ddot{N}H_2—Z \mid H^+]$

↓

mild acidic



C=O
H+
C=OH
⊕
NH2—Z
C
OH
N
Z
H
OH2
+
−H2O
C=N-Z

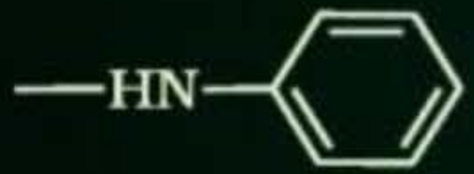
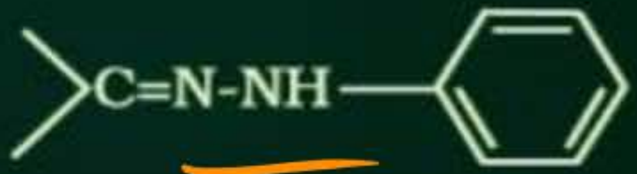
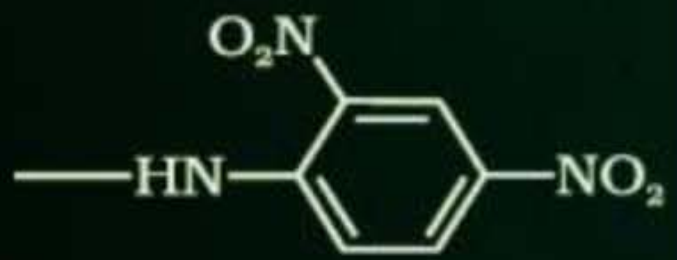
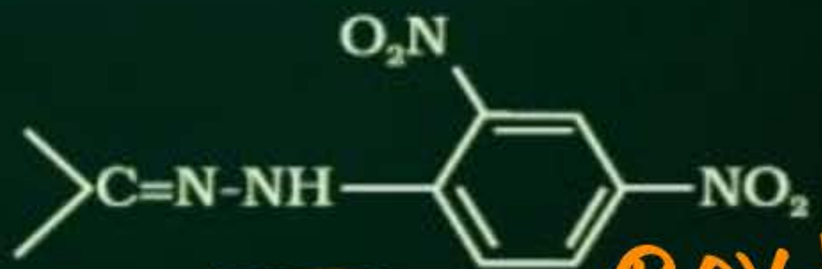
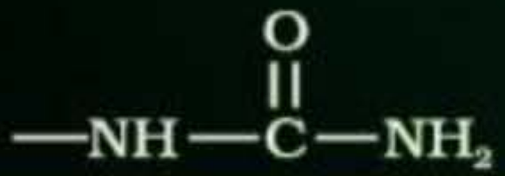
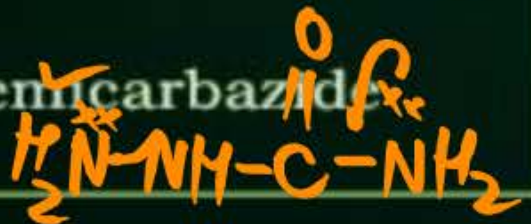
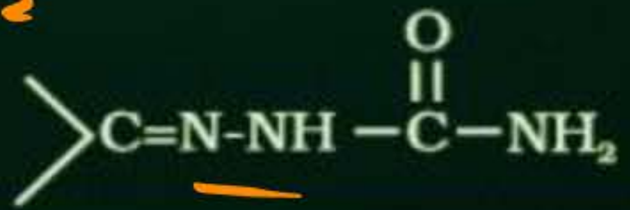


D.M
C=O + H2N-Z
C=N—Z

OP Points

1. Nucleophiles, such as ammonia and its derivatives H_2N–Z add to the carbonyl group of aldehydes and ketones.
2. The reaction is reversible and catalyzed by acid.
3. The equilibrium favours the product formation due to rapid dehydration of the intermediate to forms $>C=N-Z$.

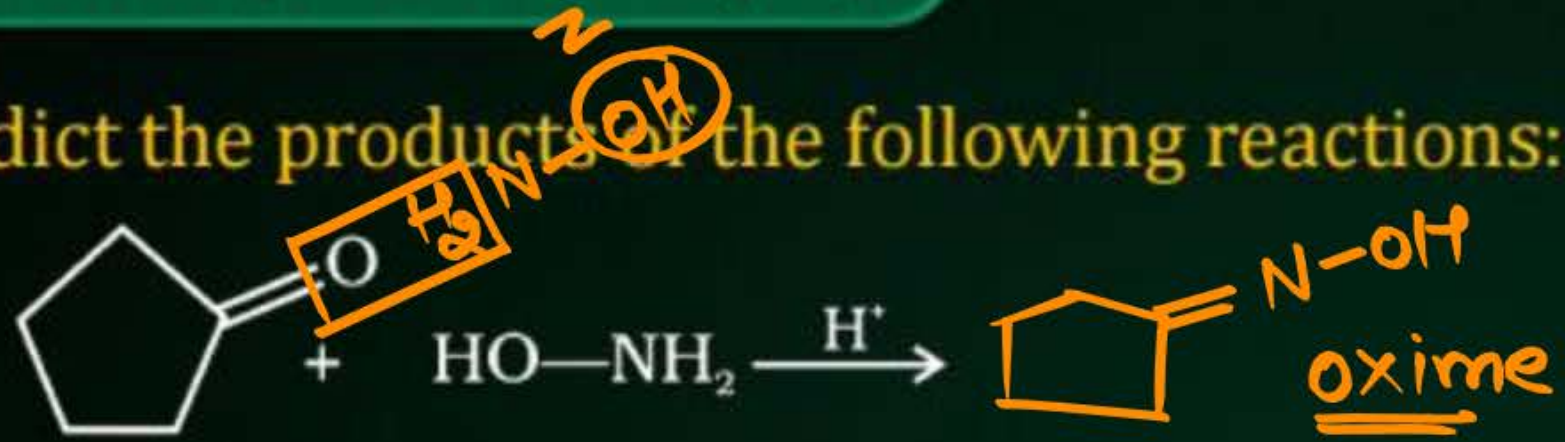
Some N-Substituted Derivatives of Aldehydes and Ketones (>C=N-Z)

Z	Reagent name	Carbonyl derivative	Product name
-H	Ammonia H_2N-H	$>C=NH$	Imine ✓
-R	Amine H_2N-R	$>C=NR$	Substituted imine (Schiff's base) ✓
—OH	Hydroxylamine H_2N-OH	$>C=N-OH$	Oxime ✓
—NH_2	Hydrazine H_2N-NH_2	$>C=N-NH_2$	Hydrazone ✓
	Phenylhydrazine $H_2N-NHPh$		Phenylhydrazone ✓
	Brady's reagent 2,4-Dinitrophenyl-hydrazine 		2,4 Dinitrophenyl-hydrazone R.O.Y ppt
 $-NH-\overset{O}{\overset{\parallel}{C}}-NH_2$	Semicarbazide  $H_2N-NH-\overset{O}{\overset{\parallel}{C}}-NH_2$	 $>C=N-NH-\overset{O}{\overset{\parallel}{C}}-NH_2$	Semicarbazone

QUESTION (NCERT Example)

Predict the products of the following reactions:

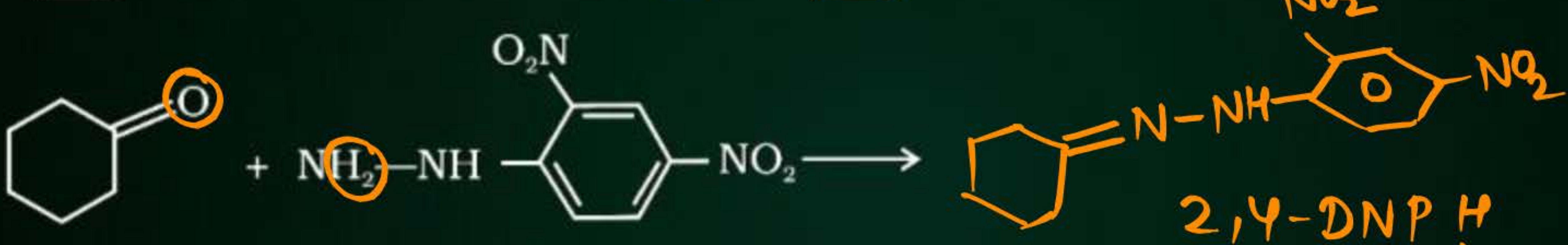
(i)



H_2N-OH
$HO-NH_2$
H^+
N-OH

oxime

(ii)



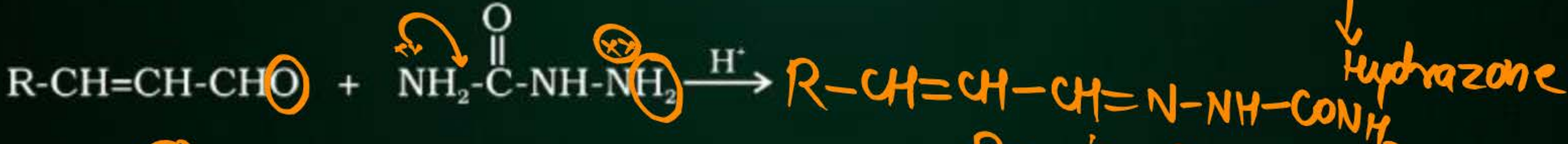
O_2N
NH_2-NH
NO_2
NO_2
N-NH
NO_2

2,4-DNP H

↓

Hydrazone

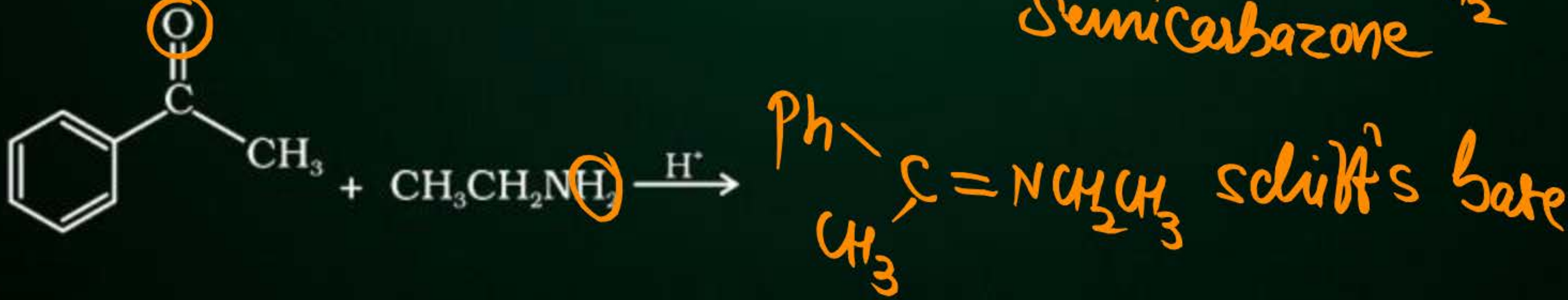
(iii)



$$R\text{-}CH{=}CH\text{-}CHO + NH_2\text{-}\overset{O}{\overset{\|}{C}}\text{-}NH\text{-}NH_2 \xrightarrow{H^+} R-CH=CH-CH=N-NH-CONH_2$$

Semicarbazone

(iv)



O
C
CH_3
$CH_3CH_2NH_2$
H^+
Ph
$C=NCH_2CH_3$
CH_3

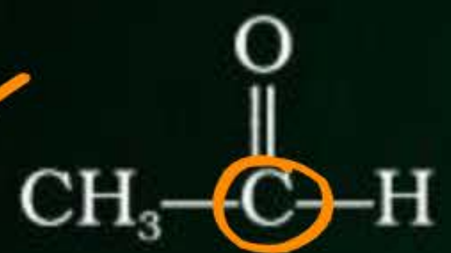
schiff's base

QUESTION (NCERT Exemplar)

NAR
Ald > Ket

Which of the following compounds is most reactive towards nucleophilic addition reactions?

[✓ A]

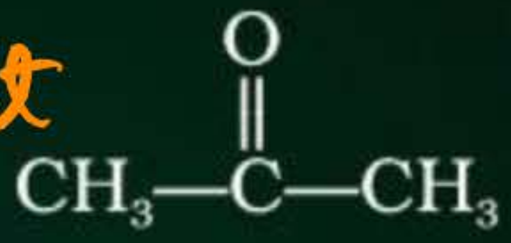


$CH_3-\overset{\overset{\displaystyle O}{\|}}{C}-H$

Ald

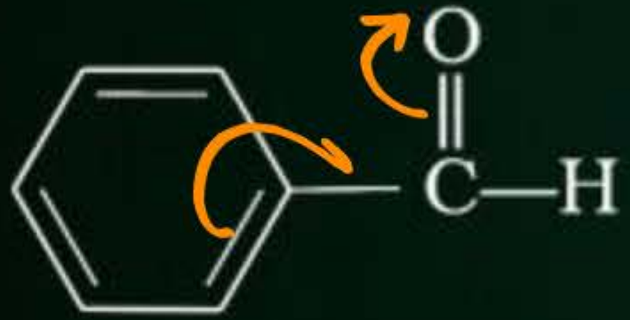
B

Ket



$CH_3-\overset{\overset{\displaystyle O}{\|}}{C}-CH_3$

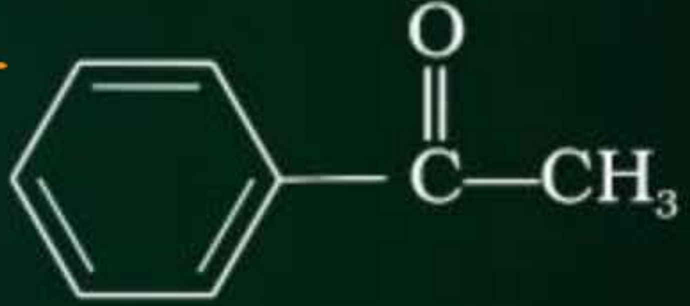
C



Ald

D

ket

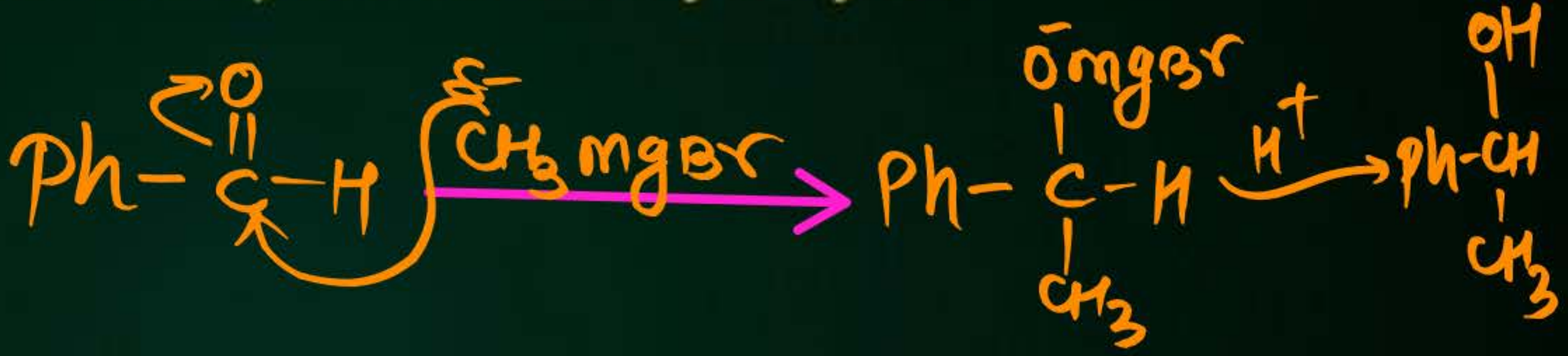


A > C > B > D

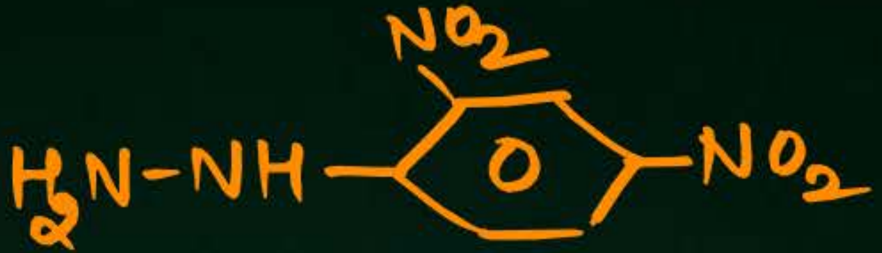
QUESTION (AIIMS 2013)

Which of the following products is formed when benzaldehyde is treated with CH_3MgBr and the addition product so obtained in subjected to acid hydrolysis?

- **A** [✓ A secondary alcohol]
- **B** A primary alcohol
- **C** Phenol
- **D** tert-butyl alcohol


Ph–C(=O)–H
δ−
CH3MgBr
Ph–C(O⁻MgBr)(CH3)–H
H+
Ph–CH(OH)–CH3

QUESTION



A compound does not react with 2, 4-dinitrophenyl hydrazine. Compound is:

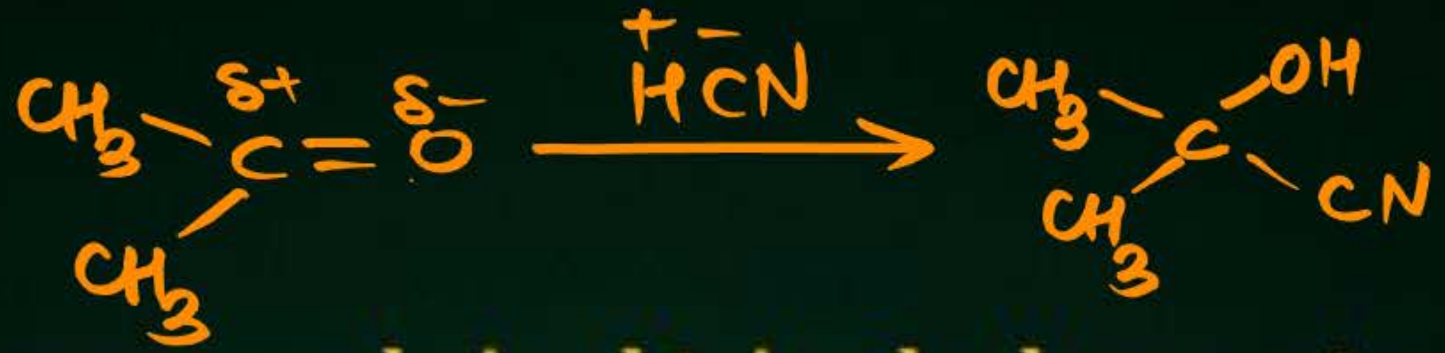
Ⓐ acetone

Ⓑ acetaldehyde

[✓ Ⓒ] CH_3OH

Ⓓ $CH_3CH_2COCH_3$

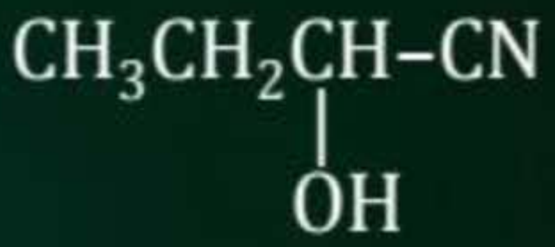
QUESTION

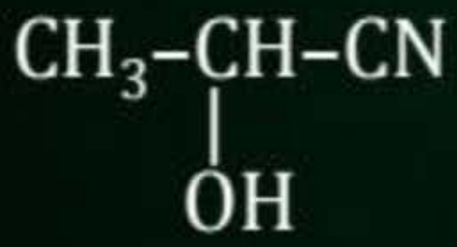


CH_3
δ+
δ−
$\overset{+}{H}\overset{-}{C}N$
CH_3
OH
CN

Which of the following compounds is obtained when acetone is reacted with HCN?

A $(CH_3)_2C(OH)NC$

B 
$CH_3CH_2\underset{\substack{|\\ OH}}{CH}-CN$

C 
$CH_3-\underset{\substack{|\\ OH}}{CH}-CN$

[✓ D] $(CH_3)_2C(OH)CN$

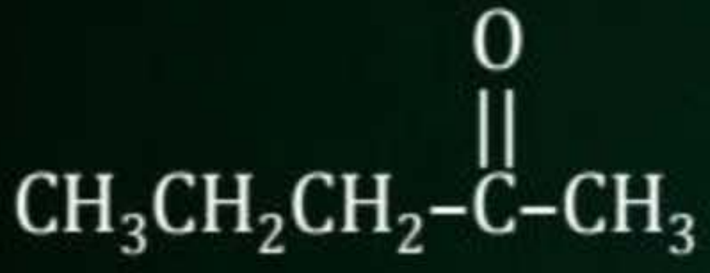
QUESTION

Nucleophilic addition reaction will be most favoured in:

(A) CH_3CH_2CHO

[✓ (B)] CH_3CHO

B > A > D > C

(C) 
$CH_3CH_2CH_2-\overset{\overset{\large O}{\|}}{C}-CH_3$

(D) $(CH_3)_2C=O$

QUESTION

On reaction with hydroxylamine, aldehydes produce:

A Ketoxime

B hydrazone

C semicarbazone

[✓ D] aldoxime

$$CH_3-CH\boxed{=O+H_2}N-OH \longrightarrow CH_3-CH=N-OH$$

QUESTION

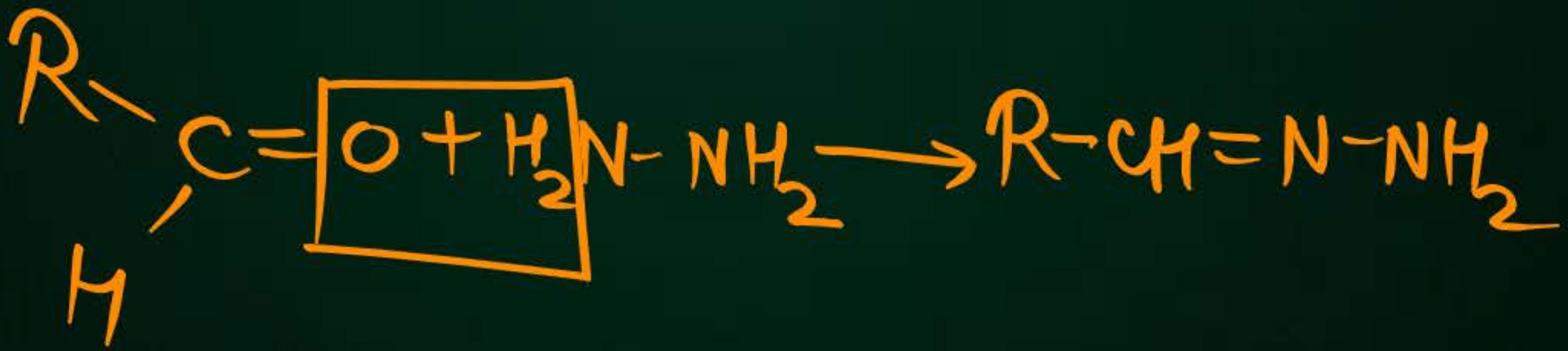
Aldehyde with $NH_2{\bullet}NH_2$ forms:

(A) aniline

[✓ (B)] hydrazones

(C) nitrobenzene

(D) none of these



$$\mathrm{R{-}C(H){=}\boxed{O + H_2}N{-}NH_2 \longrightarrow R{-}CH{=}N{-}NH_2}$$

QUESTION

Which factor/s will increase the reactivity of $>C=O$ group?

(i) Presence of a group with positive inductive effect

[✓ (ii)] Presence of a group with negative inductive effect

(iii) Presence of large alkyl group

A only (i)

[✓ B] only (ii)

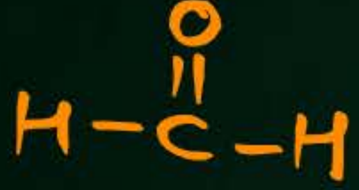
C (i) and (ii)

D (ii) and (iii)

QUESTION

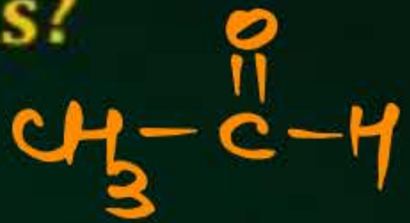
Which gives nucleophilic addition reactions?

(A) Methanal



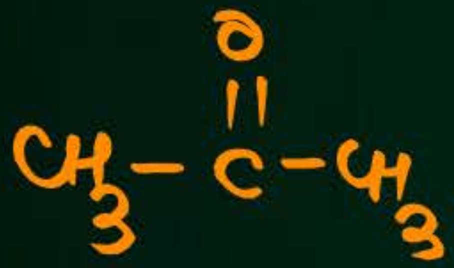
$H-\overset{O}{\overset{\|}{C}}-H$

(B) Ethanal



$CH_3-\overset{O}{\overset{\|}{C}}-H$

(C) Propanone



$CH_3-\overset{O}{\overset{\|}{C}}-CH_3$

[✓ (D)] All of these

QUESTION

$$\rangle C=\boxed{O+H_2}N-Z \longrightarrow \rangle C=N-Z$$

Acetone gives addition elimination reaction with:

Rapid dehydration

(A) $\underbrace{NH_2OH}$

(B) $\underbrace{NH_2NHC_2H_5}$

(C) $\underbrace{NH_2NHCONH_2}$

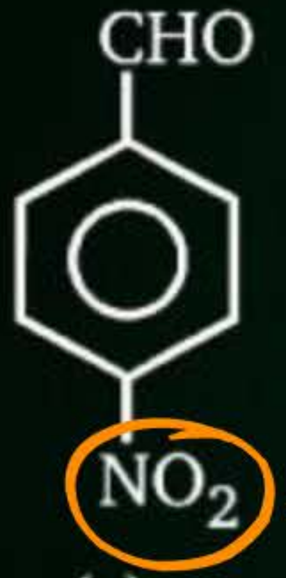
[✓ (D)] All of these

QUESTION

ROR in NAR

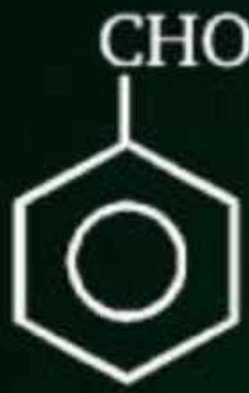
= Ald > Ket

The correct order of rate of reaction toward nucleophilic addition reaction:



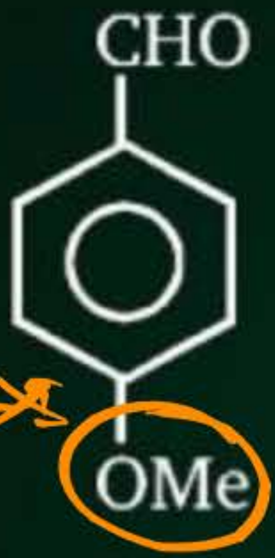
-M > -I

(a)

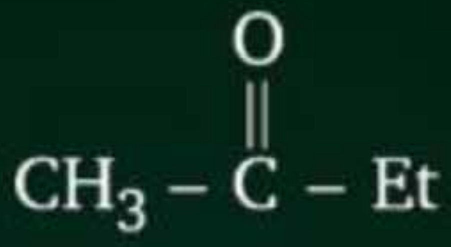


(b)

+M > -I

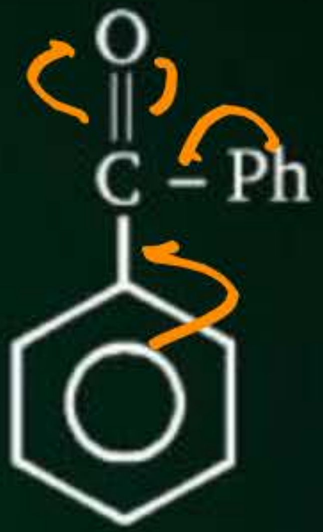


(c)



$CH_3-\overset{O}{\overset{\|}{C}}-Et$

(d)



(e)

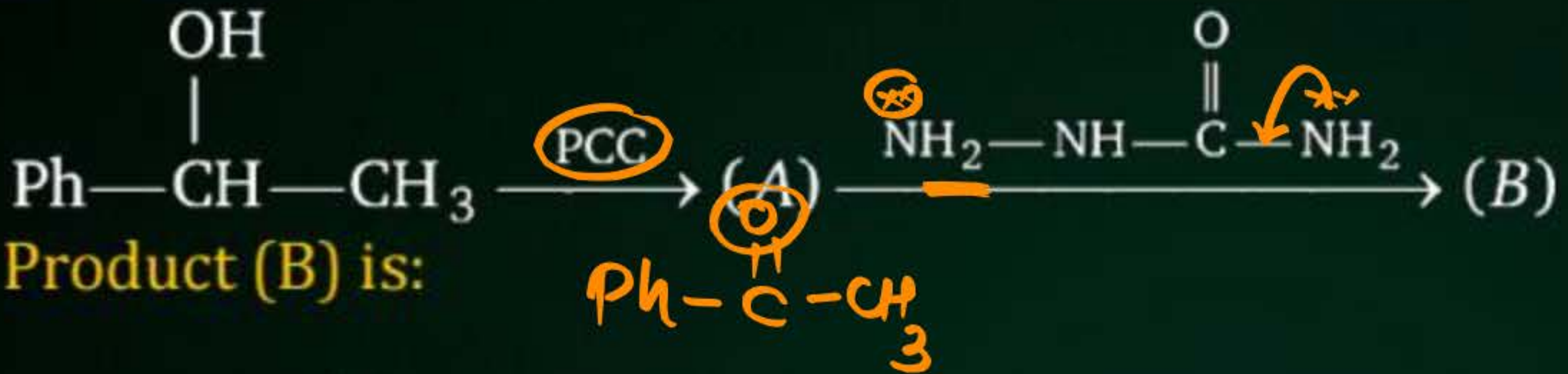
[✓ A] a > b > c > d > e

B a > b > d > c > e

C a > d > e > b > c

D a > b > e > d > c

QUESTION

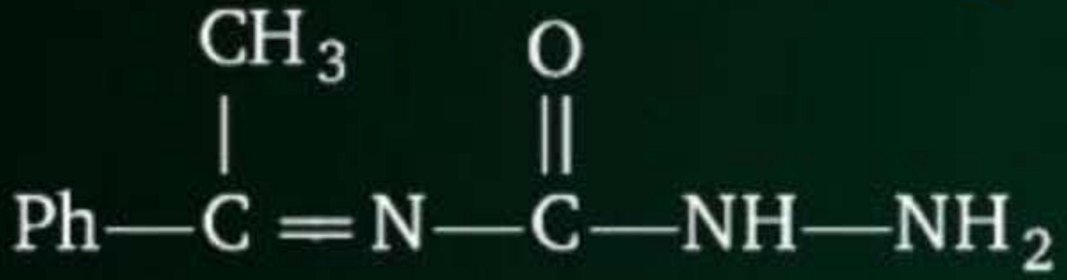


$$Ph-\overset{\overset{OH}{|}}{C}H-CH_3 \xrightarrow{PCC} (A) \xrightarrow{NH_2-NH-\overset{\overset{O}{\|}}{C}-NH_2} (B)$$

$$Ph-\overset{\overset{O}{\|}}{C}-CH_3$$

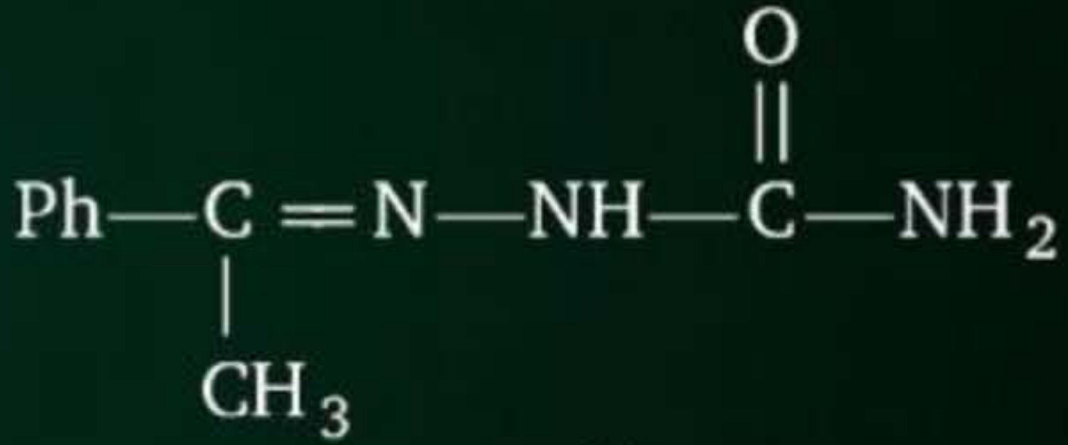
Product (B) is:

A



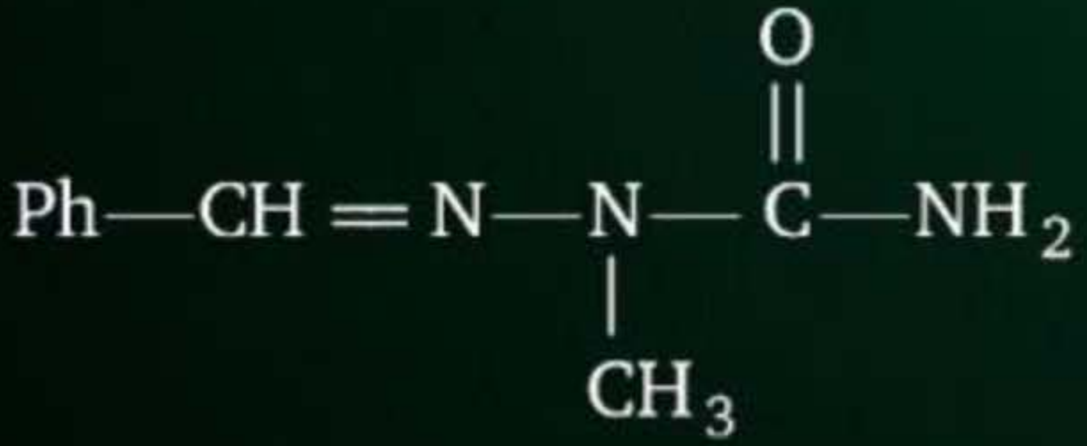
$$Ph-\overset{\overset{CH_3}{|}}{C}=N-\overset{\overset{O}{\|}}{C}-NH-NH_2$$

B ✓



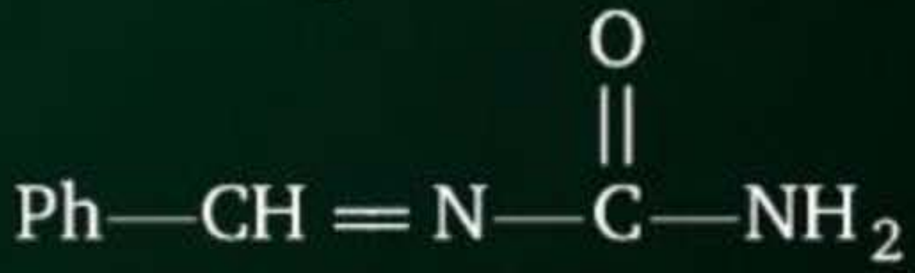
$$Ph-\underset{\underset{CH_3}{|}}{C}=N-NH-\overset{\overset{O}{\|}}{C}-NH_2$$

C



$$Ph-CH=N-\underset{\underset{CH_3}{|}}{N}-\overset{\overset{O}{\|}}{C}-NH_2$$

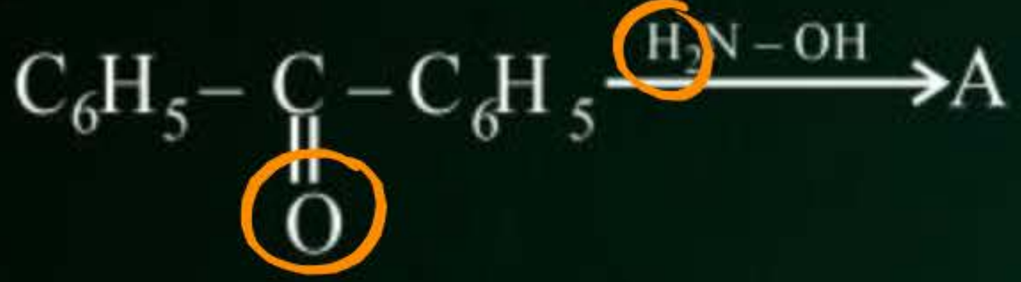
D



$$Ph-CH=N-\overset{\overset{O}{\|}}{C}-NH_2$$

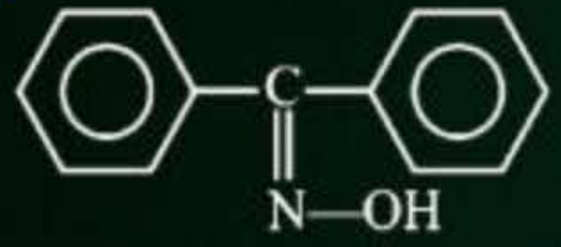
QUESTION

The final product (A) of the following reaction would be

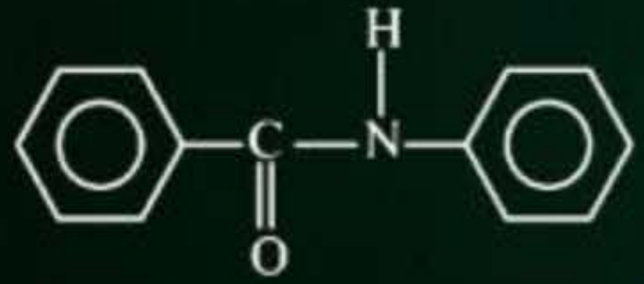


$$C_6H_5-\underset{\underset{O}{\|}}{C}-C_6H_5 \xrightarrow{H_2N-OH} A$$

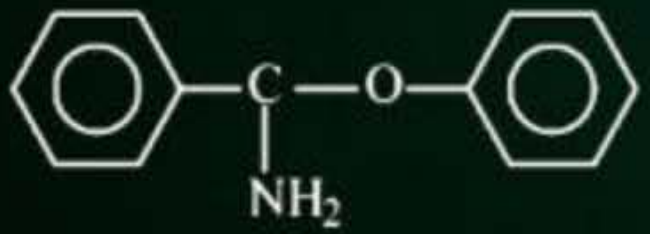
[✓ A]



B



C



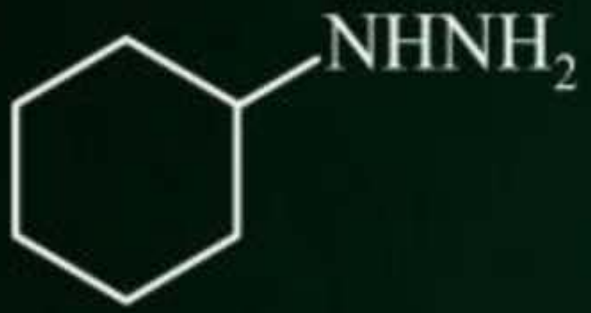
D None of these

QUESTION

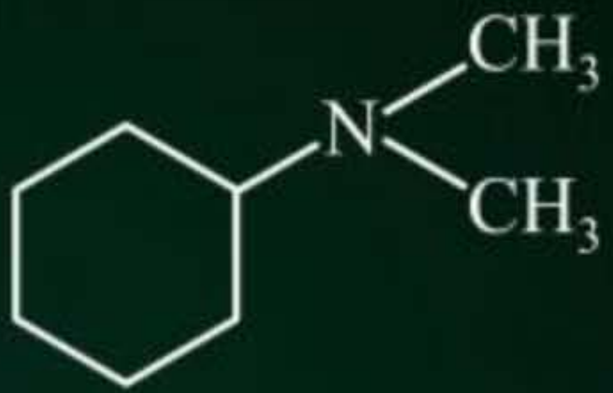
$>C=\boxed{O+H_2}N-NH_2$

Which of the following compounds is a hydrazone?

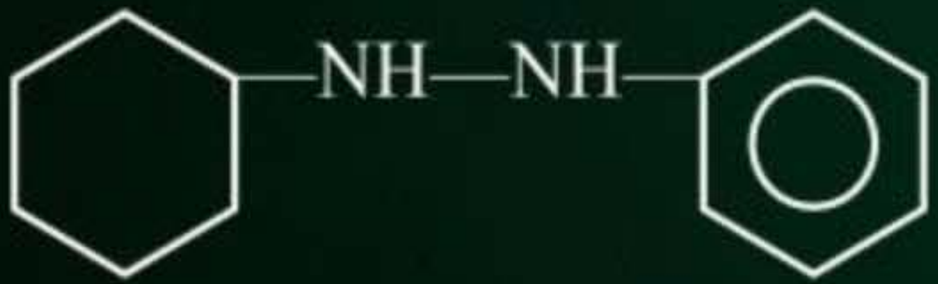
A



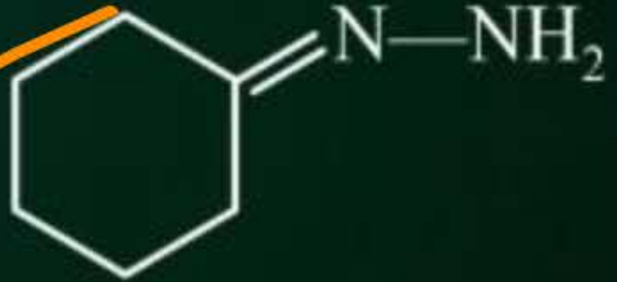
B



C



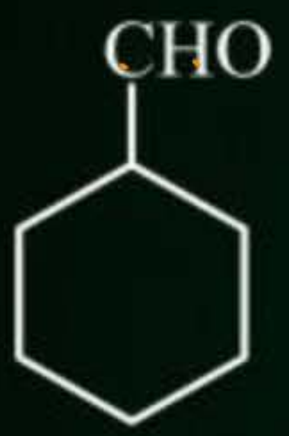
D



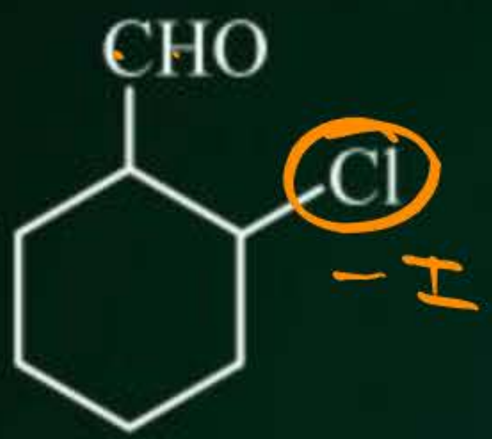
QUESTION

Give decreasing order of the following towards NA reaction.

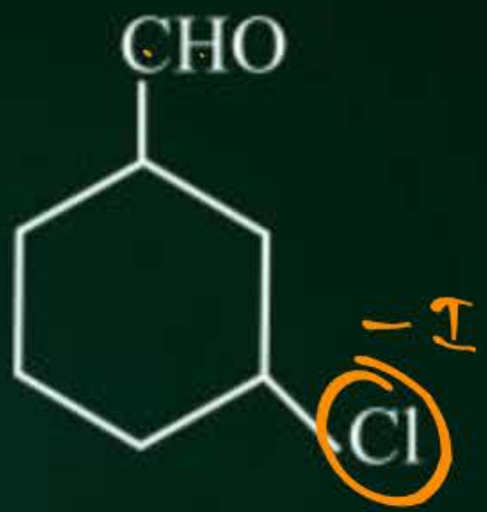
I.



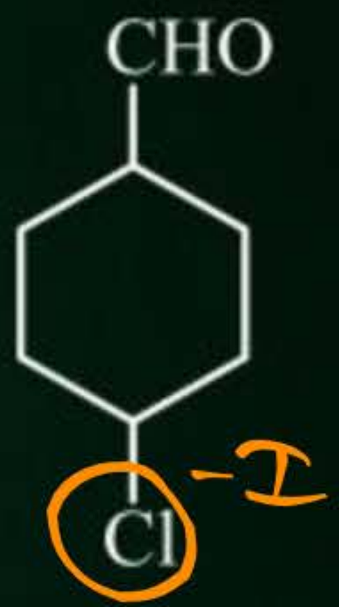
II.



III.



IV.



A (I) > (II) > (III) > (IV)

B (IV) > (III) > (II) > (I)

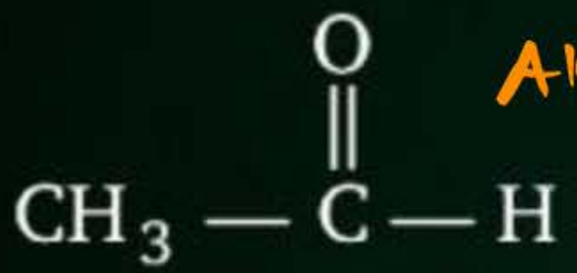
[✓ **C** (II) > (III) > (IV) > (I)]

D (I) > (IV) > (III) > (II)

QUESTION

Which of following does not react with $NaHSO_3$ (sodium bisulphite)?

A

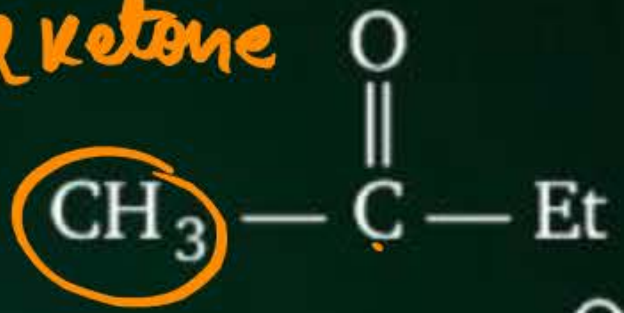


$$\mathrm{CH_3-\overset{\overset{O}{\|}}{C}-H}$$

Ald

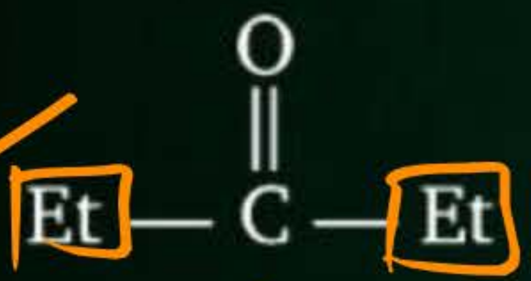
Methyl ketone

B



$$\mathrm{CH_3-\overset{\overset{O}{\|}}{C}-Et}$$

✓ **C**

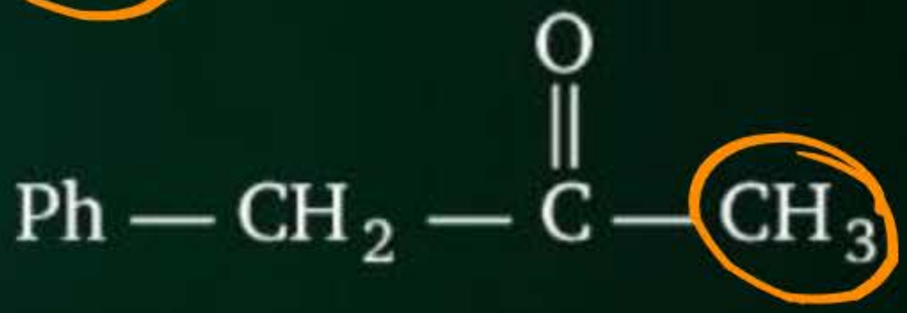


$$\mathrm{\boxed{Et}-\overset{\overset{O}{\|}}{C}-\boxed{Et}}$$

$\downarrow$

No Rxy

D



$$\mathrm{Ph-CH_2-\overset{\overset{O}{\|}}{C}-CH_3}$$

Home Work

QUESTION 01

Arrange the following compounds in increasing order of their reactivity in nucleophilic addition reactions:

Ethanal (I)

Propanal (II)

Propanone (III)

Butanone (IV)

A I < II < III < IV

B IV < III < II < I

C III < II < I < IV

D II < I < III < IV

QUESTION 02

In the reaction, $CH_3CHO + HCN \longrightarrow CH_3CHOHCN$, a chiral centre is produced. The product is:

Ⓐ meso compound

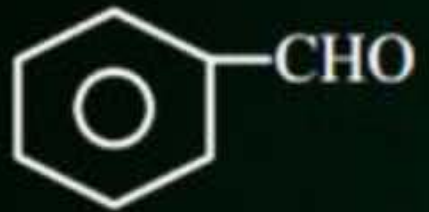
Ⓑ laevorotatory

Ⓒ dextrorotatory

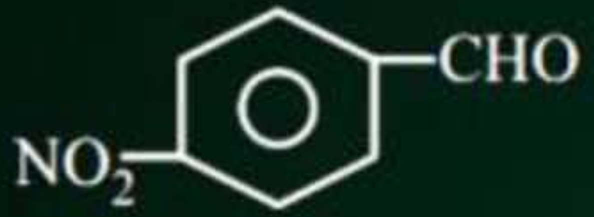
Ⓓ racemic mixture

QUESTION 03

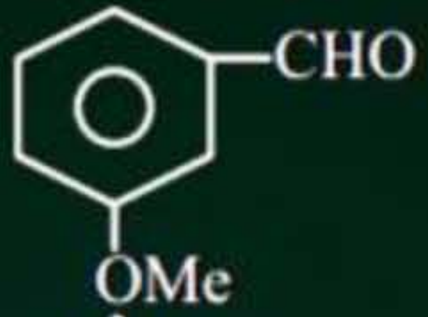
Arrange the following four compounds in order of their rate of addition with $NaCN/H^+$



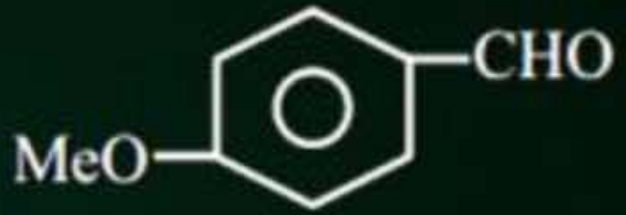
1



2



3



4

Correct order of rate of addition with HCN is:

A $2 > 1 > 3 > 4$

B $1 > 2 > 3 > 4$

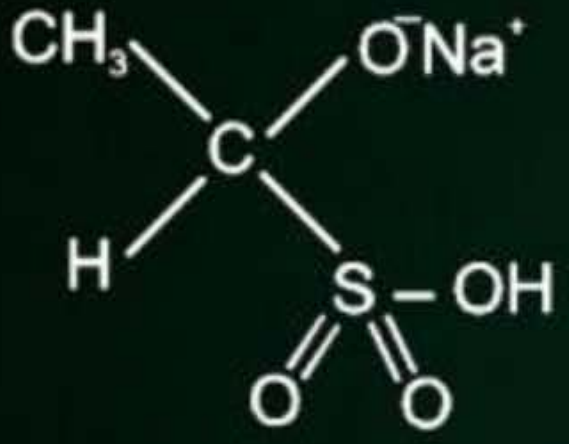
C $2 > 3 > 1 > 4$

D $3 > 4 > 1 > 2$

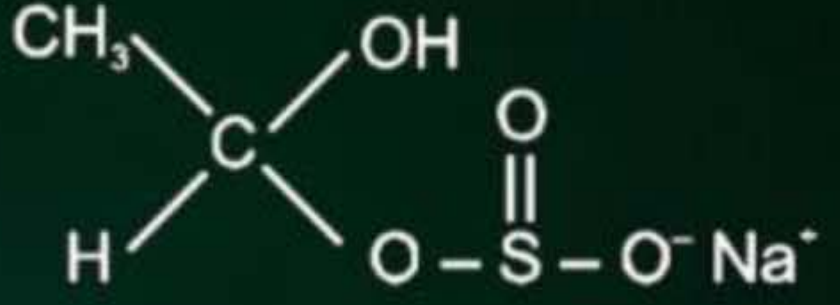
QUESTION 04

Acetaldehyde on reaction with sodium hydrogen sulphite produces

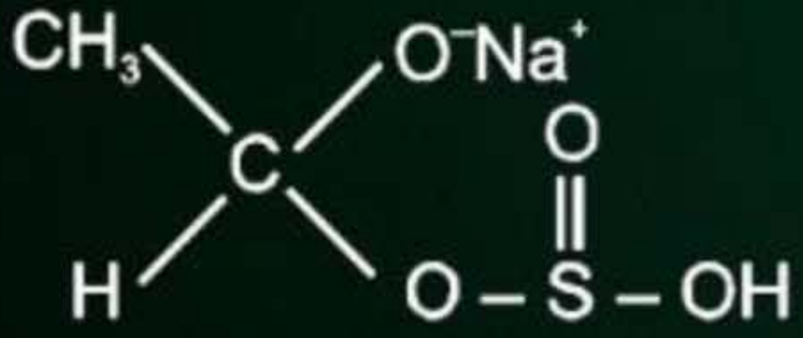
A


CH3
O⁻Na⁺
C
H
S – OH
O
O

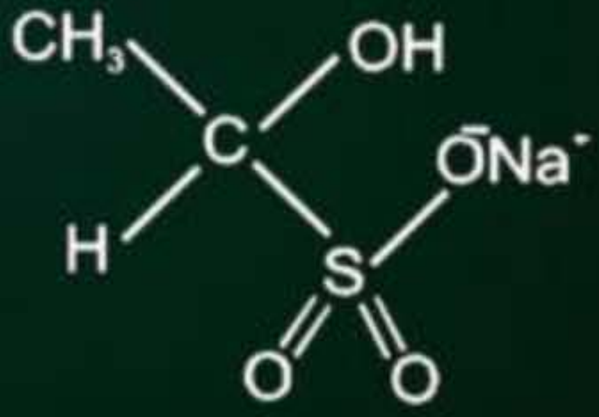
B


CH3
OH
C
O
H
O – S – O⁻ Na⁺

C


CH3
O⁻Na⁺
C
O
H
O – S – OH

D


CH3
OH
C
O⁻Na⁺
H
S
O
O

QUESTION 05

Oximes are formed by the reaction of aldehydes and ketones with:

Ⓐ NH_3

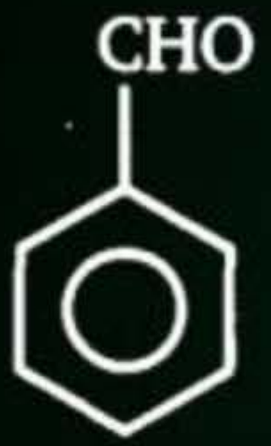
Ⓑ NH_2NH_2

Ⓒ NH_2OH

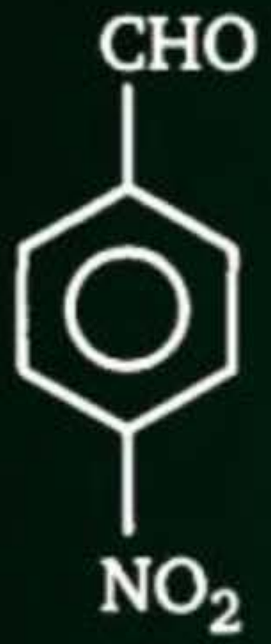
Ⓓ $NH_2CONHNH_2$

QUESTION 06

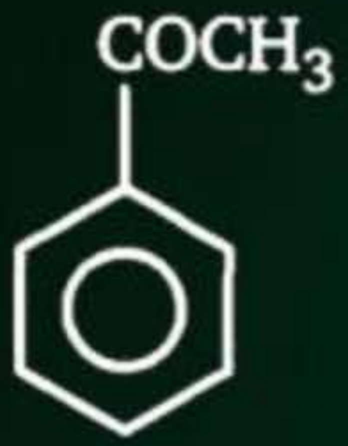
Arrange the following carbonyl compounds in decreasing order of their reactivity in nucleophilic addition reaction.



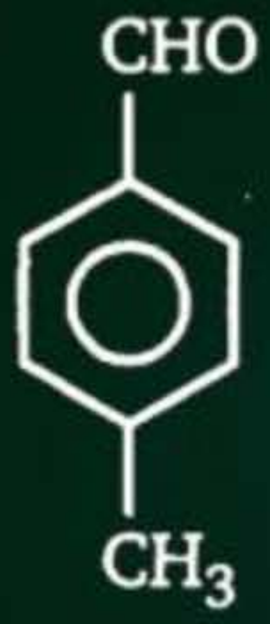
(i)



(ii)



(iii)



(iv)

A ii > iii > i > iv

B ii > i > iv > iii

C iii > ii > i > iv

D iii > i > iv > ii

QUESTION 07

The correct order of reactivity of following compounds with PhMgBr will be:

$(C_6H_5)_2CO$, (A)

$CH_3-CH=O$, (B)

$(CH_3)_2C=O$ (C)

A $A > B > C$

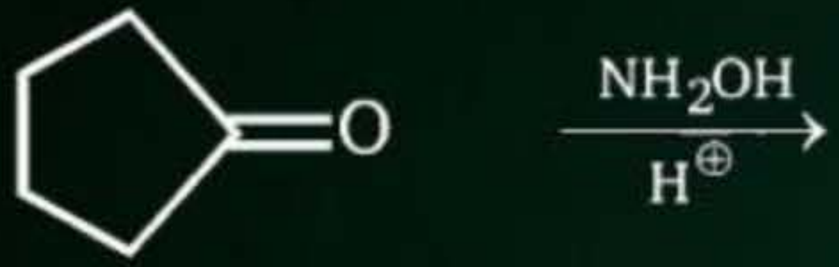
B $B > C > A$

C $C > B > A$

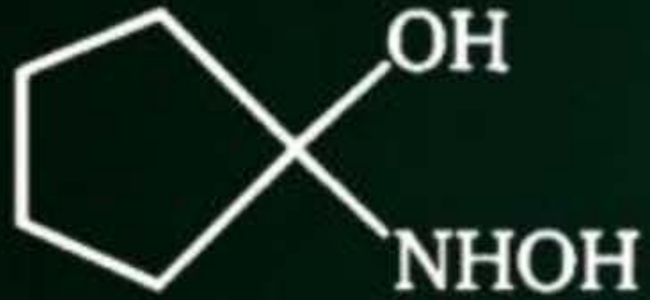
D $A > C > B$

QUESTION 08

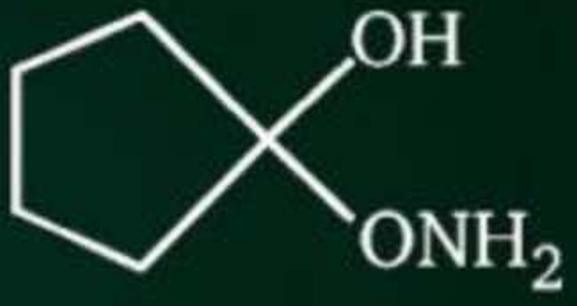
Which is the major product of the following reaction?



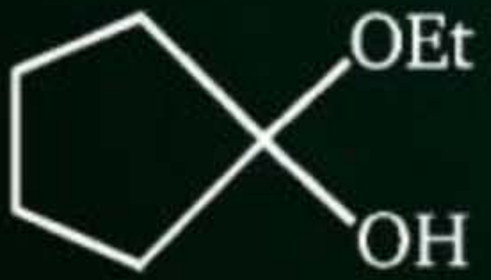
A



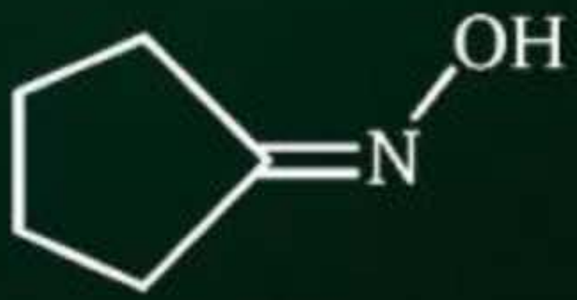
B



C



D



QUESTION 09

The structure for acetaldehyde semicarbazone is:

A $CH_3CH = NCONHNH_2$

B $CH_3CH = NNHCONH_2$

C $CH_3CH = NOH$

D $CH_3CH = NNH_2$

QUESTION 10

The compound which does not react with hydroxylamine is:

Ⓐ CH_3COOH

Ⓑ CH_3COCH_3

Ⓒ CH_3CHO

Ⓓ $HCHO$

ANSWER KEY

1. B
2. D
3. C
4. D
5. C
6. B
7. B
8. D
9. B
10. A

Home Work From PW Module (Yakeen NEET)

Prarambh: Q 20, 21, 23, 24

Prabal: Q 08, 16, 27

Parikshit: Q 16, 21, 30

Thank you!!

YAKEEN 2.0

FOR NEET 2025

Lecture- 04 Organic Chemistry

Aldehydes, Ketones and Carboxylic Acids

By- Pankaj Sir(POPU MAMA)

Physics Wallah

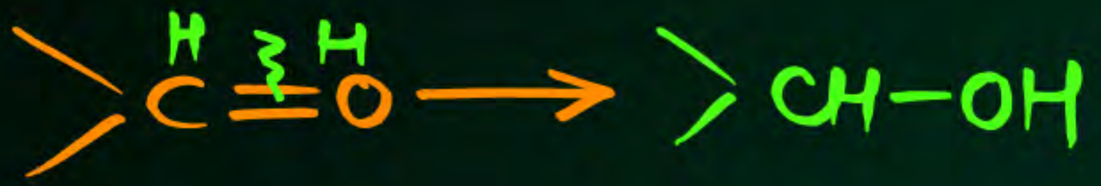
Topics *to be covered*

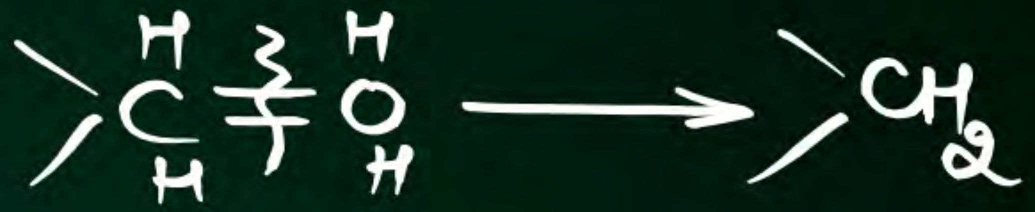
1. Chemical Properties of Aldehydes & Ketones Part 02 ✓
2. Reduction & Oxidation Reactions ✓
3. Practice

PANKAJ SIR
JOIN MY OFFICIAL TELEGRAM CHANNEL
@PSCAA
PhysicsWallah
अनुगच्छतु प्रवाहं

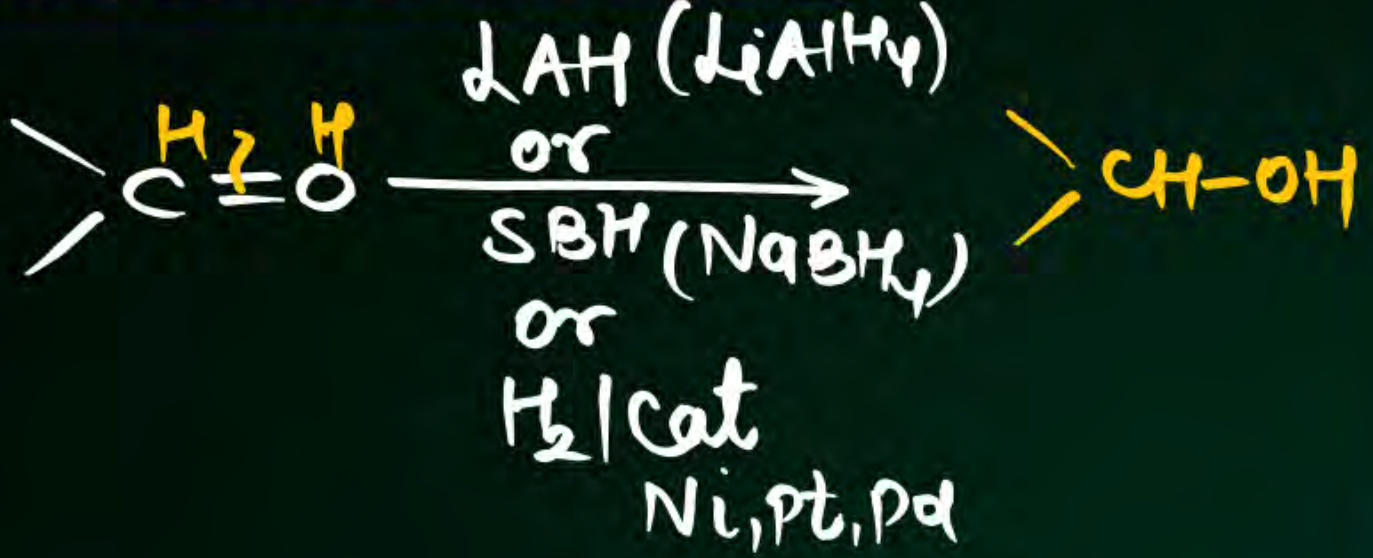
Chemical Properties of Aldehydes & Ketones

2. Reduction Reaction:

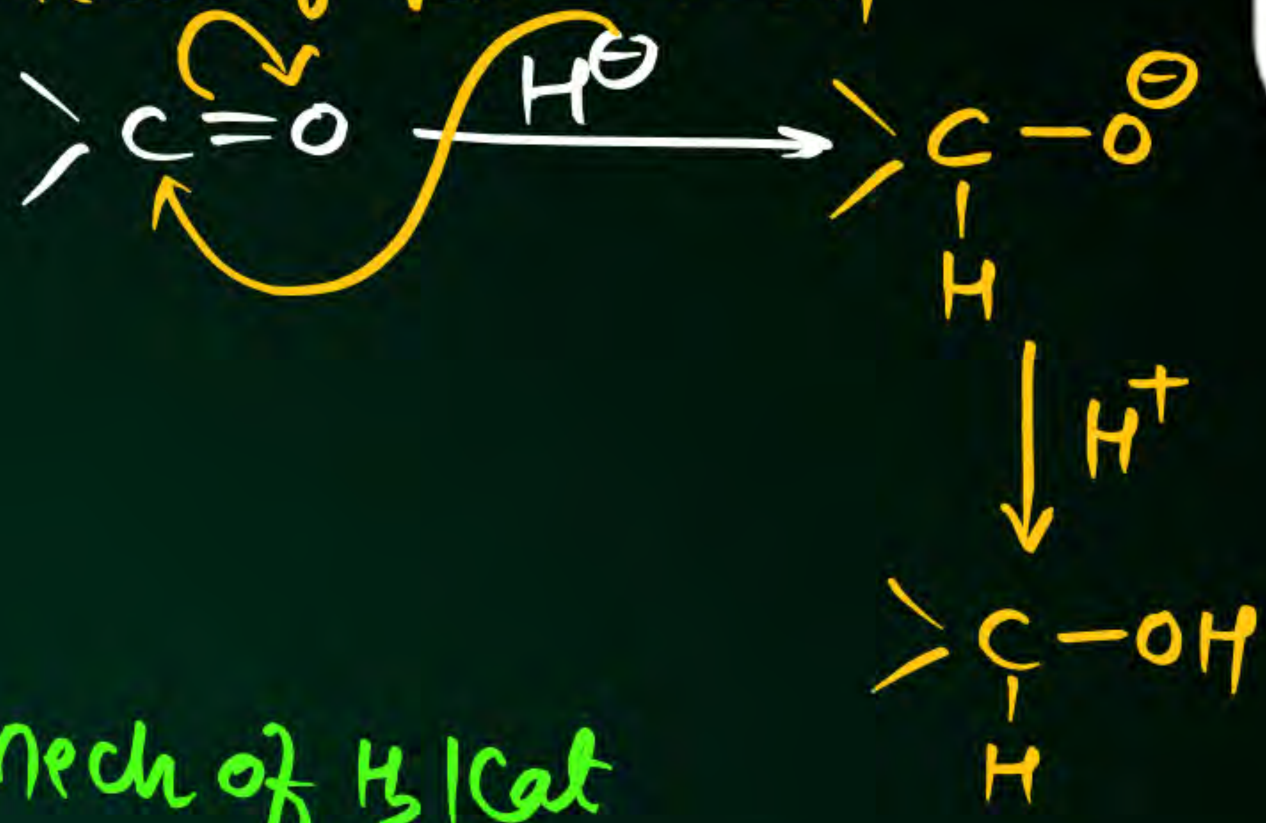




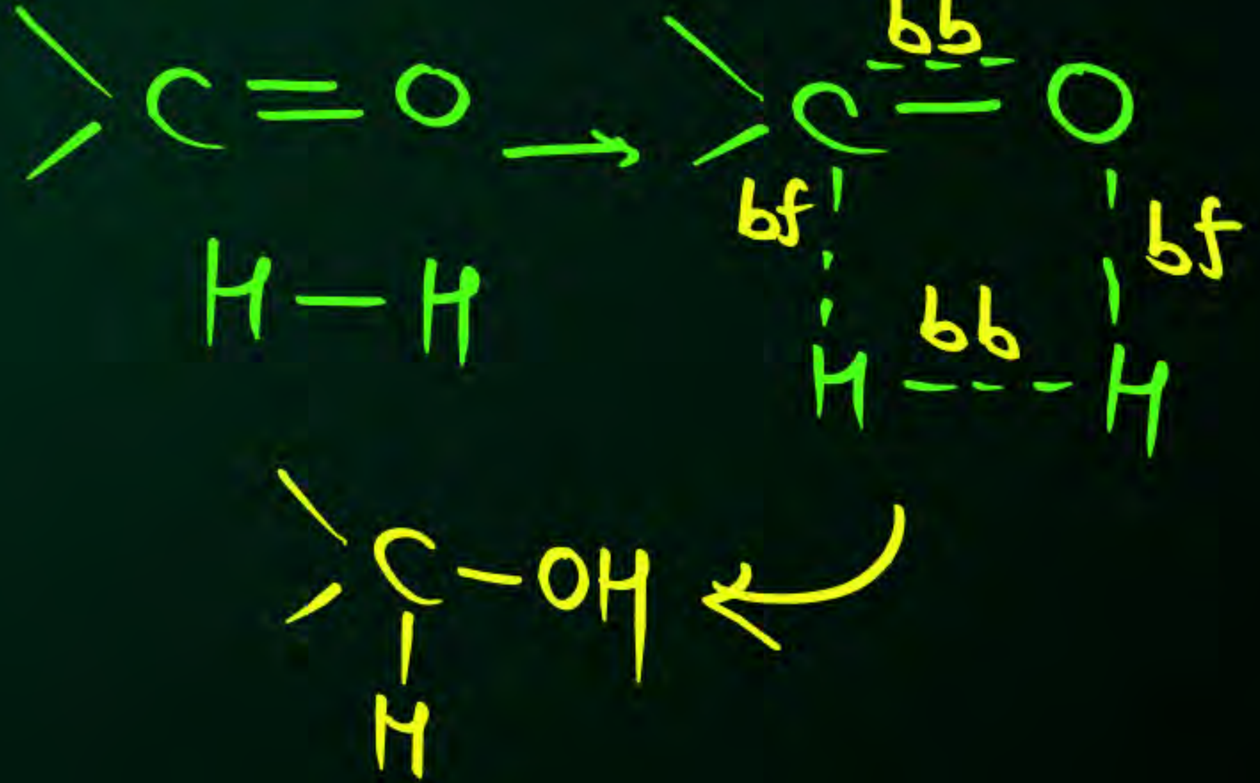
1. Reduction to Alcohols:


H
H
LAH (LiAlH$_4$)
or
SBH (NaBH$_4$)
or
H$_2$|Cat
Ni, pt, Pd
CH–OH

Mech of LAH & SBH


C=O
H$^\ominus$
C–O$^\ominus$
H
H$^+$
C–OH
H

Mech of H$_2$|Cat


C=O
H–H
bb
C
O
bf
bf
bb
H
H
C–OH
H

Selection

(Small goals) →

Daily goal

Weekly

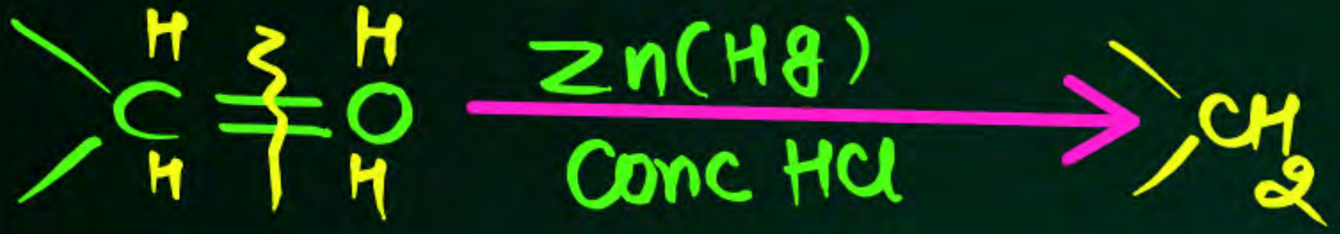
Monthly

~~100%~~

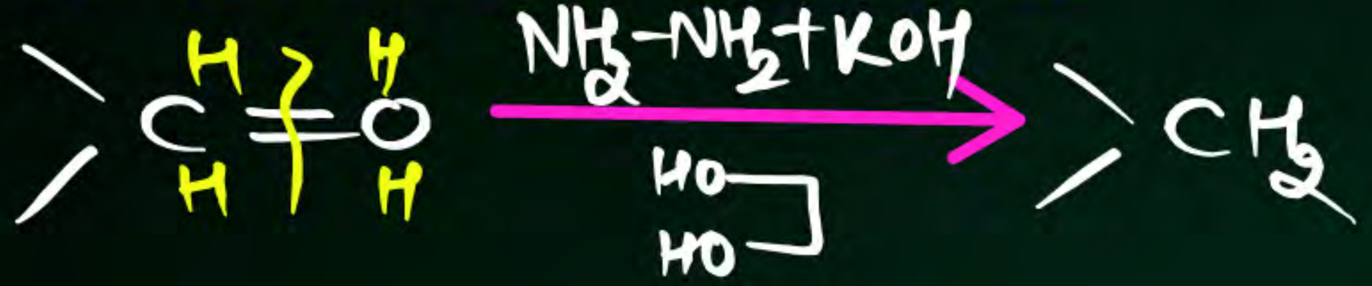
70-80%

2. Reduction to alkanes

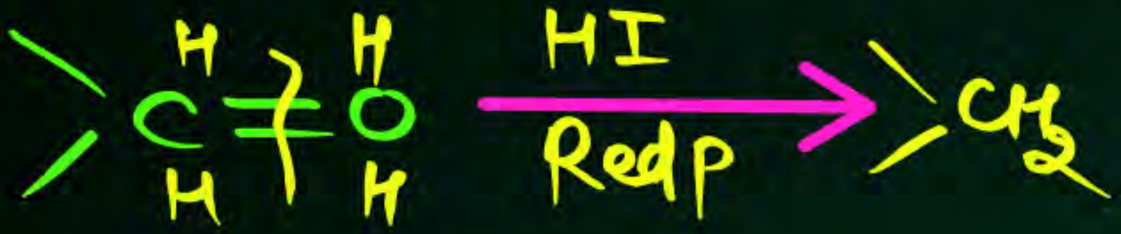
A. Clemmensen Reduction:

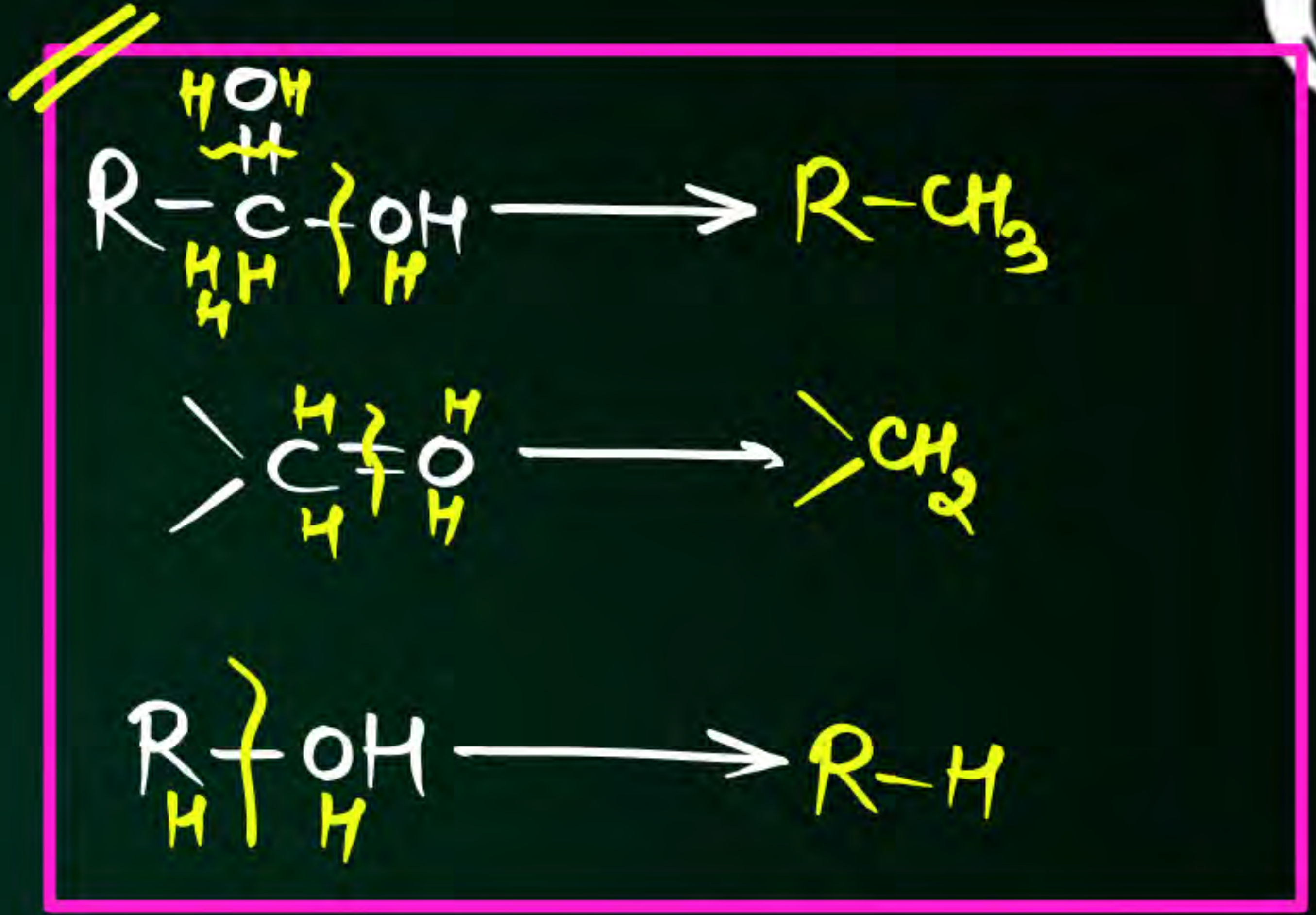

H
H
C
O
H
H
Zn(Hg)
Conc HCl
CH2

B. Wolff-Kishner Reduction:


H H H H
C=O
NH2-NH2+KOH
HO
HO
CH2

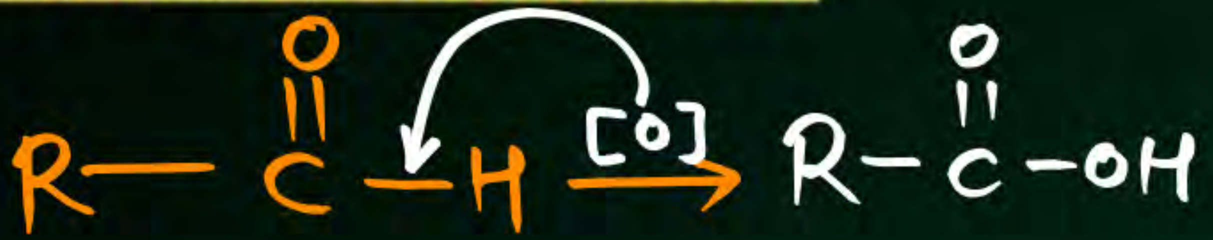
C. HI/Red P Reduction:





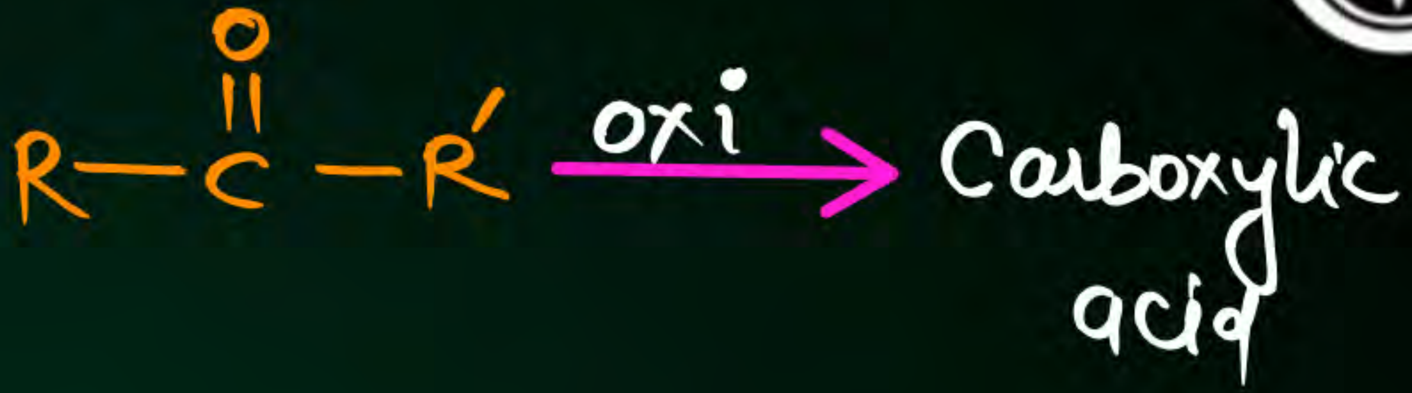
R–CH₂–OH → R–CH₃
>C=O → >CH₂
R–OH → R–H

3. Oxidation Reaction:



$$R-\overset{\overset{O}{\|}}{C}-H \xrightarrow{[O]} R-\overset{\overset{O}{\|}}{C}-OH$$

$\overline{\underline{SOA}}$ ✓



$$R-\overset{\overset{O}{\|}}{C}-R' \xrightarrow{oxi} \text{Carboxylic acid}$$

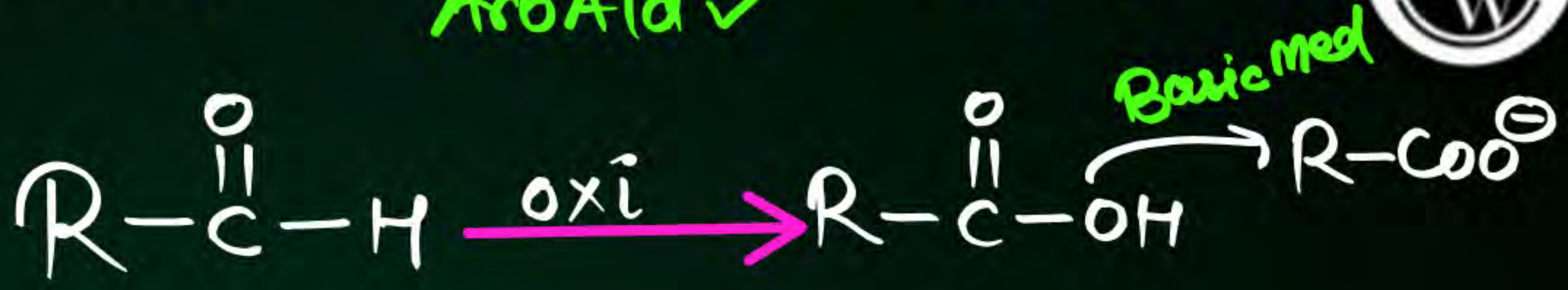
A. Tollen's Test: (Silver mirror Test)

AliAld ✓
AroAld ✓
Ket ✗

Tollen's Reagent

Ammoniacal silver nitrate

$(AgNO_3 + NH_4OH)$



$$R-\overset{O}{\overset{\|}{C}}-H \xrightarrow{oxi} R-\overset{O}{\overset{\|}{C}}-OH \xrightarrow{\text{Basic med}} R-COO^{\ominus}$$

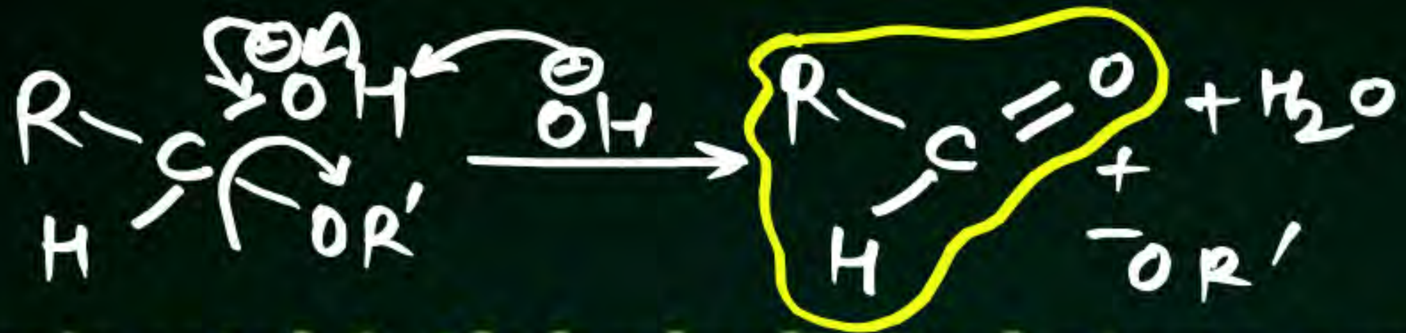
$$\overset{+1}{Ag^{+}} \xrightarrow{Red} \overset{0}{Ag}\downarrow$$

Silvery white ppt

OP Points

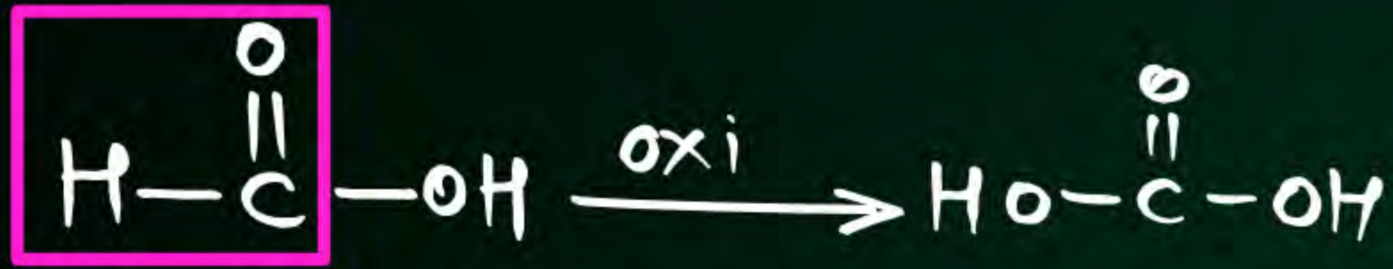
1. On warming an aldehyde with freshly prepared ammoniacal silver nitrate solution (Tollens' reagent), a bright silver mirror is produced due to the formation of silver metal.
2. The aldehydes are oxidized to corresponding carboxylate anion.
3. The reaction occurs in alkaline medium.

OP Points

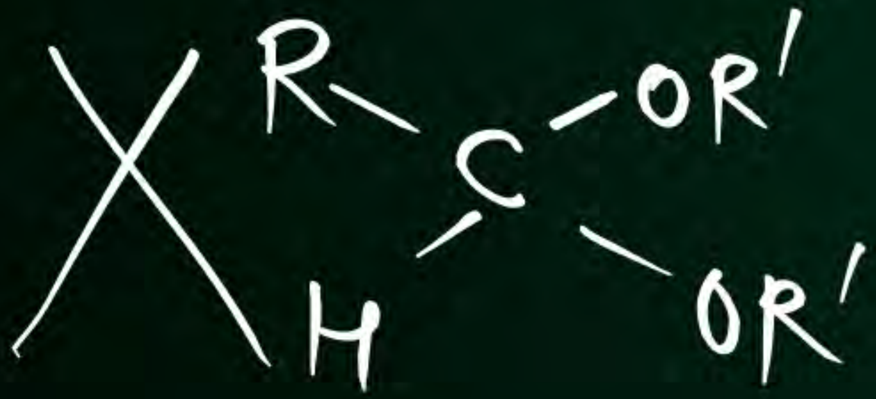


$$R-\underset{H}{C}(OH)-OR' \xrightarrow{^{\ominus}OH} R-\underset{H}{C}{=}O + H_2O + {}^{-}OR'$$

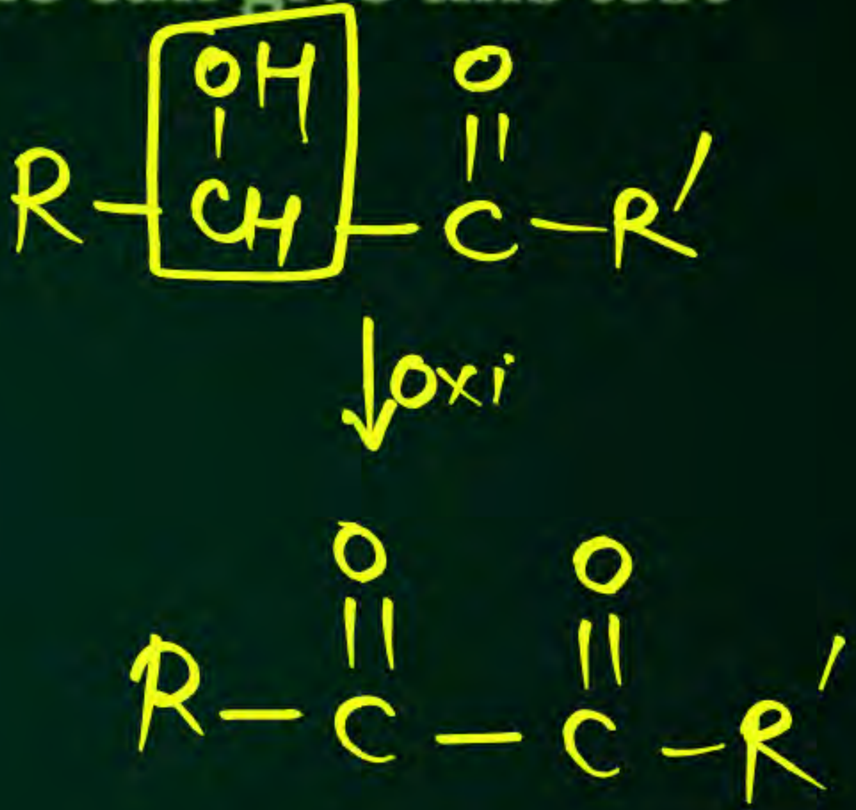
4. HCOOH & Hemiacetal & Alpha hydroxy ketone can give this test



$$H-\overset{O}{\overset{\|}{C}}-OH \xrightarrow{oxi} HO-\overset{O}{\overset{\|}{C}}-OH$$



$$R-\underset{H}{C}(OR')-OR'$$



$$R-\overset{OH}{\overset{|}{CH}}-\overset{O}{\overset{\|}{C}}-R' \xrightarrow{oxi} R-\overset{O}{\overset{\|}{C}}-\overset{O}{\overset{\|}{C}}-R'$$

B. Fehling's Test:

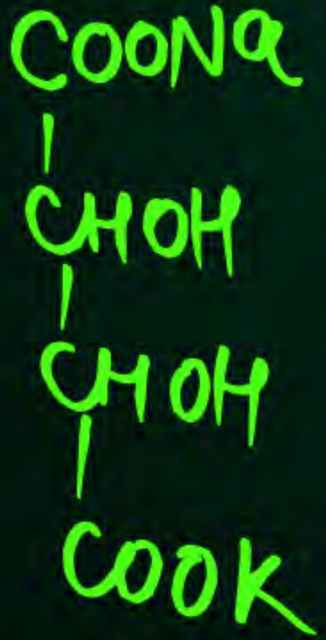
Fehling Reagents

Fehling 'A' + Fehling 'B'

Aq. $CuSO_4$

(Blue)

NaKT (Rochelle's salt)



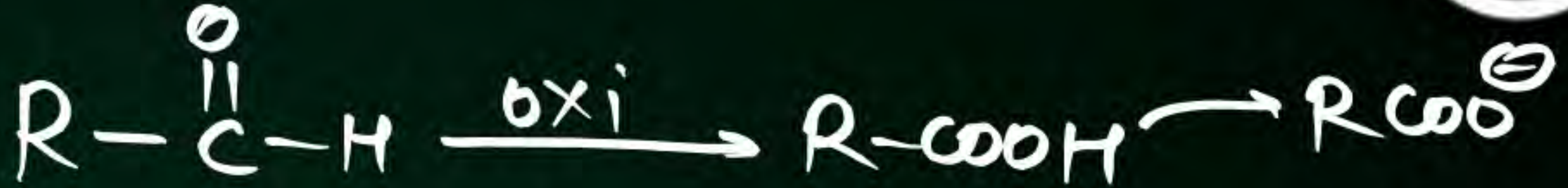
COONa
|
CHOH
|
CHOH
|
COOK

Sodium potassium tartarate

Ali Ald ✓

Aro Ald ✗

Ket ✗



$$R-\overset{O}{\overset{\|}{C}}-H \xrightarrow{oxi} R-COOH \longrightarrow RCOO^{\ominus}$$

$$Cu^{2+} \xrightarrow{Red} \overset{+1}{Cu_2O}$$

Reddish brown ppt

OP Points

1. Fehling reagent comprises of two solutions, Fehling solution A and Fehling solution B.

2. Fehling solution A is aqueous copper sulphate and Fehling solution B is alkaline sodium potassium tartarate (Rochelle salt).

3. These two solutions are mixed in equal amounts before test.

4. On heating an aldehyde with Fehling's reagent, a reddish brown precipitate is obtained.

5. Aldehydes are oxidised to corresponding carboxylate anion.

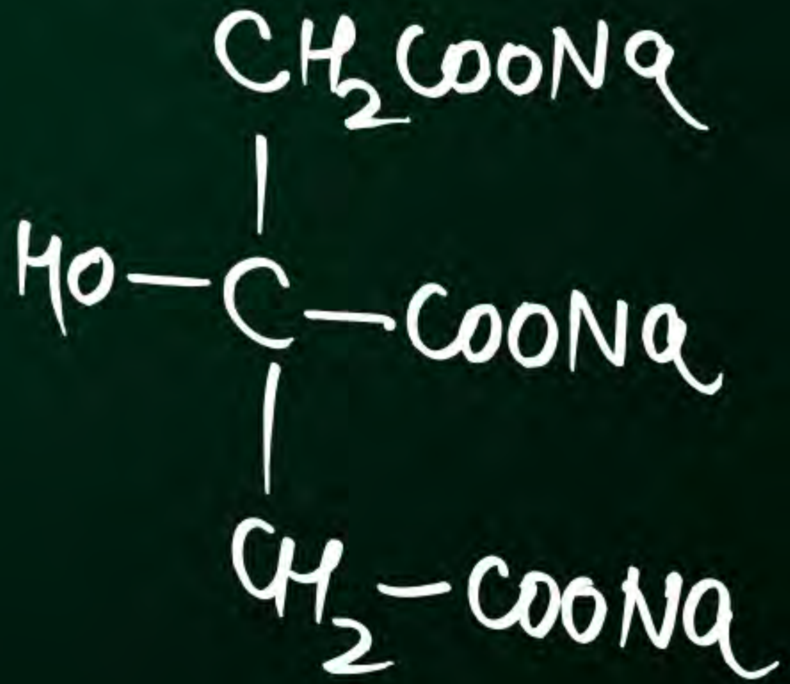
6. Aromatic aldehydes do not respond to this test.

OP Points

7. HCOOH & Hemiacetal & Alpha hydroxy ketone can give this test ✓

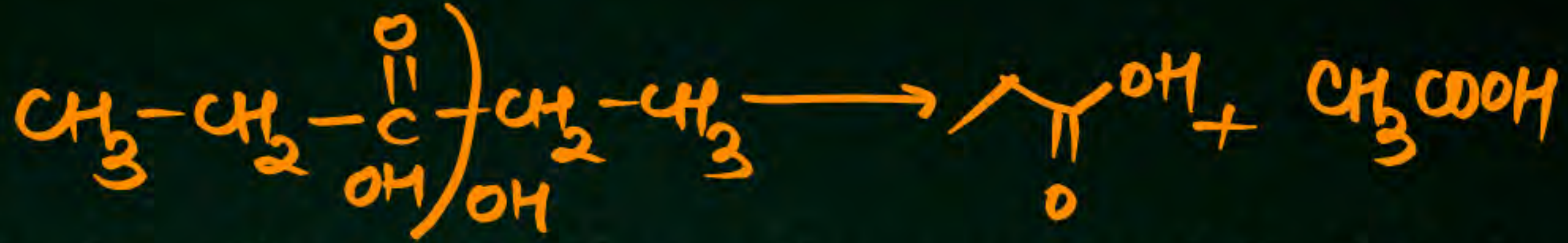
Benedict's Test :- aq $CuSO_4$ + sodium citrate

Same as fehling

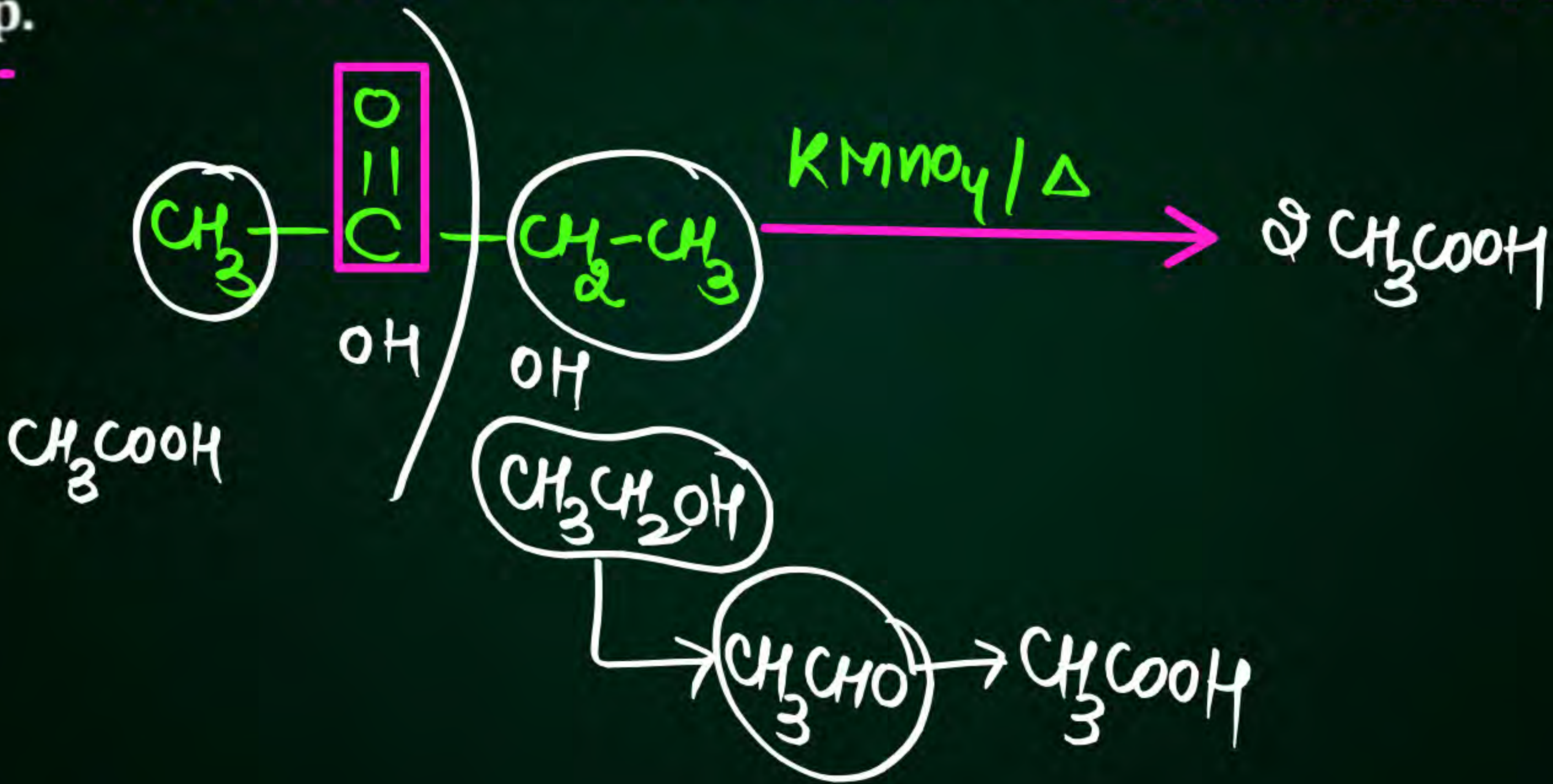


$$HO-\overset{\displaystyle CH_2COONa}{\underset{\displaystyle CH_2-COONa}{C}}-COONa$$

C. Popoff's Rule:


$CH_3-CH_2-C(=O)-CH_2-CH_3$
OH
OH
OH
$+ CH_3COOH$

Popoff's rule states that during the oxidation of unsymmetrical ketone, the cleavage of the C-CO bond is such that the keto group always stays with smaller alkyl group.


O
CH_3
C
CH_2-CH_3
OH
OH
$KMnO_4/\Delta$
$2\ CH_3COOH$
CH_3COOH
CH_3CH_2OH
CH_3CHO
CH_3COOH

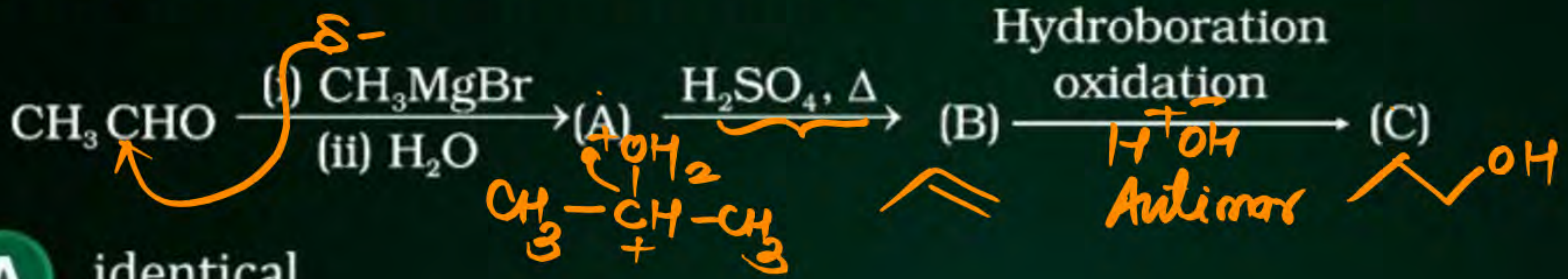
OP Points

1. Ketones are generally oxidised under vigorous conditions, i.e., strong oxidising agents and at elevated temperatures.

2. Their oxidation involves carbon-carbon bond cleavage to afford a mixture of carboxylic acids having lesser number of carbon atoms than the parent ketone.

QUESTION (NCERT Exemplar)

Compounds A and C in the following reaction are ______.



$$CH_3CHO \xrightarrow[\text{(ii) } H_2O]{\text{(i) } CH_3MgBr} (A) \xrightarrow{H_2SO_4,\ \Delta} (B) \xrightarrow{\text{Hydroboration oxidation}} (C)$$

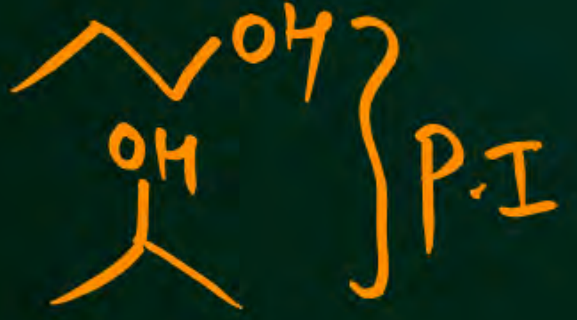
δ-
+OH2
CH3–CH–CH3
+
H+ OH-
Antimar
OH

A identical

[✓ B] positional isomers

C functional isomers

D optical isomers



QUESTION (NCERT Exemplar)

In Clemmensen Reduction carbonyl compound is treated with ________.

A [✓ Zinc amalgam + HCl]

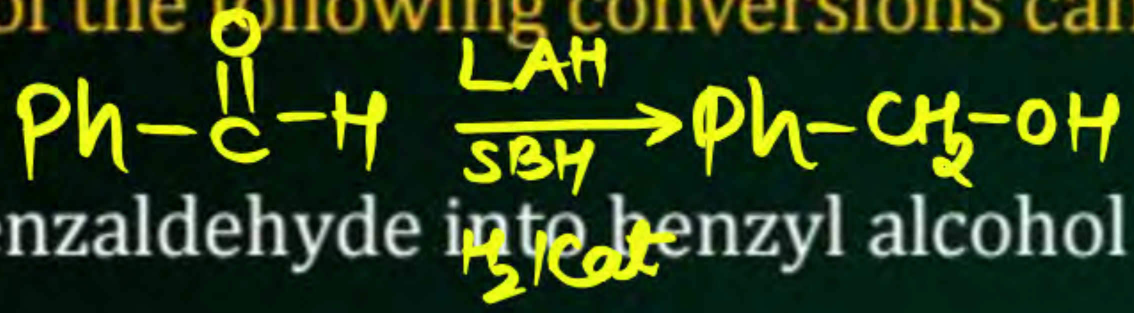
B Sodium amalgam + HCl

C Zinc amalgam + nitric acid

D Sodium amalgam + HNO_3

QUESTION (NCERT Exemplar)

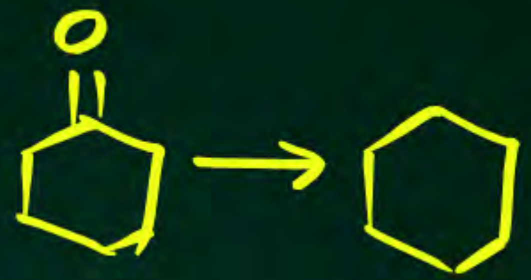
Which of the following conversions can be carried out by Clemmensen Reduction?



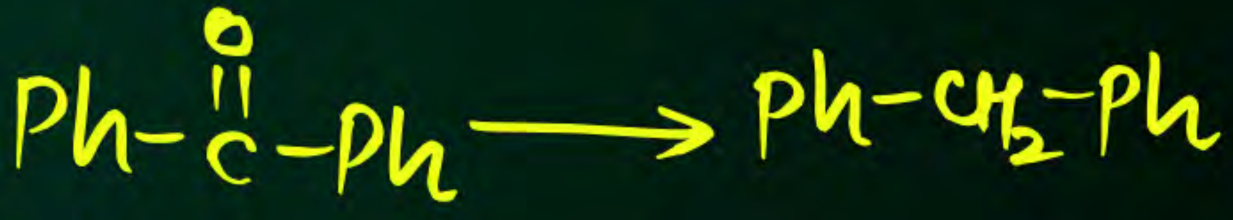
$Ph-\overset{O}{\overset{\|}{C}}-H \xrightarrow[SBH,\ H_2/Cat]{LAH} Ph-CH_2-OH$

A Benzaldehyde into benzyl alcohol

B Cyclohexanone into cyclohexane



C Benzophenone into diphenyl methane



$Ph-\overset{O}{\overset{\|}{C}}-Ph \longrightarrow Ph-CH_2-Ph$

[✓ **D**] Both (B) & (C)

QUESTION (NCERT Exemplar)

Match the reactions given in Column I with the suitable reagents given in Column II.

Column I (Reactions)	Column II (Reagents)
ⓒ (i) Benzophenone → Diphenylmethane	(a) $LiAlH_4$
ⓓ (ii) Benzaldehyde → 1-Phenylethanol	(b) DIBAL—H
ⓐ (iii) Cyclohexanone → Cyclohexanol	(c) Zn(Hg)/Conc. HCl
ⓑ (iv) Phenyl benzoate → Benzaldehyde	(d) $\underline{CH_3}MgBr$

$Ph-\overset{O}{\overset{\|}{C}}-Ph$ $\quad$ $Ph-CH_2-Ph$

$Ph-\overset{O}{\overset{\|}{C}}-H$ $\quad$ $Ph-\overset{OH}{CH}-CH_3$

$Ph-\underset{H}{\overset{O}{\overset{\|}{C}}}\}\underset{H}{O}-Ph$ $\quad$ $Ph-\overset{O}{\overset{\|}{C}}-H$

$\boxed{c, d, a, b}$

QUESTION (NCERT Exemplar)

Assertion: Aldehydes and ketones, both react with Tollen's reagent to form silver mirror.

Reason: Both aldehydes and ketones contain a carbonyl group.

- A Assertion and reason both are correct and reason is correct explanation of assertion.
- B Assertion and reason both are wrong statements.
- C Assertion is correct statement but reason is wrong statement.
- [✓ D] Assertion is wrong statement but reason is correct statement.

QUESTION (AIIMS 2001)

Aldehydes and ketones can be distinguished by:

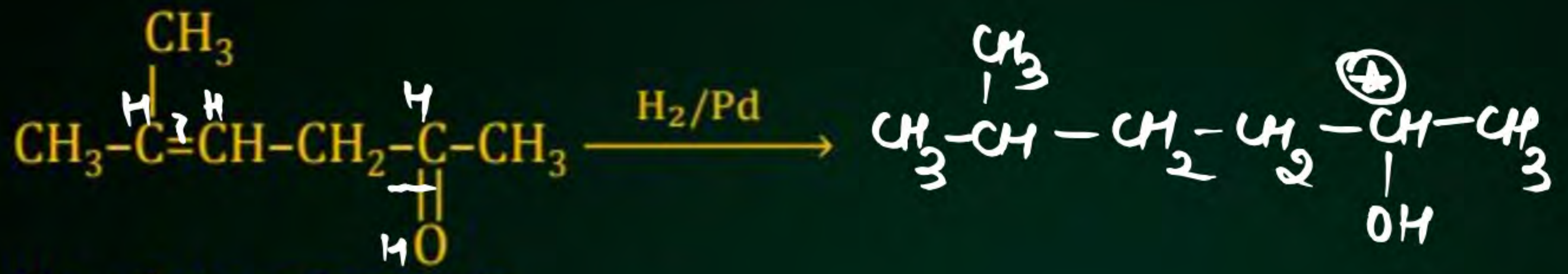
A Ammonia

B H_2SO_4

C Alkaline $KMnO_4$

[✓ D] Fehling solution

QUESTION (AIIMS 26 May, 2018 (E))



$$CH_3-\overset{\overset{CH_3}{|}}{C}=CH-CH_2-\underset{\underset{O}{\|}}{C}-CH_3 \xrightarrow{H_2/Pd} CH_3-\overset{\overset{CH_3}{|}}{CH}-CH_2-CH_2-\underset{\underset{OH}{|}}{\overset{*}{CH}}-CH_3$$

No. of stereoisomers

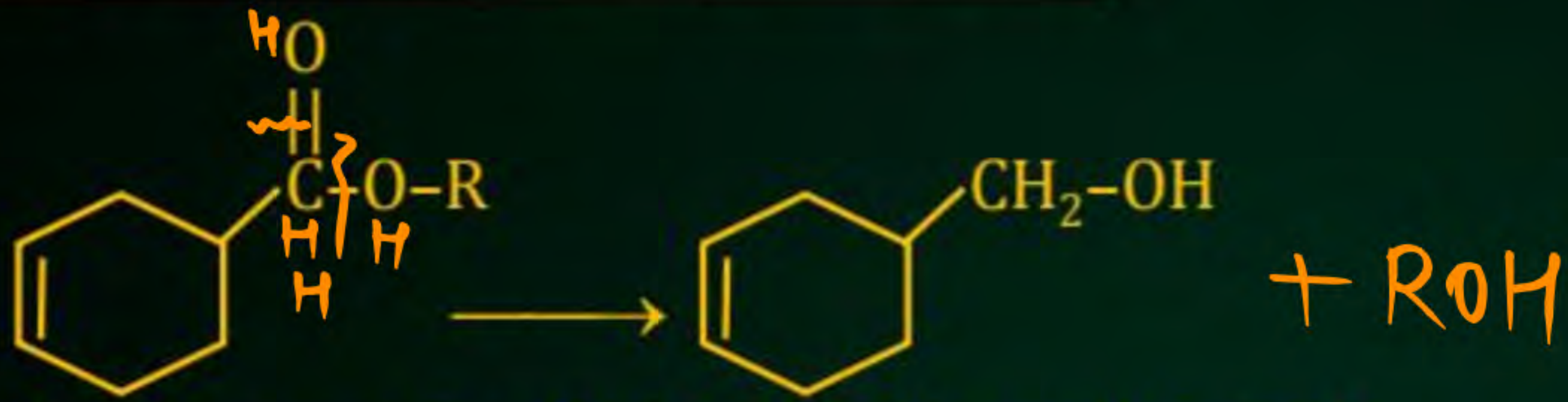
[✓ A 2]

B 4

C 8

D 6

QUESTION (AIIMS 27 May, 2018 (M))



H
O
C–O–R
H H
H
CH$_2$–OH
+ ROH

Which reagent is suitable for this conversion?

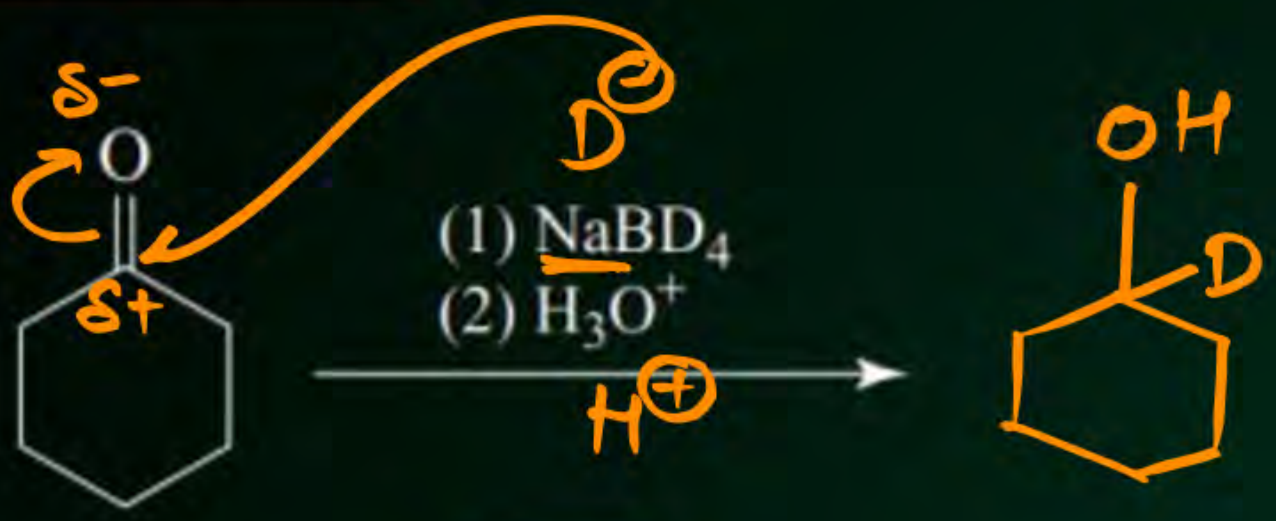
(A) Zn+Hg/HCl ✗

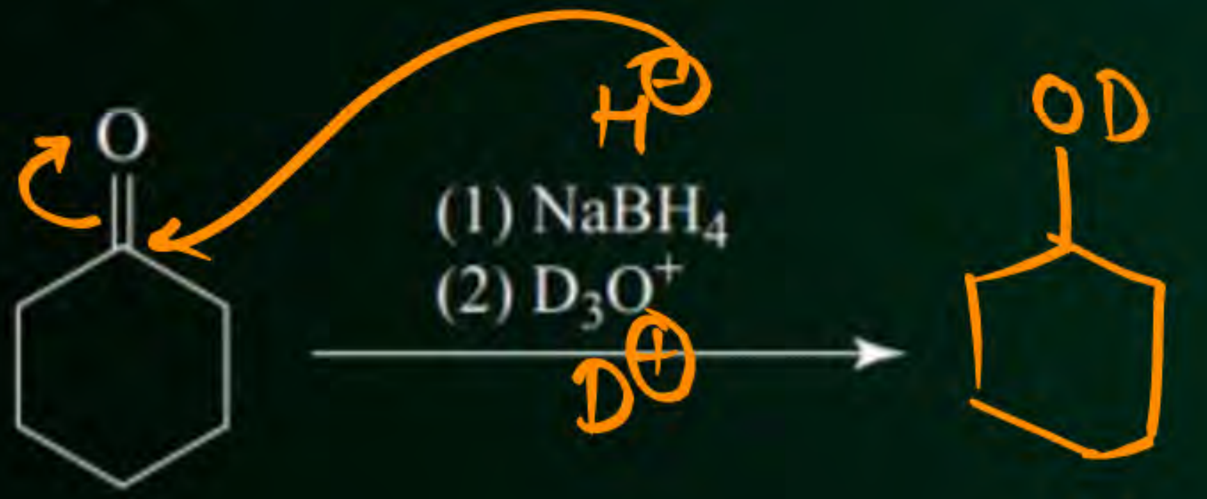
[✓ (B)] LiAlH$_4$

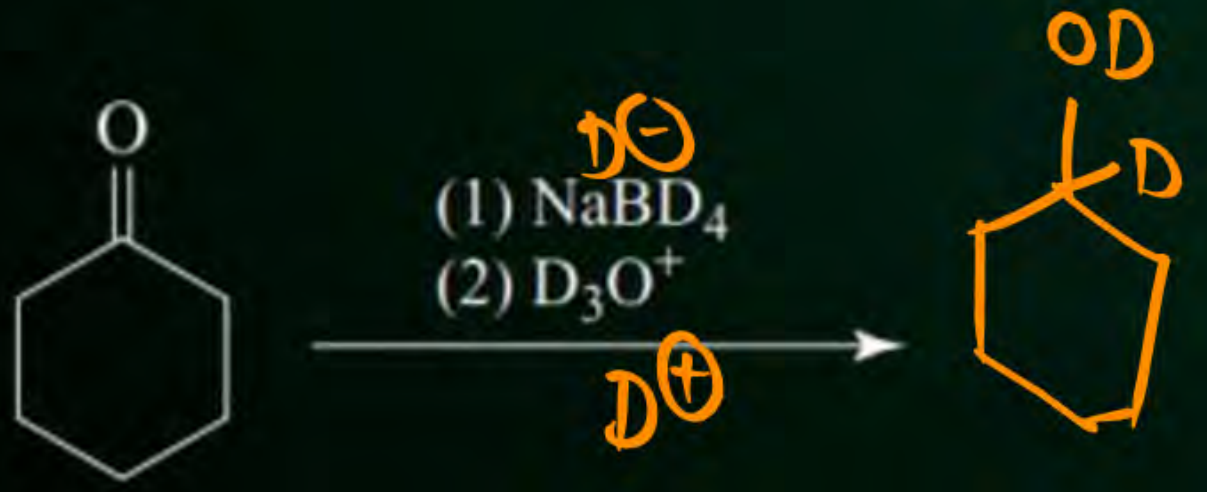
(C) NH_2–NH_2/OH^- ✗

(D) Red P + HI ✗

QUESTION


δ-
O
δ+
D⊖
(1) NaBD₄
(2) H₃O⁺
H⊕
OH
D


O
H⊖
(1) NaBH₄
(2) D₃O⁺
D⊕
OD


O
D⊖
(1) NaBD₄
(2) D₃O⁺
D⊕
OD
D

QUESTION

The reaction,

$$R_2CO + 4[H] \xrightarrow[\text{Conc. HCl}]{\text{Zn–Hg}} R_2CH_2 + H_2O$$

is well known as:

- (A) Wurtz reaction
- (B) Rosenmund reduction
- (C) Kolbe reaction
- [✓ (D)] Clemmensen reduction

QUESTION

Wolff-Kishner reduction reduces:

A $-\mathrm{COOH}$ group ✗

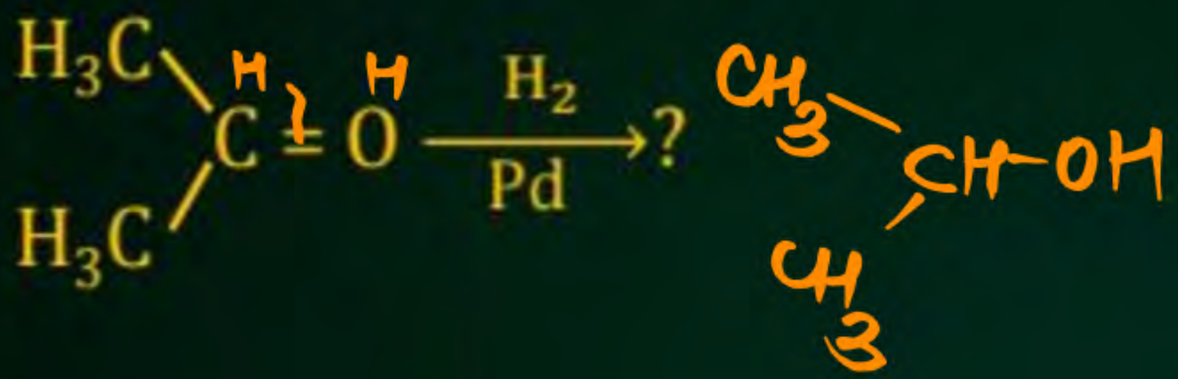
B $-\mathrm{C}\equiv\mathrm{C}$ group ✗

C $-\mathrm{CHO}$ group ✓

D $-\mathrm{O}-$ group ✗

QUESTION

Main product(s) of the reaction is/are:


H_3C
H_3C
H
H
H_2
Pd
?
CH_3
CH-OH
CH_3

A $CH_3COOH + H_2$

B CH_3CH_2COOH

[✓ C] $CH_3CH(OH)CH_3$

D CH_3CH_2OH

QUESTION

The reaction of $C_6H_5CH = CHCHO$ with $NaBH_4$ gives:

A $C_6H_5CH_2CH_2CH_2OH$

[✓ B] $C_6H_5CH = CHCH_2OH$

C $C_6H_5CH_2CH_2CHO$

D $C_6H_5CH_2CHOHCH_3$

QUESTION

Hydrocarbons are formed when aldehydes and ketones are reduced with amalgamated zinc and conc. HCl. The reaction is called:

A Dow process

B [✓ Clemmensen's reduction]

C LAH reduction

D Wolff-Kishner reduction

QUESTION

Which of the following is not correctly matched?

(A) $>C=O \xrightarrow[\text{Reduction}]{\text{Clemmensen's}} >CH_2$

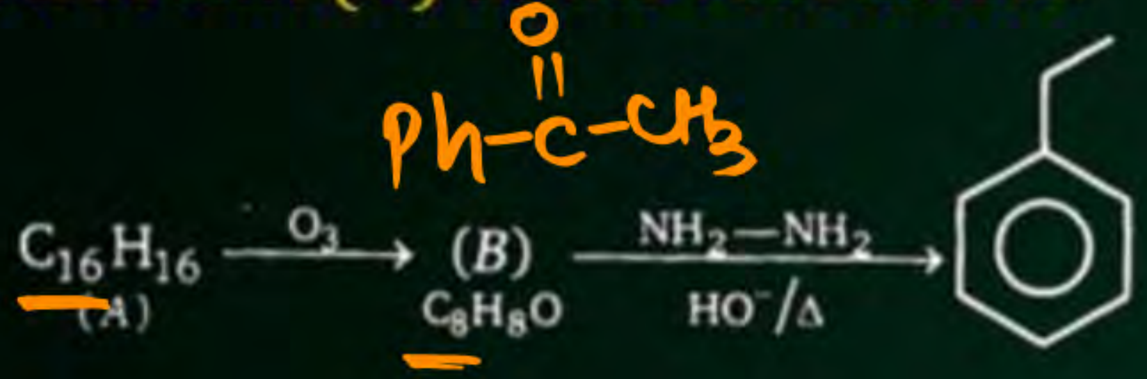
(B) ✓ $>\underline{C=O} \xrightarrow[\text{Reduction}]{\text{Wolff–Kishner}} >\underline{CHOH}$

(C) $-COCl \xrightarrow[\text{Reduction}]{\text{Rosenmund's}} -CHO$

(D) $-C\equiv N \xrightarrow[\text{Reduction}]{\text{Stephen's}} -CHO$

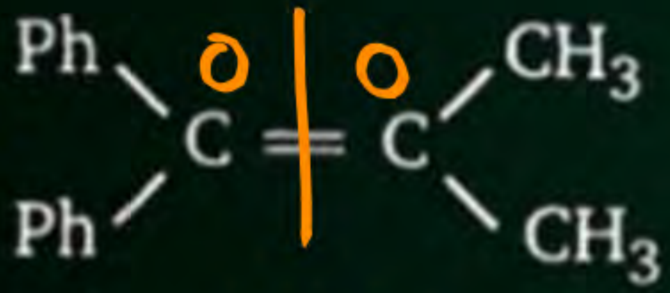
QUESTION

Reactant (A) in the reaction is:



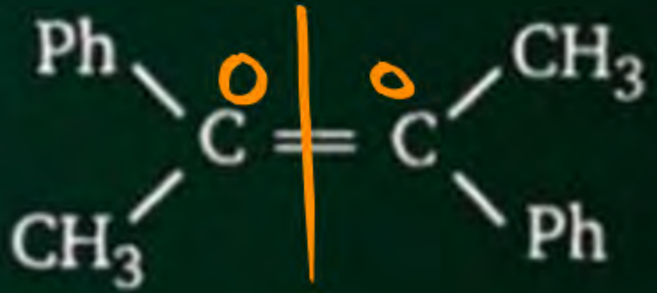
$Ph-\overset{O}{\overset{\|}{C}}-CH_3$
$C_{16}H_{16}$
(A)
O_3
(B)
C_8H_8O
NH_2-NH_2
HO^-/Δ

A



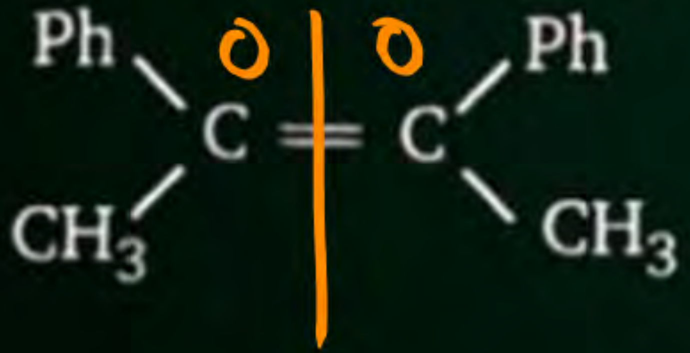
Ph
Ph
C
C
O
O
CH_3
CH_3

B



Ph
CH_3
C
C
O
O
CH_3
Ph

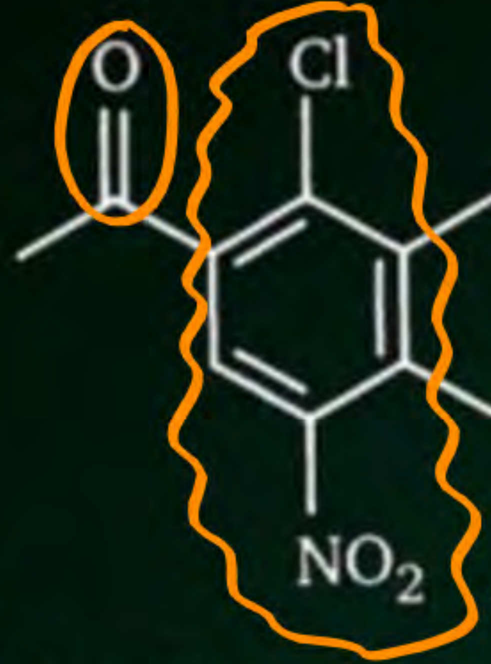
C



Ph
CH_3
C
C
O
O
Ph
CH_3

[✓ D] Both (B) and (C)

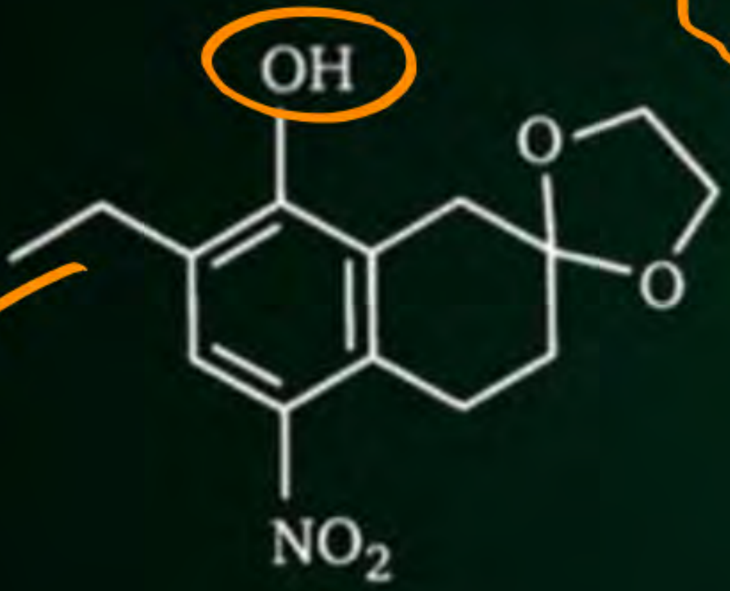
QUESTION



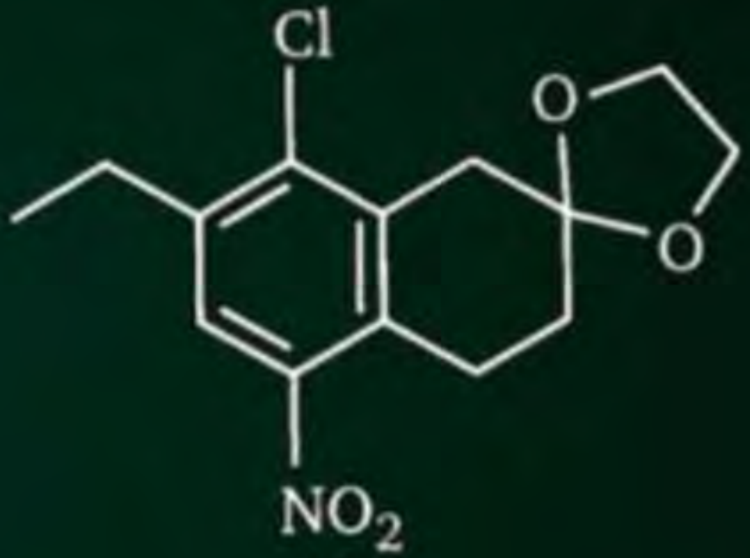
ArSN^2

$\xrightarrow[\text{(Wolff -Kishner reduction)}]{N_2H_4/KOH/H_2O}$ (A) ; Product A is :
major

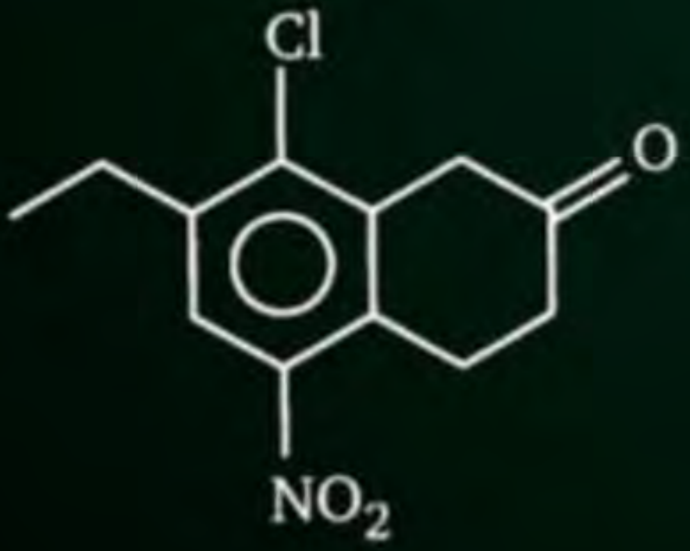
A



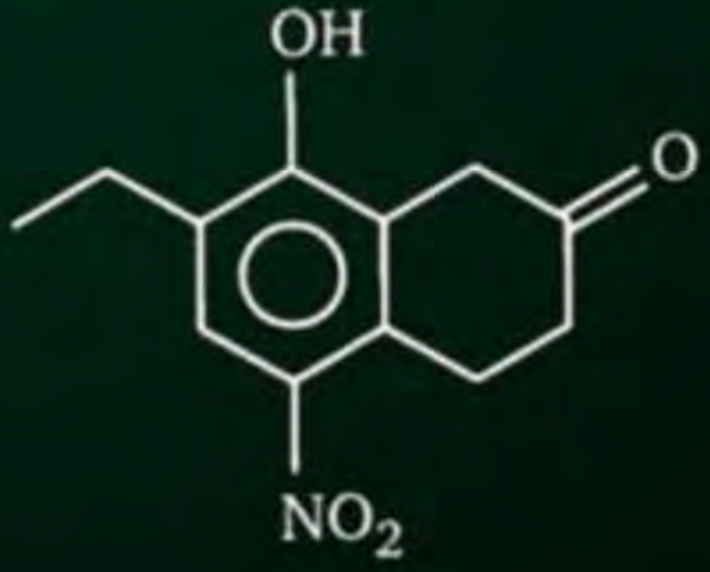
B



C

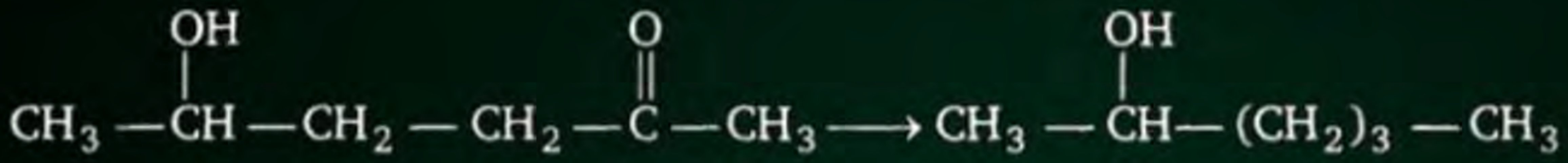


D



QUESTION

$CH_3-\overset{Cl}{CH}-(CH_2)_3-CH_3$ (Clem)



$$CH_3-\overset{OH}{CH}-CH_2-CH_2-\overset{O}{\overset{\|}{C}}-CH_3 \longrightarrow CH_3-\overset{OH}{CH}-(CH_2)_3-CH_3$$

(WKR)

Above conversion can be achieved by:

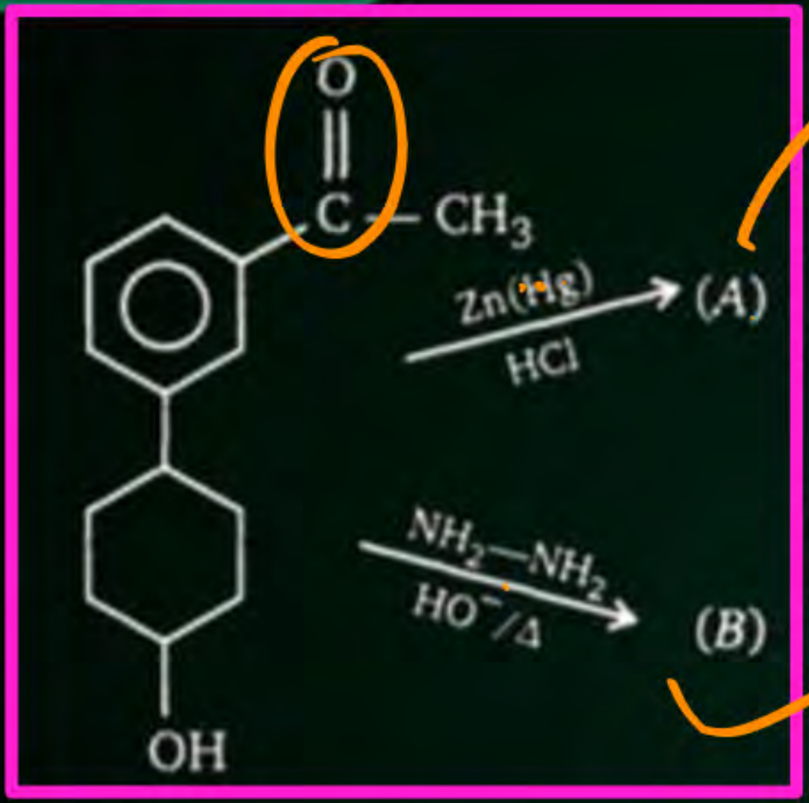
[✓ **A** Wolf-Kishner reduction]

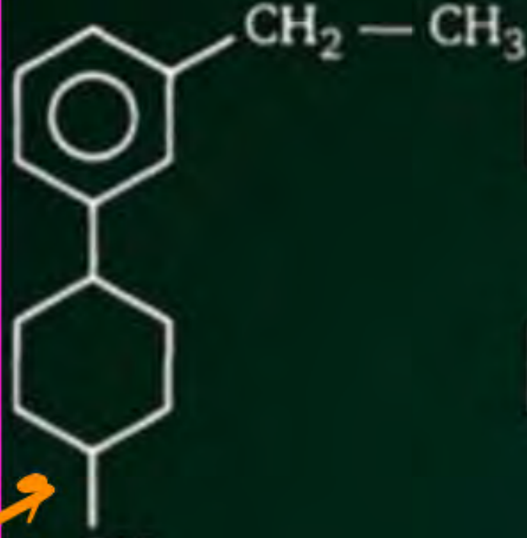
B Clemmensen reduction HCl

C $LiAlH_4$

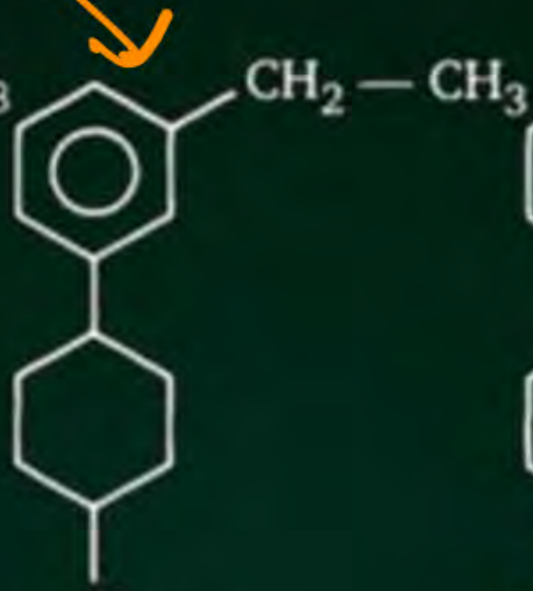
D $NaBH_4$

QUESTION

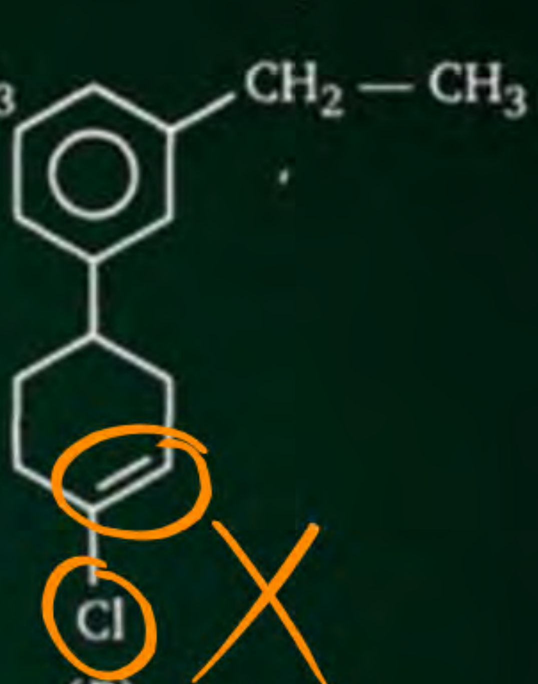

O
C
CH_3
Zn(Hg)
HCl
(A)
$NH_2—NH_2$
HO^-/Δ
(B)
OH



(P)



(Q)



(R)

Identify product (A) & (B) from the given product P, Q, R:

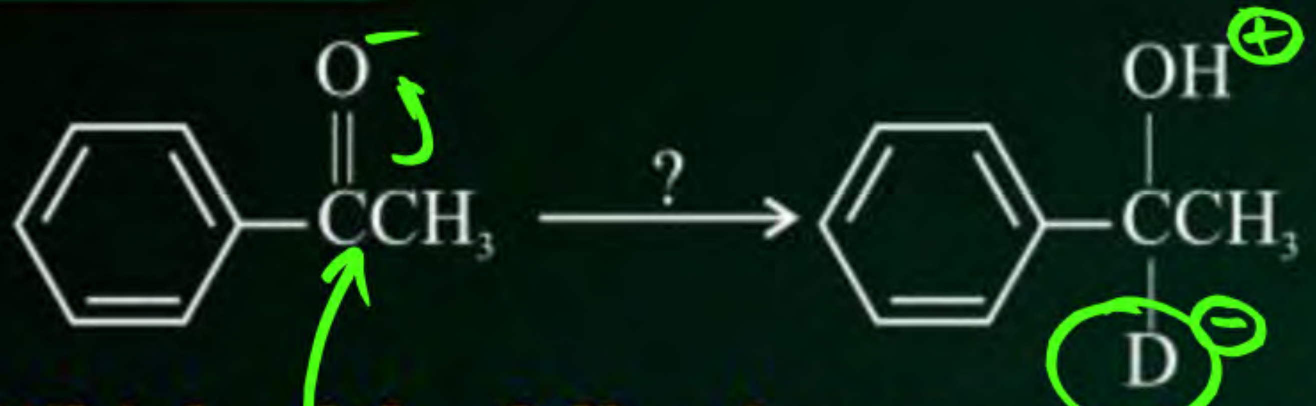
A A = P, B = Q

B A = Q, B = R

[✓ **C**] A = Q, B = P

D A = R, B = P

QUESTION


O
CCH$_3$
?
OH
CCH$_3$
D
$-$
$\oplus$
$\ominus$

Which of the following reagents would carry out the following transformation? (D = ^{2}H)

$D^{\ominus}$ $H^{\oplus}$

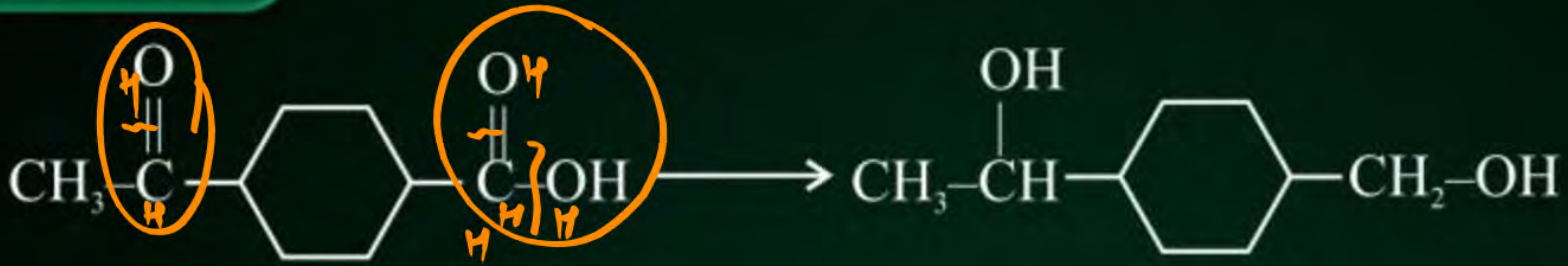
[✓ A] NaBD$_4$ in CH$_3$OH

B LiAlH$_4$ then D$_2$O

C NaBD$_4$ in CH$_3$OD

D LiAlD$_4$ then D$_2$O

QUESTION


O
CH3
C
O
C
OH
H
H
H
H
H
H
OH
CH3
CH
CH2
OH

Above conversion can be done by:

A $NaBH_4$

[✓ **B**] $LiAlH_4$

C ozonolysis

D $KMnO_4$

QUESTION

Tollens' reagent is:

- (A) alkaline mercuric chloride
- (B) alkaline potassium permanganate
- (C) [✓ ammoniacal silver nitrate]
- (D) ammonium citrate

QUESTION

Fehling's solution is:

A acidified copper sulphate solution

B ammoniacal cuprous chloride solution

[✓ C] copper sulphate and Rochelle salt + NaOH

D none of the above

QUESTION

Which one of the following reagents can distinguish aldehydes and ketones?

A [✓ Fehling's solution]

B H_2SO_4 solution

C $NaHSO_3$

D NH_3

QUESTION

Silver mirror test with Tollen's reagent is given by:

Ⓐ $C_6H_5\underline{CHO}$

Ⓑ $CH_2 = CH - \underline{CHO}$

Ⓒ $C_6H_5 - CH = CH - \underline{CHO}$

Ⓓ [✓ all of these]

QUESTION

Which will give silver mirror test with Tollen's reagent?

- A C_6H_5CHO ✓
- B $CH_3 - CHO$ ✓
- C [✓ $HCOOH$]
- D [✓ All of these]

Home Work

QUESTION 01

Fehling solution gives red precipitate with:

A Aromatic aldehyde

B Saturated aliphatic aldehyde

C Unsaturated aliphatic aldehyde

D Both (B) and (C)

QUESTION 02

Which of the given compounds will give positive test with Tollens' reagent?

A Acetamide

B Acetaldehyde

C Acetone

D Acetic acid

QUESTION 03

When acetaldehyde is reacted with $LiAlH_4$, the product formed is?

A CH_3COOH

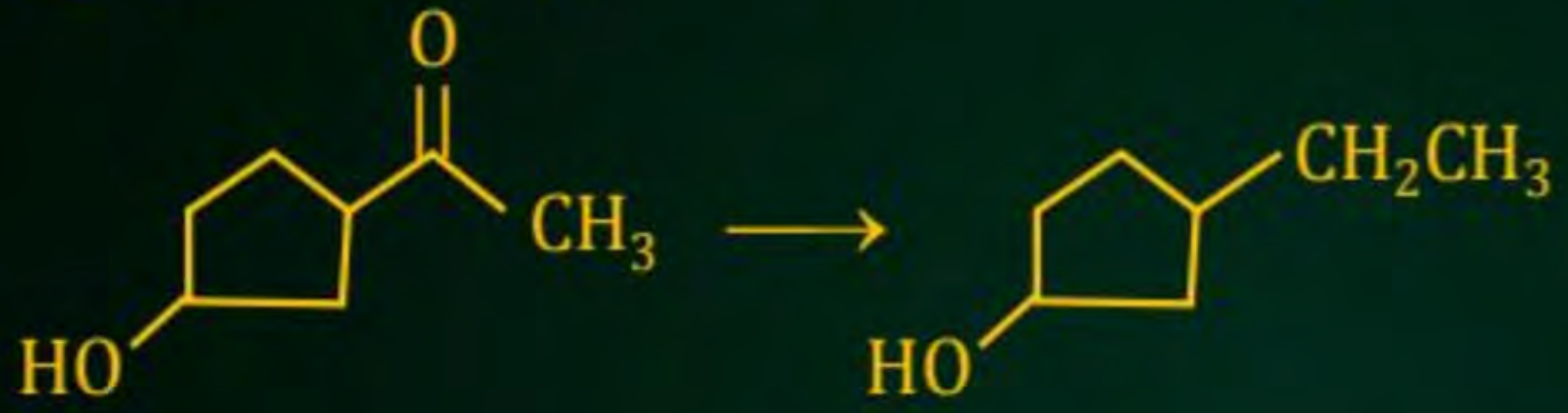
B CH_3CH_2OH

C CH_3OH

D $HCOOH$

QUESTION 04

The appropriate reagent for the following transformation


O
CH3
HO
CH2CH3
HO

is:

A Zn(Hg), HCl

B NH_2NH_2, OH^-

C H_2/Ni

D $NaBH_4$

QUESTION 05

When acetaldehyde is treated with ammoniacal silver nitrate solution, we get:

- (A) silver mirror
- (B) a brown precipitate
- (C) red colouration
- (D) no precipitate

QUESTION 06

Match the following lists:

(A) Grignard reagent	(1) $H_2/Pd\text{-}BaSO_4$
(B) Clemmensen's reduction	(2) $N_2H_4/KOH/CH_2OH\text{-}CH_2OH$
(C) Rosenmund's reduction	(3) CH_3MgX
(D) Wolff-Kishner reduction	(4) Zn-Hg/conc. HCl
	(5) H_2/Ni

the correct answer is:

Ⓐ A-3, B-4, C-1, D-2

Ⓑ A-3, B-4, C-2, D-1

Ⓒ A-2, B-1, C-4, D-5

Ⓓ A-5, B-3, C-2, D-1

QUESTION 07

When acetaldehyde is heated with Fehling's solution, it gives a red precipitate of:

- A Cu
- B CuO
- C $CuSO_4$
- D Cu_2O

QUESTION 08

Which statement is incorrect in the case of acetaldehyde and actoene?

Ⓐ Both react with hydroxylamine

Ⓑ Both react with $NaHSO_3$

Ⓒ Both react with hydrazine

Ⓓ Both reduce ammoniacal silver nitrate

QUESTION 09

Clemmensen's reduction will convert cyclohexanone into:

- (A) *n*-hexane
- (B) benzene
- (C) cyclohexane
- (D) cyclohexanol

QUESTION 10

Acetaldehyde is converted to ethane by Wolff-Kishner reduction, Acetaldehyde is treated with:

Ⓐ $LiAlH_4$

Ⓑ $NaBH_4$

Ⓒ NH_2NH_2 and $NaOC_2H_5$

Ⓓ H_2 with $Pd/BaSO_4$

ANSWER KEY

1. D
2. B
3. B
4. B
5. A
6. A
7. D
8. D
9. C
10. C

Home Work From PW Module (Yakeen NEET)

Prarambh: Q 18, 24, 25, 29, 31, 44

Parikshit: Q 01, 31, 33, 37

Home Work

Discussion of L-01

QUESTION 01

Products of the following reaction, $\underbrace{Me_2\overset{O}{C}}\wr\underbrace{\overset{O}{C}HCH_3}\xrightarrow[(ii)\ (CH_3)_2S]{(i)\ O_3}$ **? are:**

(A) ✓ $\underbrace{Me_2CO + CH_3CHO}$

(B) $CH_3CHO + CH_3COOH$

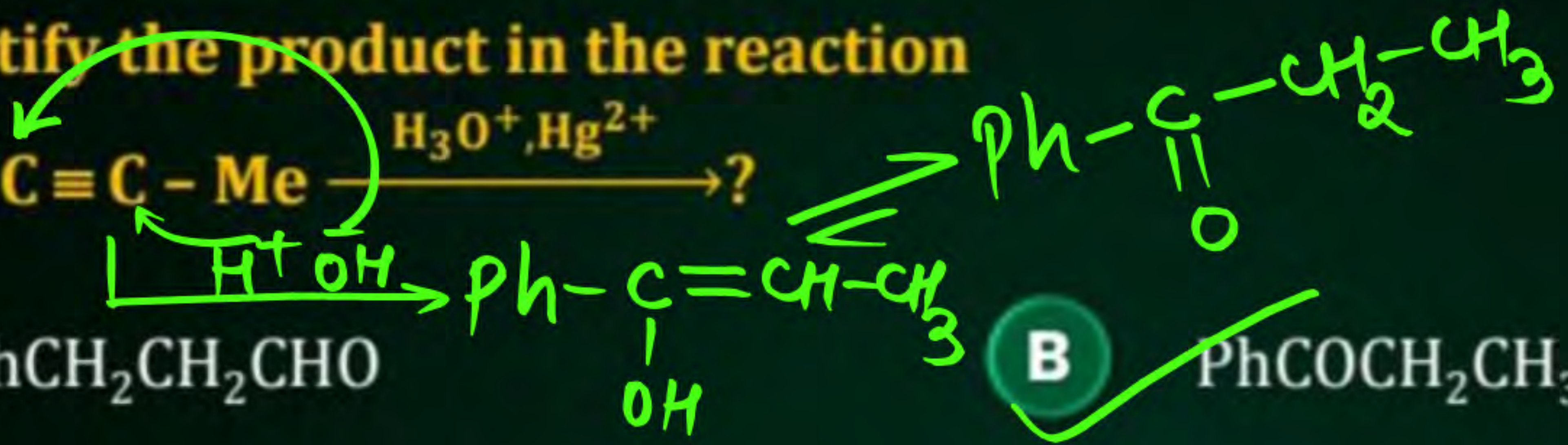
(C) $Me_2CO + CH_3COOH$

(D) $2Me_2CO$

QUESTION 02

Identify the product in the reaction

$$Ph-C\equiv C-Me \xrightarrow{H_3O^+, Hg^{2+}} ?$$



$$\xrightarrow{H^+\ OH} Ph-\underset{OH}{\underset{|}{C}}=CH-CH_3 \rightleftharpoons Ph-\underset{O}{\underset{\|}{C}}-CH_2-CH_3$$

(A) $PhCH_2CH_2CHO$

[✓ (B) $PhCOCH_2CH_3$]

(C) $PhCH_2COCH_3$

(D) $PhCOCOMe$

QUESTION 03

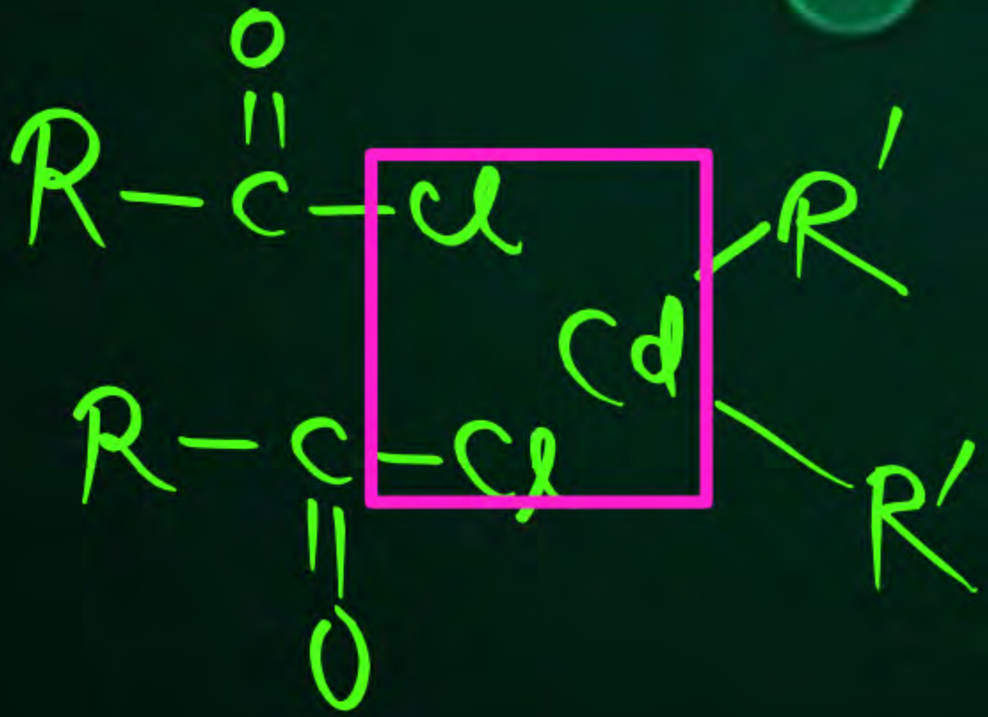
Dialkyl cadmium reacts with a compound to form a ketone. The compound is:

Ⓐ an acid

[✓ Ⓑ] an acid chloride

Ⓒ an ester

Ⓓ carbon monoxide



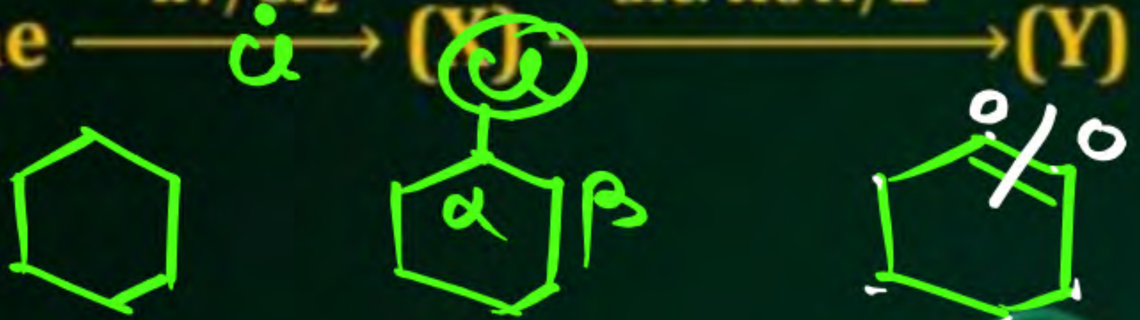
O
R
C
Cl
Cd
R'
R'
R
C
Cl
O

QUESTION 04

In the reaction sequence:

$$\text{Cyclohexane} \xrightarrow{hv/Cl_2} (X) \xrightarrow{\text{alc. KOH}/\Delta} (Y) \xrightarrow[\text{(ii) } H_2O/Zn]{\text{(i) } O_3} (Z)$$

(Z) will be:



Ⓐ Hexanal

Ⓑ 2-Hexanone

Ⓒ 3-Hexanone

[✓ Ⓓ] Hexanedial

QUESTION 05

$CH_3CH_2C\underline{\underline{\equiv N}} \xrightarrow{X} CH_3CH_2\underline{\underline{CHO}}$

the compound X is:

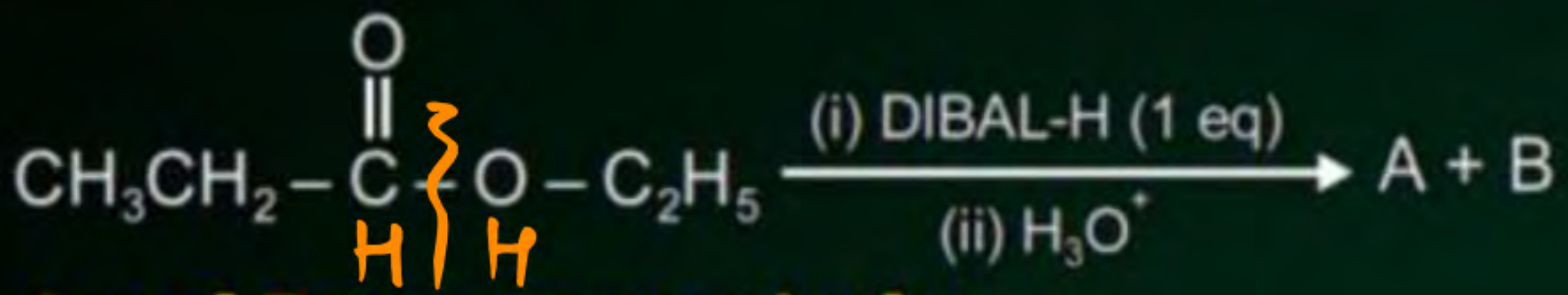
(A) ✗ $H_2/Pd\text{-}BaSO_4$

[✓ (B) $SnCl_2/HCl/H_2O$, boil]

(C) ✗ $LiAlH_4$/ether

✗ (D) $NaBH_4/\text{ether}/H_3O^+$

QUESTION 06



$$CH_3CH_2-\underset{H}{\overset{\overset{O}{\|}}{C}}-\underset{H}{O}-C_2H_5 \xrightarrow[\text{(ii) } H_3O^+]{\text{(i) DIBAL-H (1 eq)}} A + B$$

A and B are respectively:

A $CH_3CH_2CH_2OH + C_2H_5OH$

[✓ **B**] $CH_3CH_2CHO + C_2H_5OH$

C $CH_3CH_2CHO + CH_3CHO$

D $CH_3CH_2CH_2OH + CH_3CHO$

QUESTION 07

Reduction of acetonitrile in presence of $SnCl_2/HCl$, followed by hydrolysis gives:

$CH_3-\boxed{CN} \longrightarrow CH_3-\boxed{CHO}$

A HCHO

[✓ **B** CH_3CHO]

C CH_3CH_2CHO

D CH_3COCH_3

QUESTION 08

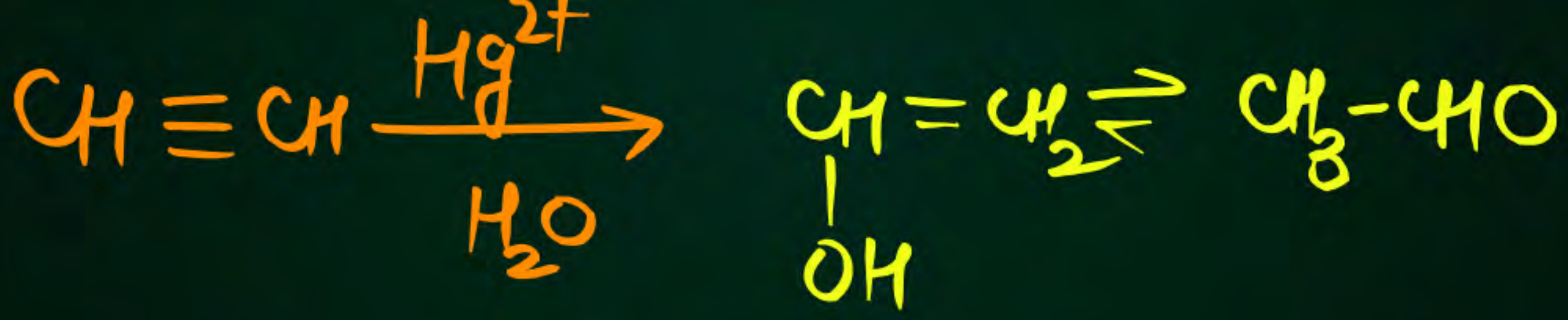
Acetylene on treatment with dil. H_2SO_4 having $HgSO_4$ gives:

[✓ (A) acetaldehyde]

(B) acetic acid

(C) ethanol

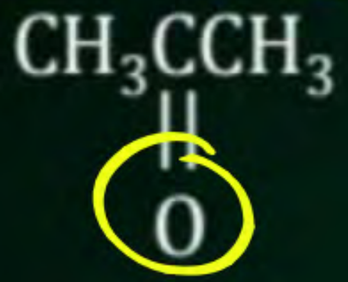
(D) ethylene

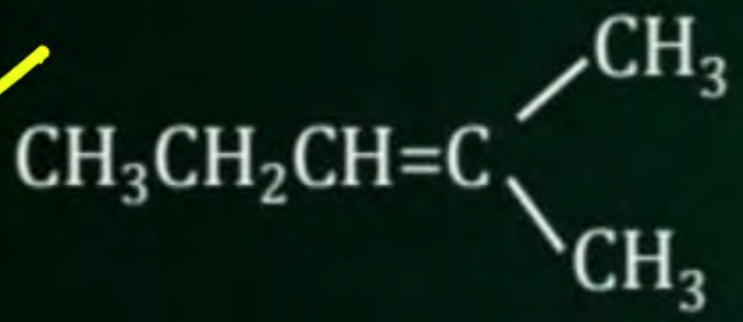


$$CH\equiv CH \xrightarrow[H_2O]{Hg^{2+}} \underset{\underset{OH}{|}}{CH}=CH_2 \rightleftharpoons CH_3-CHO$$

QUESTION 09

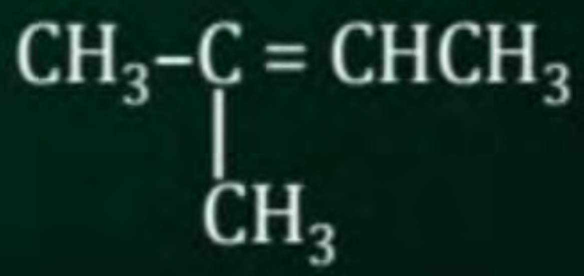
Which alkene on ozonolysis gives?

CH_3CH_2CHO and 
$CH_3\underset{\underset{O}{\|}}{C}CH_3$

[✓ A] 

B $CH_3CH_2CH = CHCH_2CH_3$

C $CH_3CH_2CH = CHCH_3$

D 
$CH_3-\underset{\underset{CH_3}{|}}{C} = CHCH_3$

QUESTION 10

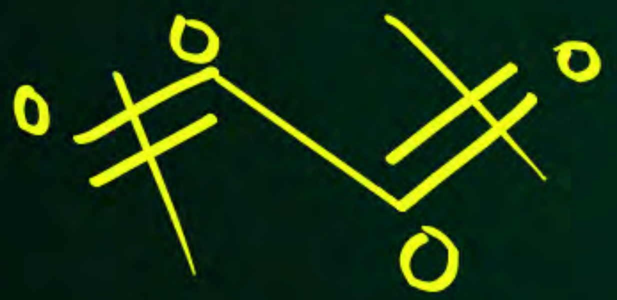
Ozonolysis of buta-1, 3-diene gives:

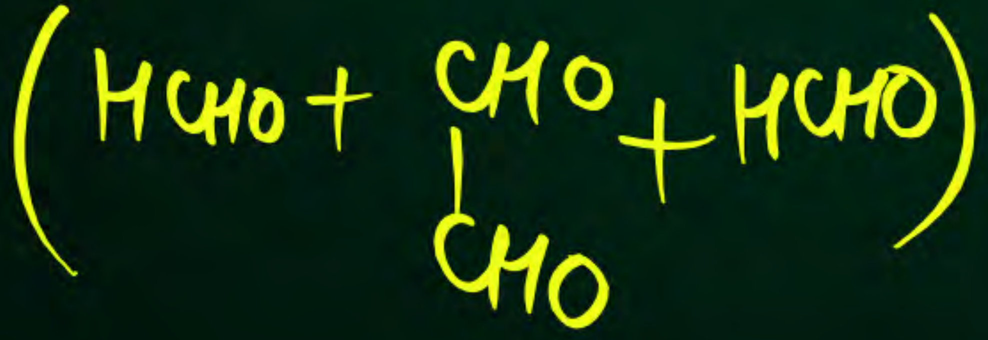
[✓ A] HCHO and glyoxal

(B) CH_3CHO and glyoxal

(C) CO_2 and glyoxal

(D) HCHO + glyoxal + CH_3CHO





$$\left(HCHO + \begin{array}{c}CHO\\|\\CHO\end{array} + HCHO\right)$$

ANSWER KEY

1.A
2.B
3.B
4.D
5.B
6.B
7.B
8.A
9.A
10.A

Home Work

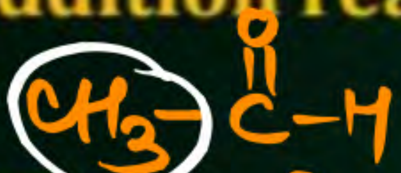
Discussion of L-03

QUESTION 01

in NAR
Ald > ket

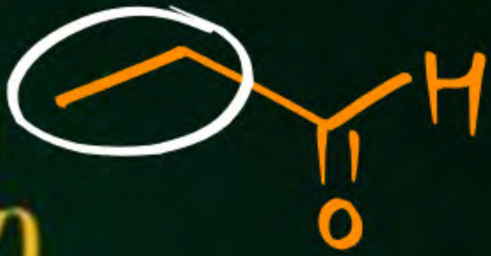
Arrange the following compounds in increasing order of their reactivity in nucleophilic addition reactions:

Ethanal (I)

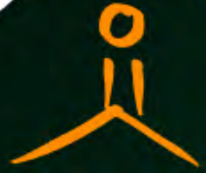


$CH_3-\overset{O}{\overset{\|}{C}}-H$

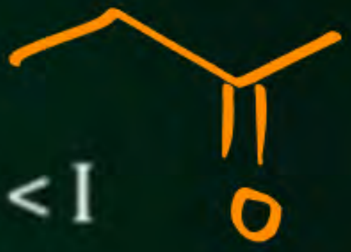
Propanal (II)



Propanone (III)



Butanone (IV)



(A) I < II < III < IV

[✓ (B)] IV < III < II < I

(C) III < II < I < IV

(D) II < I < III < IV

QUESTION 02

In the reaction, $\underbrace{CH_3CHO} + \underbrace{HCN} \longrightarrow \underbrace{CH_3\overset{*}{C}HOHCN}_{2\ iso}$, a chiral centre is produced. The product is:

$\boxed{d \mid l}$

R.M

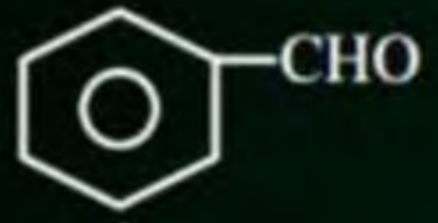
- A meso compound
- B laevorotatory
- C dextrorotatory
- [✓ D] racemic mixture

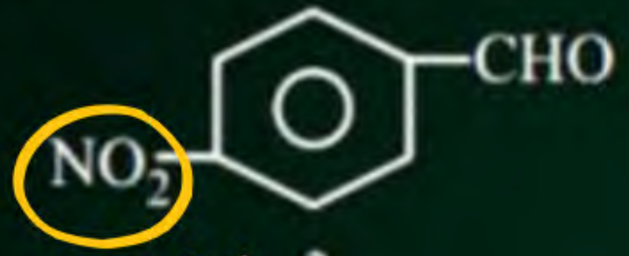
QUESTION 03

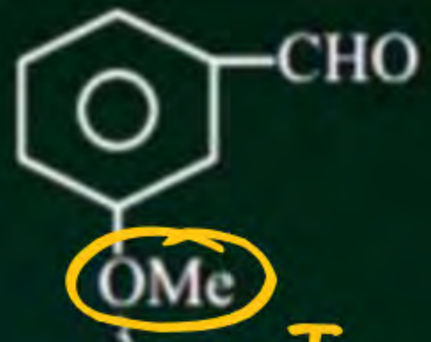
ROR ∝ Electrophilicity $\propto -M, -I, -H \propto \frac{1}{+M, +I, +H}$

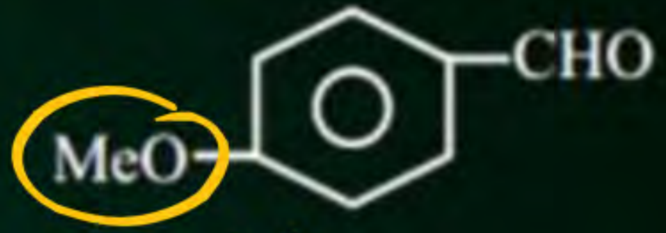
in NAR

Arrange the following four compounds in order of their rate of addition with NaCN/H^+ (NAR)


1


$-M > \cancel{I}$ 2


3 $-I$


$+M > \cancel{I}$ 4

Correct order of rate of addition with HCN is:

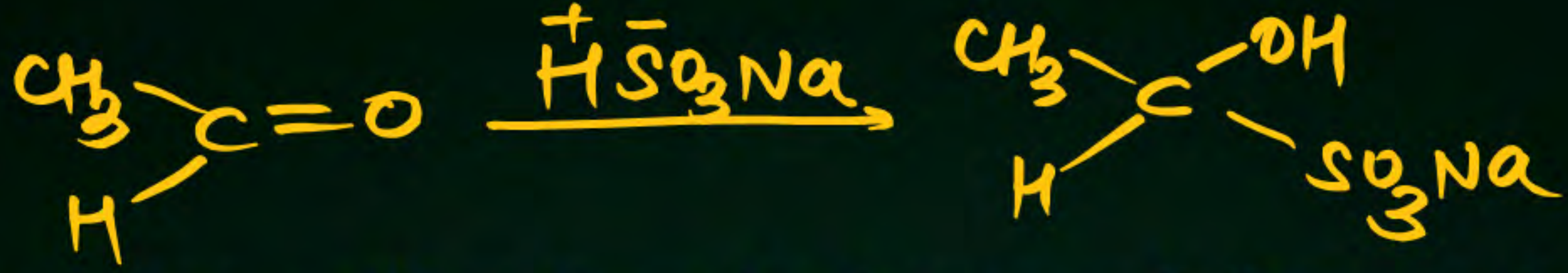
A 2 > 1 > 3 > 4

B 1 > 2 > 3 > 4

[✓ C] 2 > 3 > 1 > 4

D 3 > 4 > 1 > 2

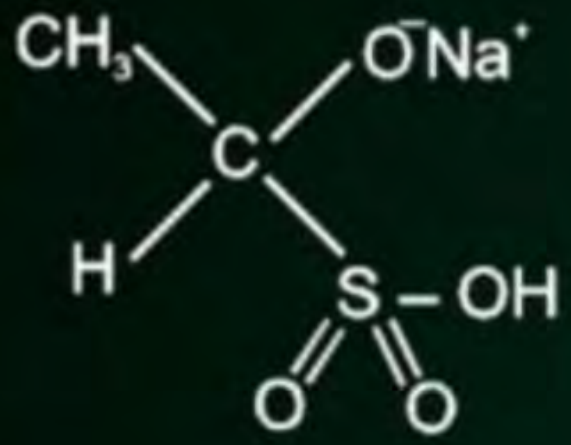
QUESTION 04



CH3
C=O
H
HSO3Na
CH3
C
OH
H
SO3Na

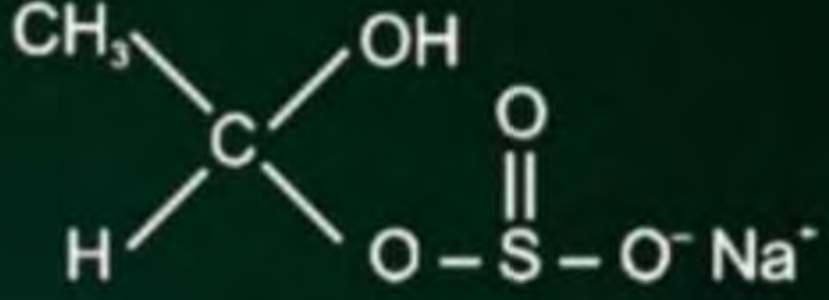
Acetaldehyde on reaction with sodium hydrogen sulphite produces

(A)



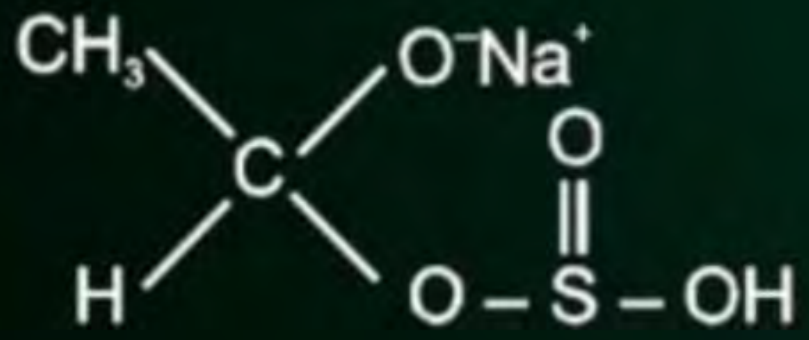
CH3
O⁻Na⁺
C
H
S–OH
O
O

(B)



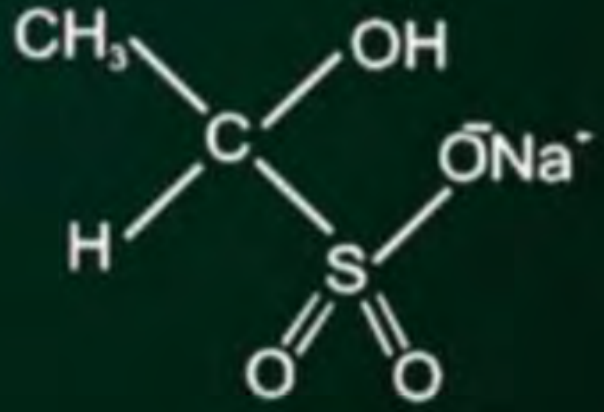
CH3
OH
C
O
H
O–S–O⁻ Na⁺

(C)



CH3
O⁻Na⁺
C
O
H
O–S–OH

[✓ (D)]



CH3
OH
C
O⁻Na⁺
H
S
O
O

QUESTION 05

Oximes are formed by the reaction of aldehydes and ketones with:

Products

A NH_3 → Amine

B NH_2NH_2 → Hydrazone

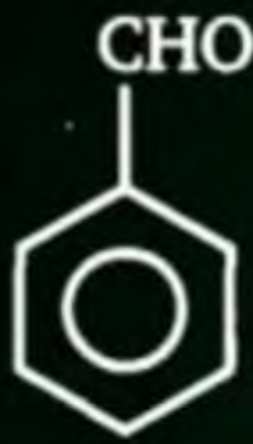
[✓ C] NH_2OH → Oxime

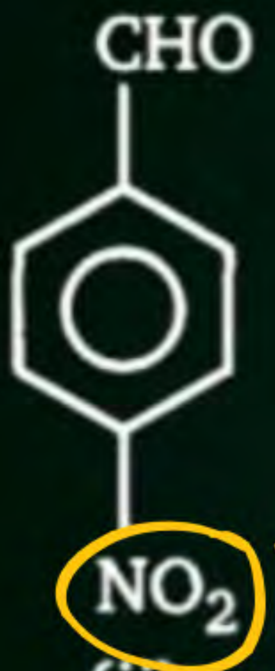
D $NH_2CONHNH_2$ → Semicarbazone

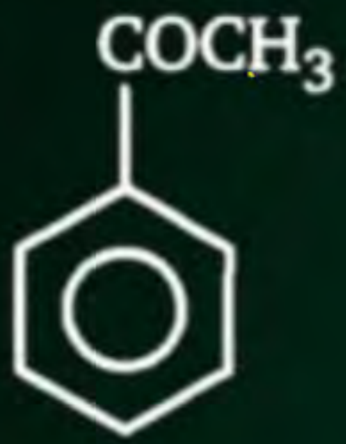
QUESTION 06

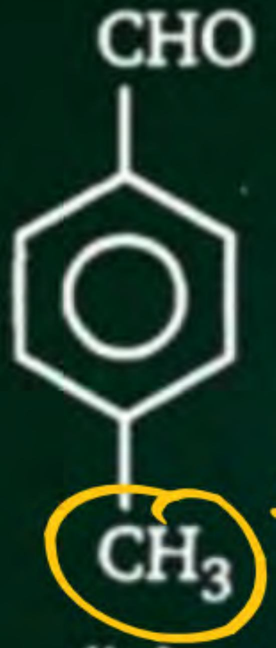
Arrange the following carbonyl compounds in decreasing order of their reactivity in nucleophilic addition reaction.

Ald > Ket


(i)


-M >
(ii)


(iii)


+H >
(iv)

A ii > iii > i > iv

[✓ B] ii > i > iv > iii

C iii > ii > i > iv

D iii > i > iv > ii

QUESTION 07

The correct order of reactivity of following compounds with PhMgBr will be:

$(C_6H_5)_2CO$,
(A)

$CH_3-CH=O$,
(B)

$(CH_3)_2C=O$
(C)

NAR

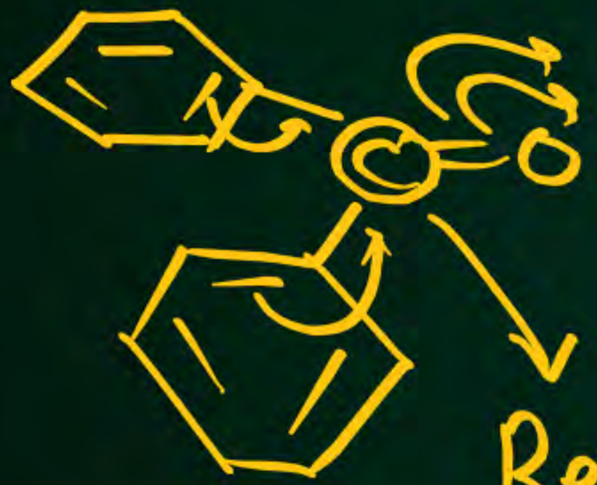
Ald > ket

A A > B > C

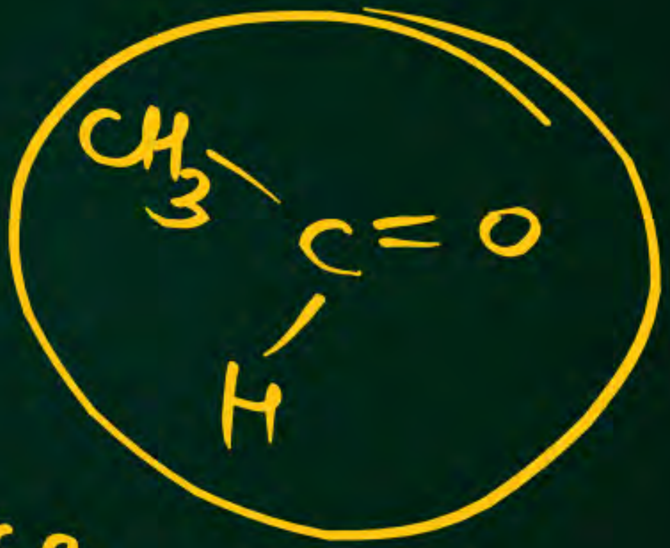
[✓ **B**] B > C > A

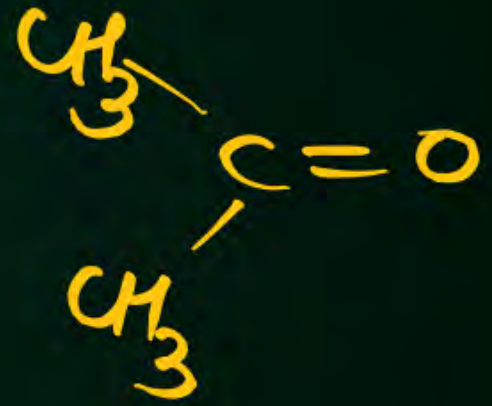
C C > B > A

D A > C > B



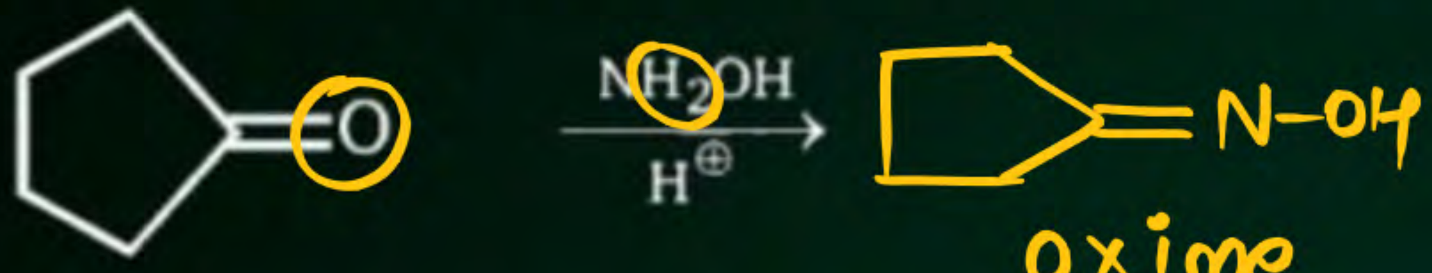
Reduce electrophilicity





QUESTION 08

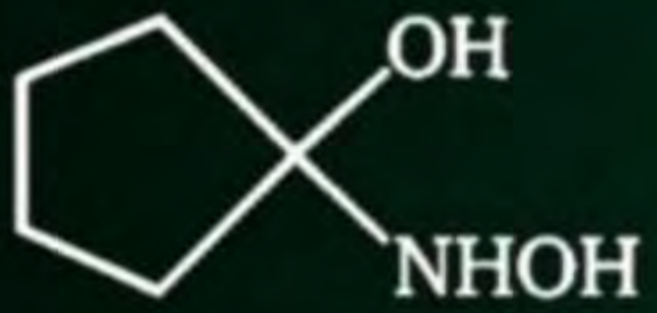
Which is the major product of the following reaction?



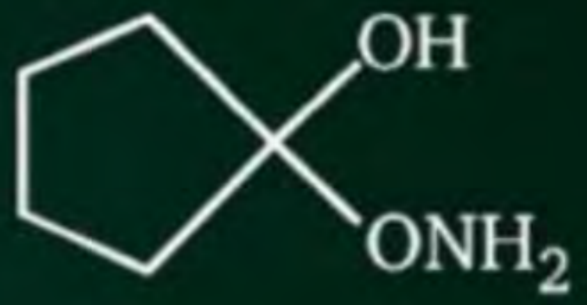
NH_2OH
$H^\oplus$
N–OH

oxime

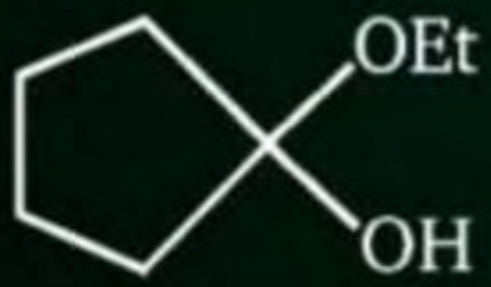
(A)



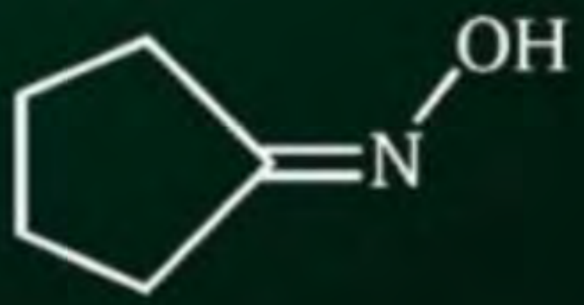
(B)



(C)



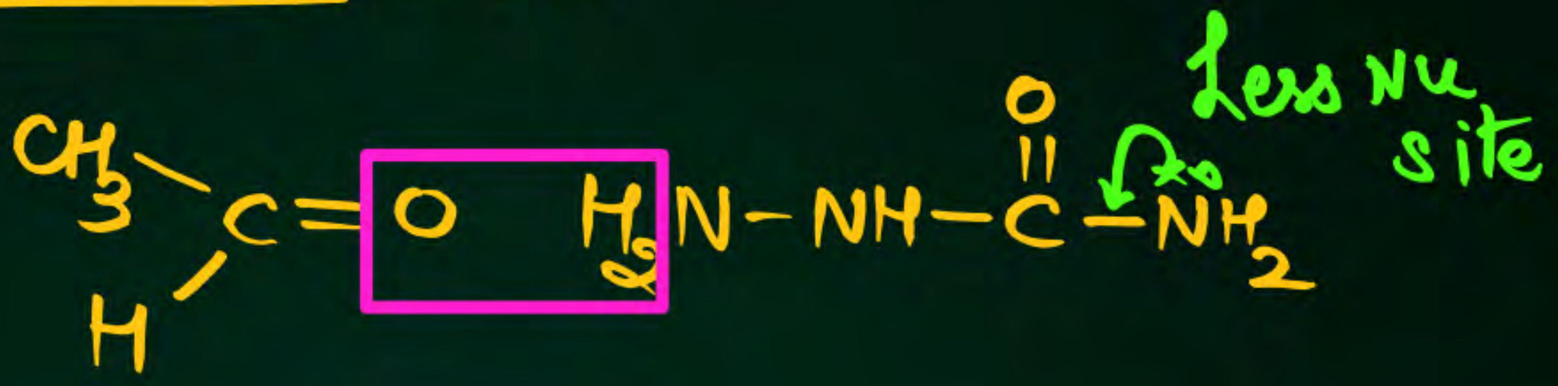
[✓ (D)]



QUESTION 09

The structure for acetaldehyde semicarbazone is:

- A $CH_3CH=NCONHNH_2$
- [✓ B] $CH_3CH=NNHCONH_2$
- C $CH_3CH=NOH$
- D $CH_3CH=NNH_2$



QUESTION 10

NH_2OH

The compound which does not react with hydroxylamine is:

Acid

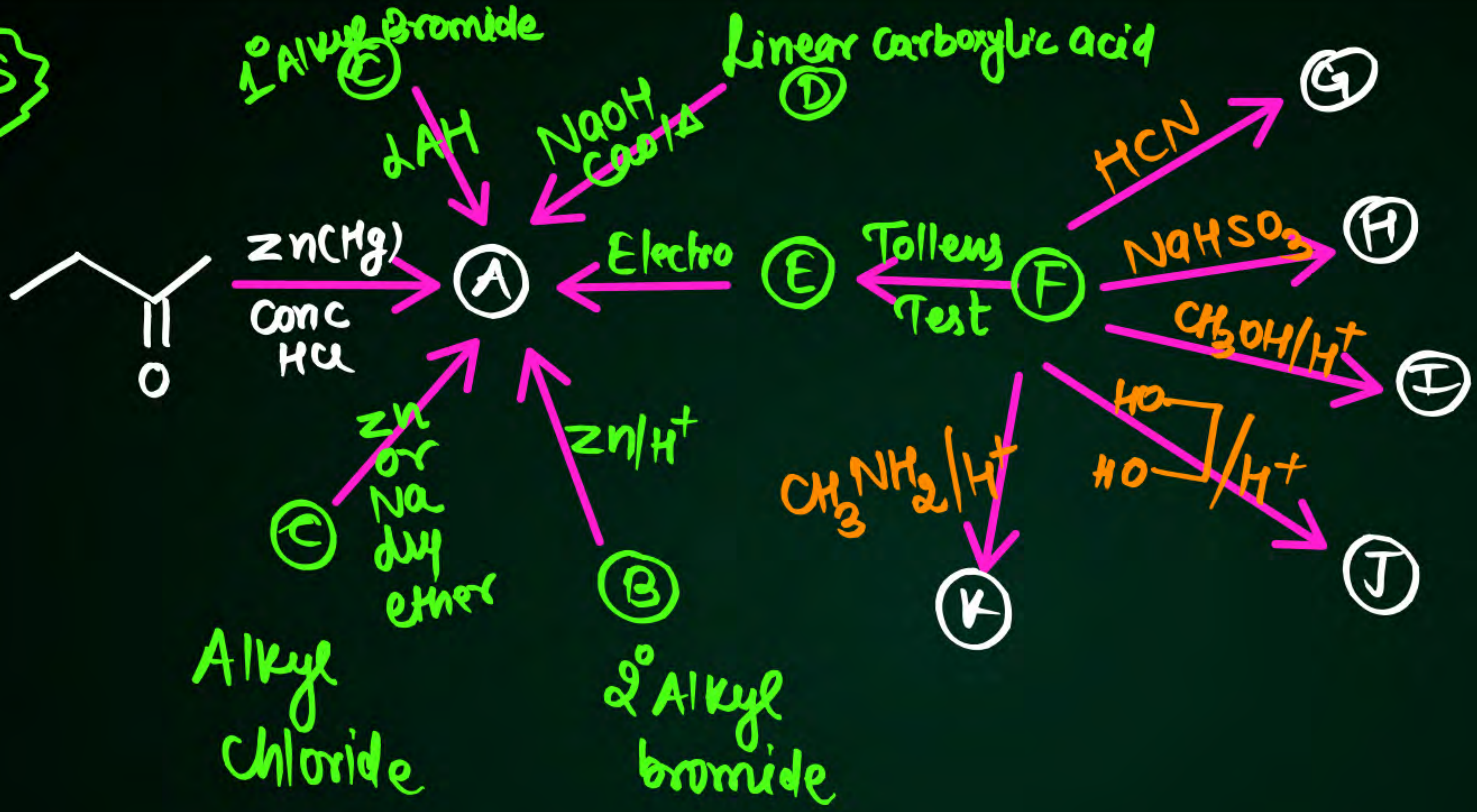
[✓ A] CH_3COOH

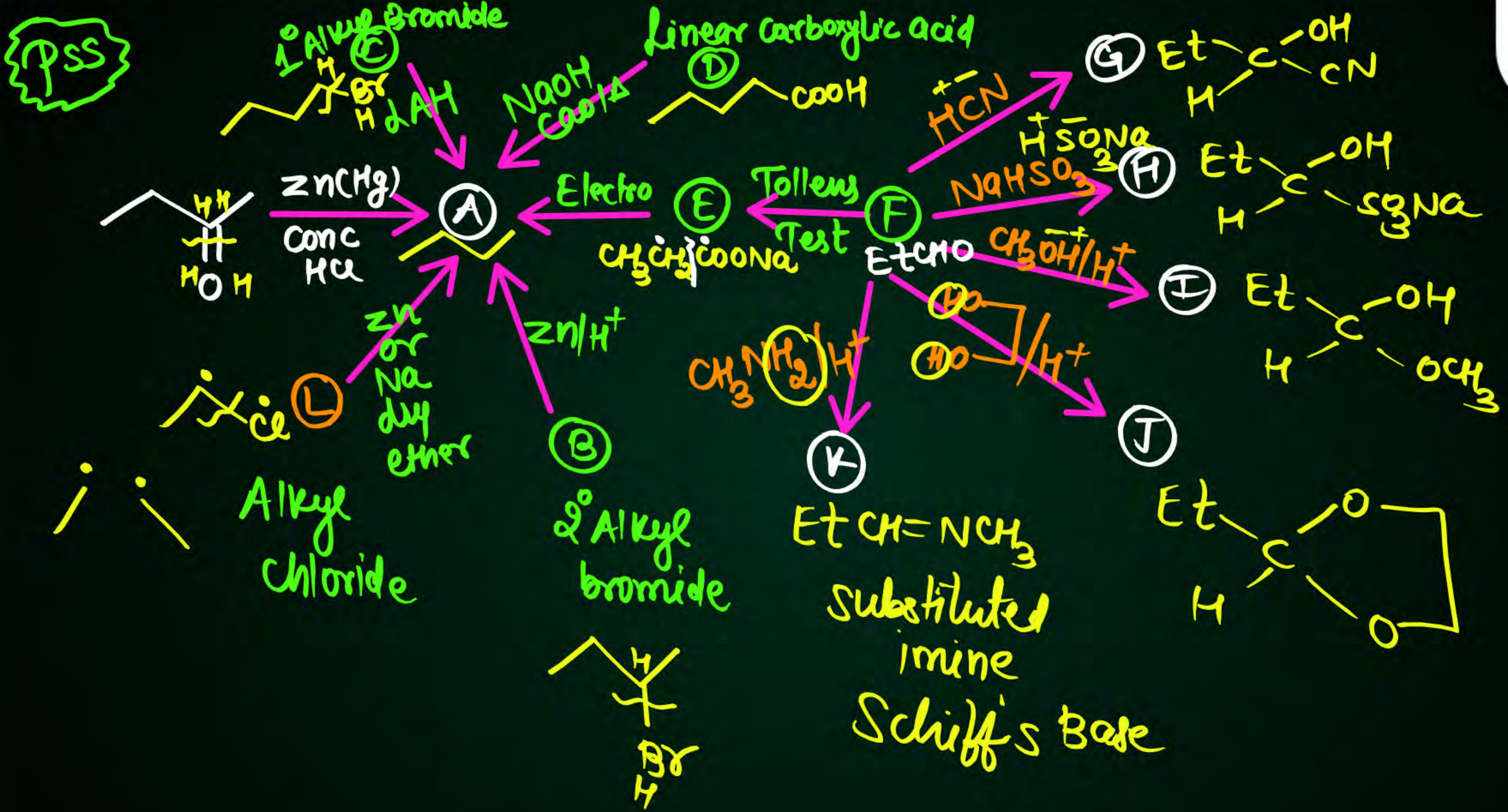
B CH_3COCH_3

C CH_3CHO

D HCHO

PSS


1° Alkyl Bromide
C
LAH
Linear carboxylic acid
D
NaOH
CaO / Δ
Zn(Hg)
Conc HCl
A
Electro
E
Tollens Test
F
HCN
G
NaHSO3
H
CH3OH / H+
I
HO
HO
/ H+
J
CH3NH2 / H+
K
Zn / H+
B
Zn or Na dry ether
C
Alkyl Chloride
2° Alkyl bromide

PSS
1° Alkyl Bromide
C
H
Br
H
LiAlH
Linear carboxylic acid
D
COOH
NaOH
CaO / Δ
A
Zn(Hg)
Conc HCl
H H
H O H
Electro
E
CH3CH2COONa
Tollens Test
F
EtCHO
HCN
G
Et
C
OH
CN
H
HSO3Na
NaHSO3
H
SO3Na
CH3OH / H+
I
OCH3
HO
HO
H+
J
O
O
CH3NH2 / H+
K
EtCH=NCH3
Substituted imine
Schiff's Base
Zn / H+
B
2° Alkyl bromide
Zn or Na dry ether
L
Cl
Alkyl Chloride

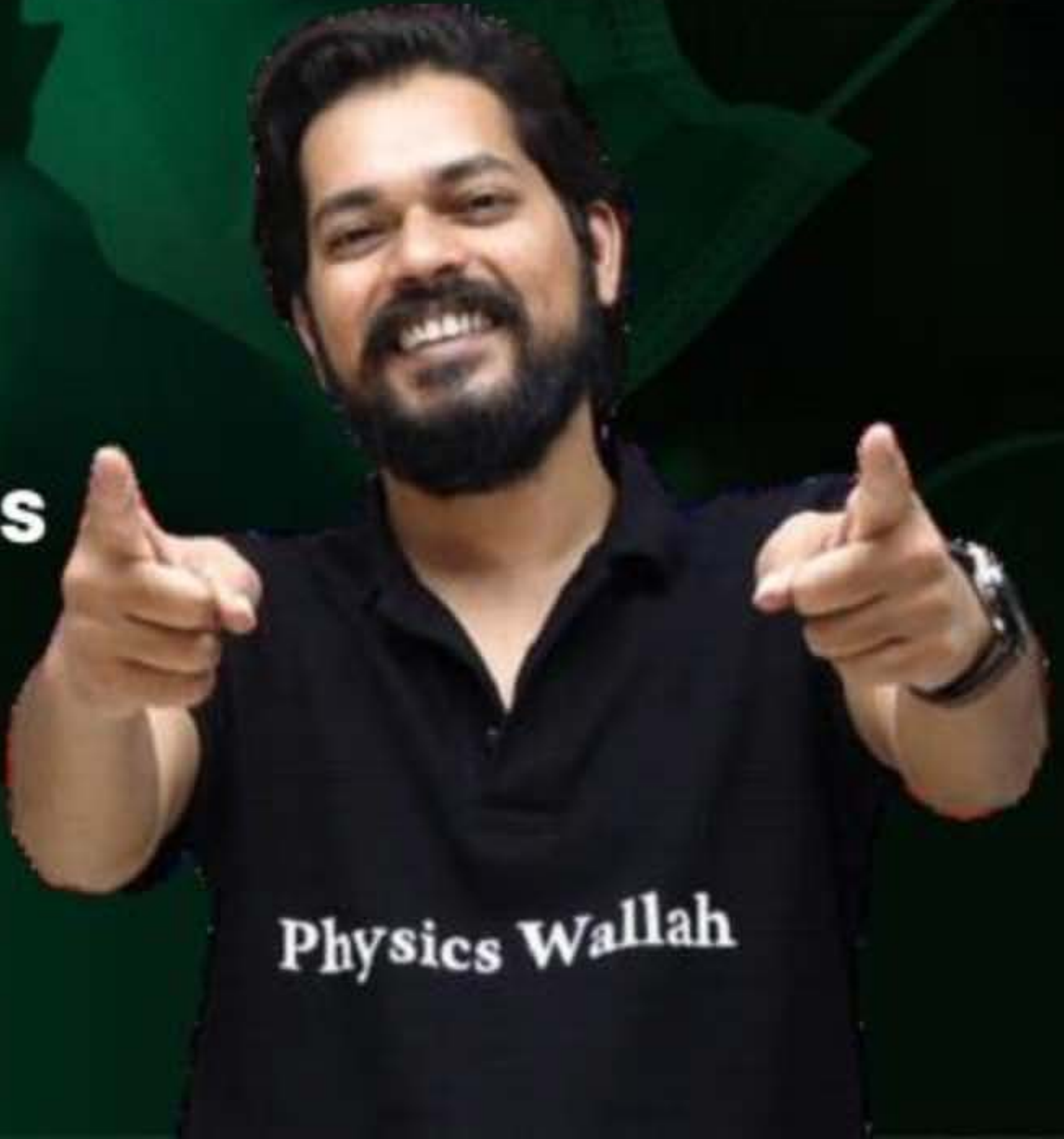
Thank you!!

YAKEEN 2.0

FOR NEET 2025

Lecture- 05 | **Organic Chemistry**

Aldehydes, Ketones and Carboxylic Acids


Physics Wallah

By- Pankaj Sir(POPU MAMA)

Topics *to be covered*

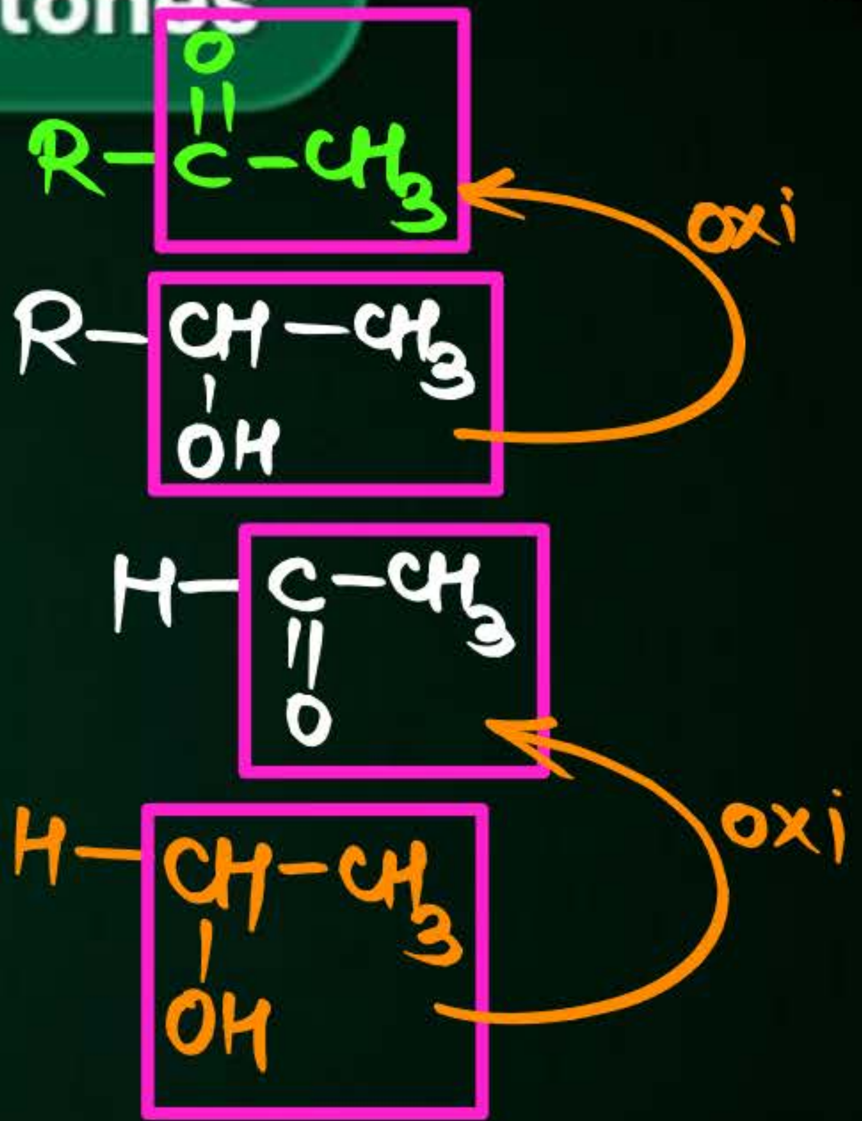
1. Chemical Properties of Aldehydes & Ketones Part 03 ✓
2. Haloform Test ✓
3. Practice ✓

Chemical Properties of Aldehydes & Ketones

D. Haloform Test:

Haloform Test is given by

- Methyl ketones
- 2° Alcohol
- Acetaldehyde
- Ethanol



$R-\overset{\overset{O}{\|}}{C}-CH_3$

$R-\underset{\underset{OH}{|}}{CH}-CH_3$

$H-\underset{\underset{O}{\|}}{C}-CH_3$

$H-\underset{\underset{OH}{|}}{CH}-CH_3$

Reagents

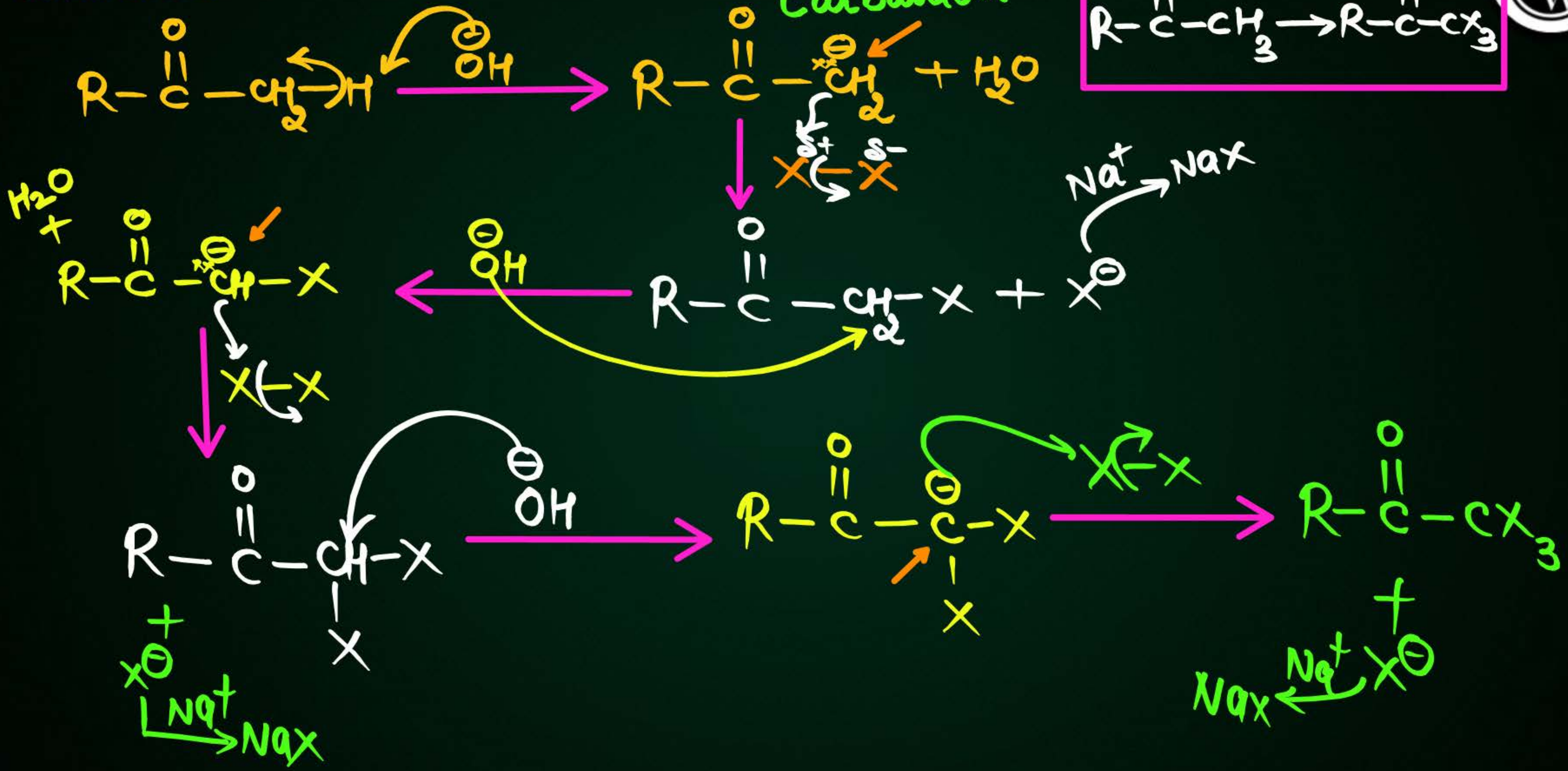
X_2 + alkali ($NaOH$, KOH, $Ca(OH)_2$)
^{-}OH
or
$NaOX$ | KOX | $Ca(OX)_2$
or
$CaOCl_2$ (Bleaching powder)

Mechanism :-

$NaOH \longrightarrow Na^{+} + \overset{-}{O}H$

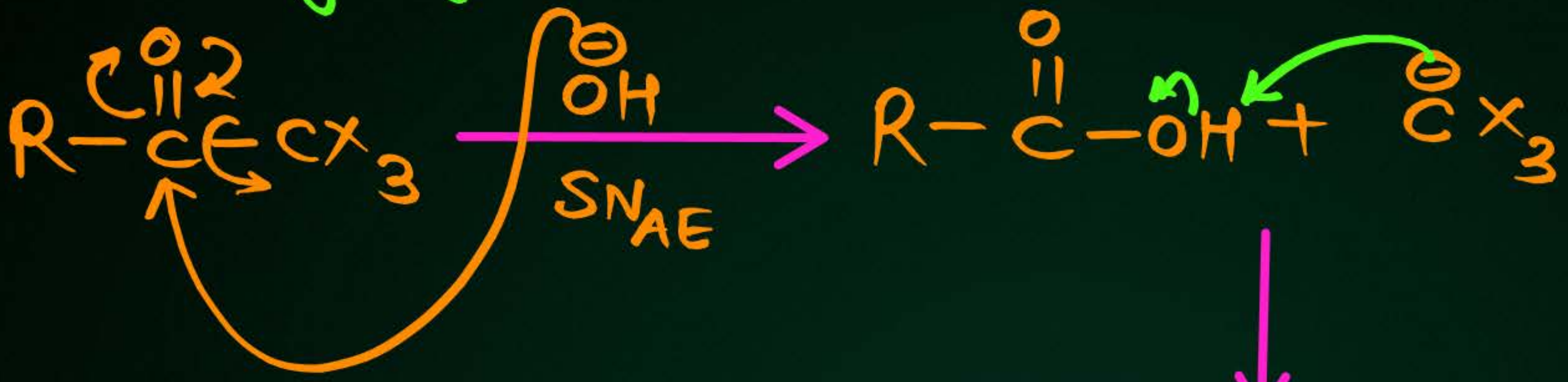
Halogenation

$$R-\overset{O}{\overset{\|}{C}}-CH_3 \longrightarrow R-\overset{O}{\overset{\|}{C}}-CX_3$$

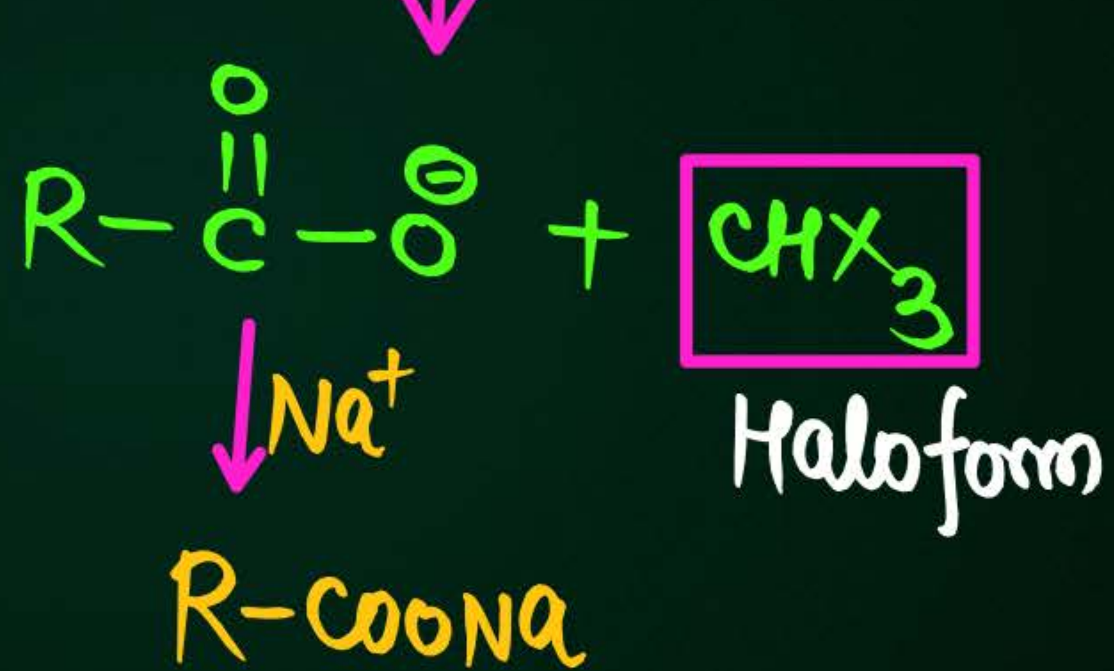


Carbanion
$\overset{\ominus}{O}H$
$R-\overset{O}{\overset{\|}{C}}-CH_2-H$
$R-\overset{O}{\overset{\|}{C}}-\overset{\ominus}{C}H_2 + H_2O$
$\overset{\delta+}{X}-\overset{\delta-}{X}$
$R-\overset{O}{\overset{\|}{C}}-CH_2-X + X^{\ominus}$
Na^{+}
NaX
$H_2O + R-\overset{O}{\overset{\|}{C}}-\overset{\ominus}{C}H-X$
X–X
$R-\overset{O}{\overset{\|}{C}}-CH(X)-X$
$+ X^{\ominus}$
Na^{+}
NaX
$R-\overset{O}{\overset{\|}{C}}-\overset{\ominus}{C}(X)-X$
X–X
$R-\overset{O}{\overset{\|}{C}}-CX_3$
$+ X^{\ominus}$
Na^{+}
NaX

Alkaline Hydrolysis



$$R-\overset{O}{\overset{\|}{C}}-CX_3 \xrightarrow[SN_{AE}]{\overset{\ominus}{O}H} R-\overset{O}{\overset{\|}{C}}-\ddot{O}H + \overset{\ominus}{C}X_3$$



$$R-\overset{O}{\overset{\|}{C}}-\overset{\ominus}{O} + \boxed{CHX_3}$$

Haloform

$\downarrow Na^+$

R-COONa

$$\boxed{R-\overset{O}{\overset{\|}{C}}-CH_3 \xrightarrow[NaOH]{X_2} RCOONa + CHX_3}$$

(yellow)

CHI_3 ppt

Antiseptic

op points

① Carbanion intermediate formation is the R.D.S

② Total moles of alkali used = 4 → 3 Halogenation
→ 1 Alkaline hydro (SNAE)

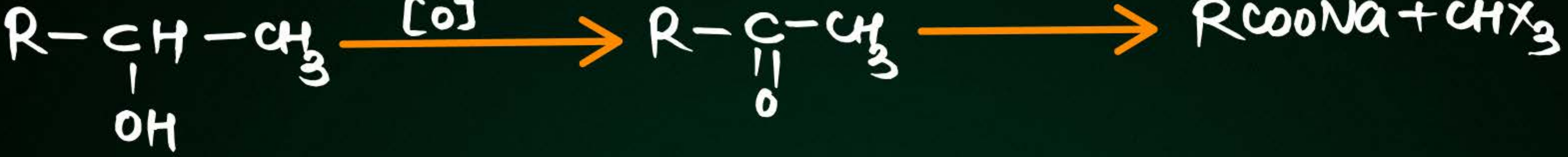
③ $R-\overset{\overset{O}{\|}}{C}-CH_2-X$, $R-\overset{\overset{O}{\|}}{C}-CHX_2$, $R-\overset{\overset{O}{\|}}{C}-CX_3$ → give haloform Test

④ ROR increases in each step

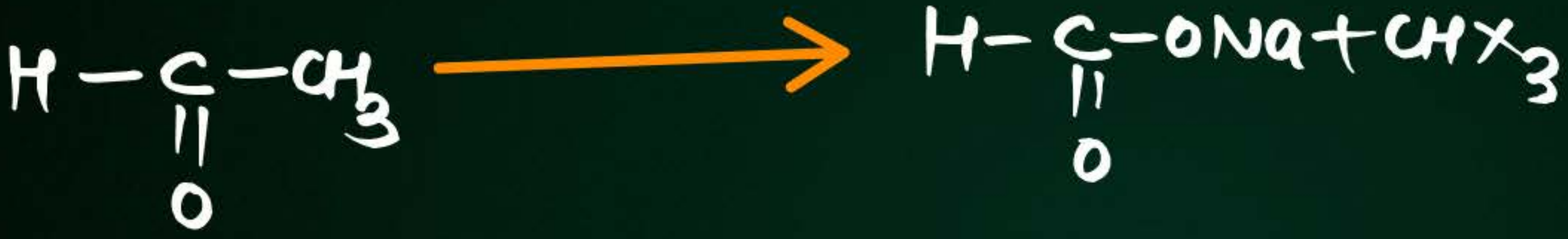
$$R-\overset{\overset{O}{\|}}{C}-\overset{\ominus}{C}X_2 > R-\overset{\overset{O}{\|}}{C}-\overset{\ominus}{C}HX > R-\overset{\overset{O}{\|}}{C}-\overset{\ominus}{C}H_2$$

⑤ $r_{CHF_3} \simeq r_{CHCl_3} \simeq r_{CHBr_3} \simeq r_{CHI_3}$

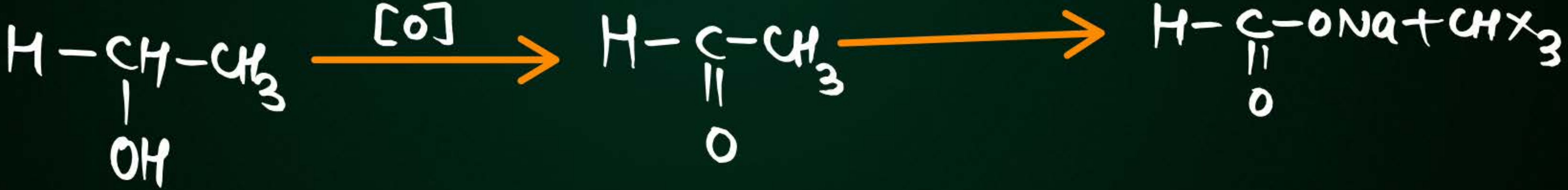
$X_2 + NaOH \longrightarrow$ are Mild O·A

# 

$$R-\underset{\underset{OH}{|}}{CH}-CH_3 \xrightarrow{[O]} R-\underset{\underset{O}{||}}{C}-CH_3 \longrightarrow RCOONa + CHX_3$$

# 

$$H-\underset{\underset{O}{||}}{C}-CH_3 \longrightarrow H-\underset{\underset{O}{||}}{C}-ONa + CHX_3$$

# 

$$H-\underset{\underset{OH}{|}}{CH}-CH_3 \xrightarrow{[O]} H-\underset{\underset{O}{||}}{C}-CH_3 \longrightarrow H-\underset{\underset{O}{||}}{C}-ONa + CHX_3$$

OP Points

1. Aldehydes and ketones having at least one methyl group linked to the carbonyl carbon atom (methyl ketones) are oxidized by sodium hypohalite to sodium salts of corresponding carboxylic acids having one carbon atom less than that of carbonyl compound.

2. The methyl group is converted to haloform.

3. This oxidation does not affect a carbon-carbon double bond, if present in the molecule.

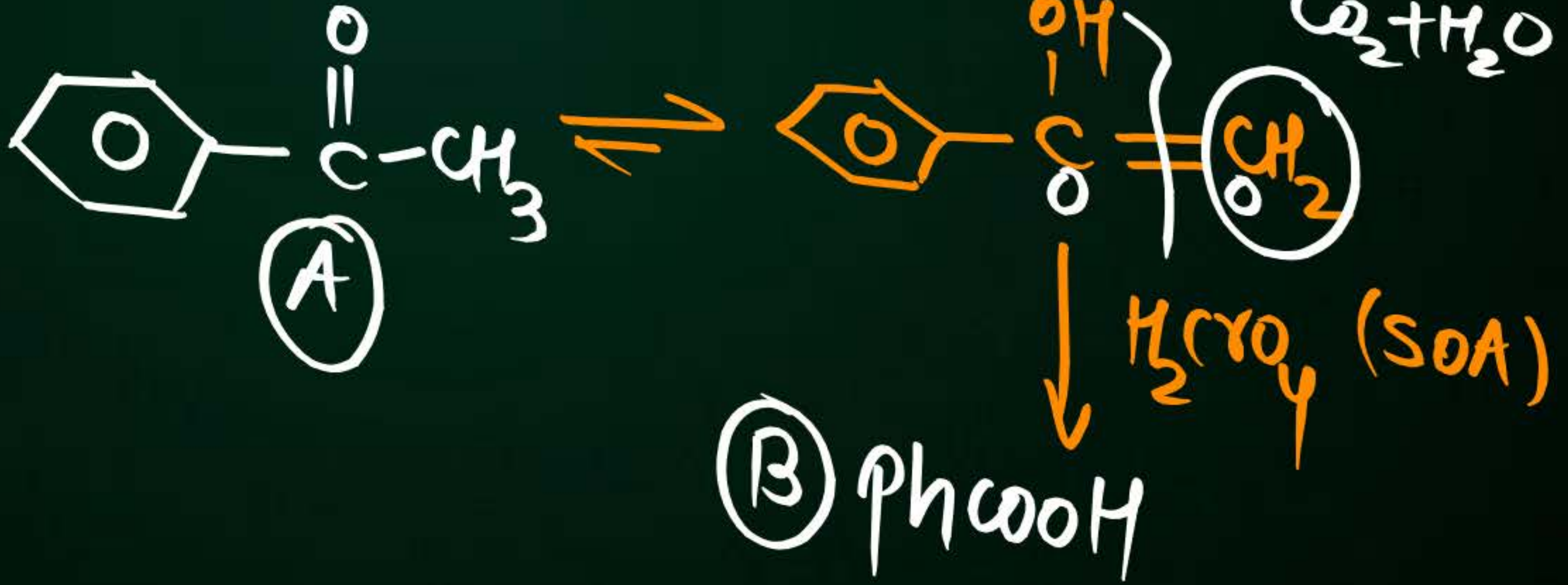
4. Iodoform reaction with sodium hypoiodite is also used for detection of CH_3CO group or $CH_3CH(OH)$ group which produces CH_3CO group on oxidation.

QUESTION (NCERT Example)

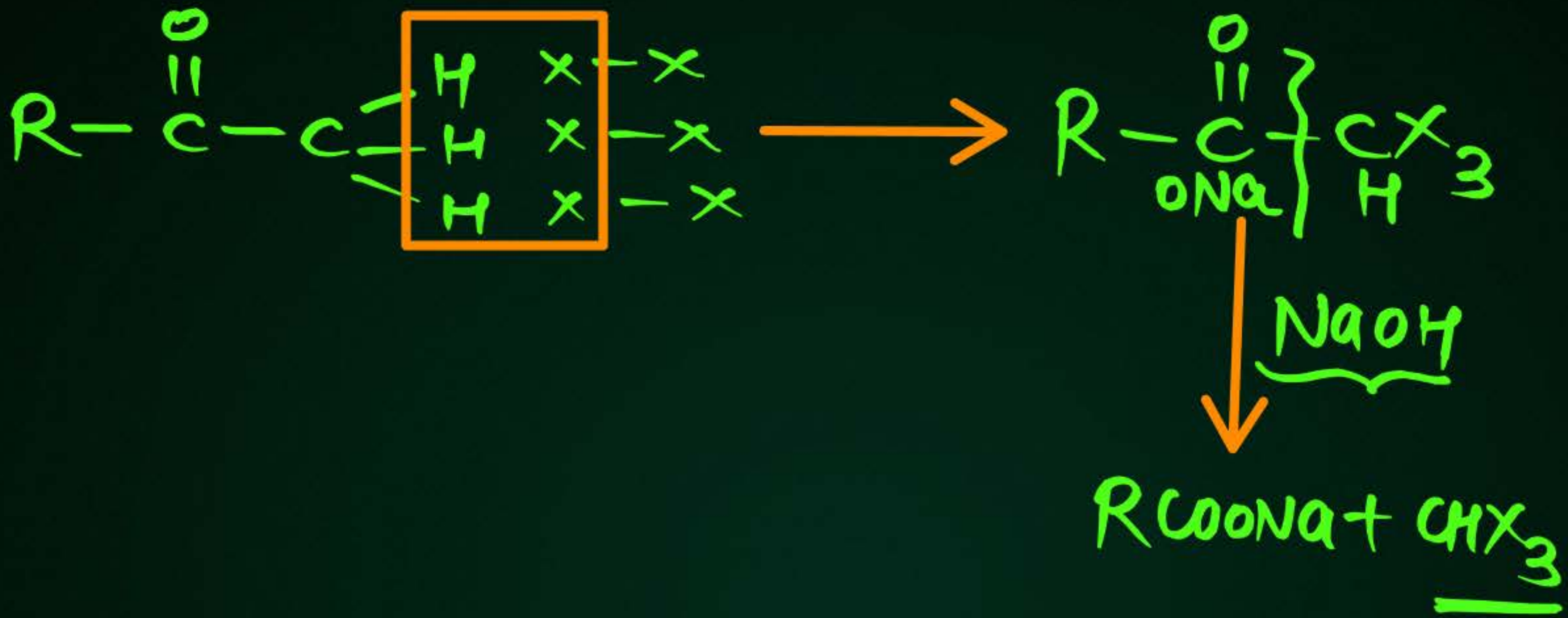
$(8+1)-\left(\frac{8+0-0}{2}\right)$

$9-4=5$

An organic compound (A) with molecular formula C_8H_8O forms an orange-red precipitate with 2, 4-DNP reagent and gives yellow precipitate on heating with iodine in the presence of sodium hydroxide. It neither reduces Tollens' or Fehlings' reagent, nor does it decolourise bromine water or Baeyer's reagent. On drastic oxidation with chromic acid (H_2CrO_4), it gives a carboxylic acid (B) having molecular formula $C_7H_6O_2$. Identify the compounds (A) and (B) and explain the reactions involved.



D.M



R
O
C
H
H
H
X
X
X
ONa
CX
3
NaOH

$$R-\overset{O}{\overset{\|}{C}}-CH_3 \rightarrow R-\overset{O}{\overset{\|}{C}}-CX_3 \xrightarrow{NaOH} RCOONa + \underline{CHX_3}$$

QUESTION

Write the product of the following reaction:

(A) $\underset{1^\circ}{CH_3-CH_2-OH} \xrightarrow{I_2/KOH} H-\underset{\underset{O}{\|}}{C}-CH_3 \longrightarrow H-\underset{\underset{O}{\|}}{\overset{OK}{C}}-\overset{H}{C}I_3 \longrightarrow HCOOK + CHI_3$

(B) $Ph-CH_2-CO-\underline{CH_3} \xrightarrow{I_2/KOH} Ph-CH_2-\underset{OK}{\overset{\overset{O}{\|}}{C}}-\underset{H}{C}I_3 \longrightarrow Ph-CH_2-COOK + CHI_3$

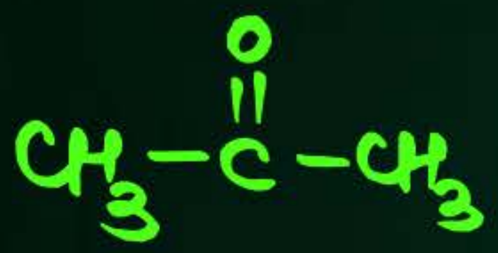
(C) $CH_3-CH(OH)-Ph \xrightarrow{I_2/KOH} CH_3-\underset{\underset{O}{\|}}{C}-Ph$

$CHI_3 + PhCOOK \longleftarrow \overset{H}{C}I_3-\underset{\underset{O}{\|}}{\overset{OK}{C}}-Ph$

QUESTION

The compound that will not give iodoform test on treatment with alkali and iodine is:

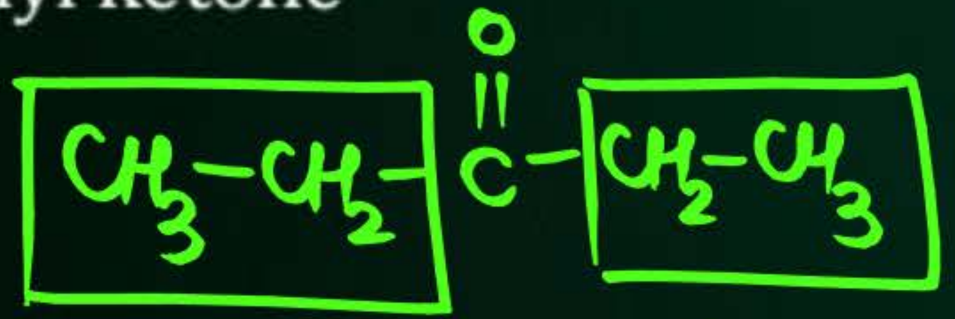
(A) acetone



$CH_3-\overset{O}{\overset{\|}{C}}-CH_3$

(B) ethanol CH_3-CH_2-OH

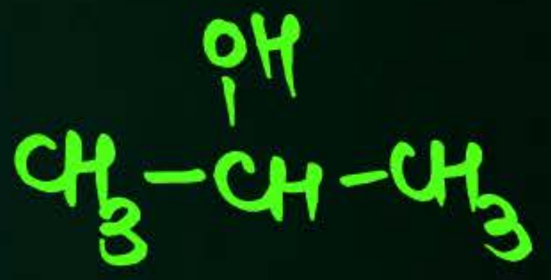
[✓ (C)] diethyl ketone



$\boxed{CH_3-CH_2}-\overset{O}{\overset{\|}{C}}-\boxed{CH_2-CH_3}$

Ethyl Ethyl

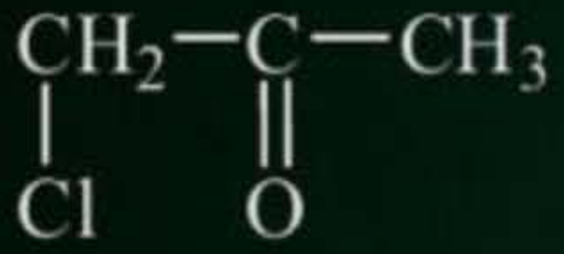
(D) isopropyl alcohol

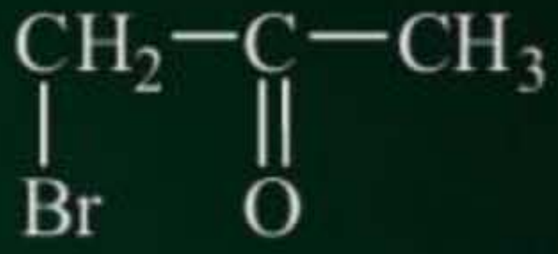


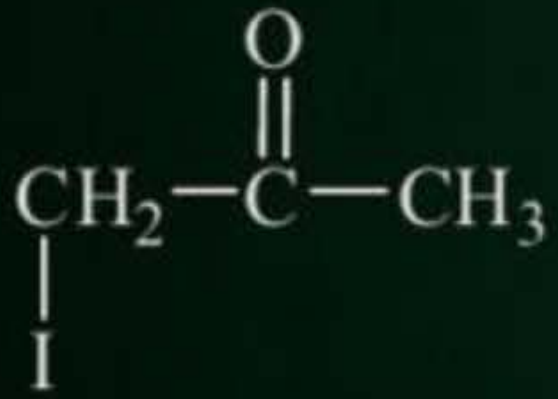
$CH_3-\overset{OH}{\overset{|}{CH}}-CH_3$

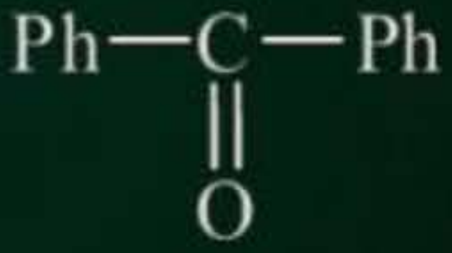
QUESTION

Which of the following compound will not gives haloform reaction?

A 
$\underset{\substack{|\\Cl}}{CH_2}-\underset{\substack{\|\\O}}{C}-CH_3$

B 
$\underset{\substack{|\\Br}}{CH_2}-\underset{\substack{\|\\O}}{C}-CH_3$

C 
$\underset{\substack{|\\I}}{CH_2}-\overset{\substack{O\\\|}}{C}-CH_3$

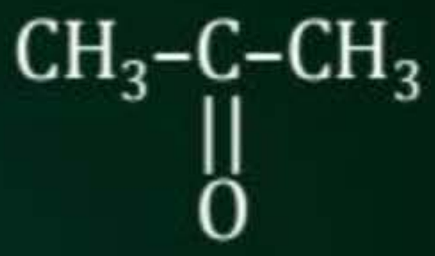
[✓ D] 
$Ph-\underset{\substack{\|\\O}}{C}-Ph$

QUESTION

A compound (X) C_3H_6O reduces Fehling's solution gives a negative iodoform test. The structure of (X) is:

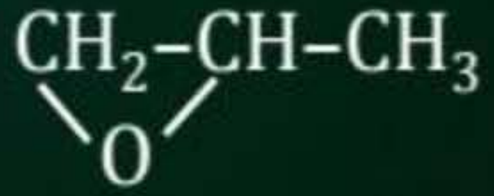
Iodoform nahi deta

[✓ A] CH_3-CH_2-CHO

B 

$CH_3-\underset{\underset{O}{\|}}{C}-CH_3$

C $CH_2=CH-CH_2-OH$

D 

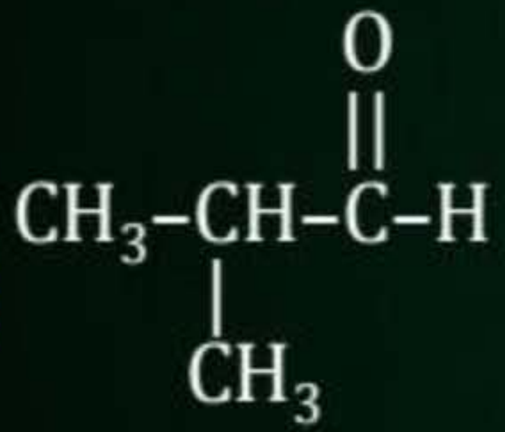
QUESTION

Which gives iodoform test?

A ✗ C_2H_5CHO

[✓ B] $C_6H_5\underline{COCH_3}$

C ✗



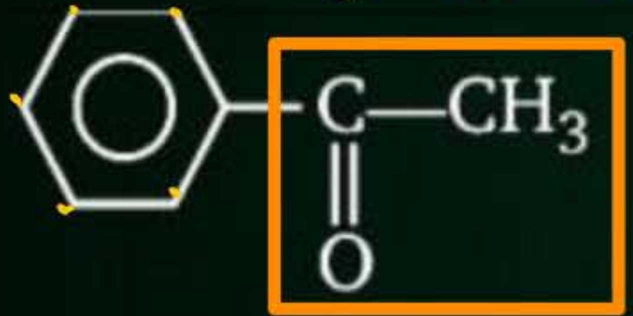
$$CH_3-\underset{\displaystyle CH_3}{\underset{|}{CH}}-\overset{\displaystyle O}{\overset{||}{C}}-H$$

D All of these

QUESTION

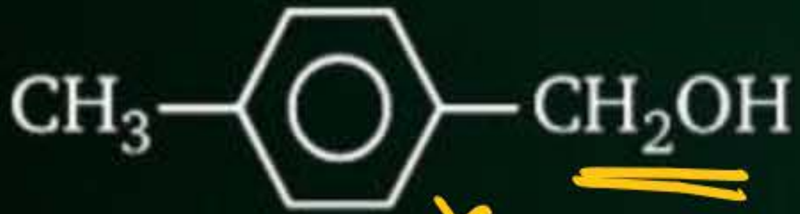
An aromatic compound A of the molecular formula $\boxed{C_8H_{10}O}$ on reaction with iodine and dilute NaOH give a yellow precipitate. The structure of the compound is expected to be:

[C_8H_8O]

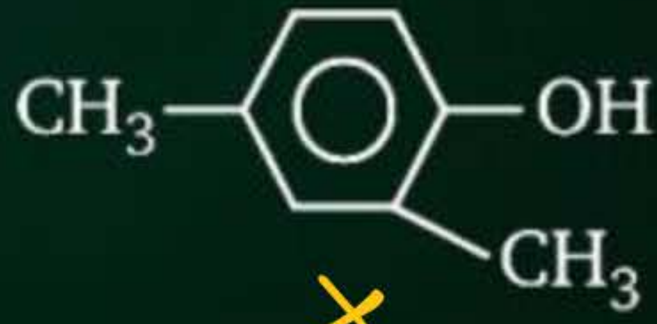
(A) 

✓ (B) $C_6H_5\boxed{CHOHCH_3}$

[$C_6H_{10}O$]

(C) 

✗

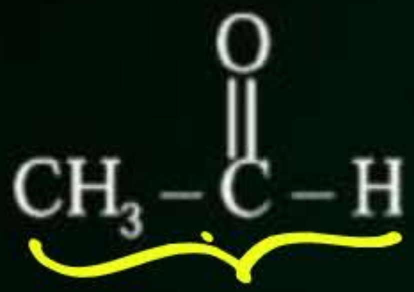
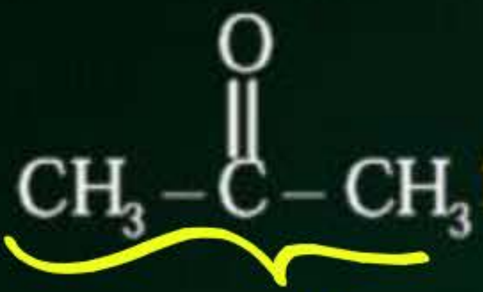
(D) 

✗

Silly mistake avoid

Ham sapath lete hai ki
question ko dhang se poora padenge

QUESTION

 and  is differentiated by:

$\underbrace{CH_3-\overset{O}{\overset{\|}{C}}-H}$ and $\underbrace{CH_3-\overset{O}{\overset{\|}{C}}-CH_3}$ is differentiated by:

(A) Tollen's reagent

(B) Fehling’s reagent

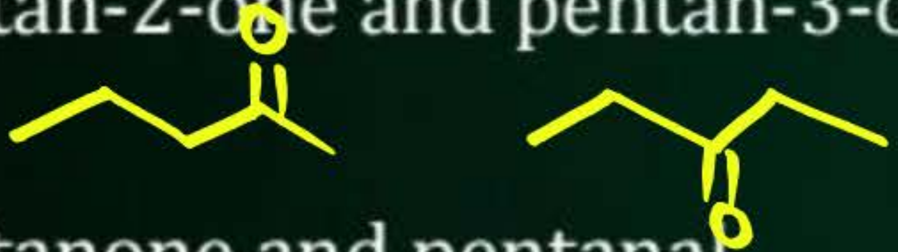
(C) Iodoform Test

[✓ (D)] Both (A) & (B)

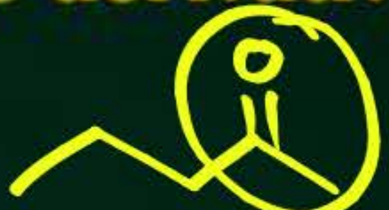
QUESTION

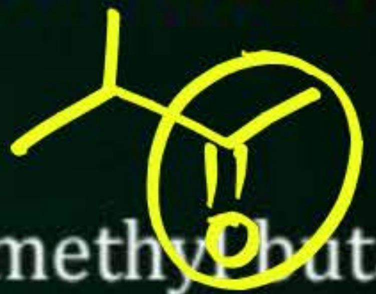
A carbonyl compound with molecular weight 86, does not reduce Fehling's solution but forms crystalline bisulphite derivatives and gives iodoform test. The possible compound can be:

(A) pentan-2-one and pentan-3-one

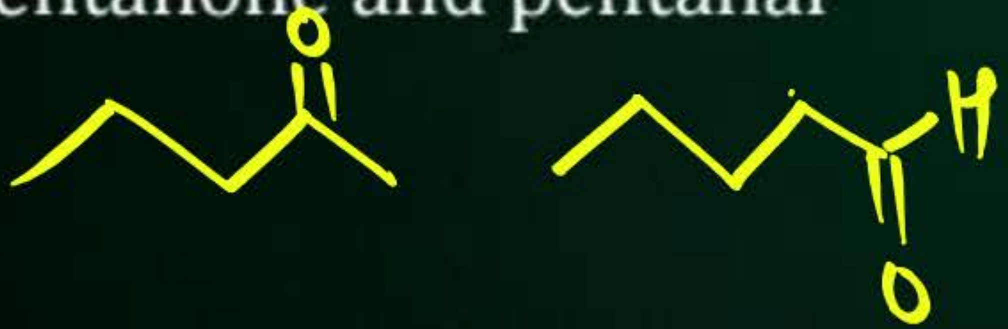


(B) pentan-2-one and methylbutan-2-one

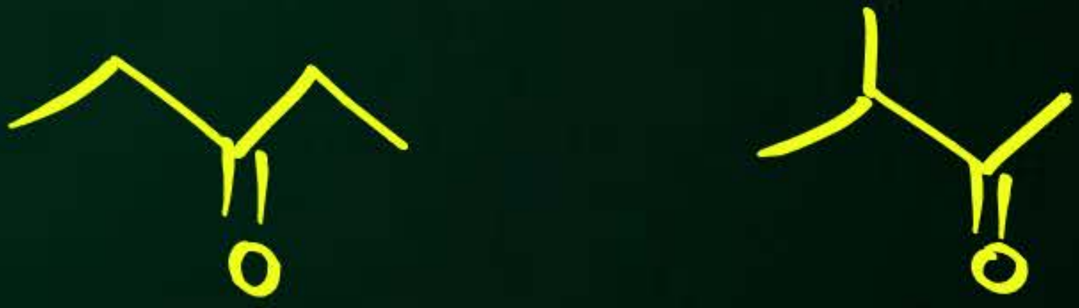




(C) pentanone and pentanal



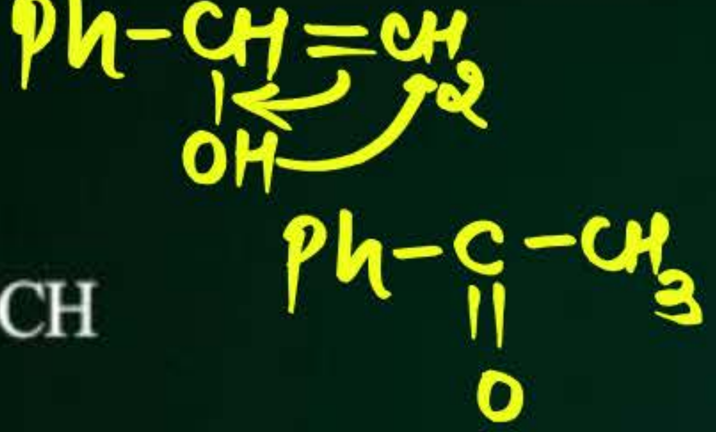
(D) pentan-3-one and 3-methyl butan-2-one



QUESTION

$$A \xrightarrow[1\%\ HgSO_4]{20\%\ H_2SO_4} B \xrightarrow{I_2 + NaOH} \overset{CHI_3}{C} + \underbrace{C_6H_5COONa}$$

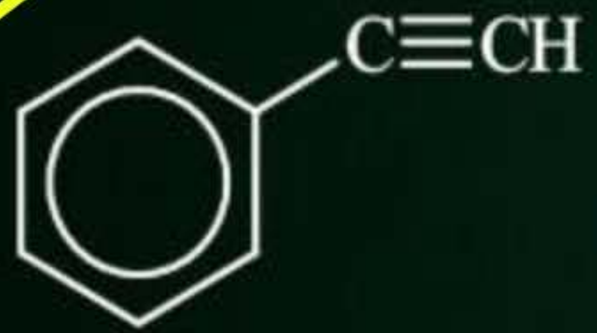
The reactant 'A' is:



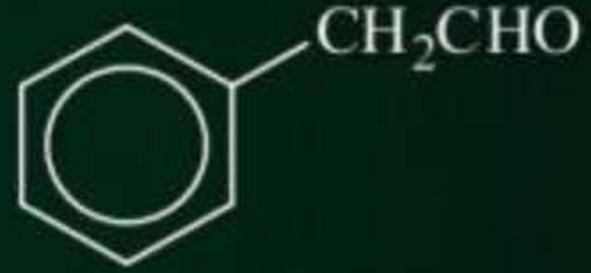
$Ph-\underset{OH}{\underset{|}{CH}}=CH_2$

$Ph-\underset{O}{\underset{||}{C}}-CH_3$

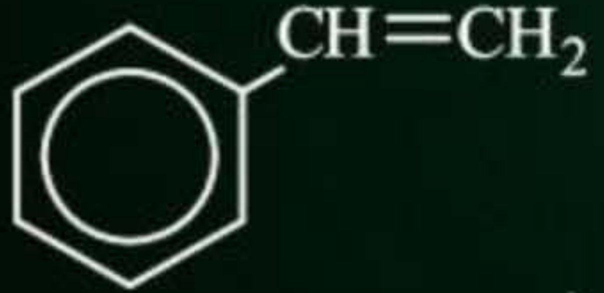
[✓ A]



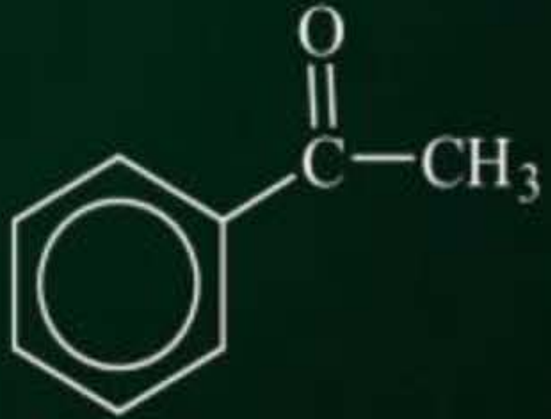
B



C



D



QUESTION

A compound give a positive test with $I_2/NaOH$ and is extracted from benzene by saturated $\underline{NaHSO_3}$ it may be:

Test All Ald & Methyl ketone

(A) ✗ $CH_3(CH_2)_4\underline{CHO}$

[✓ (B)] $CH_3(CH_2)_3\underline{COCH}_3$

(C) ✗ $\underline{CH_3CH_2}CO\underline{CH_2CH_3}$

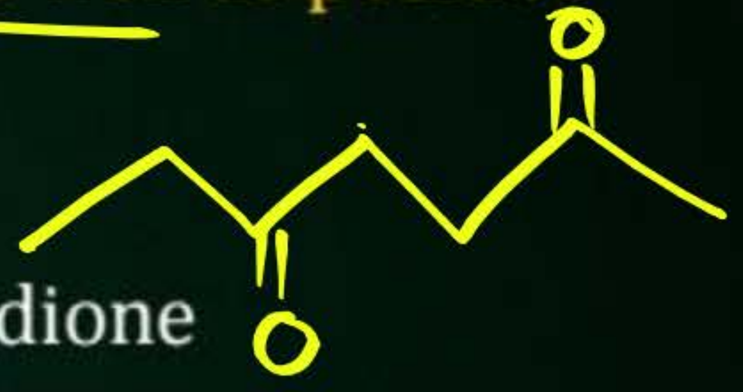
(D) ✗ $CH_3(CH_2)_4CH_2OH$

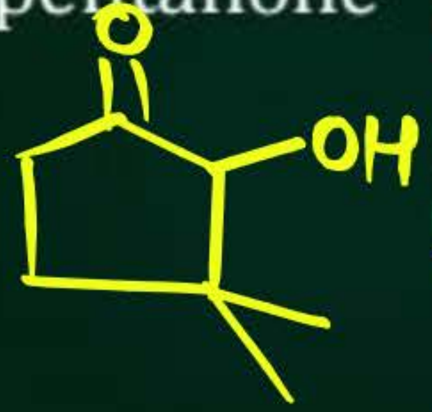
QUESTION

A $C_7H_{12}O_2$ Compound gives a positive Tollens' silver mirror test as well as positive iodoform test. Which of the following would satisfy these facts?

A ✗ 2-hydroxy-3, 3-dimethylcyclopentanone

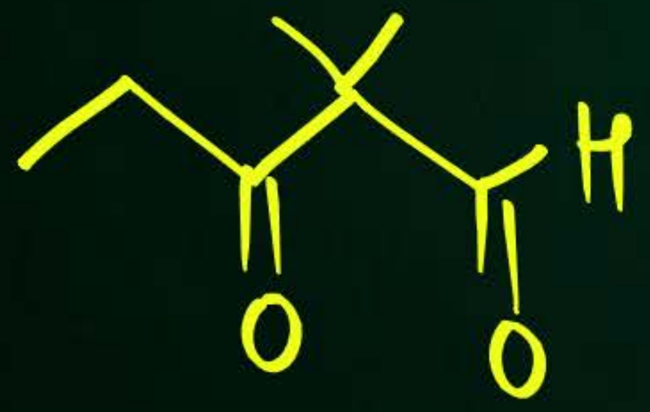
B ✗ 2, 5-heptanedione



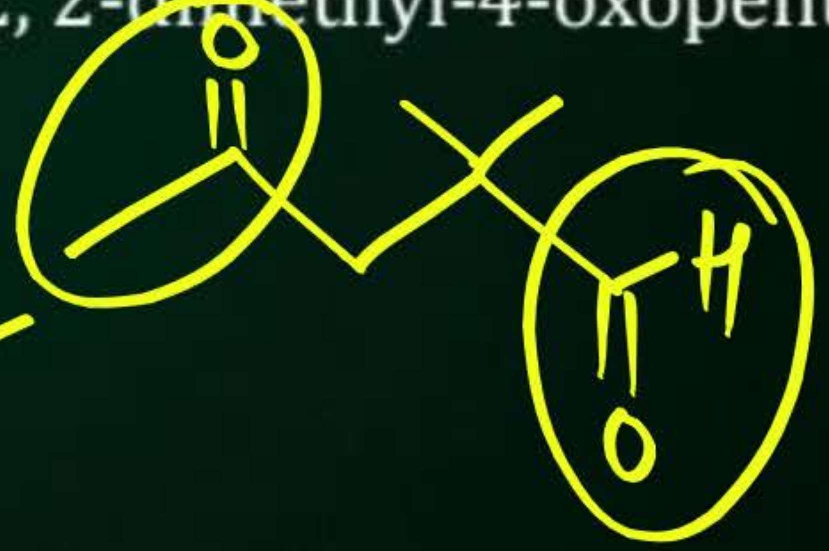


C ✗ 2, 2-dimethyl-3-oxopentanal

D ✓ 2, 2-dimethyl-4-oxopentanal



Halo ✓



Tollens

May → Garmi

Aug → Baarish

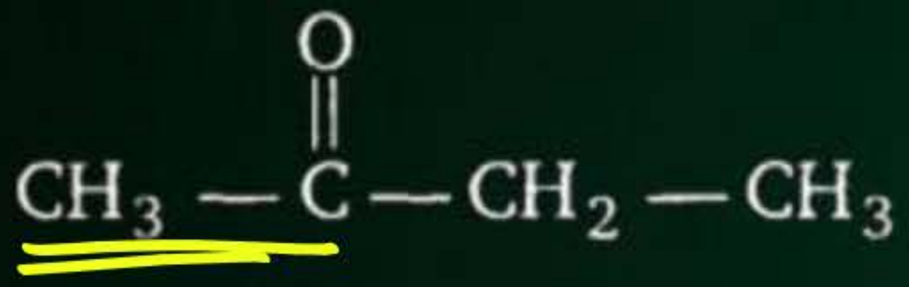
Jan → Thand

May → Garmi

QUESTION

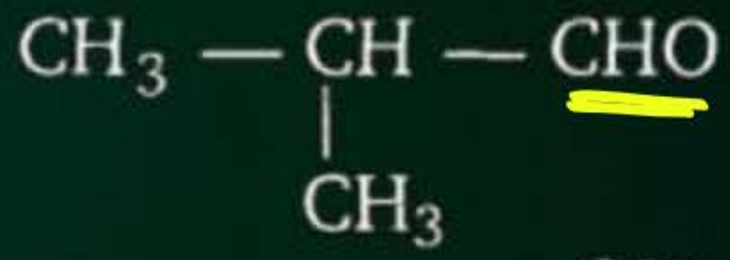
Compound (X) C_4H_8O, which reacts with 2, 4-DNP derivative and gives negative haloform test is:

(A) ✗



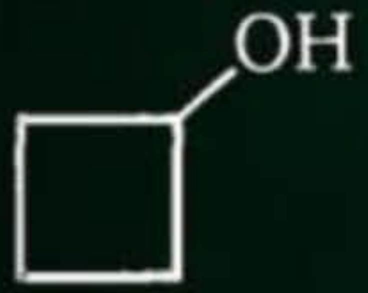
$CH_3-\overset{\overset{O}{\|}}{C}-CH_2-CH_3$

(B) ✓

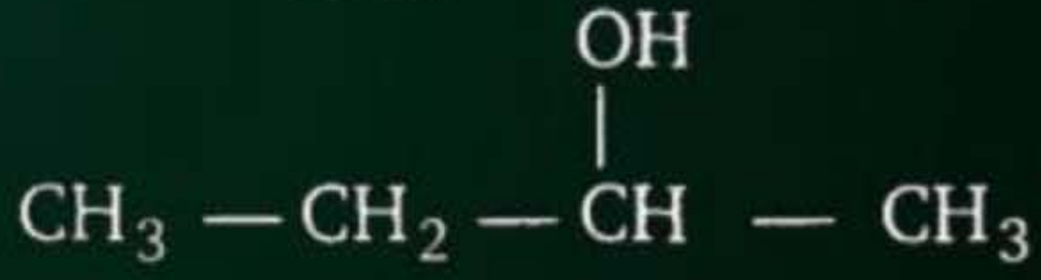


$CH_3-\underset{\underset{CH_3}{|}}{CH}-CHO$

(C)



(D)

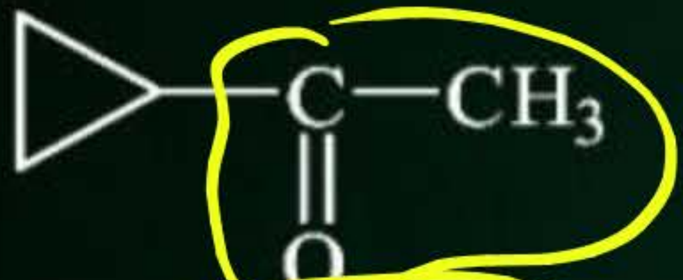


$CH_3-CH_2-\overset{\overset{OH}{|}}{CH}-CH_3$

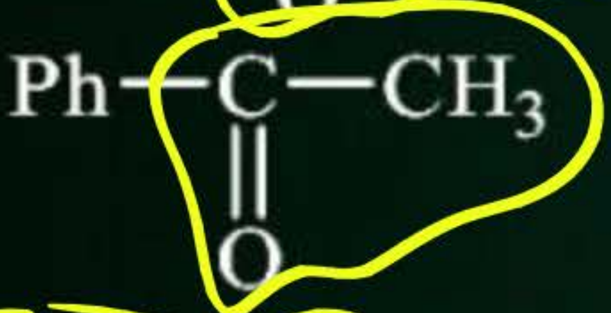
QUESTION

Which of the following compound will not gives iodoform with NaOI?

A

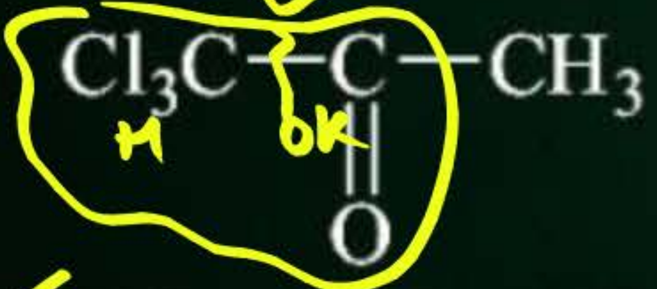


B



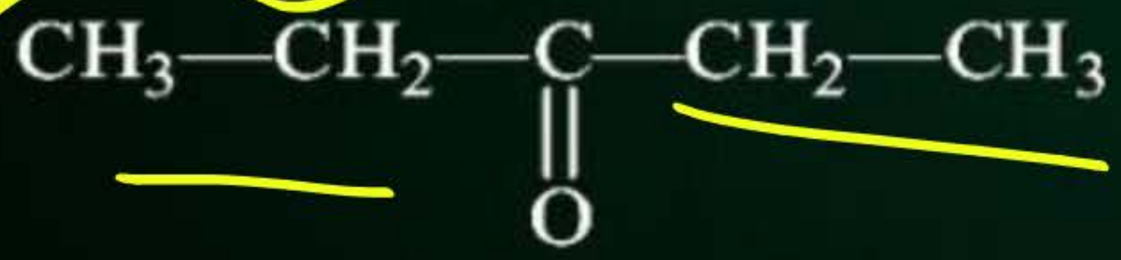
$\mathrm{Ph}-\underset{\underset{\mathrm{O}}{\|}}{\mathrm{C}}-\mathrm{CH_3}$

C



$\mathrm{Cl_3C}-\underset{\underset{\mathrm{O}}{\|}}{\mathrm{C}}-\mathrm{CH_3}$

D

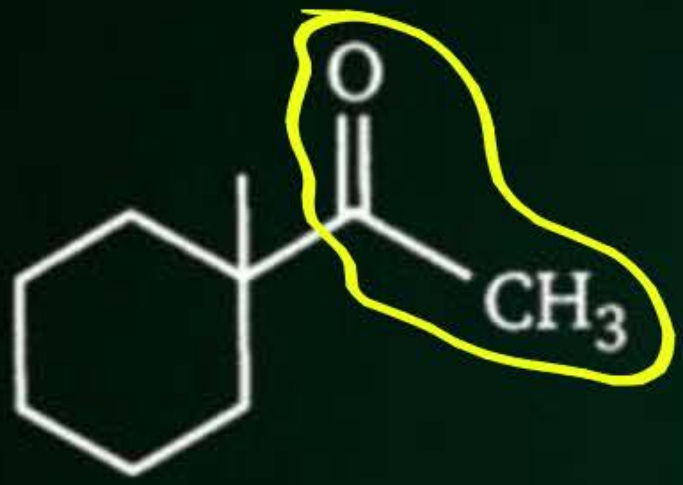


$\mathrm{CH_3}-\mathrm{CH_2}-\underset{\underset{\mathrm{O}}{\|}}{\mathrm{C}}-\mathrm{CH_2}-\mathrm{CH_3}$

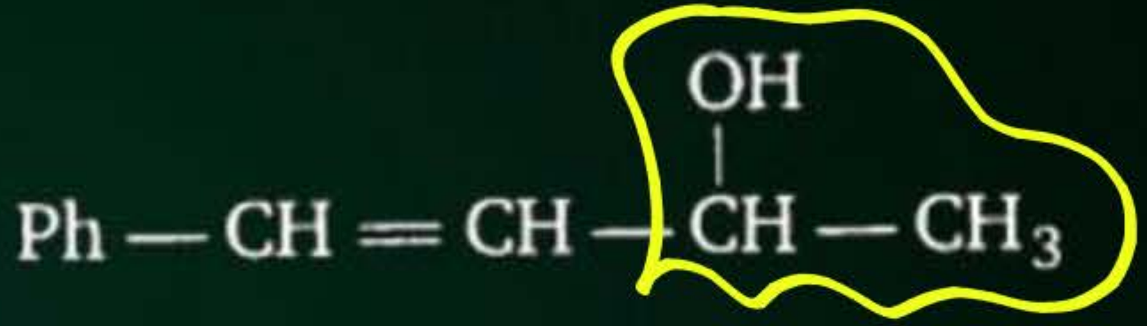
QUESTION

Which of the following is in capable to show iodoform test?

A

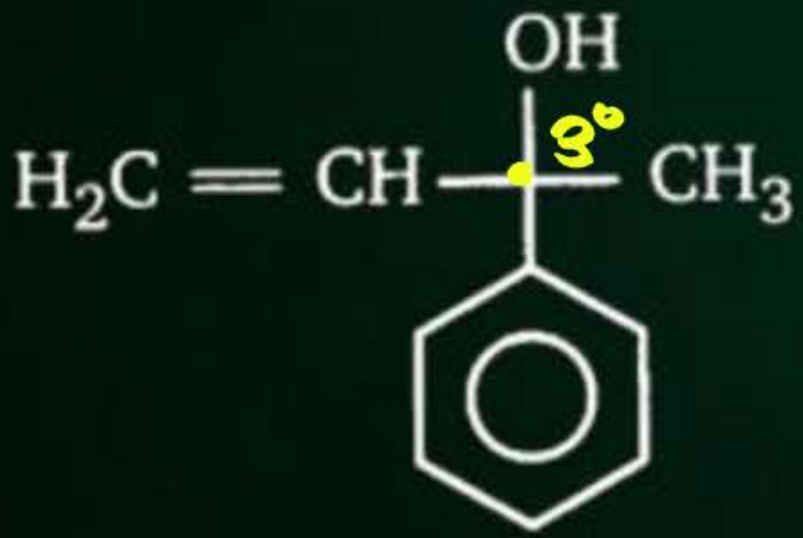


B

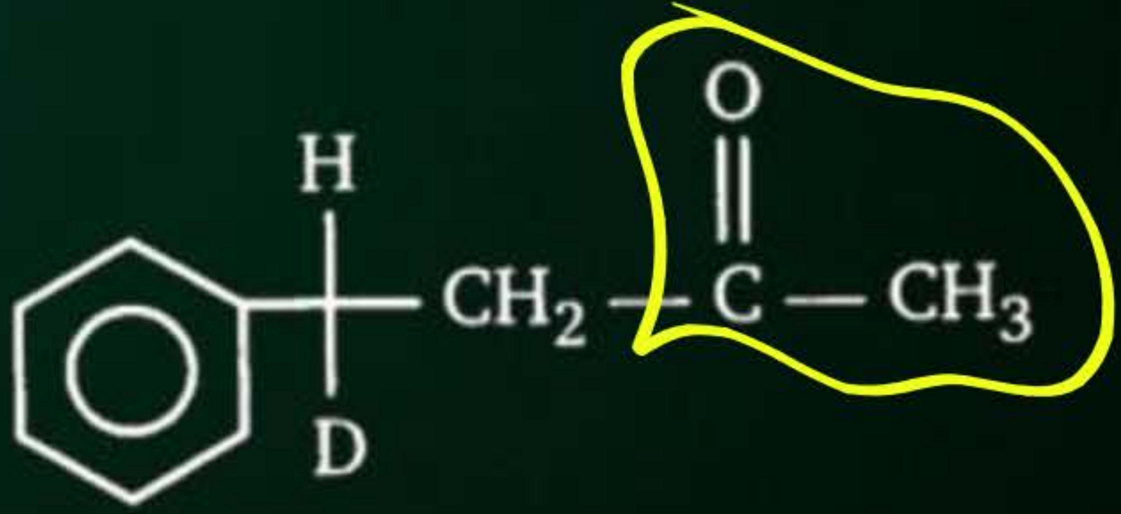


$Ph-CH=CH-\overset{OH}{\overset{|}{C}H}-CH_3$

C

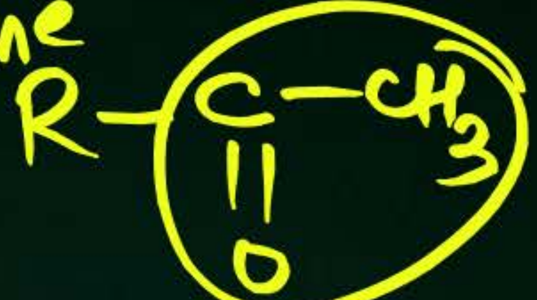


D



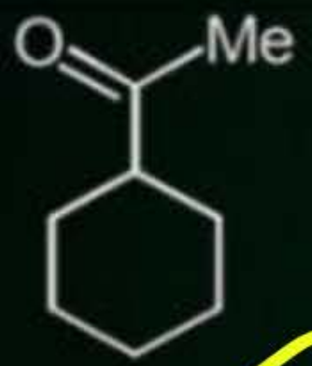
QUESTION

Ketone

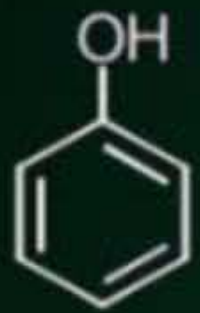


$R-\underset{O}{\underset{\|}{C}}-CH_3$

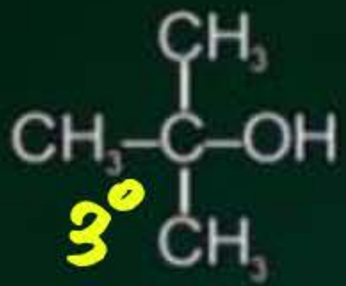
Observe the following compounds, How many compounds give haloform test?



(I)



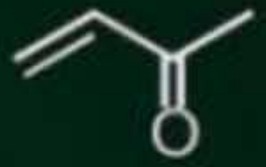
(II)



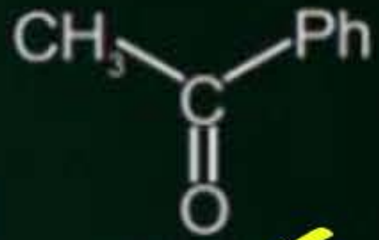
$CH_3-\overset{CH_3}{\underset{CH_3}{C}}-OH$

3°

(III)

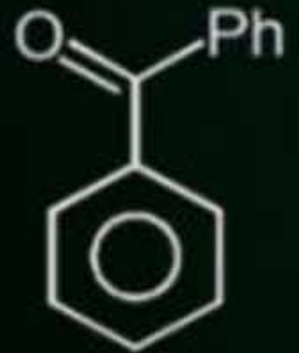


(IV)

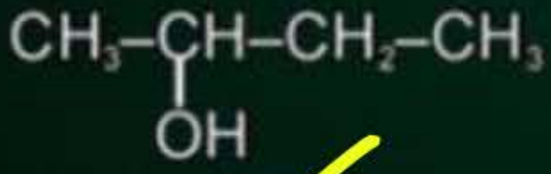


$CH_3-\underset{O}{\underset{\|}{C}}-Ph$

(V)

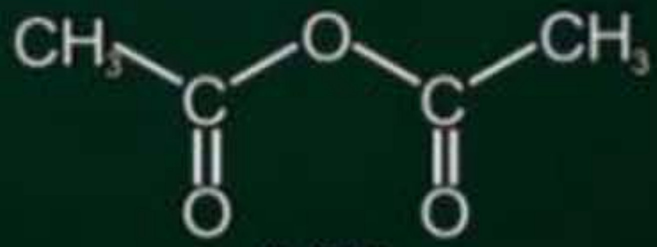


(VI)



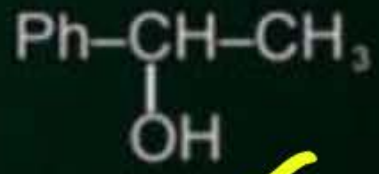
$CH_3-\underset{OH}{CH}-CH_2-CH_3$

(VII)



$CH_3-\underset{O}{\underset{\|}{C}}-O-\underset{O}{\underset{\|}{C}}-CH_3$

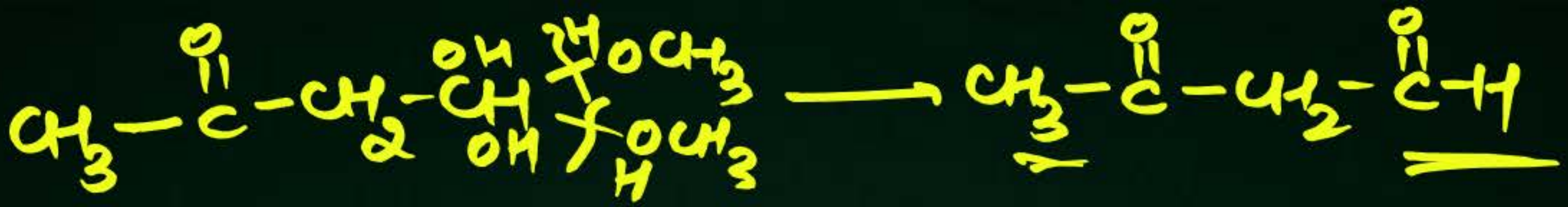
(VIII)



$Ph-\underset{OH}{CH}-CH_3$

(IX)

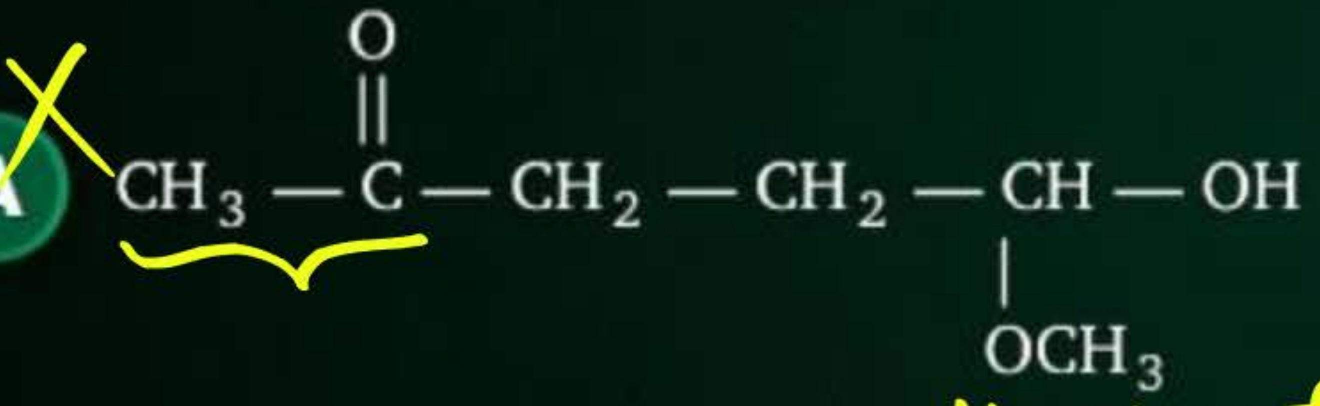
QUESTION



$CH_3-\overset{\overset{O}{\parallel}}{C}-CH_2-\overset{OH}{\underset{OH}{CH}} + 2\,HOCH_3 \longrightarrow CH_3-\overset{\overset{O}{\parallel}}{C}-CH_2-\overset{\overset{O}{\parallel}}{C}-H$

Compound (A) $C_6H_{12}O_3$ when treated with I_2 in aqueous sodium hydroxide gives yellow precipitate. When A is treated with Tollens reagent no reaction occurs. When A is hydrolyzed and then treated with Tollens reagent, a silver mirror is formed in test tube. Compound (A) will be:

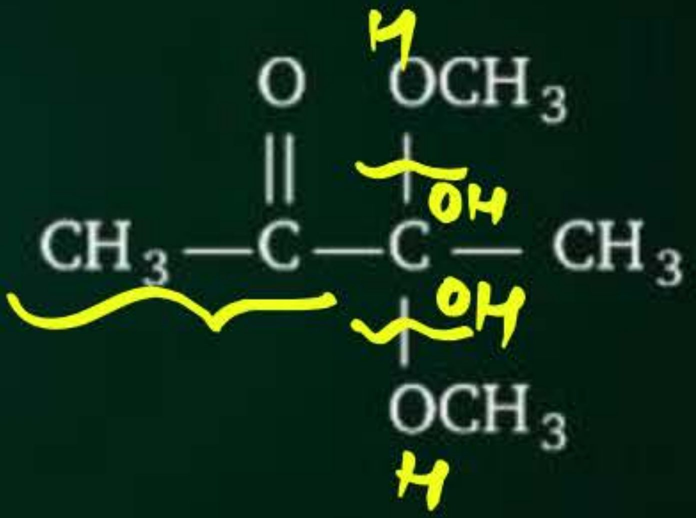
(A)



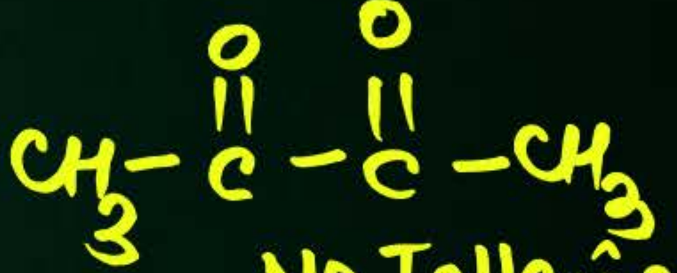
$CH_3-\overset{\overset{O}{\parallel}}{C}-CH_2-CH_2-\underset{\underset{OCH_3}{|}}{CH}-OH$

Hemiacetal

(B)



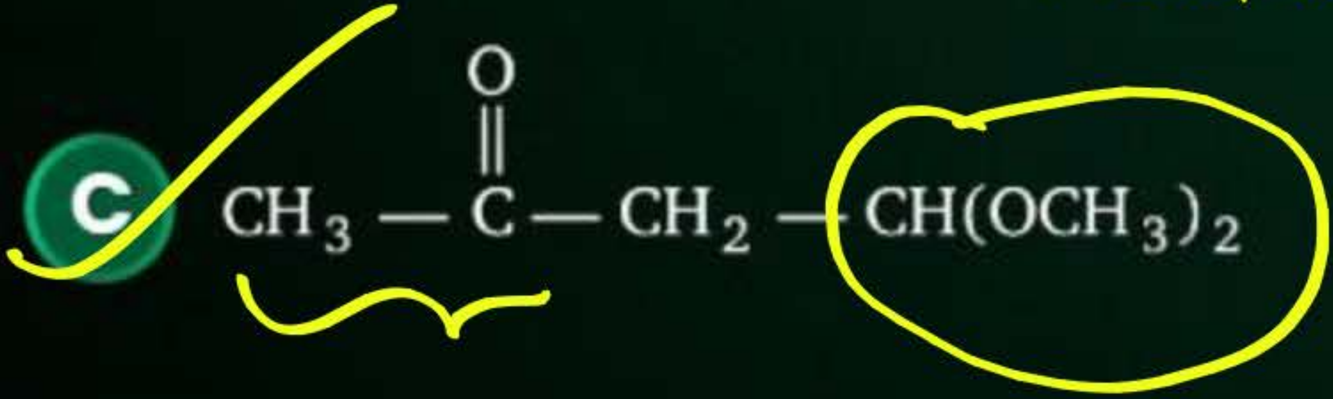
$CH_3-\overset{\overset{O}{\parallel}}{C}-\overset{\overset{OCH_3}{|}}{\underset{\underset{OCH_3}{|}}{C}}-CH_3$



$CH_3-\overset{\overset{O}{\parallel}}{C}-\overset{\overset{O}{\parallel}}{C}-CH_3$

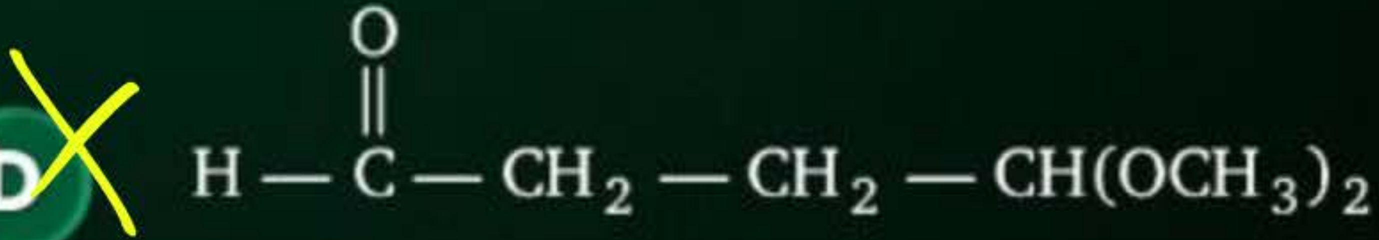
No Tollen's Test

(C)

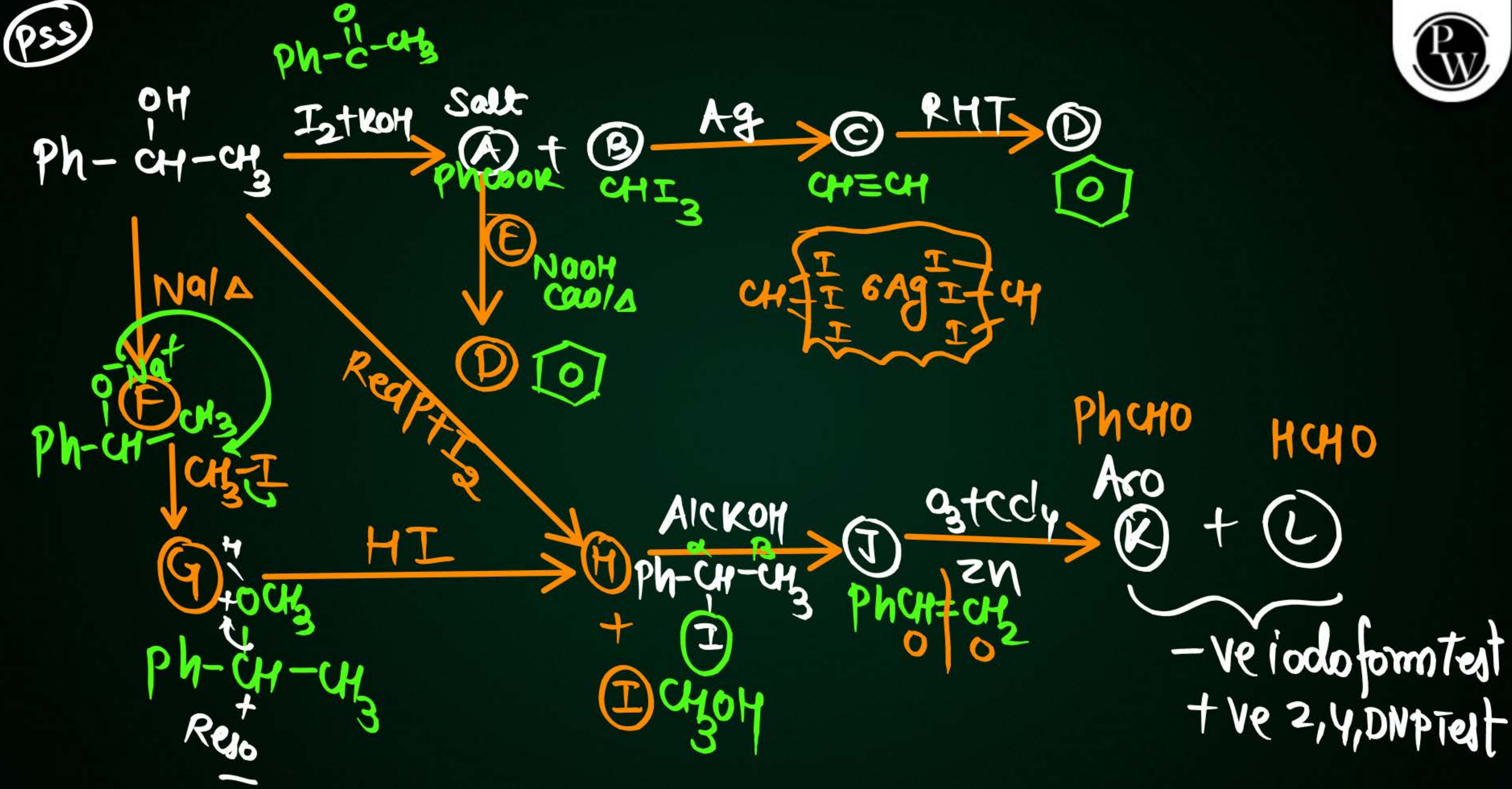


$CH_3-\overset{\overset{O}{\parallel}}{C}-CH_2-CH(OCH_3)_2$

(D)

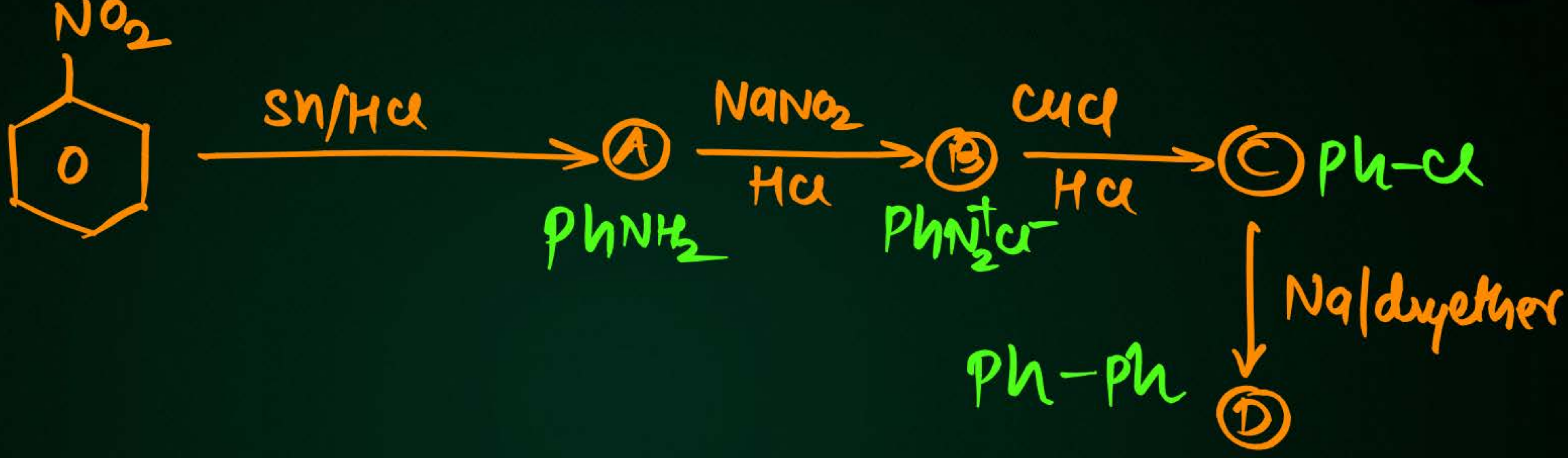


$H-\overset{\overset{O}{\parallel}}{C}-CH_2-CH_2-CH(OCH_3)_2$


PSS
Ph-C(=O)-CH3
Ph-CH(OH)-CH3
I2+KOH
Salt
A + B
PhCOOK
CHI3
Ag
C
CH≡CH
RHT
D
E
NaOH
CaO/Δ
D
CH I I I 6Ag I I I CH
Na/Δ
O⁻Na⁺
F
Ph-CH-CH3
CH3-I
G
H
+OCH3
Ph-CH-CH3
+
Reso
Red P+I2
HI
H
Alc KOH
α β
Ph-CH-CH3
I
+
I
CH3OH
J
PhCH=CH2
O O
O3+CCl4
Zn
PhCHO
HCHO
Aro
K + L
-ve iodoform test
+ve 2,4,DNP Test

PSS

JEE main 2025 Jan M.S
22 Jan


NO_2
Sn/HCl
A
$PhNH_2$
$NaNO_2$
HCl
B
$PhN_2^+Cl^-$
CuCl
HCl
C
Ph–Cl
Na/dry ether
D
Ph–Ph

M·W of D

PANKAJ SIR
JOIN MY OFFICIAL TELEGRAM CHANNEL
PhysicsWallah
अनुगच्छतु प्रवाहं
@PSCAA

Home Work From PW Module (Yakeen NEET)

Prarambh: Q 84, 87, 88, 89

Prabal: Q 18, 23

Parikshit: Q 05, 10

Thankyou!!

YAKEEN 2.0

FOR NEET 2025

Lecture- 06 Organic Chemistry

Aldehydes, Ketones and Carboxylic Acids

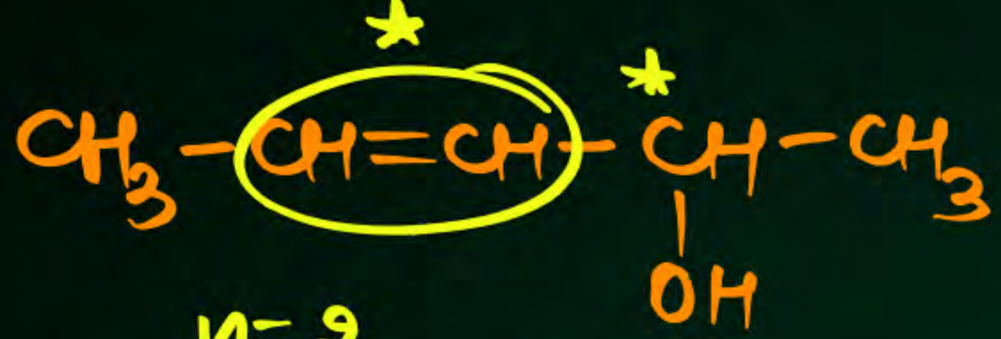
By- Pankaj Sir(POPU MAMA)

Physics Wallah

Topics *to be covered*

1. Aldol Condensation Reaction ✓
2. Cannizzaro Reaction ✓
3. Practice

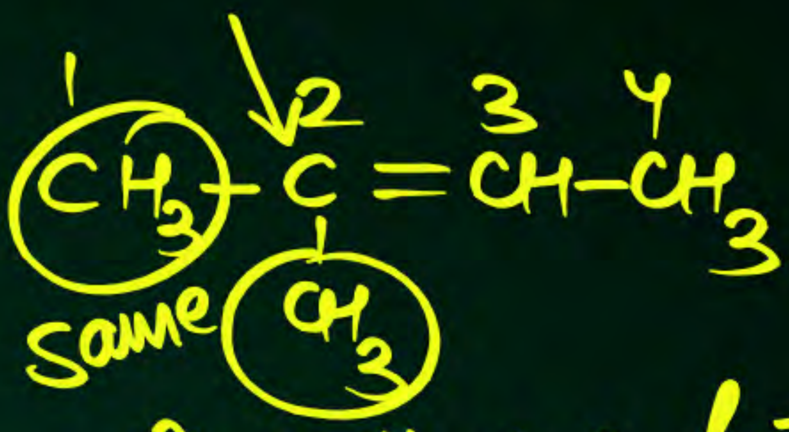
Q



$CH_3-\overset{*}{CH=CH}-\overset{*}{\underset{OH}{CH}}-CH_3$

n=2

Total S.I = $2^2 = 4$



$\overset{1}{CH_3}-\overset{2}{\underset{CH_3}{C}}=\overset{3}{CH}-\overset{4}{CH_3}$

2-methyl-2-butene

Q Incorrect ?

A) MP cis-2-butene > Trans-2-butene ✓

B) 2-methyl-2-butene cannot have G.I

C) DP cis-2-butene > Trans-2-butene

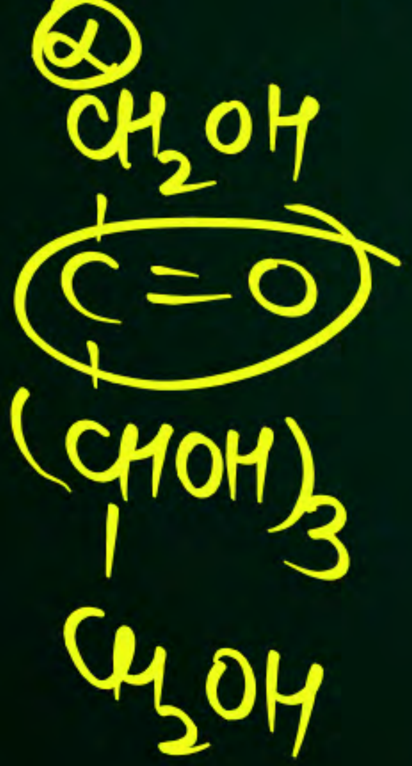
D) In Trans isomer iden grp are opp dir.

Q +ve Fehling Test

✓ $Ph-CH_2-CHO$

× $Ph-CHO$

× $PhCOCH_3$

✓ 

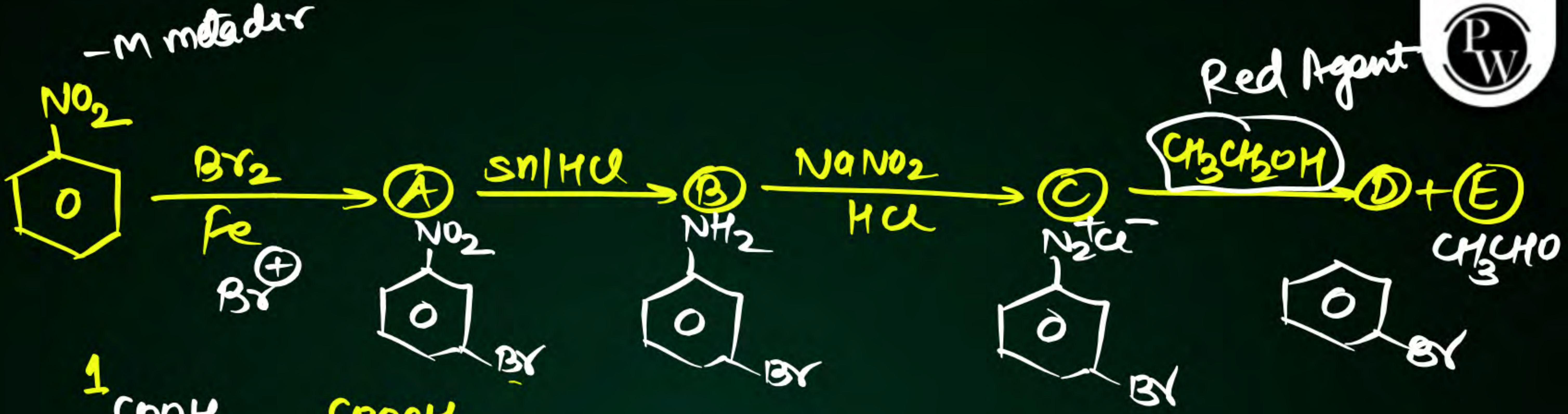
$$\begin{array}{c} \text{①} \\ CH_2OH \\ | \\ \boxed{C=O} \\ | \\ (CHOH)_3 \\ | \\ CH_2OH \end{array}$$

HCOOH

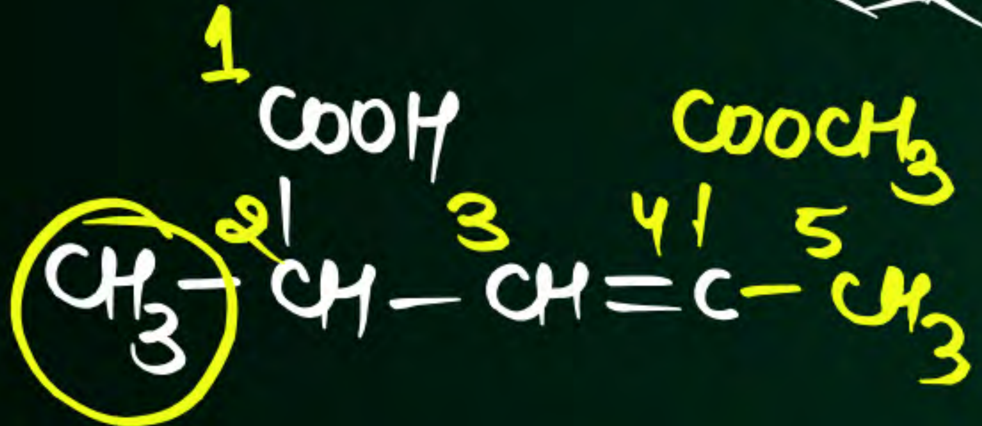
Hemiacetal

α-hydroxy ketone

PSS


-M metadir
NO_2
Br_2
Fe
$Br^{\oplus}$
A
NO_2
Br
Sn|HCl
B
NH_2
Br
$NaNO_2$
HCl
C
$N_2^+Cl^-$
Br
Red Agent
CH_3CH_2OH
D
+
E
CH_3CHO
Br

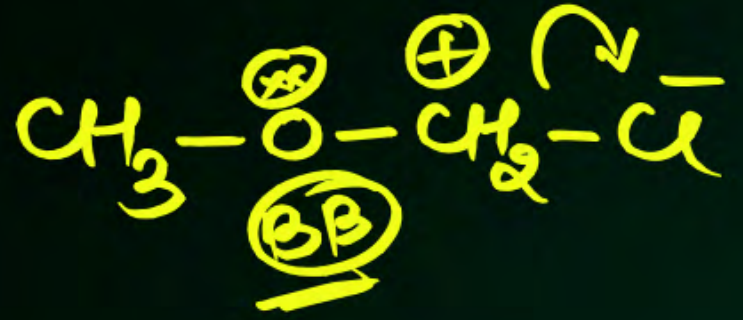
Q



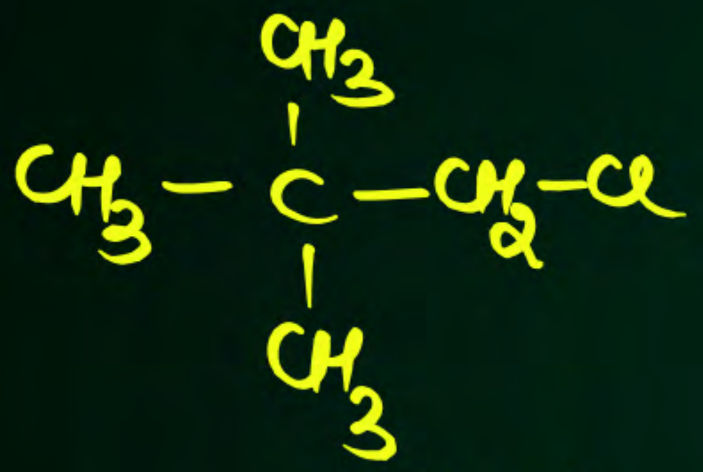
$$\overset{1}{\mathrm{COOH}}\qquad\qquad \mathrm{COOCH_3}$$
$$\mathrm{CH_3-\overset{2|}{C}H-\overset{3}{C}H=\overset{4|}{C}-\overset{5}{C}H_3}$$

4-methoxycarbonyl-2-methyl | pent-3-en~~e~~-1-oic acid |

Q.



$CH_3-\overset{\oplus}{O}-\overset{\oplus}{C}H_2-\overset{-}{Cl}$ SN1 ✓



$CH_3-\underset{CH_3}{\overset{CH_3}{C}}-CH_2-Cl$ SN2 ×

SH ↑

Q

% Cl = ?

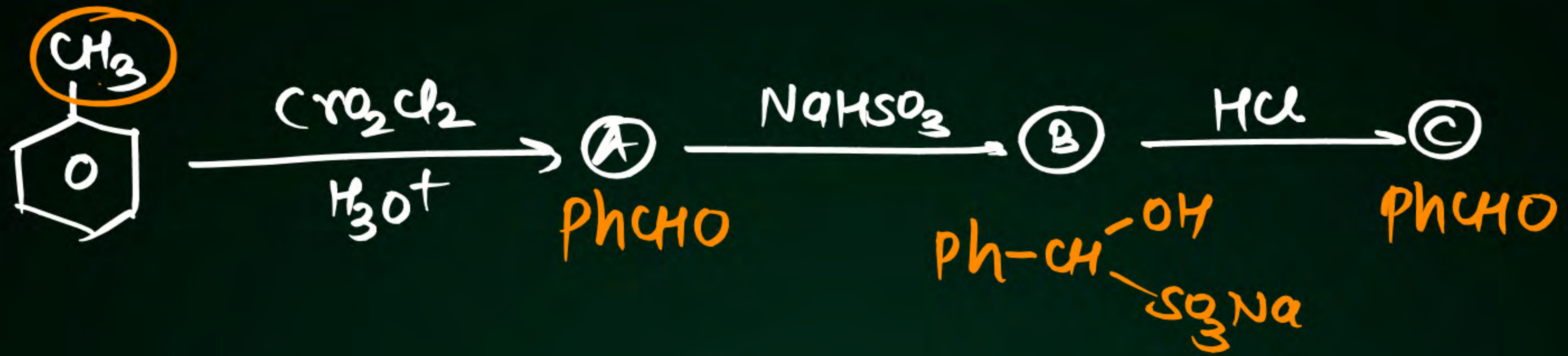
wt $_{AgCl}$ = 143.5

O.C wt = 180

$$\% \, Cl = \frac{35.5}{\cancel{143.5}} \times \frac{\cancel{143.5}}{180} \times 100\,\%$$

$$= 19.7 \simeq 20\,\%$$

Q.


CH3
CrO2Cl2
H3O+
A
PhCHO
NaHSO3
B
Ph-CH
-OH
-SO3Na
HCl
C
PhCHO

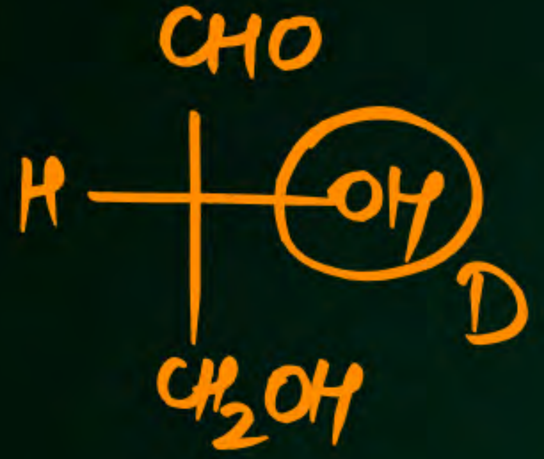
Q S-1: Lassaigne's test → P, S, N, X ✓

S2: Lassaigne's extract is made by Mg ✗

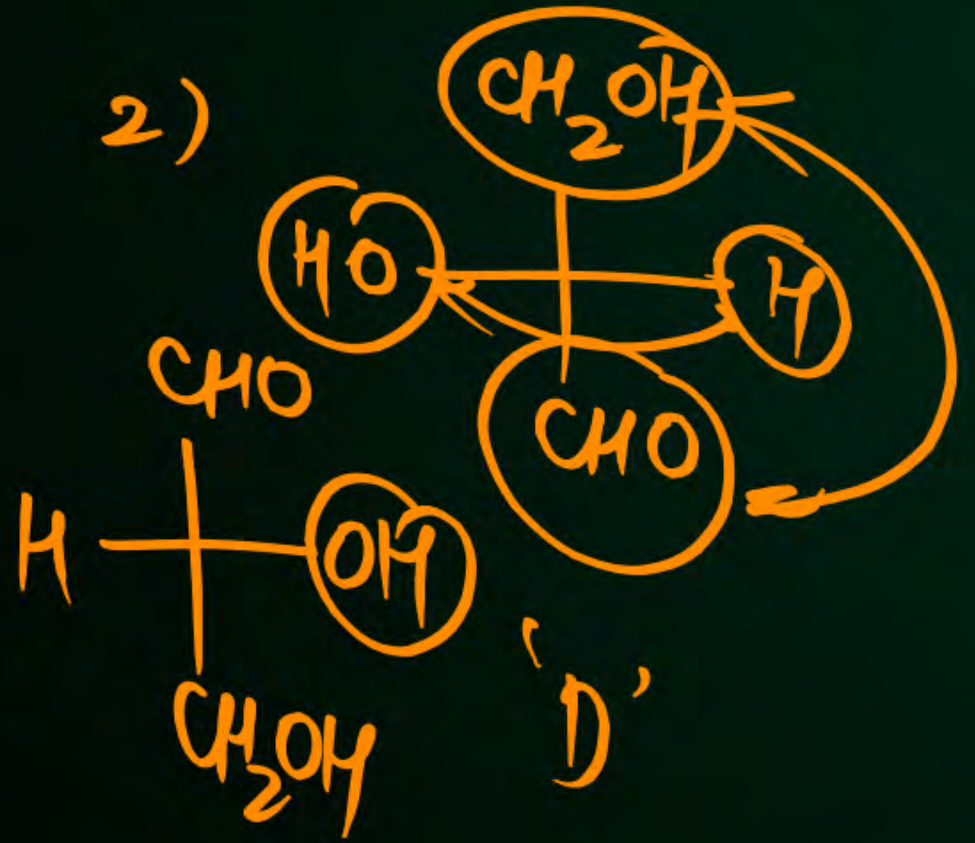
Na

Q L-Glyceraldehyde

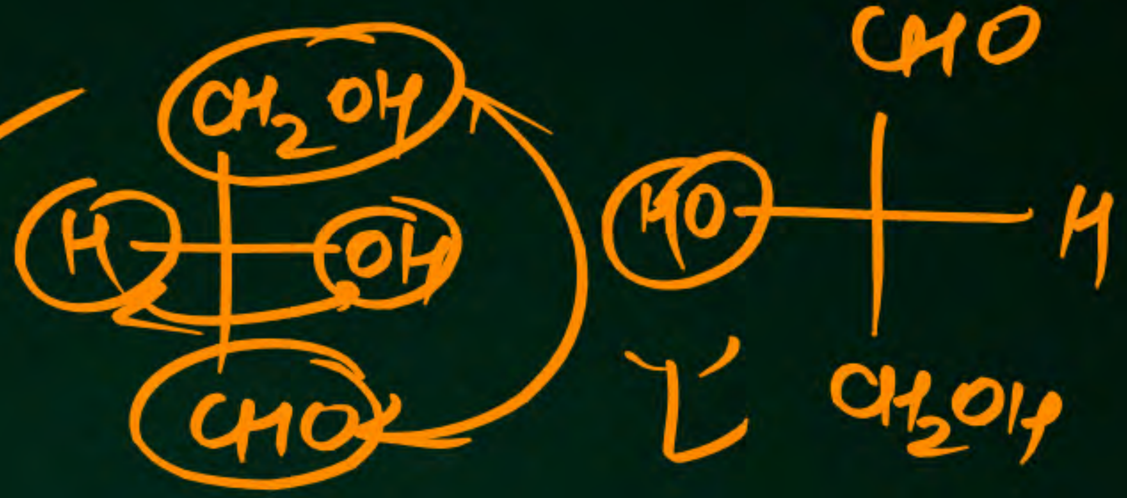
1)


CHO
H
OH
D
CH2OH

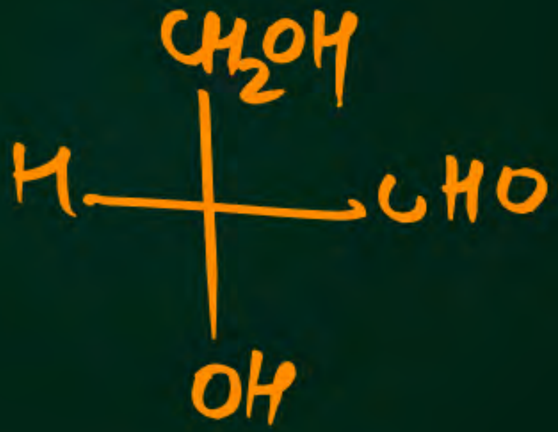
2)


CH2OH
HO
H
CHO
CHO
H
OH
CH2OH
'D'

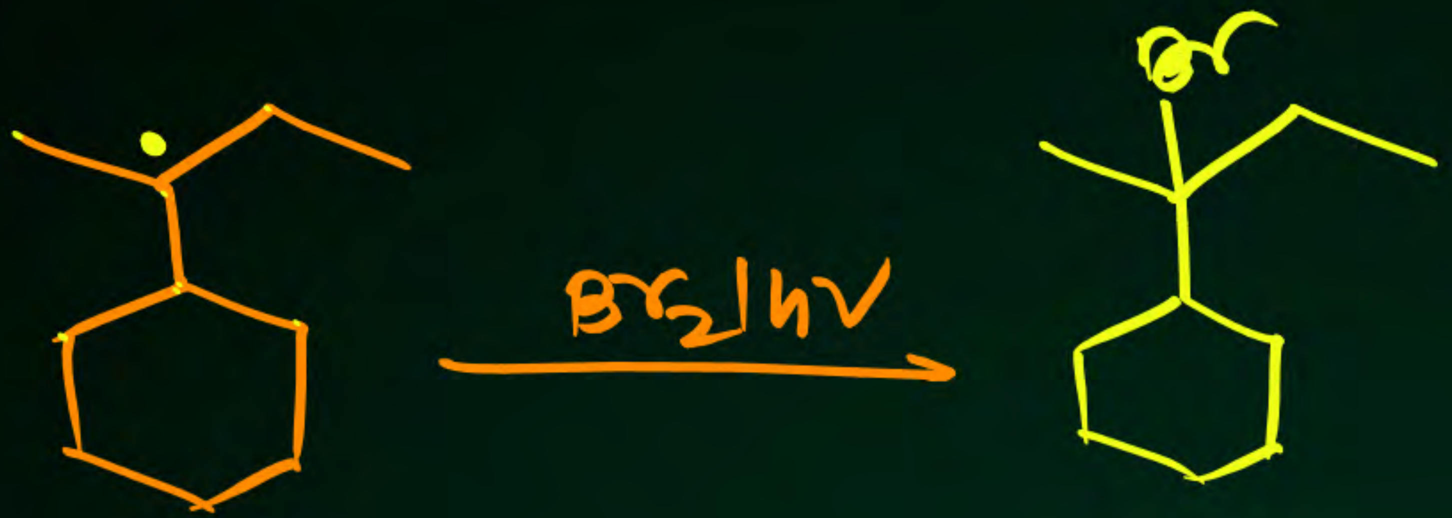
3) ✓


CH2OH
H
OH
CHO
CHO
HO
H
CH2OH
'L'

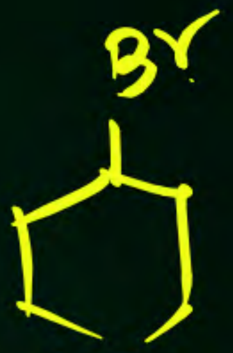
4)

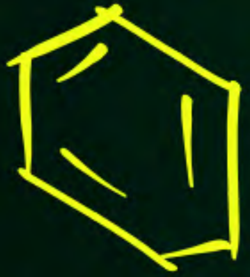

CH2OH
H
CHO
OH

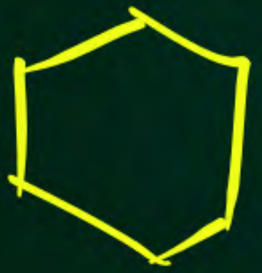
Q.



Q. (X) $C_6H_6 \xrightarrow[Ni]{H_2(\text{Excess})}$ (A) $\xrightarrow[h\nu]{Br_2}$ only one mono bromo product



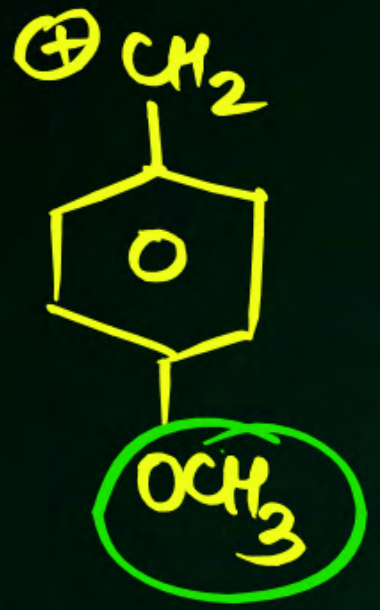




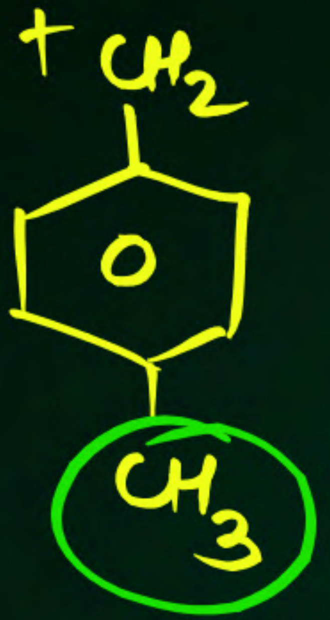
π Bond in 'x'

= 3

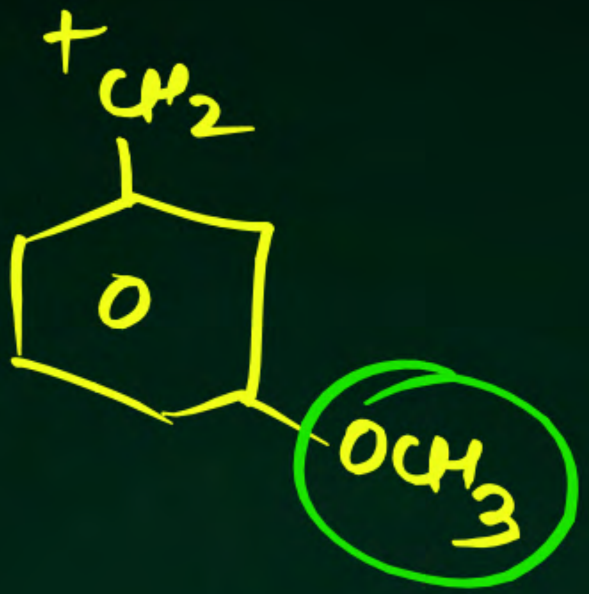
Q.



+M > ~~-I~~



+H > ~~I~~



-I

1 > 2 > 3

NEET-2025

Easy paper

[Organic chem]

short notes → Revise

[PSS] Diazotisation

Copy class notes

H.W ✓

Test ✓ Analysis

Silly mistake

20% Theory

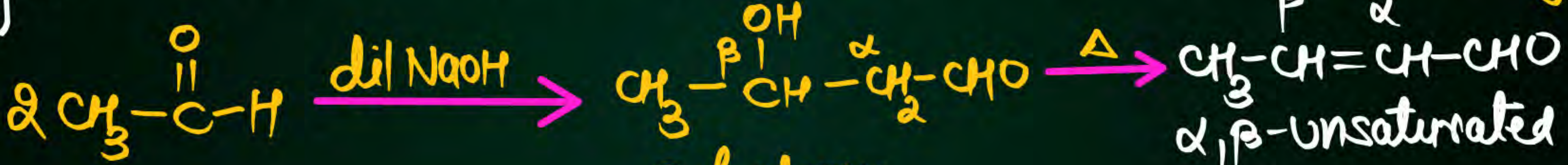
80% Sawal

Aldol Condensation Reaction

Requirement ÷ Ald & ket having α-H

Reagent ÷ dil NaOH, KOH, $Ba(OH)_2$, Na_2CO_3, K_2CO_3......

Crotonaldehyde



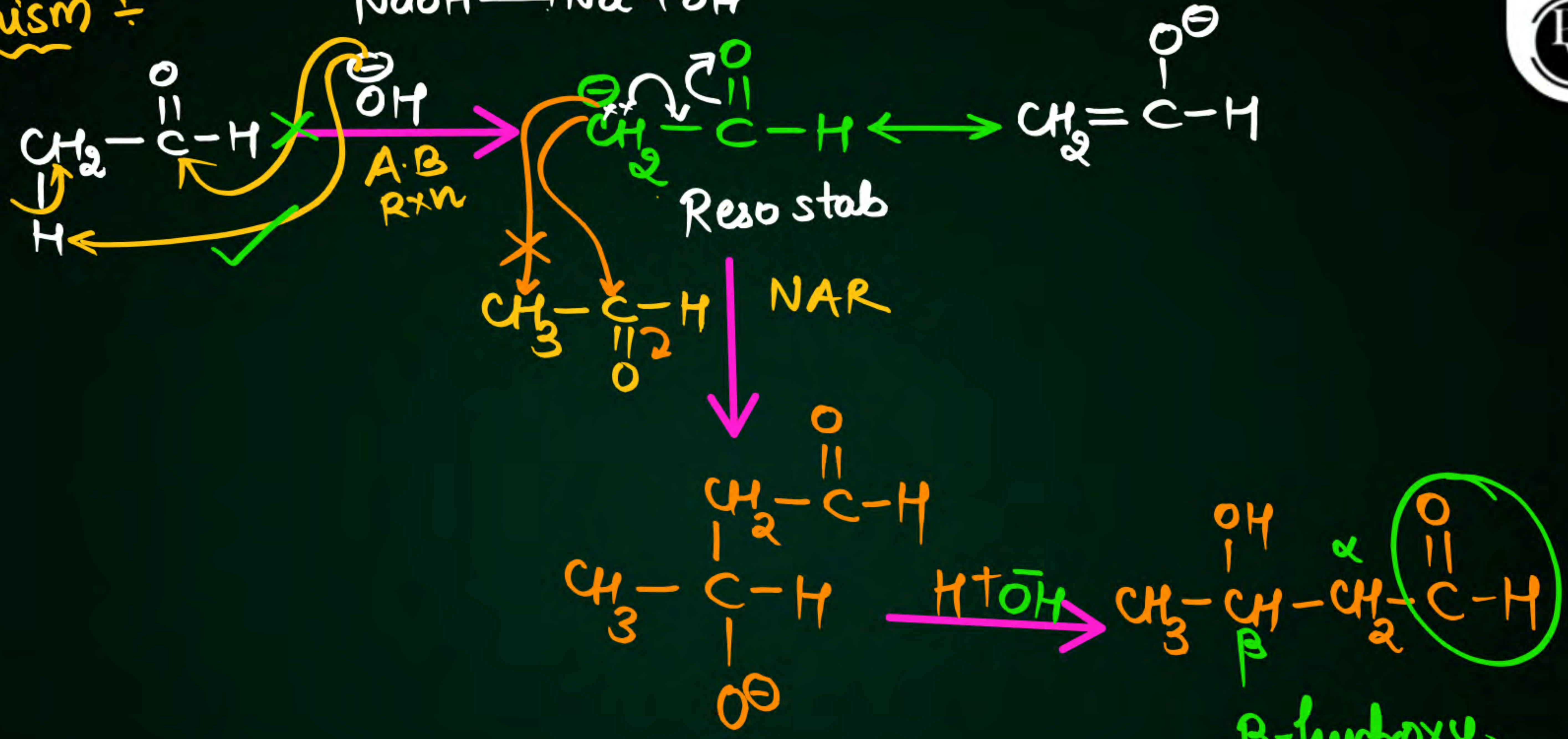
$$2\,CH_3-\overset{O}{\overset{\|}{C}}-H \xrightarrow{\text{dil NaOH}} CH_3-{}^{\beta}\overset{OH}{\overset{|}{C}}H-{}^{\alpha}CH_2-CHO \xrightarrow{\Delta} CH_3-\overset{\beta}{C}H=\overset{\alpha}{C}H-CHO$$

β-hydroxy Carbonyl comp

α, β-unsaturated Carbonyl comp

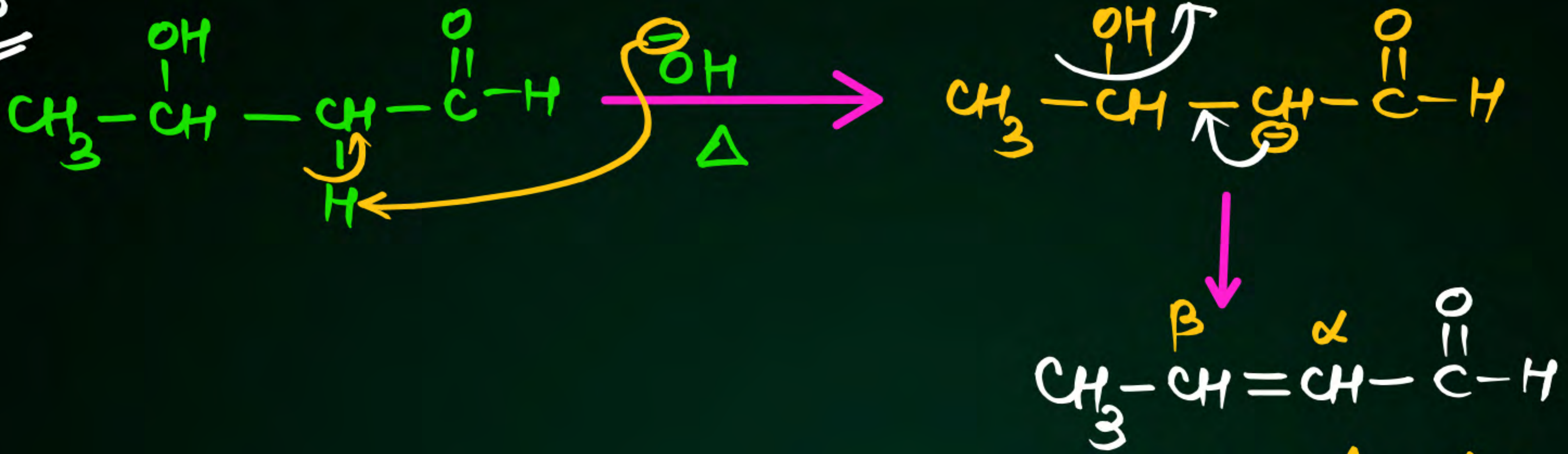
Mechanism ÷

$NaOH \longrightarrow Na^+ + \bar{O}H$


A.B
Rxn
Reso stab
NAR
$H^+\bar{O}H$
α
β

β-hydroxy
Carbonyl comp.

E1cb



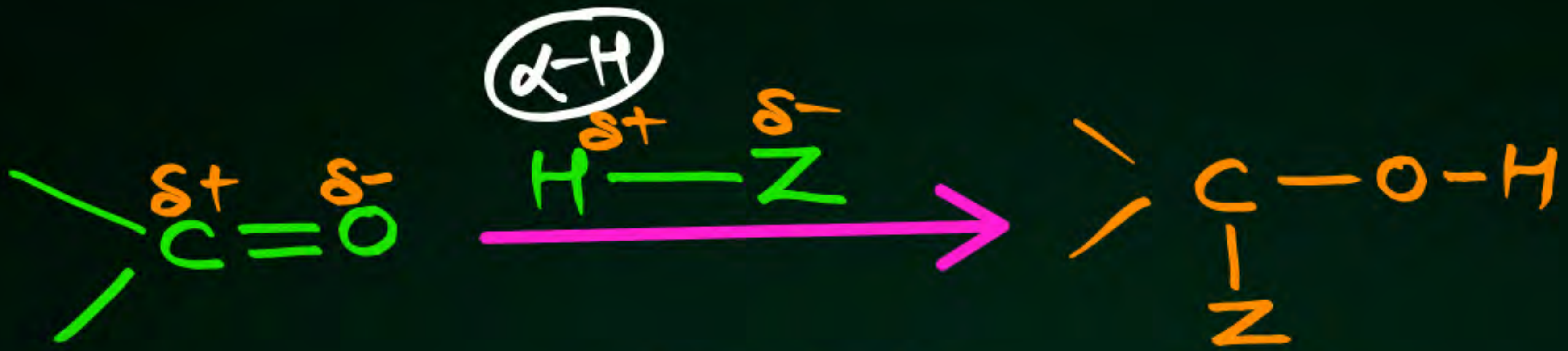
$$CH_3-\overset{OH}{\overset{|}{CH}}-\underset{\underset{H}{|}}{CH}-\overset{O}{\overset{\|}{C}}-H \xrightarrow[\Delta]{\overset{\ominus}{O}H} CH_3-\overset{OH}{\overset{|}{CH}}-\overset{\ominus}{CH}-\overset{O}{\overset{\|}{C}}-H$$

$$\downarrow$$

$$CH_3-\overset{\beta}{CH}=\overset{\alpha}{CH}-\overset{O}{\overset{\|}{C}}-H$$

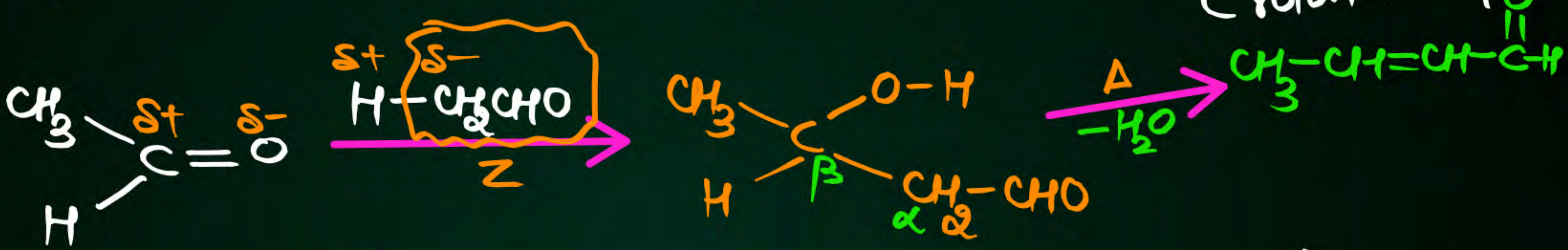
α,β-unsaturated
Carbonyl comp.

DM



α-H
δ+ C = O δ−
δ+ H — Z δ−
C — O — H
Z

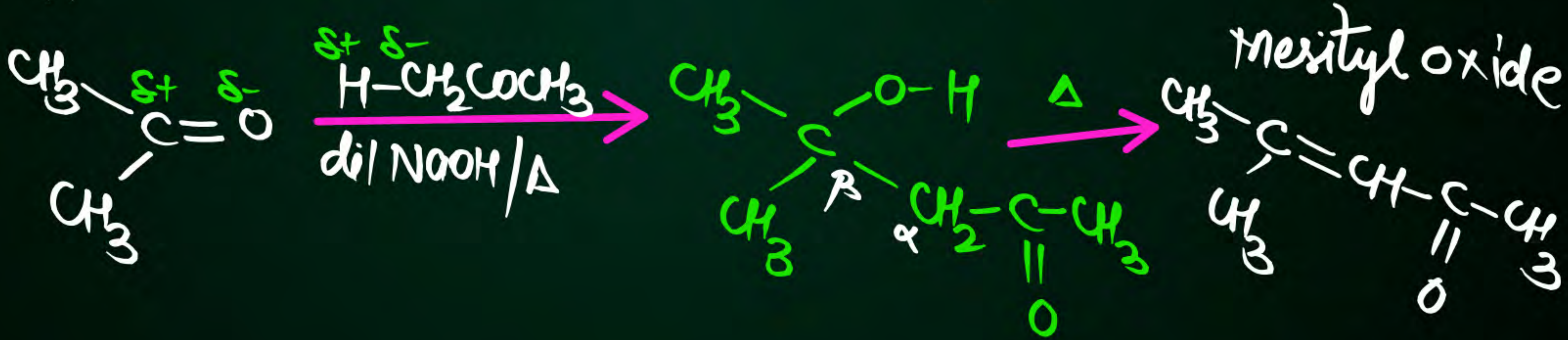
①



CH₃
H
δ+ C = O δ−
δ+ H — CH₂CHO δ−
Z
CH₃
O — H
H
β
α
CH₂ — CHO
Δ
−H₂O
CH₃ — CH = CH — C — H
O

Crotonaldehyde

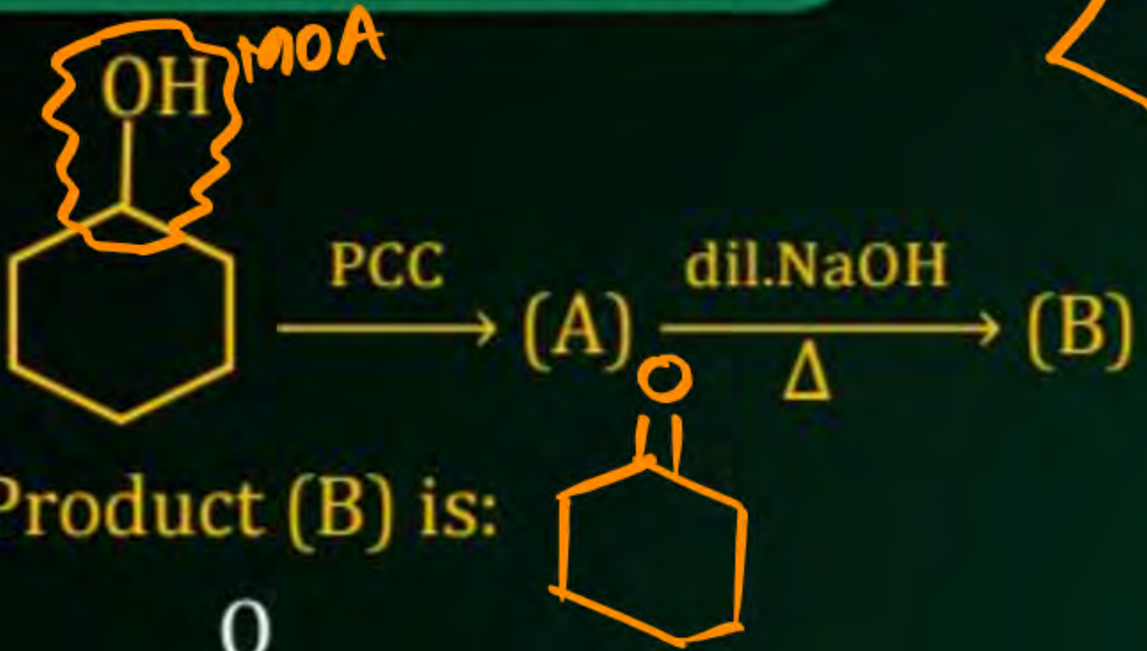
②



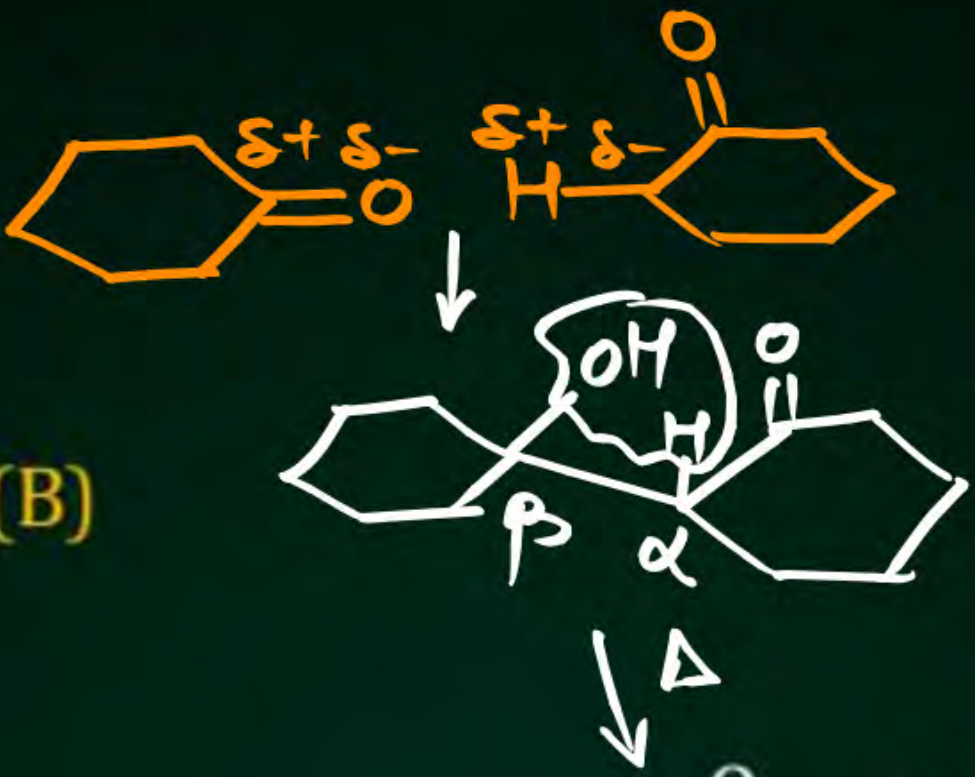
CH₃
CH₃
δ+ C = O δ−
δ+ δ−
H — CH₂COCH₃
dil NaOH/Δ
CH₃
O — H
CH₃
β
α
CH₂ — C — CH₃
O
Δ
CH₃ — C = CH — C — CH₃
CH₃
O

mesityl oxide

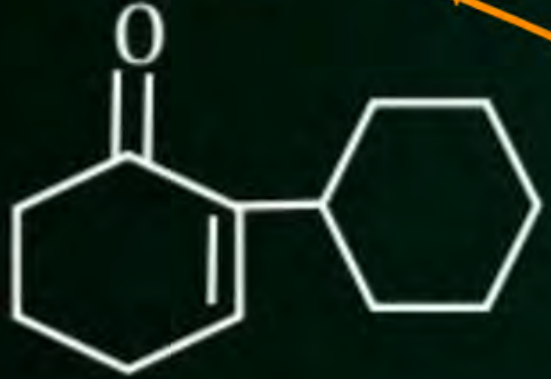
QUESTION (AIIMS 2019)


OH
MOA
PCC
(A)
dil.NaOH
Δ
(B)
O

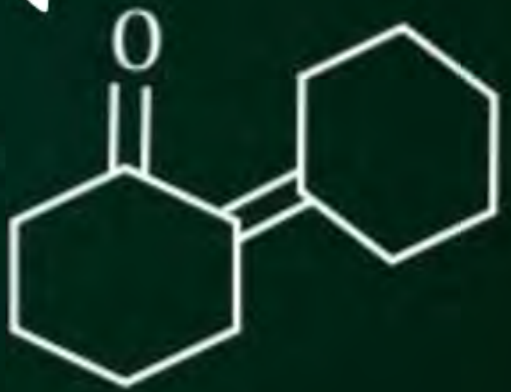
Product (B) is:


δ+ δ-
O
δ+ δ-
H
O
OH
H
O
β
α
Δ

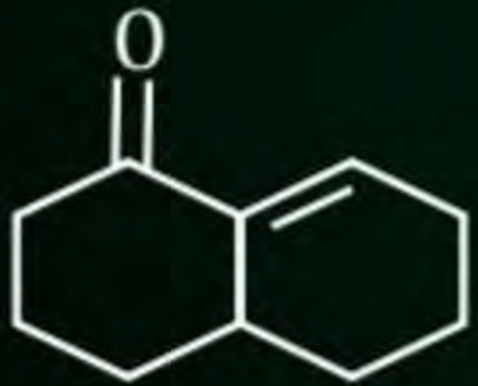
A



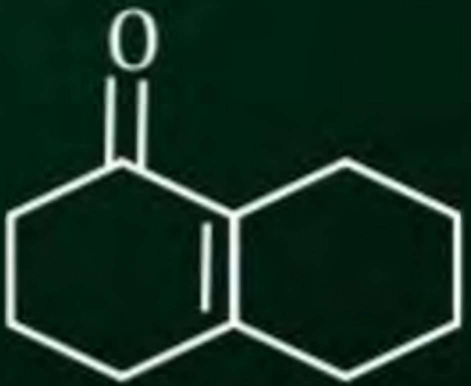
[✓ **B**]



C

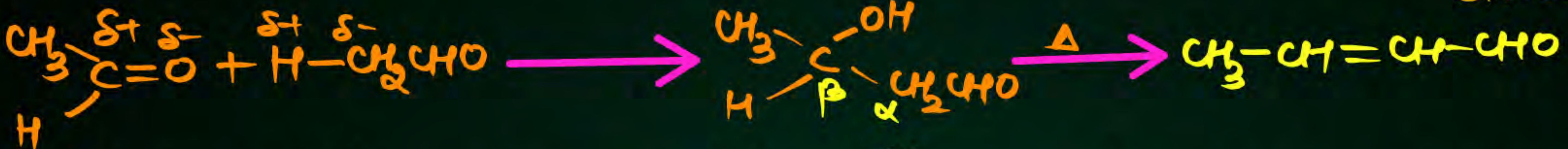


D

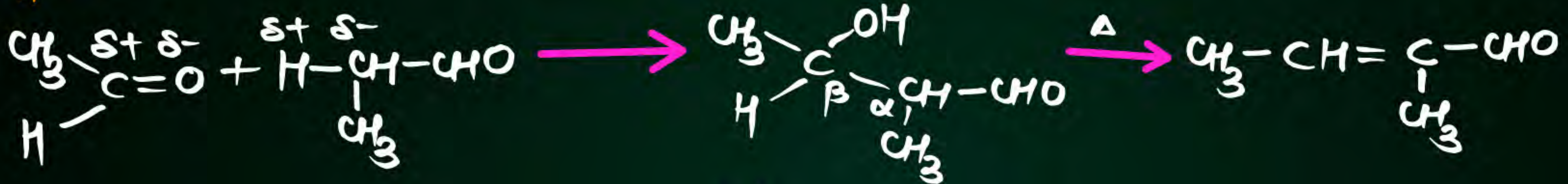


Cross or Mixed Aldol:

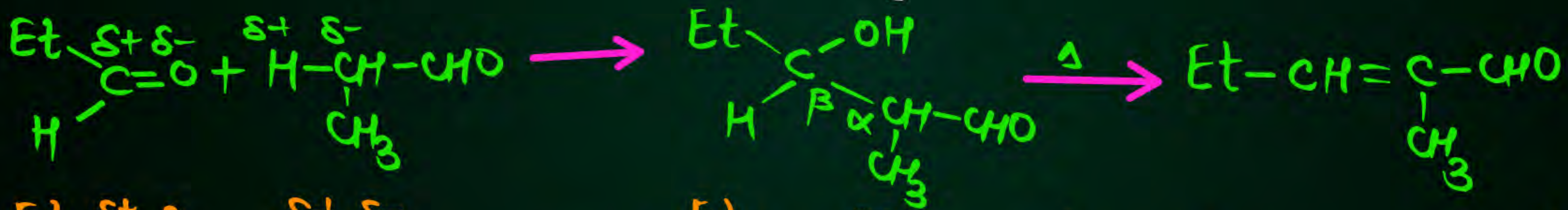
$CH_3-CHO + CH_3CH_2CHO \xrightarrow[\Delta]{^-OH}$ Total no of prod Excluding Stereo


δ+
δ−
OH
β
α
Δ
$CH_3-CH=CH-CHO$

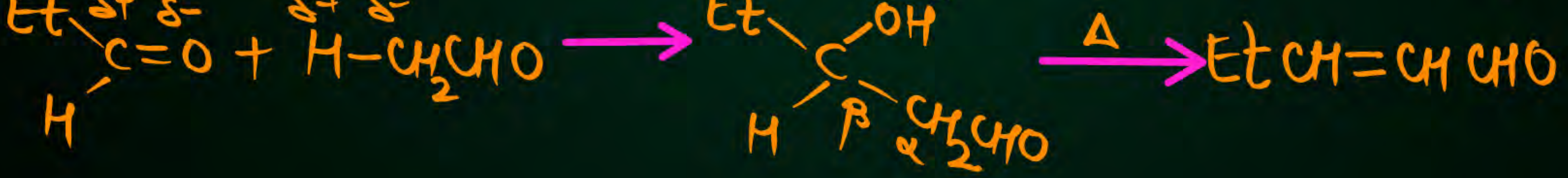
Self product


δ+
δ−
OH
β
α
Δ
$CH_3-CH=C(CH_3)-CHO$

Cross product


δ+
δ−
OH
β
α
Δ
$Et-CH=C(CH_3)-CHO$

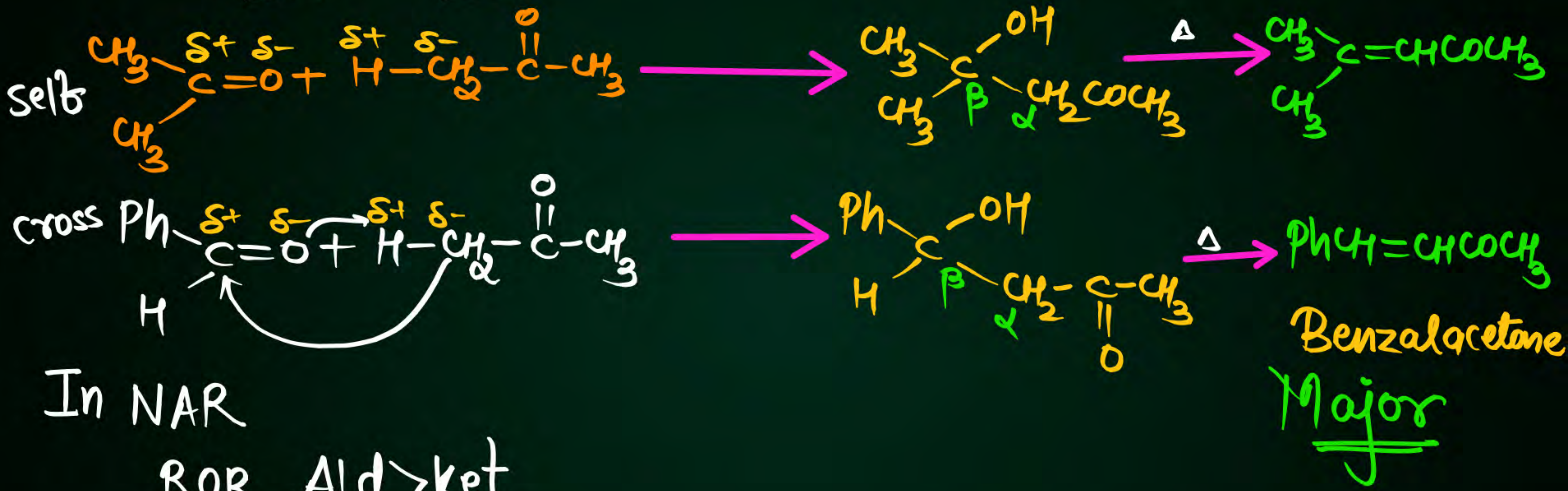
Self product


δ+
δ−
OH
β
α
Δ
$EtCH=CHCHO$

Cross product

Q/ $Ph-CHO + CH_3-\overset{O}{\overset{\|}{C}}-CH_3 \xrightarrow{\bar{O}H/\Delta}$ Total no of prod Excluding stere ②

αH(✗) αH(✓)

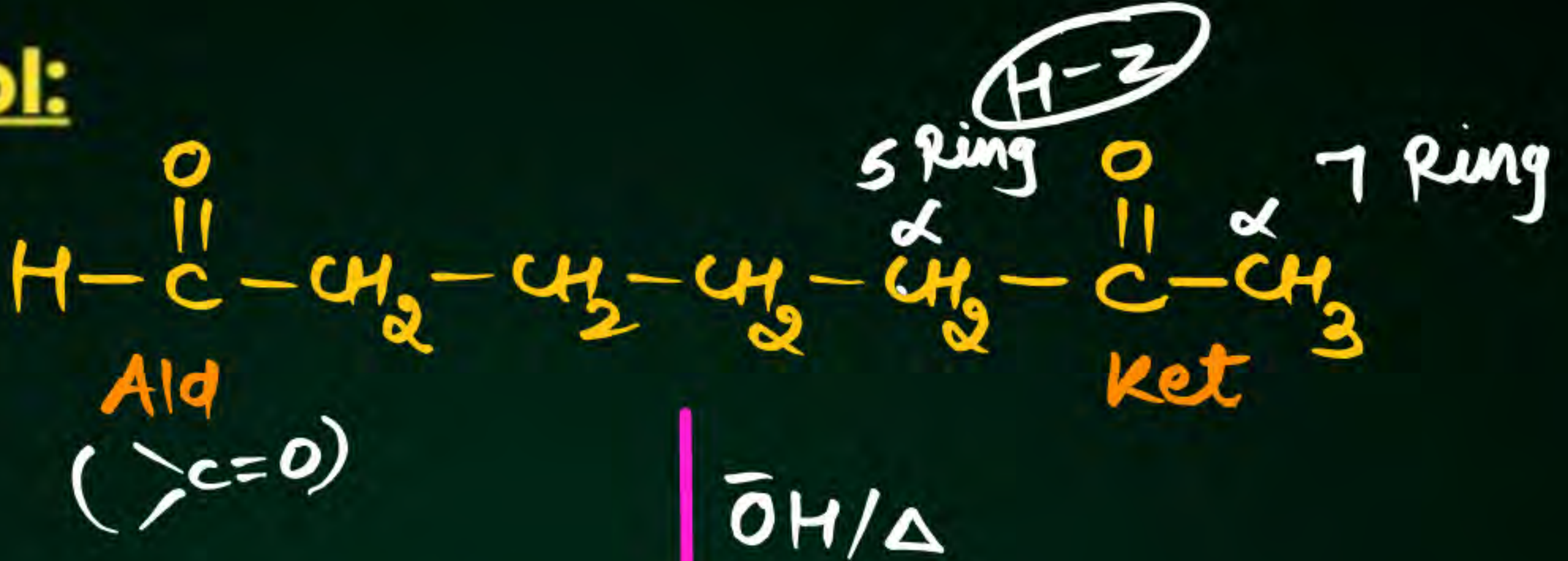

self
δ+ δ−
δ+ δ−
CH_3
$C=O$
$H-CH_2-\overset{O}{\overset{\|}{C}}-CH_3$
OH
β
α
CH_2COCH_3
Δ
$CH_3-C=CHCOCH_3$
CH_3
cross
Ph
H
α
β
$CH_2-\overset{}{C}-CH_3$
O
$PhCH=CHCOCH_3$
Benzalacetone
Major

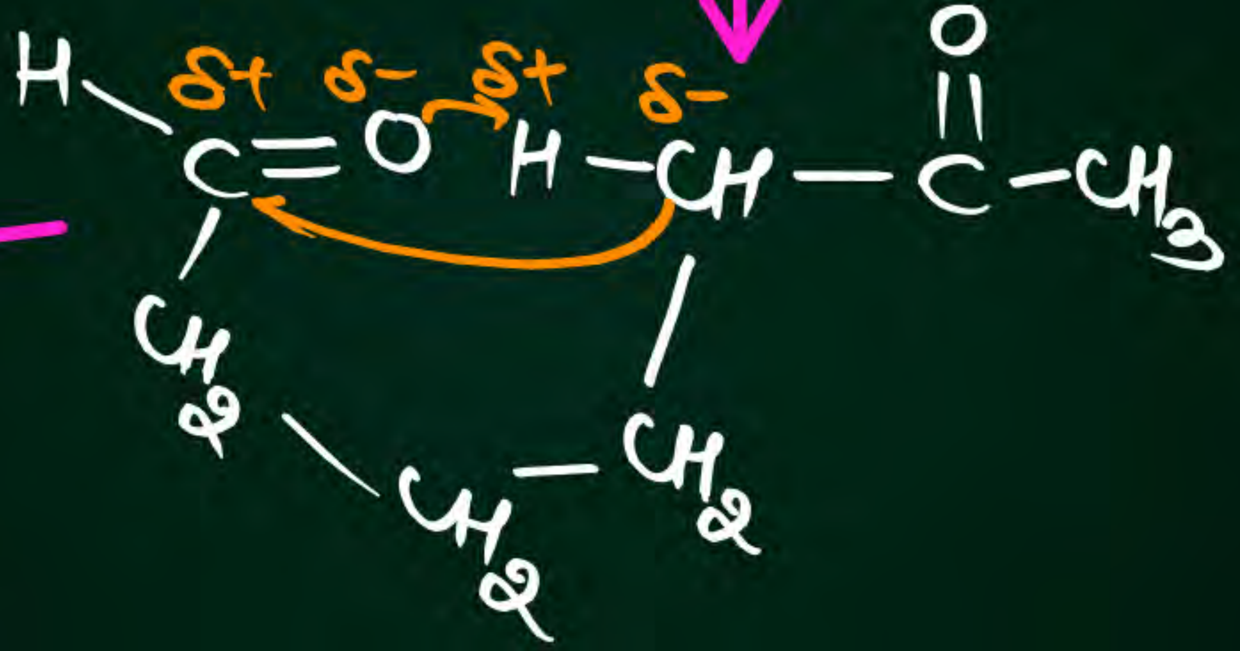
In NAR

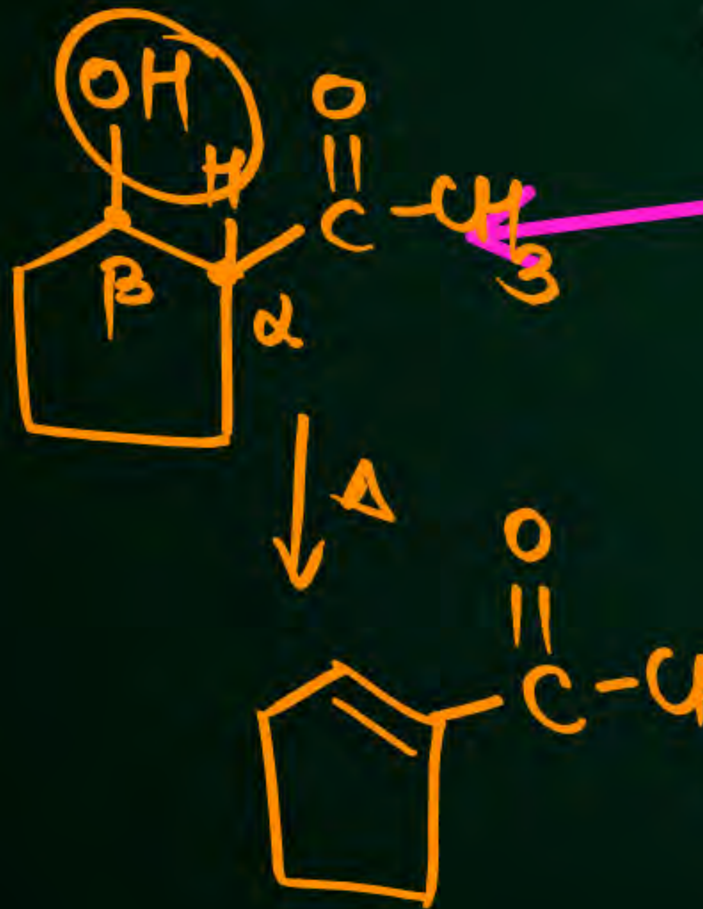
ROR Ald>Ket

Intramolecular Aldol:

Kya sochna hai
Ring ki stability
[6 > 5 > 7 > 4]
✓ ✓

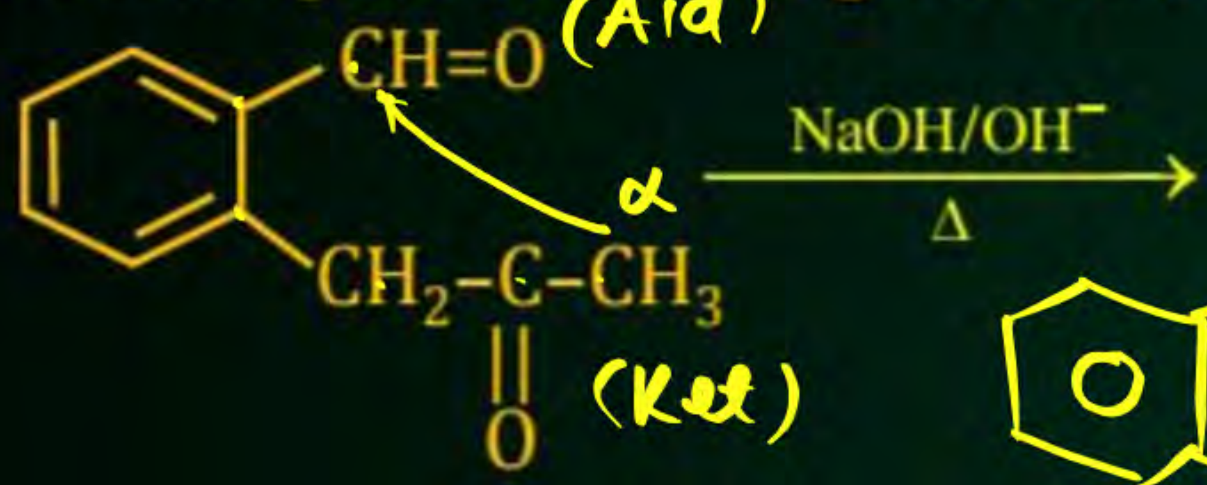

$H-\overset{O}{\overset{\|}{C}}-CH_2-CH_2-CH_2-\overset{\alpha}{CH_2}-\overset{O}{\overset{\|}{C}}-\overset{\alpha}{CH_3}$
H-Z
5 Ring
7 Ring
α
α
Ald
(>C=O)
Ket
$\bar{O}H/\Delta$



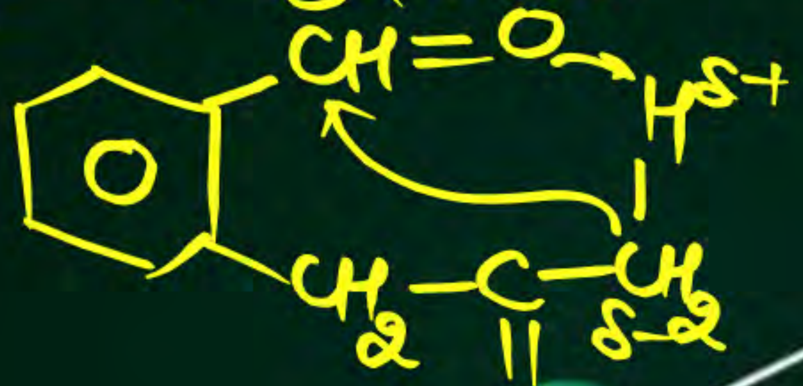


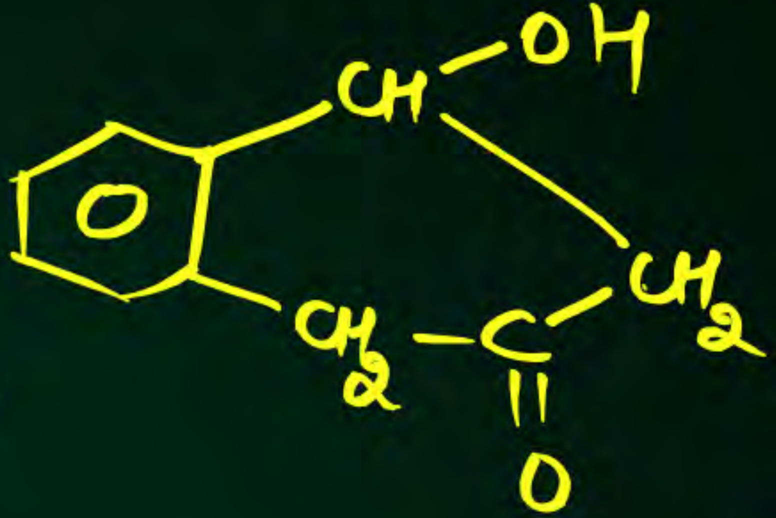
QUESTION (AIIMS 2019)

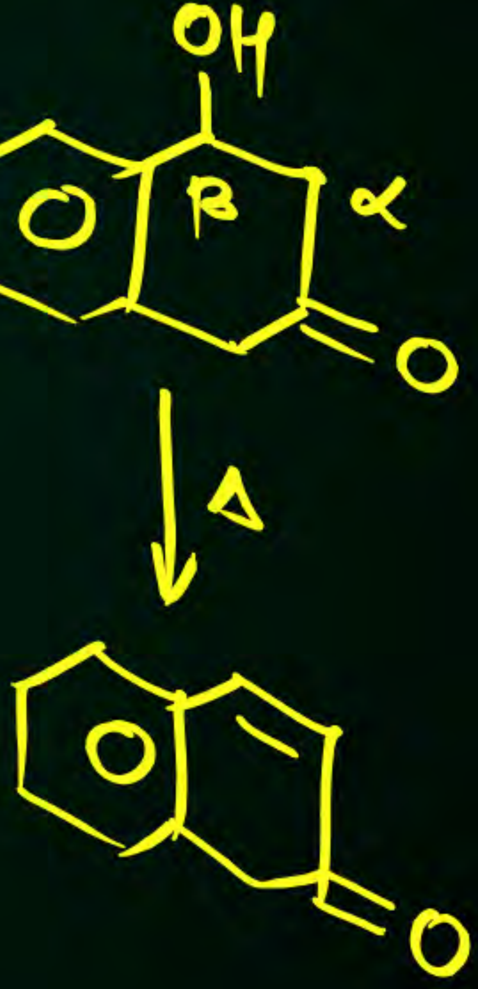
The end product of the given reaction

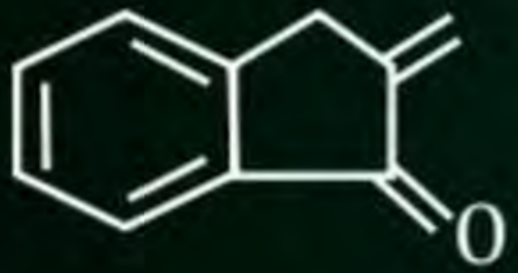

CH=O
(Ald)
α
CH$_2$–C–CH$_3$
O
(Ket)
NaOH/OH$^-$
Δ

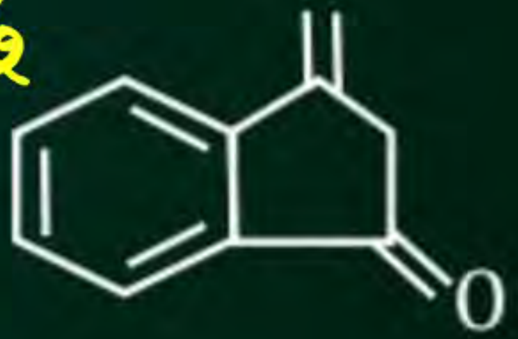
Product is:

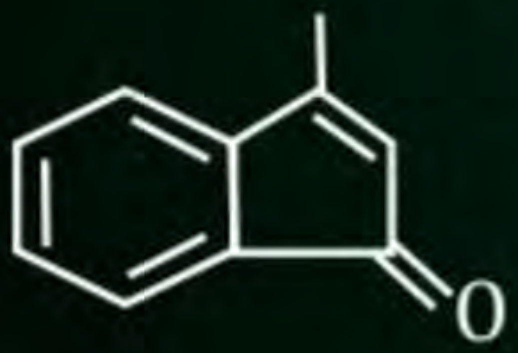

δ+
CH=O
H δ+
CH$_2$–C–CH$_2$
δ−
O

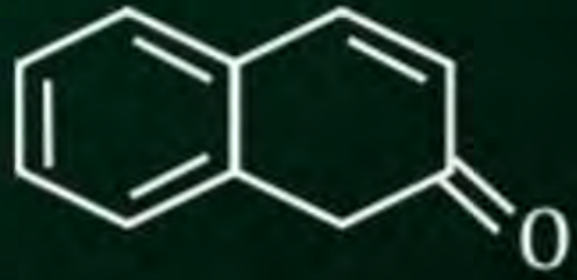

CH–OH
CH$_2$
CH$_2$–C
O



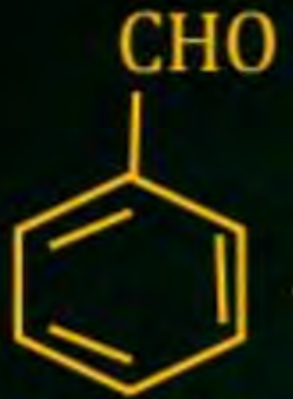
A 

B 

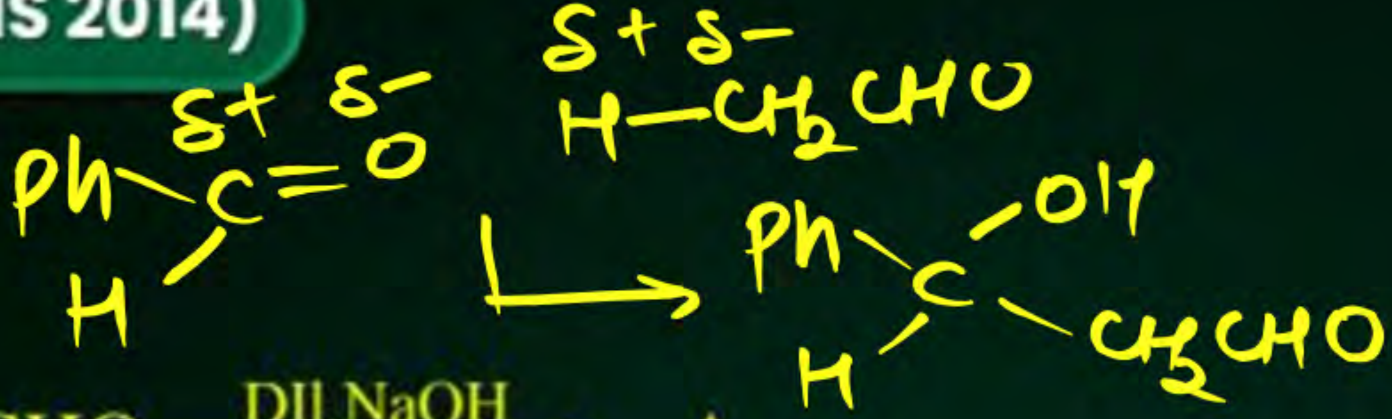
C 

✓ **D** 

QUESTION (AIIMS 2014)

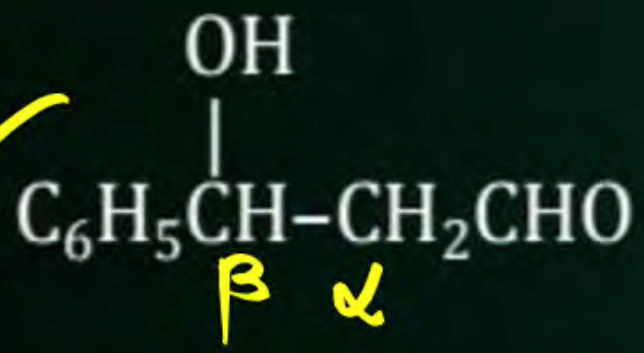


$+CH_3CHO \xrightarrow{\text{Dil.NaOH}} \underset{\text{(Major)}}{A}$.



δ+ δ−
Ph
C=O
H
δ+ δ−
H—CH₂CHO
Ph
C
OH
H
CH₂CHO

(A) will be:

A ✓ 

$C_6H_5\underset{\beta}{\overset{OH}{CH}}-\underset{\alpha}{CH_2}CHO$

B $C_6H_5CH=CH-CHO$

C $C_6H_5CH_2CH_2CHO$

D Both (B) and (C)

in O.C

MCQs

Samajh ata hai

Samajh nahi ata

[10-15 sec] ques Ans.

option elimination

Test ↑

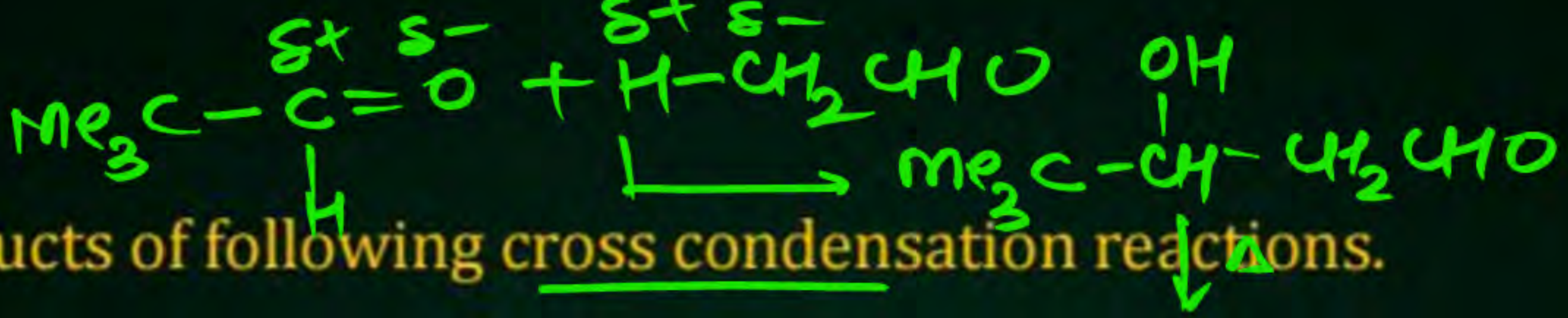
Neet ↑

QUESTION

Aldol condensation is:

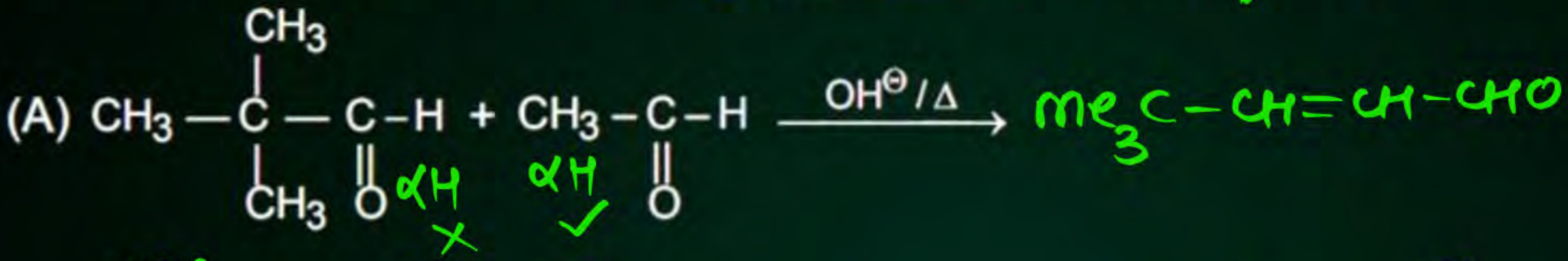
- A self condensation of aldehydes only having at least one alpha hydrogen.
- B self condensation of ketones only having at least one alpha hydrogen.
- [✓ C] self condensation of both aldehydes and ketones having at least one alpha hydrogen.
- D Self condensation of both aldehydes and ketones having no alpha hydrogen.

QUESTION



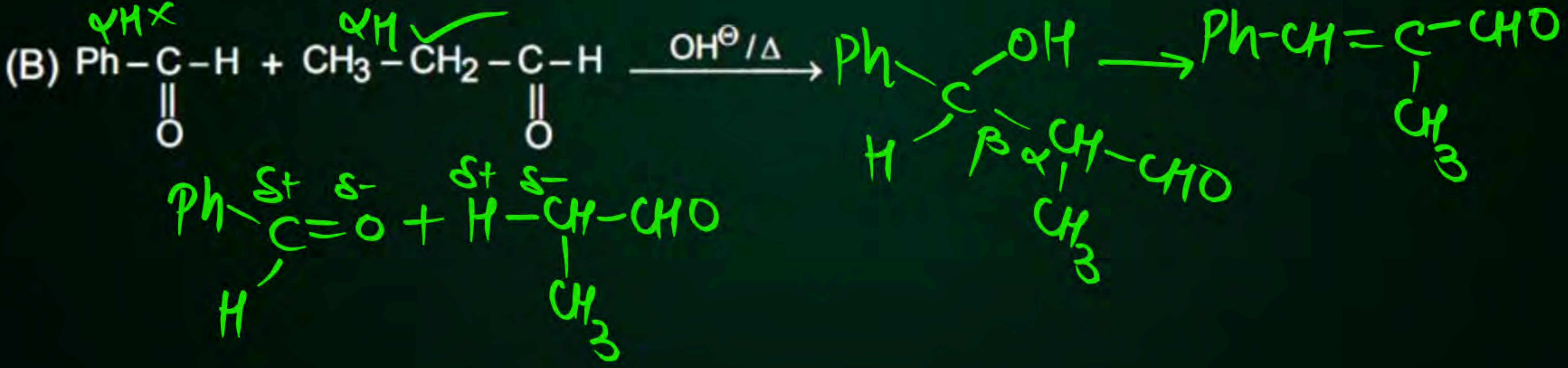
$$\overset{\delta+}{\underset{H}{Me_3C-C}}=\overset{\delta-}{O} + \overset{\delta+}{H}-\overset{\delta-}{CH_2}CHO \longrightarrow Me_3C-\overset{OH}{CH}-CH_2CHO \xrightarrow{\Delta}$$

Predict the products of following cross condensation reactions.



$$\text{(A)}\ CH_3-\overset{CH_3}{\underset{CH_3}{C}}-\underset{O}{\overset{\|}{C}}-H + CH_3-\underset{O}{\overset{\|}{C}}-H \xrightarrow{OH^{\ominus}/\Delta} Me_3C-CH=CH-CHO$$

αH ✗ αH ✓



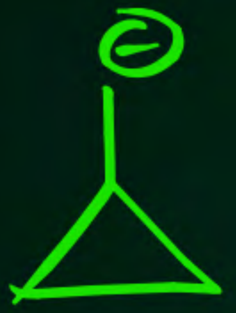
$$\text{(B)}\ Ph-\underset{O}{\overset{\|}{C}}-H + CH_3-CH_2-\underset{O}{\overset{\|}{C}}-H \xrightarrow{OH^{\ominus}/\Delta} Ph-\overset{OH}{\underset{H}{C}}-\underset{CH_3}{CH}-CHO \longrightarrow Ph-CH=\underset{CH_3}{C}-CHO$$

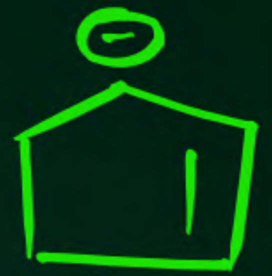
αH ✗ αH ✓

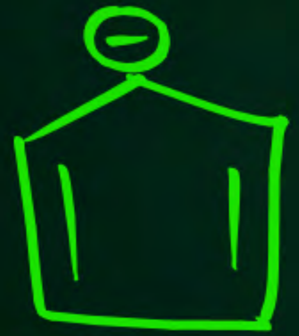
$$\underset{H}{Ph-\overset{\delta+}{C}}=\overset{\delta-}{O} + \overset{\delta+}{H}-\underset{CH_3}{\overset{\delta-}{CH}}-CHO$$

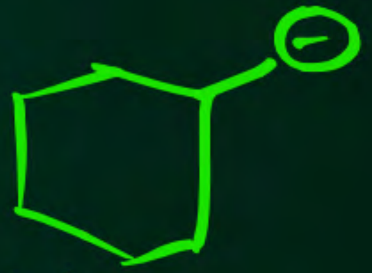
JEE main
2023
23 Jan
S-1

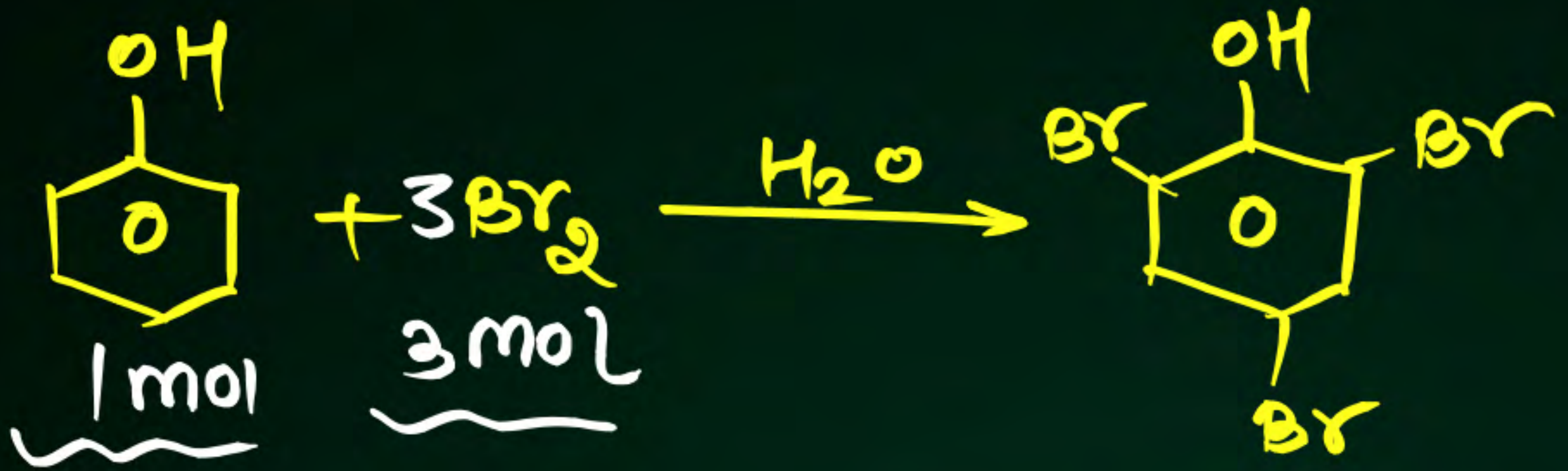
most stable Carbanion

1)

NA

3)

NA

✓ 2)

A

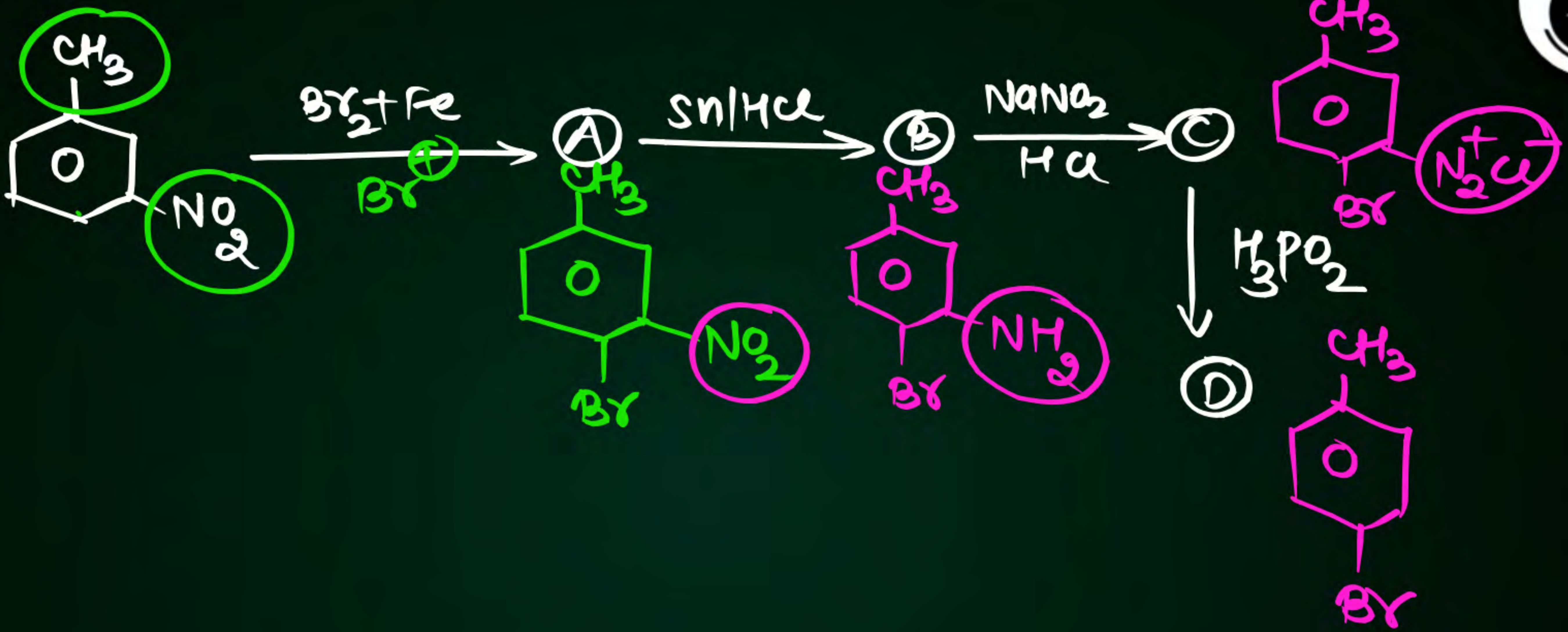
4)

NA


OH
+3Br2
1 mol
3 mol
H2O
OH
Br
Br
Br

Amount of Br_2 required from 2g phenol

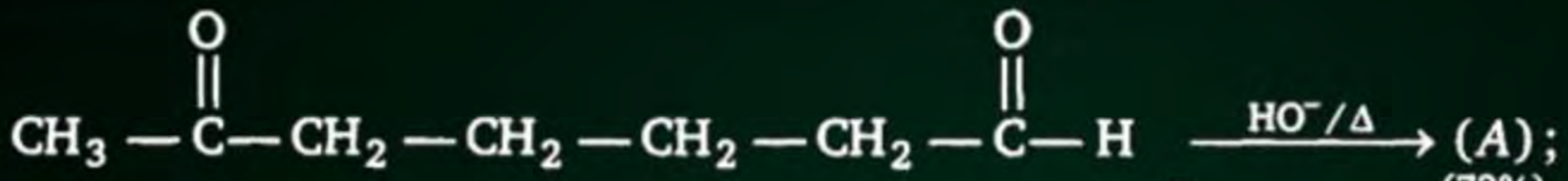
$$n_{Br_2} = 3 \times \frac{2}{94}$$

$$w_{Br_2} = \frac{3\times2}{94} \times 160$$


CH3
NO2
Br2 + Fe
Br⊕
A
CH3
NO2
Br
Sn/HCl
B
CH3
NH2
Br
NaNO2
HCl
C
CH3
N2+Cl−
Br
H3PO2
D
CH3
Br

Home Work

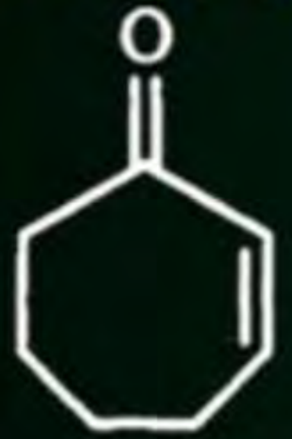
QUESTION 01



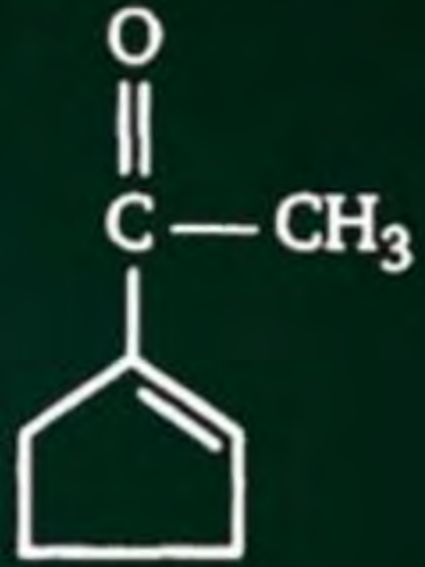
$$CH_3-\overset{O}{\overset{\|}{C}}-CH_2-CH_2-CH_2-CH_2-\overset{O}{\overset{\|}{C}}-H \xrightarrow{HO^-/\Delta} \underset{(73\%)}{(A)};$$

Product (A) is:

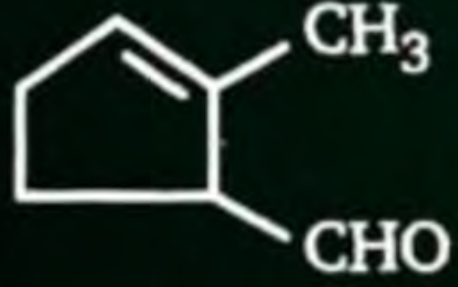
Ⓐ



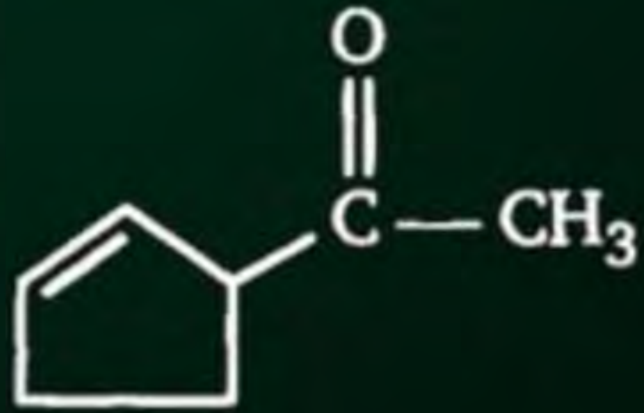
Ⓑ



Ⓒ



Ⓓ



QUESTION 02

Base-catalysed aldol condensation will occur with

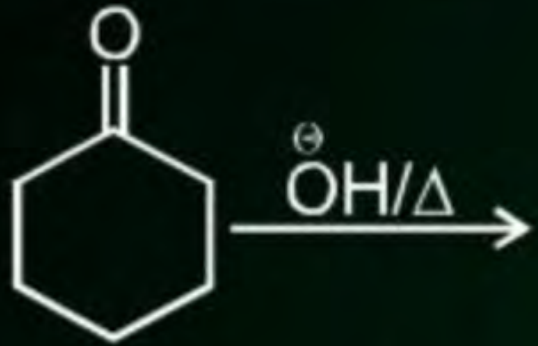
Ⓐ Benzaldehyde

Ⓑ Propionaldehyde

Ⓒ Formaldehyde

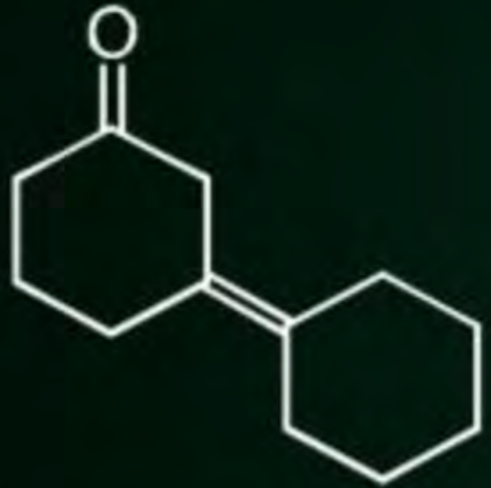
Ⓓ 2, 2-Dimethylpropionaldehyde

QUESTION 03

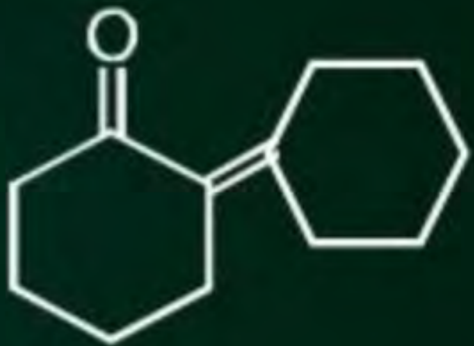

$\overset{\ominus}{O}H/\Delta$

Product is:

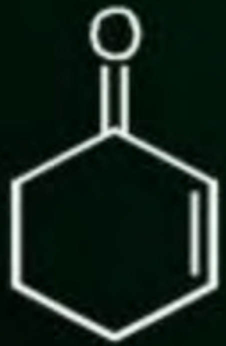
(A)



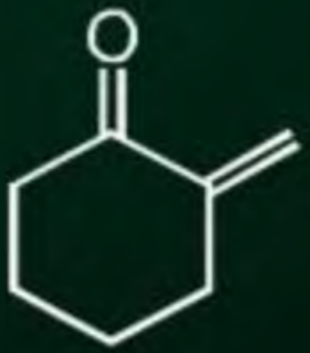
(B)



(C)

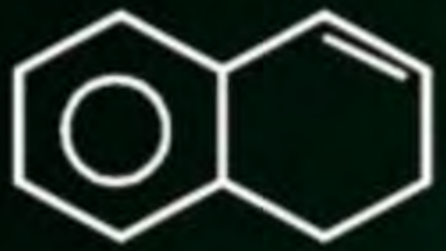


(D)



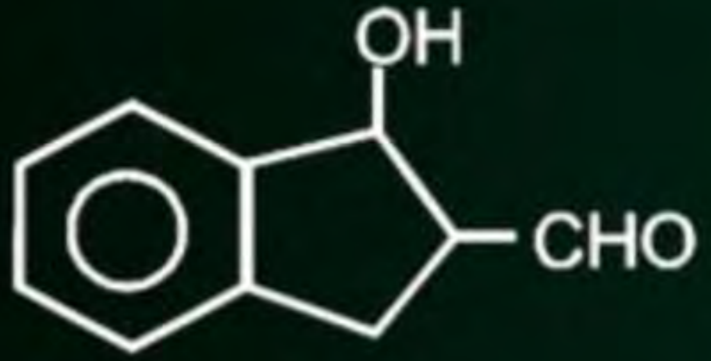
QUESTION 04

In the given reaction sequence, B is:

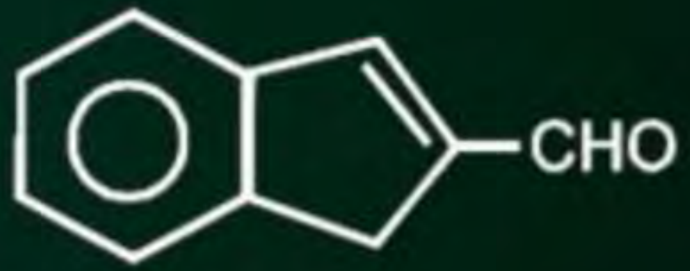


$\xrightarrow[\text{(2) Zn/H}_2\text{O}]{\text{(1) O}_3}$ (A) $\xrightarrow{\overset{\ominus}{\text{O}}\text{H}/\Delta}$ (B)

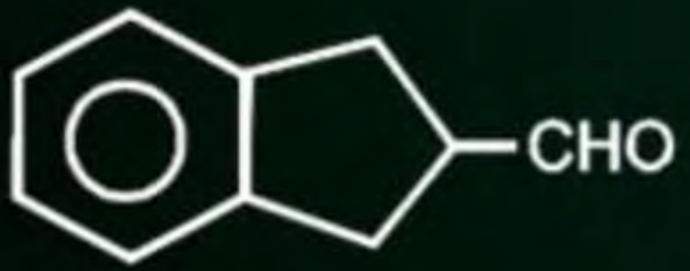
A



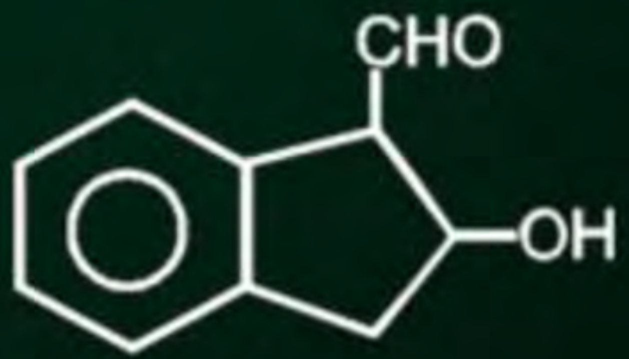
B



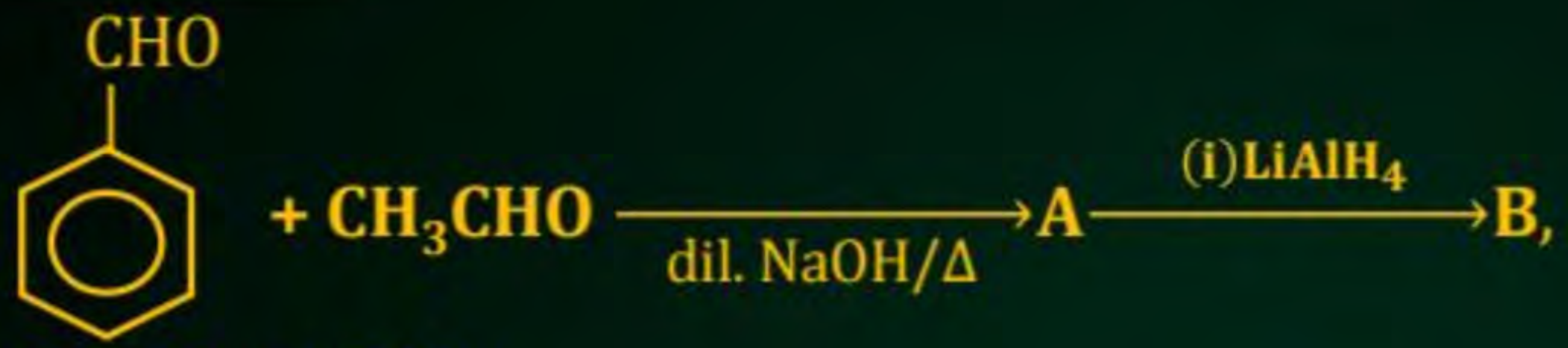
C



D

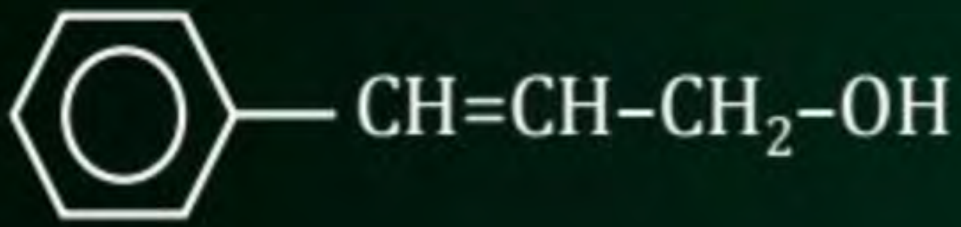


QUESTION 05

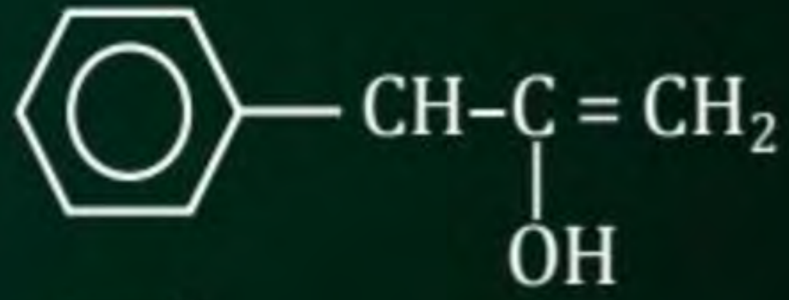


$+ CH_3CHO \xrightarrow[\text{dil. NaOH}/\Delta]{} A \xrightarrow{\text{(i)LiAlH}_4} B,$

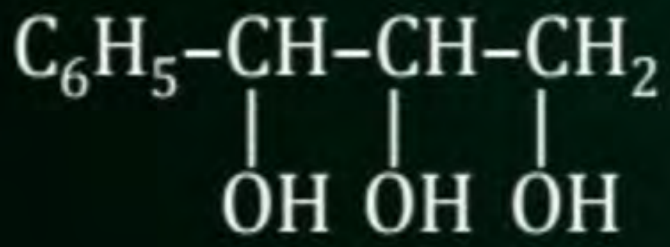
Copound 'B' is:

Ⓐ


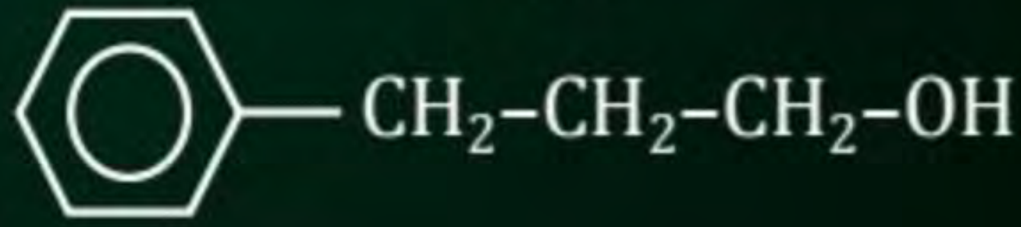
$C_6H_5-CH=CH-CH_2-OH$

Ⓑ


$C_6H_5-CH-C(OH)=CH_2$

Ⓒ


$C_6H_5-\underset{OH}{CH}-\underset{OH}{CH}-\underset{OH}{CH_2}$

Ⓓ


$C_6H_5-CH_2-CH_2-CH_2-OH$

QUESTION 06

The end product of the reaction is:

$$2CH_3\text{–}CHO \xrightarrow{OH^-} A \xrightarrow{\Delta} B \xrightarrow{[Ag(NH_3)_2]NO_3}$$

Ⓐ $Me - CH_2 - CH_2 - COOH$

Ⓑ $Me - CH = CH - COOH$

Ⓒ $Me - CH = CH - CH_2OH$

Ⓓ $MeCH_2CH_2CHO$

QUESTION 07

Which of the following would undergo aldol condensation?

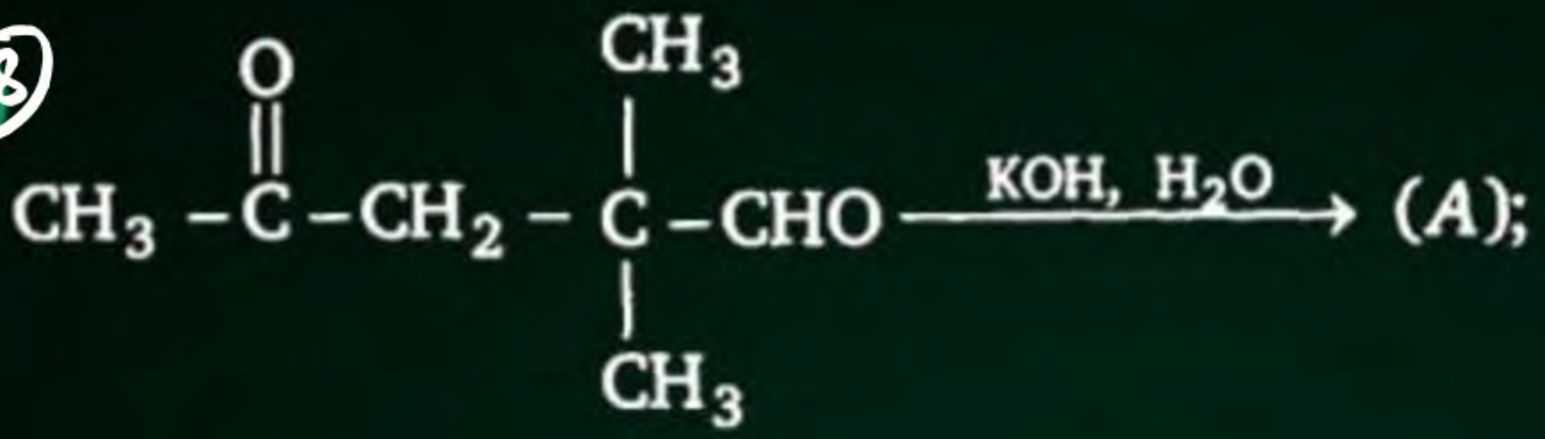
A CH_3CHO

B CCl_3CHO

C $HCHO$

D $(CH_3)_3CCHO$

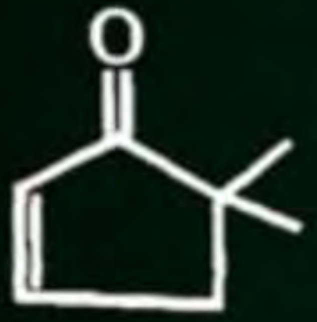
QUESTION 08



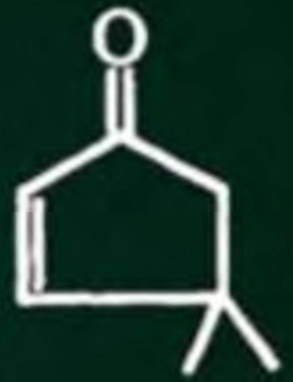
$$CH_3-\overset{O}{\overset{\|}{C}}-CH_2-\underset{CH_3}{\overset{CH_3}{\underset{|}{\overset{|}{C}}}}-CHO \xrightarrow{KOH,\ H_2O} (A);$$

Product A is:

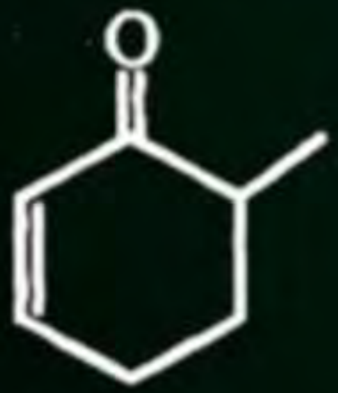
A



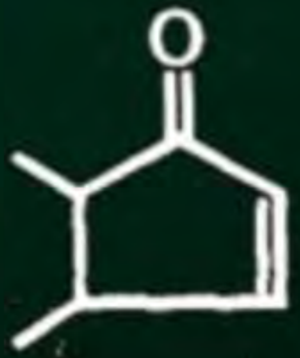
B



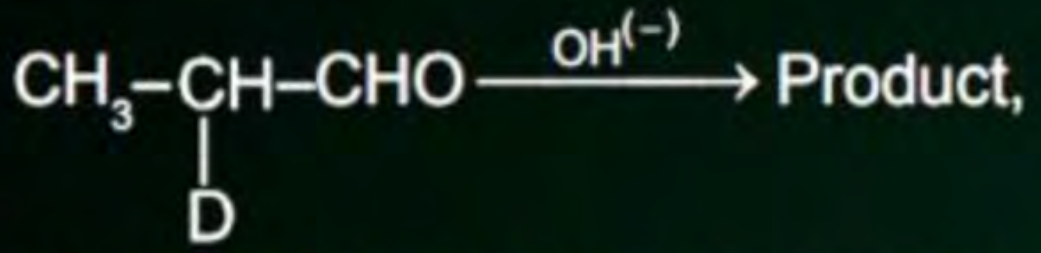
C



D



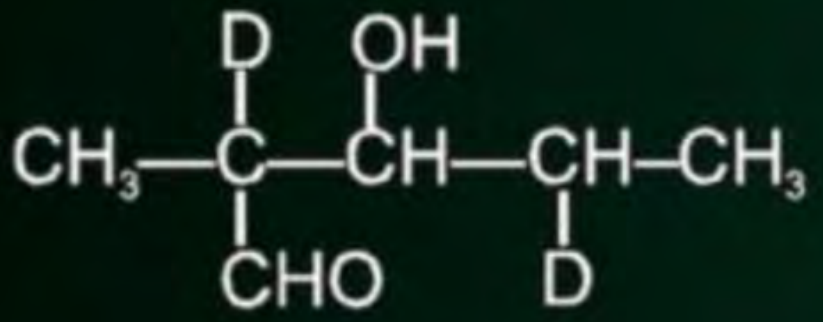
QUESTION 09



$$CH_3-\underset{D}{\underset{|}{CH}}-CHO \xrightarrow{OH^{(-)}} \text{Product,}$$

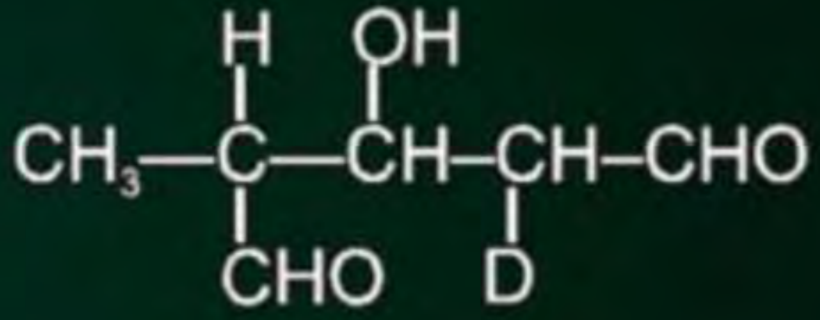
The product of this reaction would be:

A



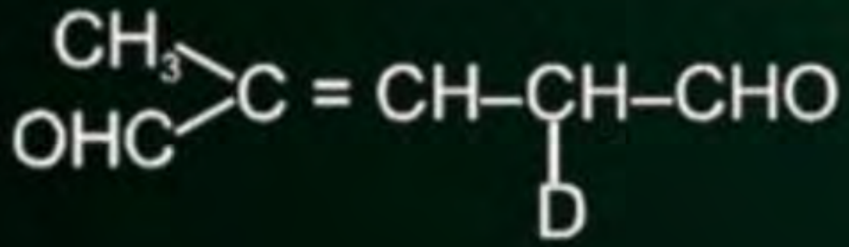
$$CH_3-\overset{D}{\overset{|}{\underset{CHO}{\underset{|}{C}}}}-\overset{OH}{\overset{|}{CH}}-\underset{D}{\underset{|}{CH}}-CH_3$$

B



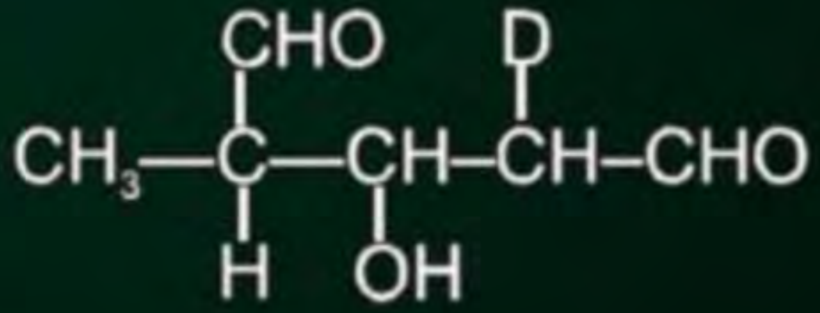
$$CH_3-\overset{H}{\overset{|}{\underset{CHO}{\underset{|}{C}}}}-\overset{OH}{\overset{|}{CH}}-\underset{D}{\underset{|}{CH}}-CHO$$

C



$$\begin{matrix}CH_3\\OHC\end{matrix}\!\!>C=CH-\underset{D}{\underset{|}{CH}}-CHO$$

D



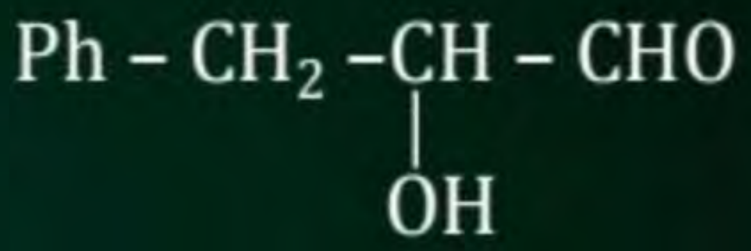
$$CH_3-\overset{CHO}{\overset{|}{\underset{H}{\underset{|}{C}}}}-\underset{OH}{\underset{|}{CH}}-\overset{D}{\overset{|}{CH}}-CHO$$

QUESTION ⑩

$Ph - CHO + CH_3 - CHO \xrightarrow{\overset{\ominus}{O}H/\Delta}$ Product is:

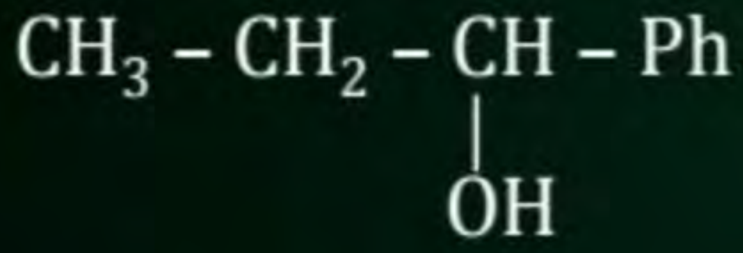
A $Ph - CH = CH - CHO$

B



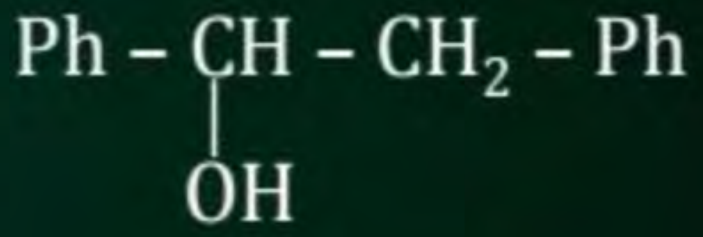
$Ph - CH_2 - \underset{\displaystyle OH}{\underset{|}{CH}} - CHO$

C



$CH_3 - CH_2 - \underset{\displaystyle OH}{\underset{|}{CH}} - Ph$

D



$Ph - \underset{\displaystyle OH}{\underset{|}{CH}} - CH_2 - Ph$

ANSWER KEY

1. B
2. B
3. B
4. B
5. D
6. B
7. A
8. B
9. A
10. A

PANKAJ SIR
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PhysicsWallah
अनुगच्छतु प्रवाहं
CH
CH2
SO3
H2O

Home Work From PW Module (Yakeen NEET)

Prarambh: Q 19, 26, 27, 32, 34, 41, 83

Prabal: Q 02, 04, 06, 07, 11, 19, 20, 22

Parikshit: Q 07, 11, 12, 14, 23, 34

Thank you!!

YAKEEN 2.0

FOR NEET 2025

Lecture- 07 Organic Chemistry

Aldehydes, Ketones and Carboxylic Acids

By- Pankaj Sir(POPU MAMA)

Physics Wallah

Topics *to be covered*

1. Cannizzaro Reaction ✓ (Part-02)
2. Methods of Preparation of Carboxylic Acids ✓
3. Practice

Cannizzaro Reaction

Req ÷ **Ald** do not have α-H

Reagent ÷ conc. Alkali

$\bar{O}H$

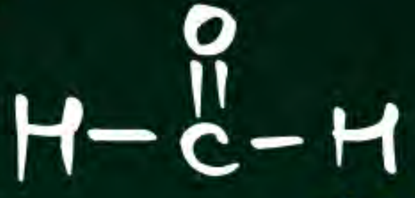
NaOH

KOH

or

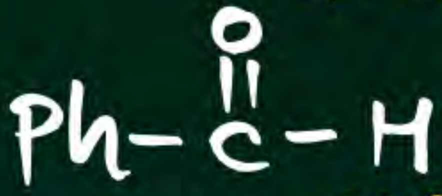
50% KOH/NaOH

Q Cannizzaro Rxn is givenby ?



$H-\overset{O}{\overset{||}{C}}-H$ ✓

αH(×)



$Ph-\overset{O}{\overset{||}{C}}-H$ ✓

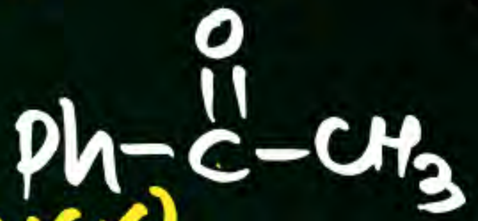
αH(×)

$\overset{\beta}{(CH_3)_3}\overset{\alpha}{C}-CHO$ ✓

αH(×)

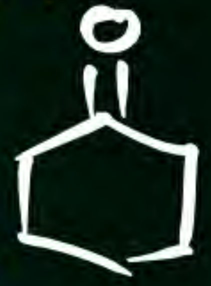
$Ph-CH_2-CHO$ ×

αH(✓)

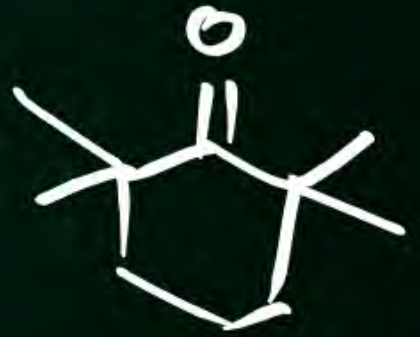


$Ph-\overset{O}{\overset{||}{C}}-CH_3$ ×

αH(✓)

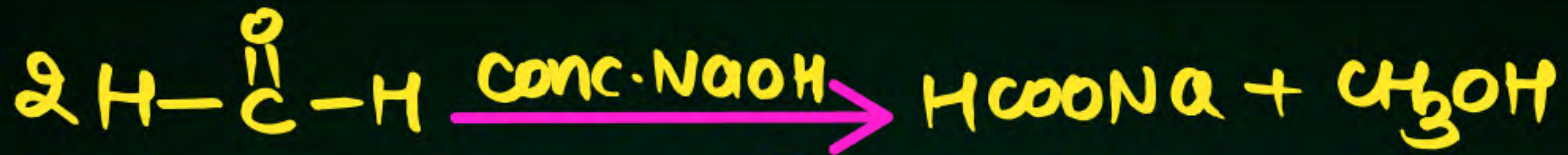


αH (✓) ×

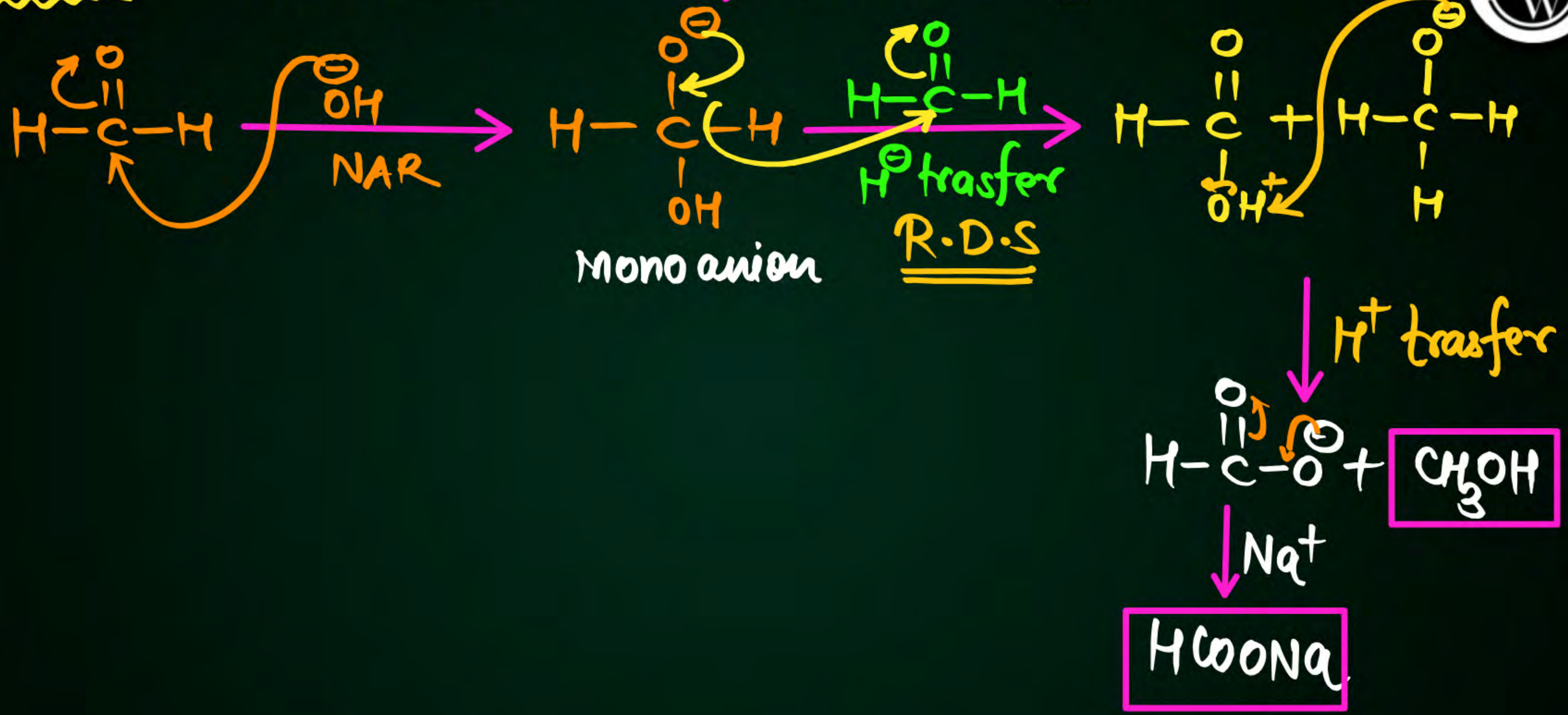


× αH(×)

Mechanism :-



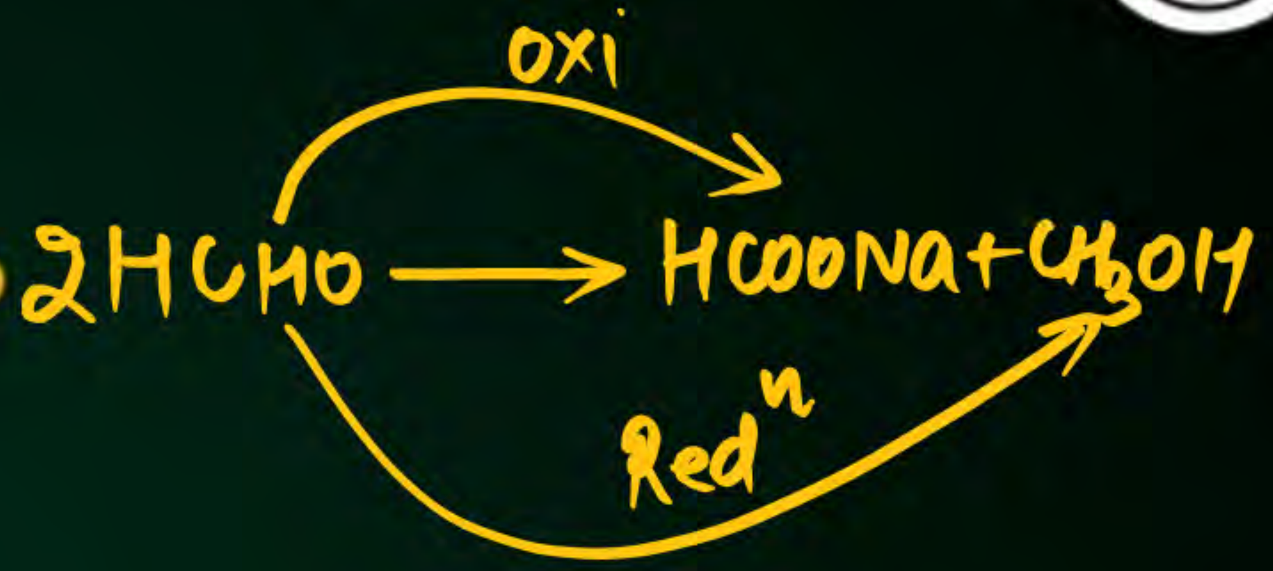
$$2\,H-\overset{O}{\overset{\|}{C}}-H \xrightarrow{conc.NaOH} HCOONa + CH_3OH$$


$\overset{\ominus}{OH}$
NAR
Mono anion
$H^{\ominus}$ trasfer
R.D.S
H^{+} trasfer
Na^{+}
CH_3OH
HCOONa

OP Points

1. Hydride transfer is the R.D.S.

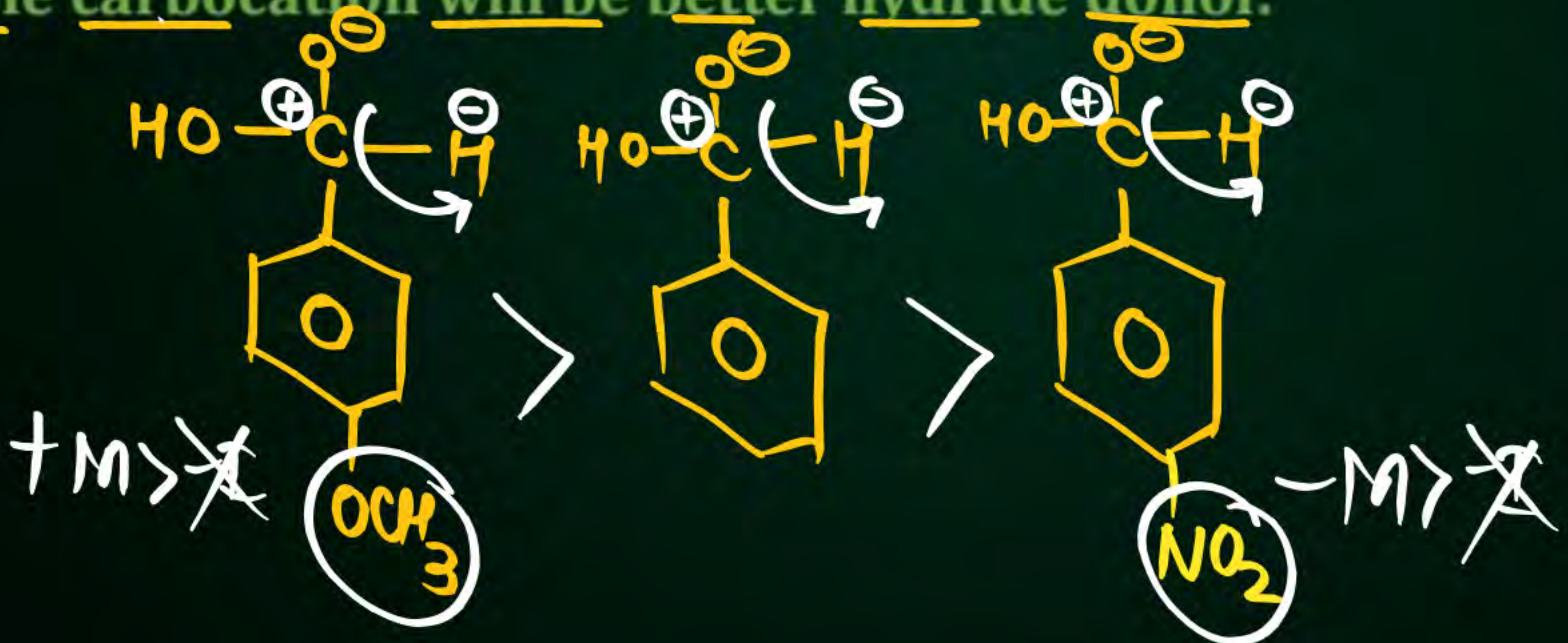
2. Disproportionation reaction in self cannizzaro



$2HCHO \rightarrow HCOONa + CH_3OH$

3. H⁻ and H⁺ Both type of transfer.

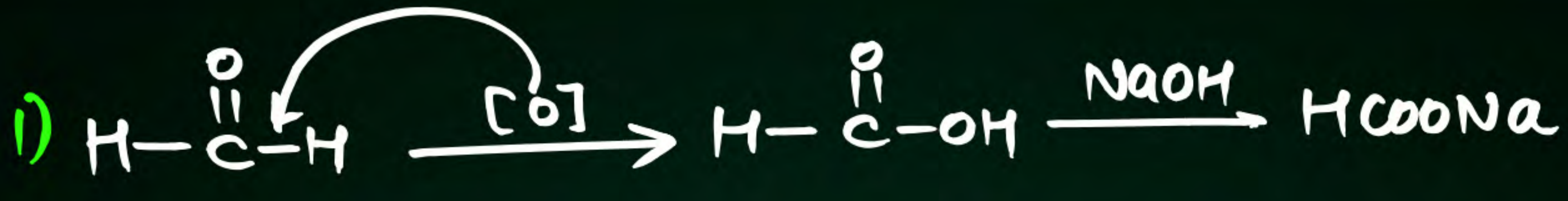
4. Stable carbocation will be better hydride donor.



HO
C
H
O
⊕
⊖
OCH3
NO2
>
>
+M > I
-M > I

D.M

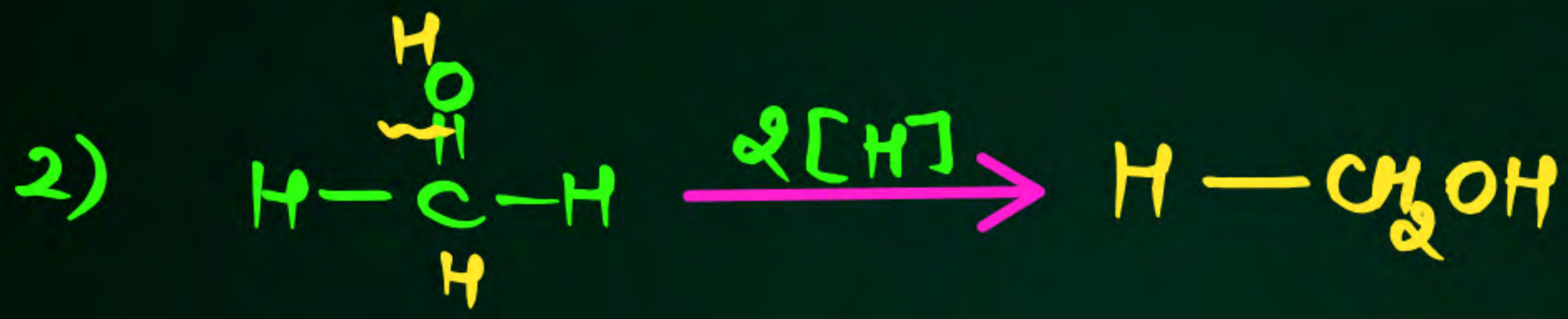
1)



$$H-\overset{O}{\overset{\|}{C}}-H \xrightarrow{[O]} H-\overset{O}{\overset{\|}{C}}-OH \xrightarrow{NaOH} HCOONa$$

$$H-\boxed{CHO} \longrightarrow H-\boxed{COONa}$$

2)



$$H-\overset{\overset{H}{O}}{\overset{\|}{\underset{H}{C}}}-H \xrightarrow{2[H]} H-CH_2OH$$

$$H-\boxed{CHO} \longrightarrow H-\boxed{CH_2OH}$$

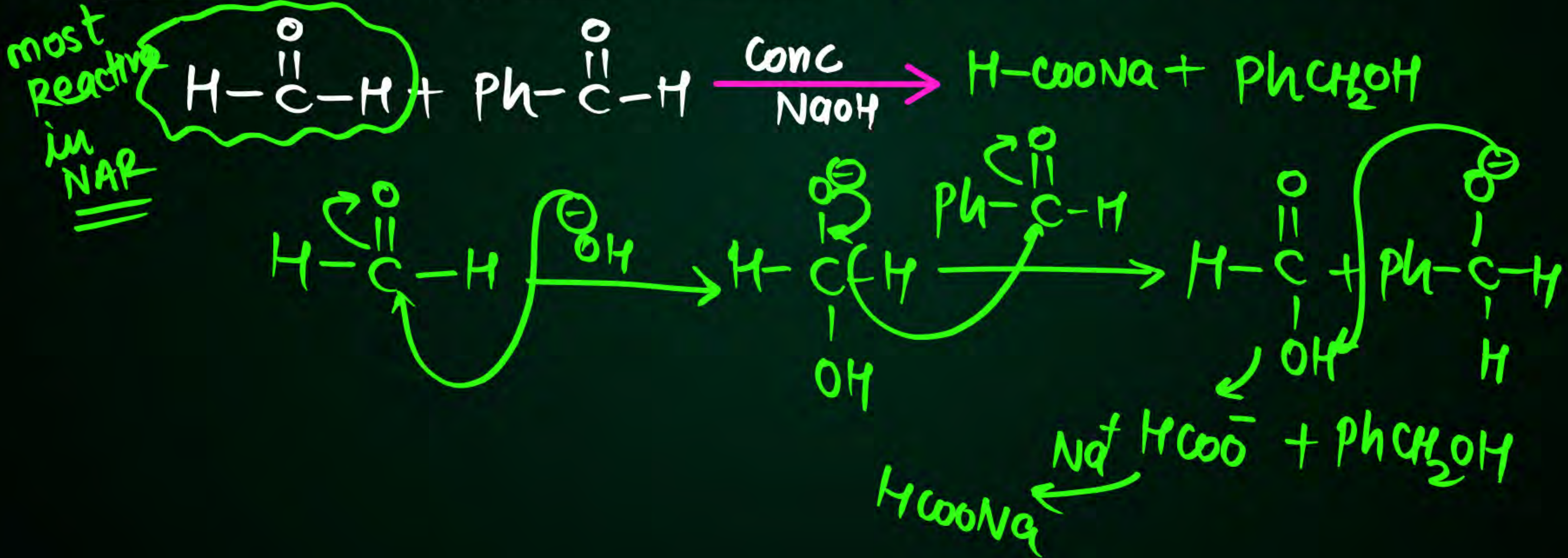
$Alco \xrightarrow{oxi} Ald \xrightarrow{oxi} Car$

$Alco \xleftarrow[Red]{} Ald \xleftarrow[Red]{} acid$

Cross Cannizzaro Reaction:

2 diff Ald → contain no α-H

1. It is redox but not disproportionation reaction.
2. More electrophilic Aldehyde will oxidize. (More Reactive in NAR)



$$H-\overset{O}{\overset{\|}{C}}-H + Ph-\overset{O}{\overset{\|}{C}}-H \xrightarrow[NaOH]{Conc} H-COONa + PhCH_2OH$$

most Reactive in NAR
$\overset{\ominus}{O}H$
$Na^+ HCOO^- + PhCH_2OH$
HCOONa

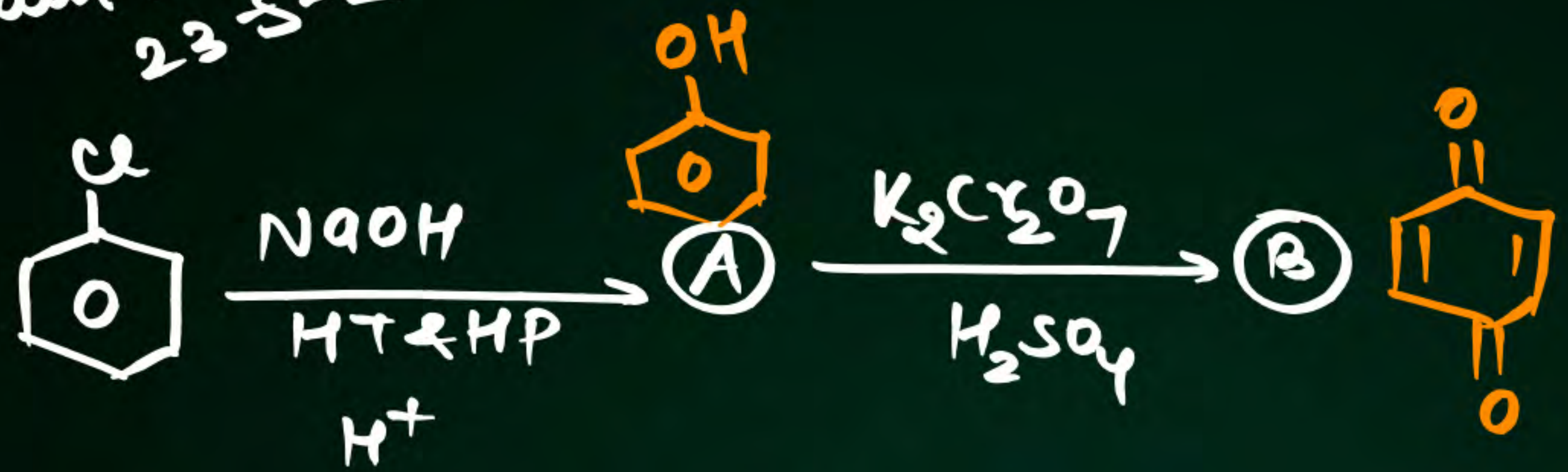
Q $2Ph-\boxed{CHO} \xrightarrow{conc\,KOH} Ph\boxed{COOK} + Ph-\boxed{CH_2OH}$

Q $Me_3C-\boxed{CHO} \xrightarrow{''} Me_3C-\boxed{COOK} + Me_3C-\boxed{CH_2OH}$

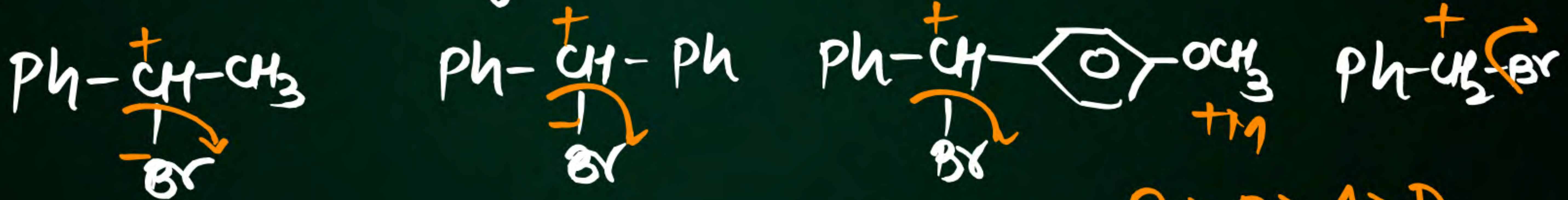
Q $\underbrace{H-\overset{O}{\overset{\|}{C}}-H} + Me_3C-CHO \xrightarrow{''} H-\boxed{COOK} + Me_3C-\boxed{CH_2OH}$

Jee main 2025
23-5-2

Q


Cl
NaOH
HT&HP
H+
OH
A
$K_2Cr_2O_7$
H_2SO_4
B
O
O

Q compare Rate of solvolysis

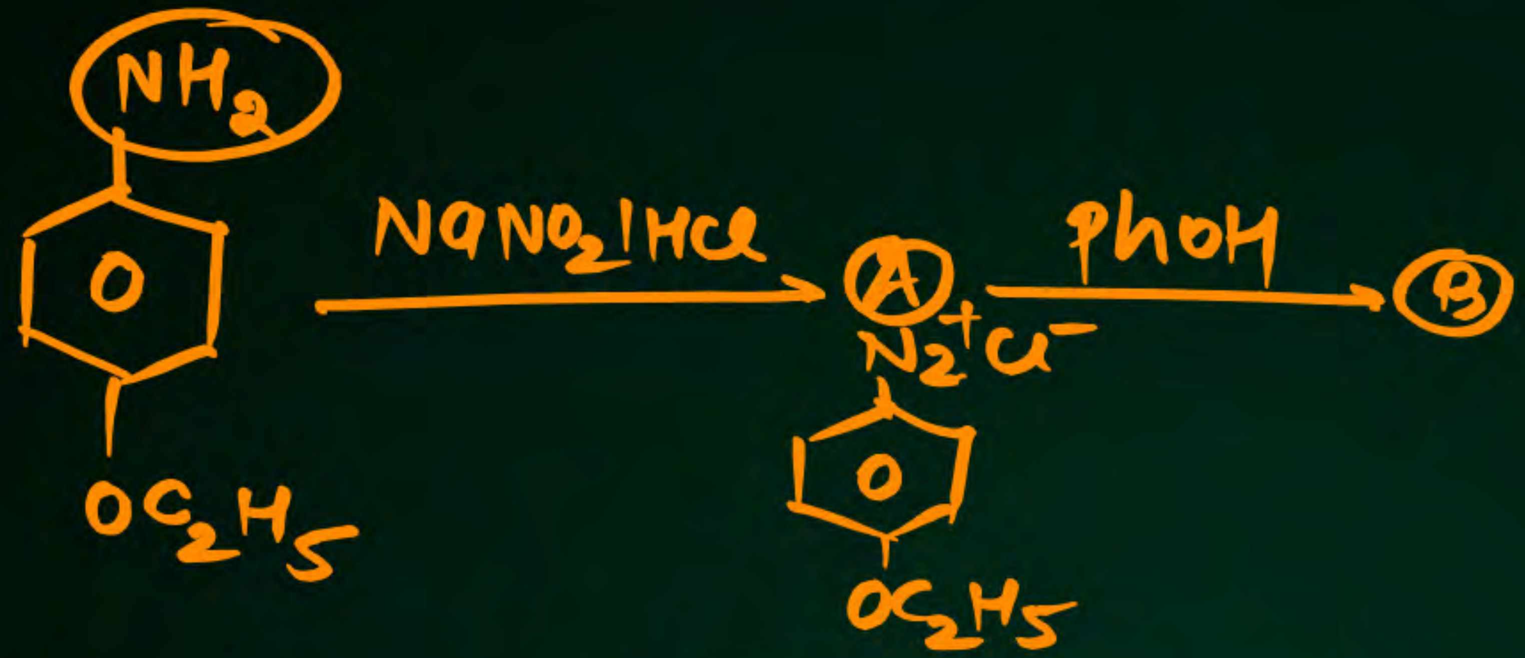

Ph-CH-CH3
Br
+
Ph-CH-Ph
Br
+
Ph-CH
Br
OCH3
+M
+
Ph-CH2-Br
+

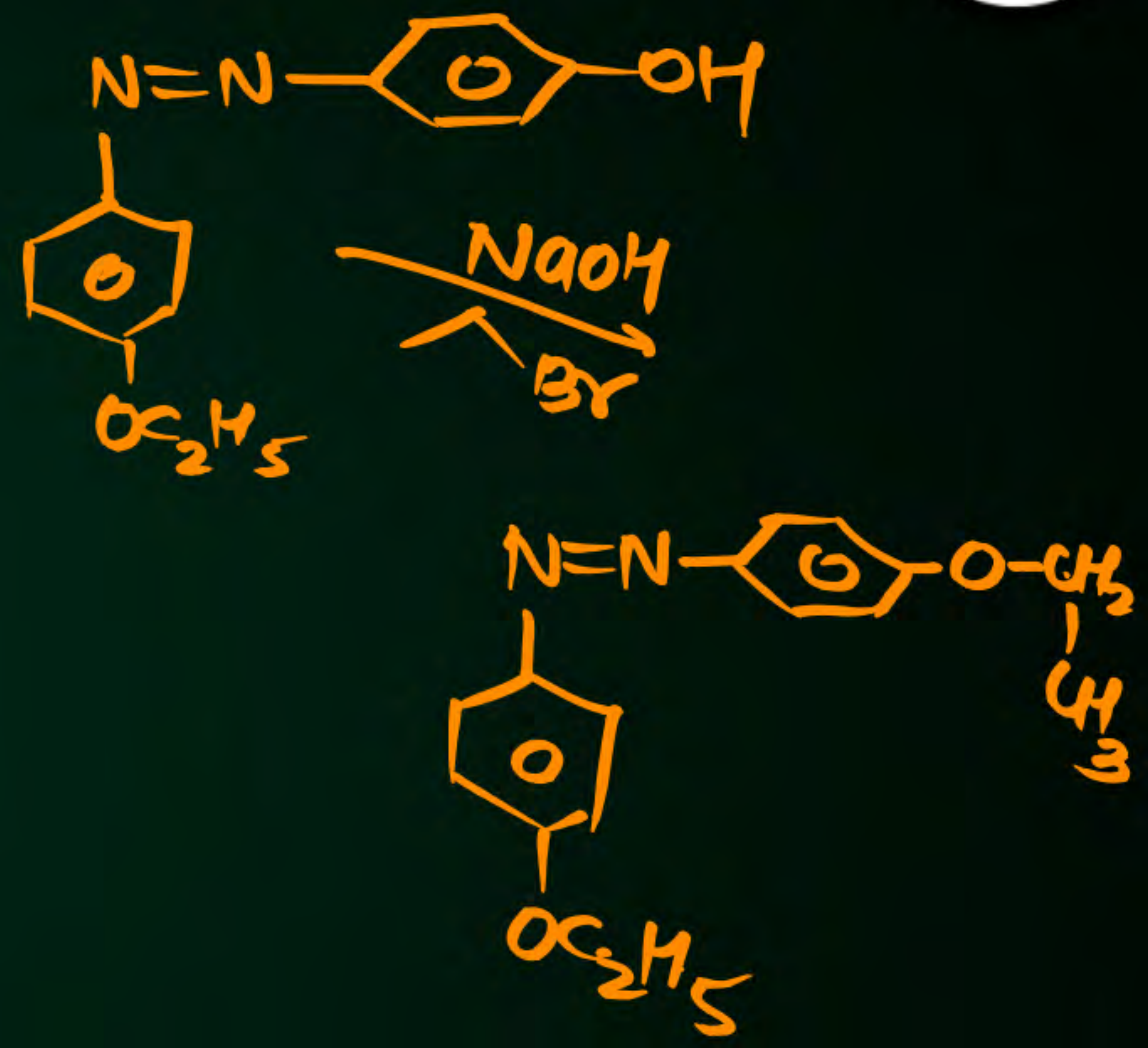
C > B > A > D

Q α- Helix & β-pleated sheet

A) 1°
[✓ B) 2°]
C) 3°
D) 4°

Q.


NH2
OC2H5
NaNO2/HCl
A
N2+Cl-
OC2H5
PhOH
B

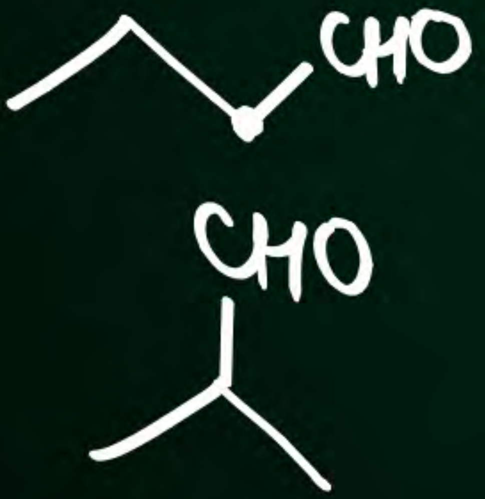

N=N
OH
OC2H5
NaOH
Br
N=N
O–CH2
CH3
OC2H5

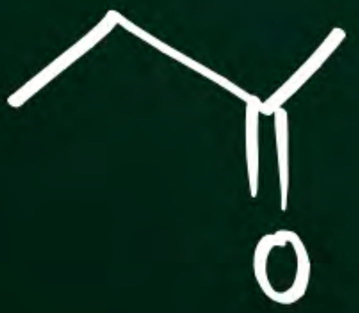
Ans: ④

sp^3 'C'

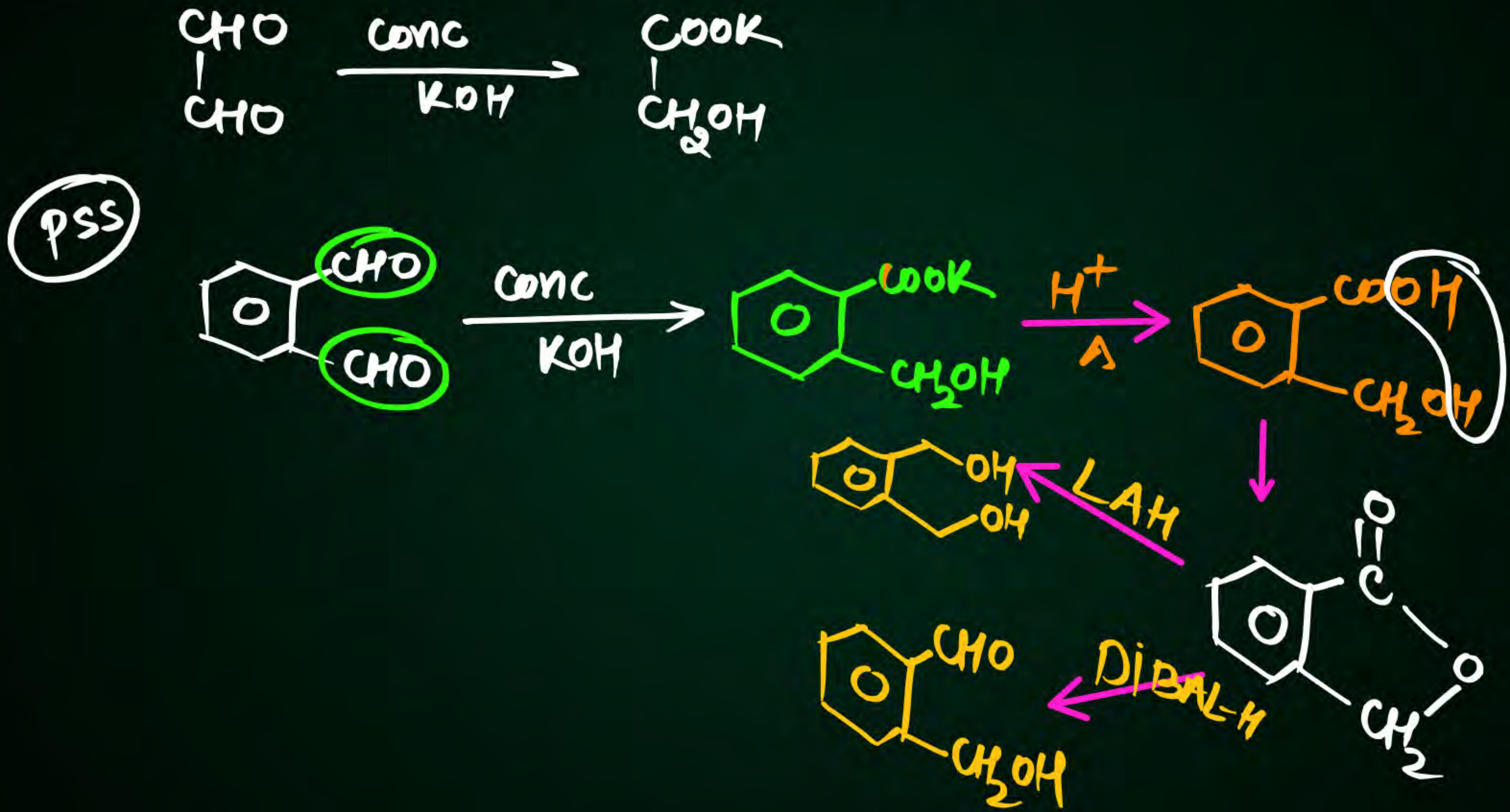
Q Total Ald & Ket of MF C_4H_8O

DU = 1



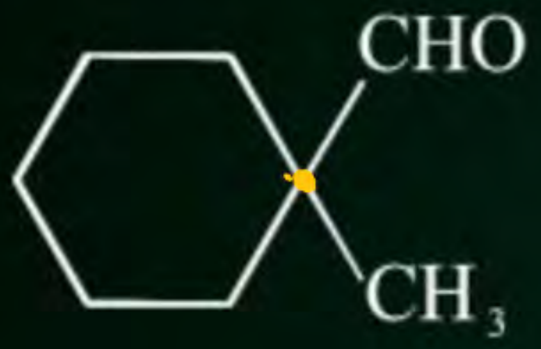


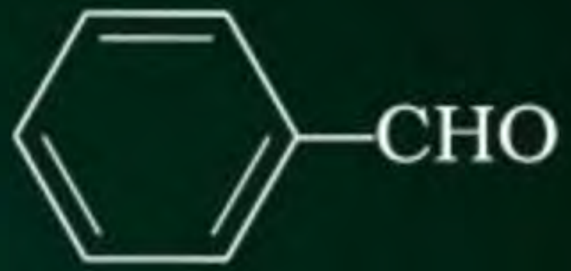
Intramolecular Cannizzaro Reaction:


CHO
CHO
conc
KOH
COOK
CH₂OH
PSS
CHO
CHO
conc
KOH
COOK
CH₂OH
H⁺
Δ
COOH
CH₂OH
OH
OH
LAH
O
C
O
CH₂
DIBAL-H
CHO
CH₂OH

QUESTION (NCERT Exemplar)

Cannizzaro's reaction is not given by ________.

A


B


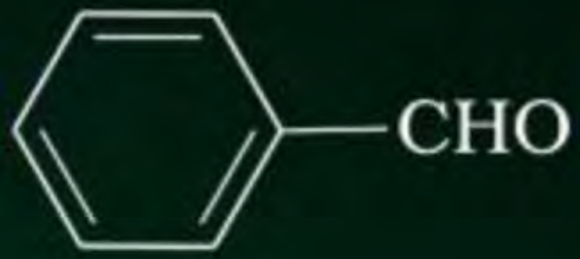
C HCHO

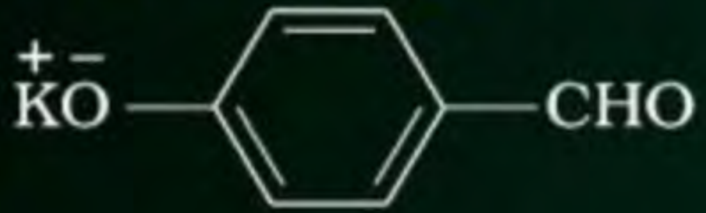
[✓ D] CH_3CHO

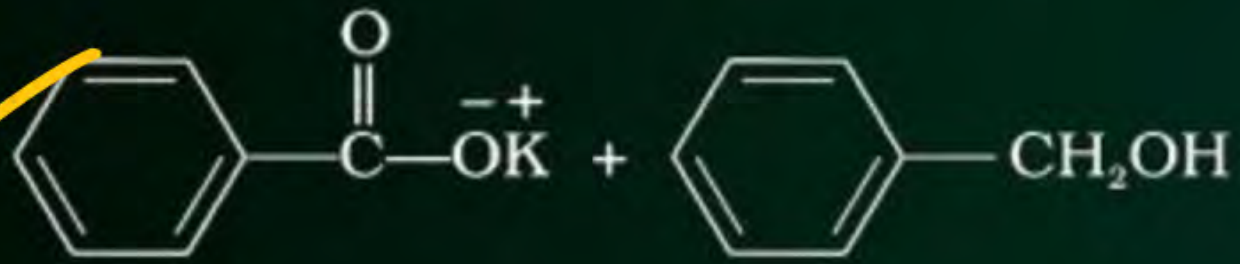
αH(✓)

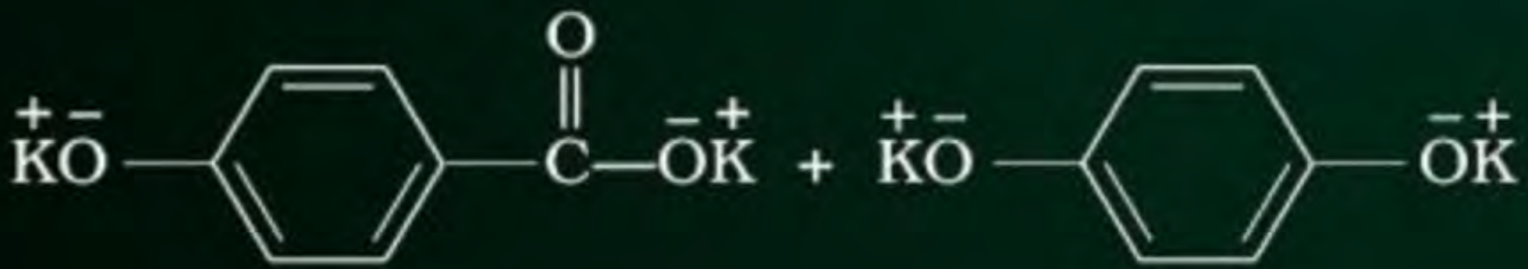
Canni(✗)

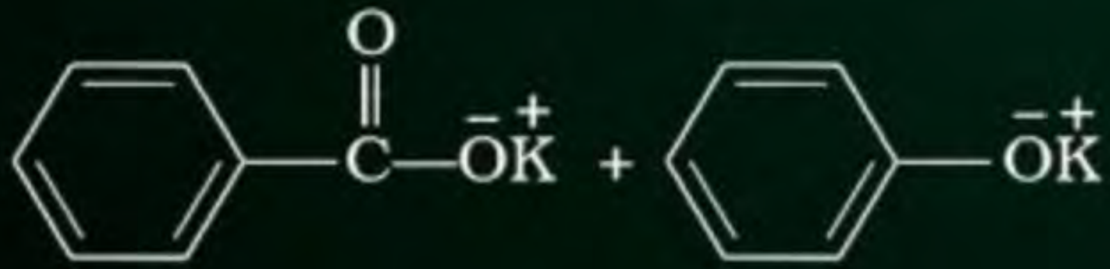
QUESTION (NCERT Exemplar)

Which product is formed when the compound  is treated with concentrated aqueous KOH solution?

A 

B 

C 
KO
O
C
OK
+
KO
OK

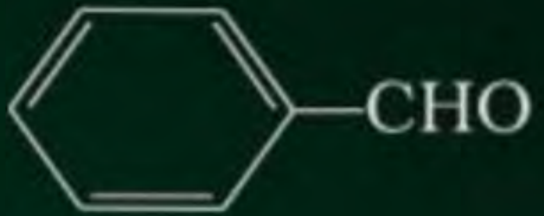
D 

QUESTION (NCERT Exemplar)

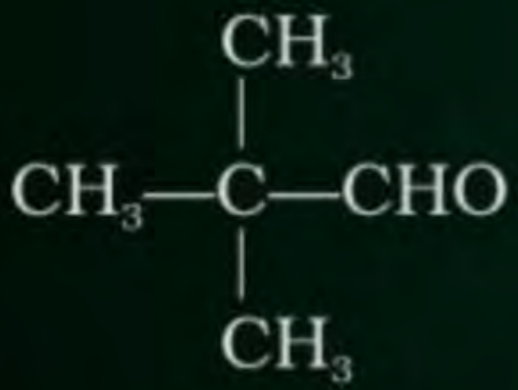
Which of the following compounds do not undergo aldol condensation?

(A) $CH_3—CHO$

(B)



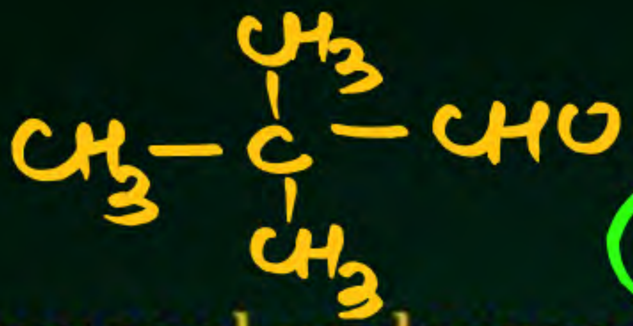
(C)



$$CH_3—\underset{\displaystyle CH_3}{\overset{\displaystyle CH_3}{\overset{|}{\underset{|}{C}}}}—CHO$$

[✓ (D) Both (B) & (C)]

QUESTION (AIIMS 2012)



$CH_3-\overset{CH_3}{\underset{CH_3}{C}}-CHO$

αH ×

Assertion: 2, 2–dimethyl propanal undergoes Cannizzaro reaction with conc. NaOH.

Reason: Cannizzaro reaction is a disproportionation reaction.

- **A** If both Assertion and Reason are correct and the Reason is the correct explanation of Assertion.
- [✓ **B**] If both Assertion and Reason are correct but Reason is not the correct explanation of Assertion.
- **C** If Assertion is correct but Reason is incorrect.
- **D** If both the Assertion and Reason are incorrect.

QUESTION

In the Cannizzaro reaction given below:

$$2\text{Ph–CHO} \xrightarrow{\bar{O}H} \text{PhCH}_2\text{OH} + \text{PhCOO}^-$$

the slowest step is: $H^{\ominus}$ trasfer

A × The attack of OH^- at the carbonyl group.

B ✓ The transfer of hydride ion to the carbonyl group.

C The abstraction of proton from carboxylic acid.

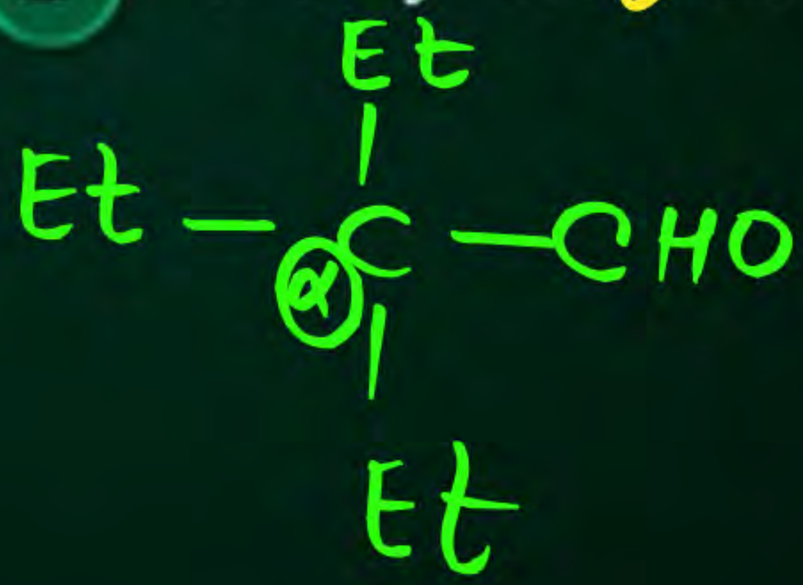
D The deprotonation of $PhCH_2OH$.

QUESTION

$\alpha H \times$

Cannizzaro's reaction is not given by:

- **A** ✓ CH_3CHO $\alpha H(\checkmark)$
- **B** $HCHO$ ✓
- **C** benzaldehyde
  PhCHO
- **D** triethyl acetaldehyde



$Et-\underset{Et}{\overset{Et}{C}}-CHO$

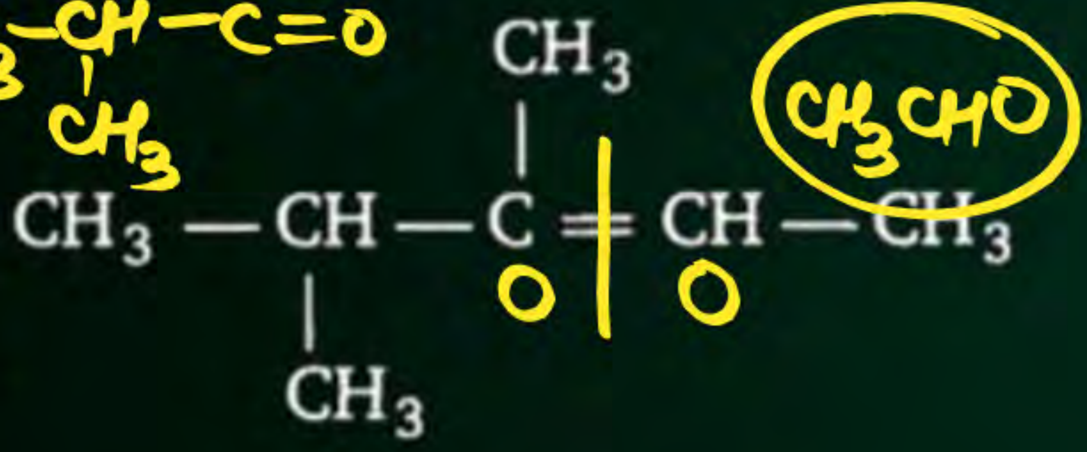
QUESTION

$$\underset{C_7H_{14}}{(A)} \xrightarrow[\boxed{Zn}\ AcOH]{O_3} (B) + (C)$$

Reduc

Compound (A) exist in geometrical isomers and (B) gives Cannizzaro reaction. (A) will be:

$CH_3-\underset{CH_3}{CH}-\overset{CH_3}{C}=O$

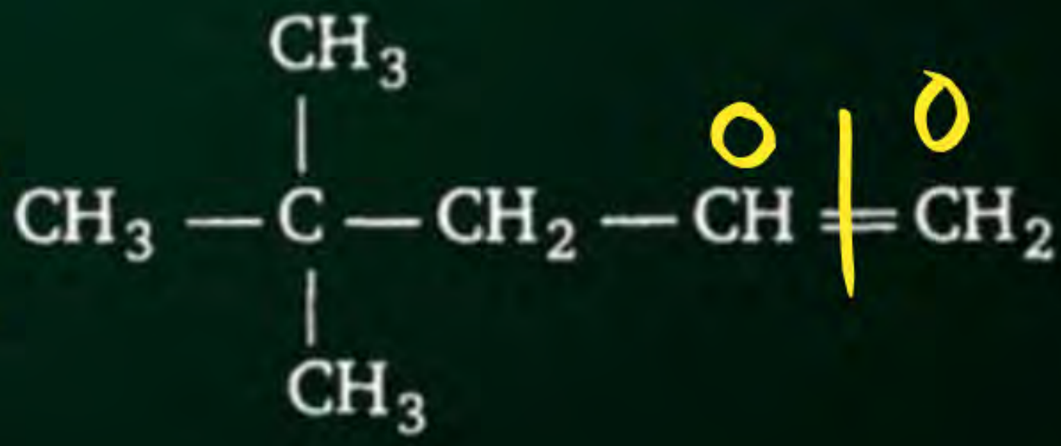


(A) $CH_3-\underset{CH_3}{CH}-\overset{CH_3}{\underset{O}{C}}=\underset{O}{CH}-CH_3$

$\boxed{CH_3CHO}$

(B) $(CH_3)_3CCH_2-\overset{O}{CH}=\overset{O}{CH_2}$

(C) $\underbrace{(CH_3)_3C-\overset{O}{CH}}_{Me_3C-CHO}=\overset{O}{CH}-CH_3$



(D) $CH_3-\underset{CH_3}{\overset{CH_3}{C}}-CH_2-\overset{O}{CH}=\overset{O}{CH_2}$

QUESTION

$C^{\ominus}$ Less stable

sH

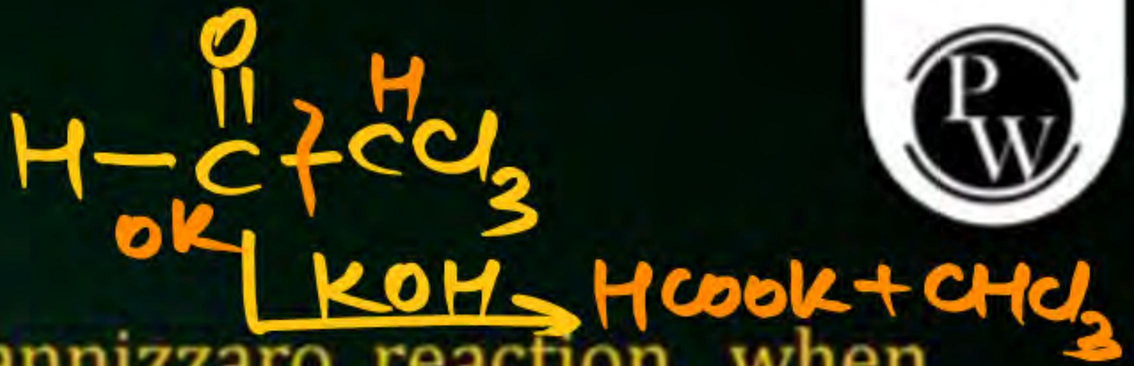
Me_2CHCHO

Cannizzaro ✓

in $^{\ominus}OH$ Haloform occurs

CCl_3-CHO

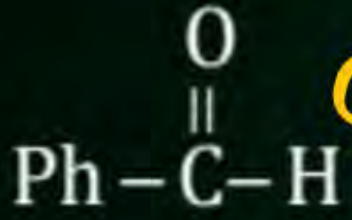
Cannizzaro ✗



O
H
H
CCl3
OK
KOH
HCOOK + CHCl3

Which of the following compounds will not undergo Cannizzaro reaction, when treated with 50% aqueous alkali?

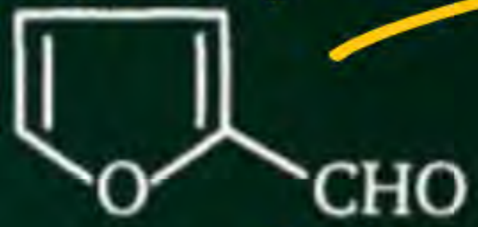
A



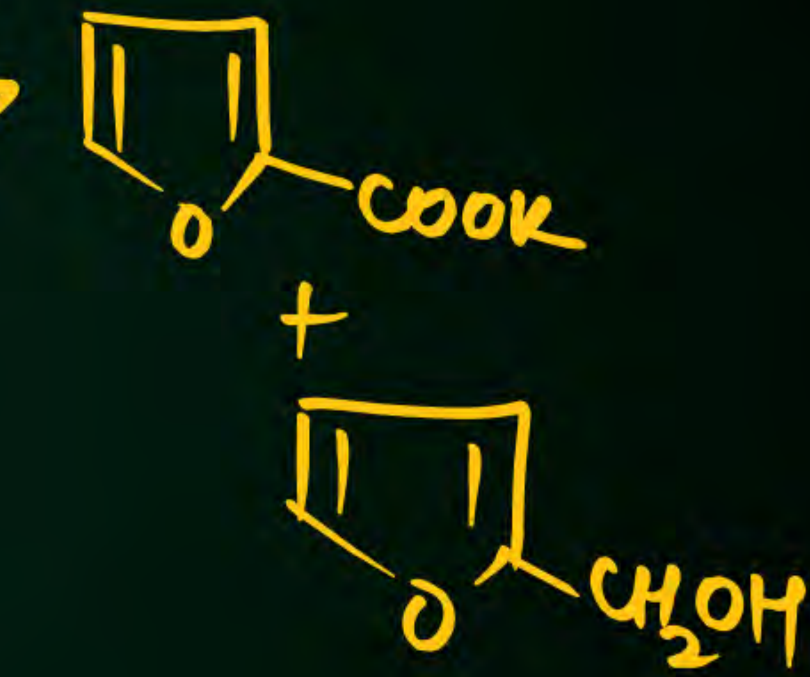
$Ph-\overset{\overset{O}{\|}}{C}-H$

Canni(✓)

B



Cannizaro(✓) 50%·KOH



O
COOK
+
O
CH2OH

✓

C Me_2CHCHO

αH(✓)

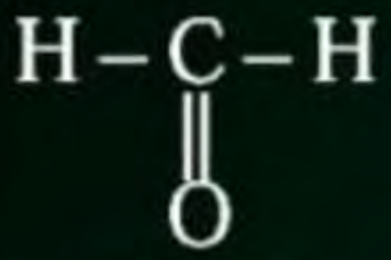
Cannizzaro ✓

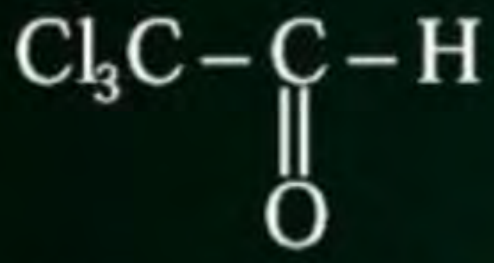
D $Ph-CH_2-CHO$

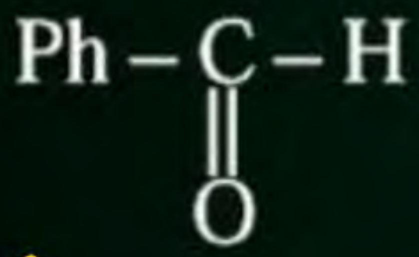
Aldol

QUESTION

Which of the following compound can show cannizzaro reaction?

(A) 
$H-\underset{\underset{O}{\|}}{C}-H$ ✓

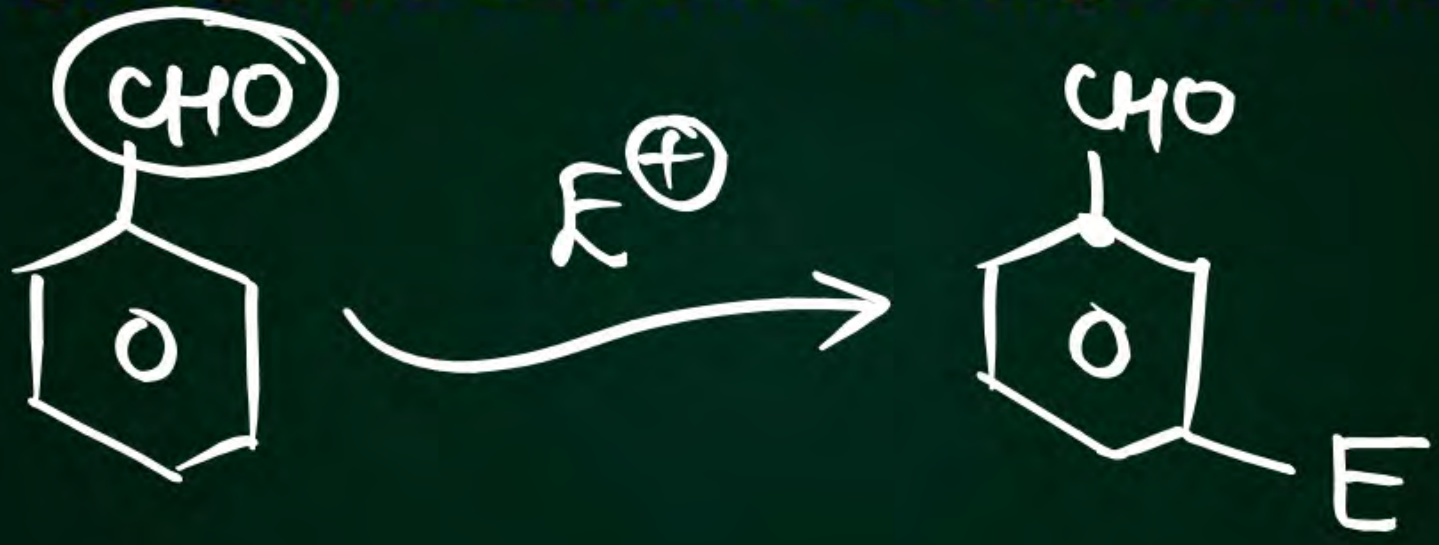
(B) 
$Cl_3C-\underset{\underset{O}{\|}}{C}-H$ Haloform

(C) 
$Ph-\underset{\underset{O}{\|}}{C}-H$ ✓

[✓ (D)] Both (A) & (C)

3. Electrophilic Substitution Reaction

Aromatic aldehydes and ketones undergo electrophilic substitution at the ring in which the carbonyl group acts as a deactivating and meta-directing group.



−M
meta
dir

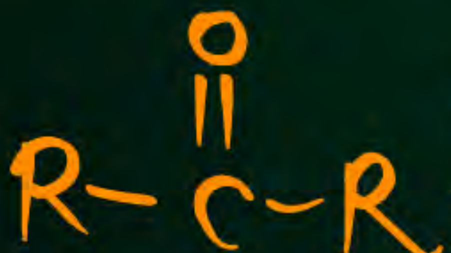
Methods of Preparation of Carboxylic Acids

1. From primary alcohols and aldehydes:

Already done

$$R-CH_2-OH \xrightarrow{SOA} R-COOH$$

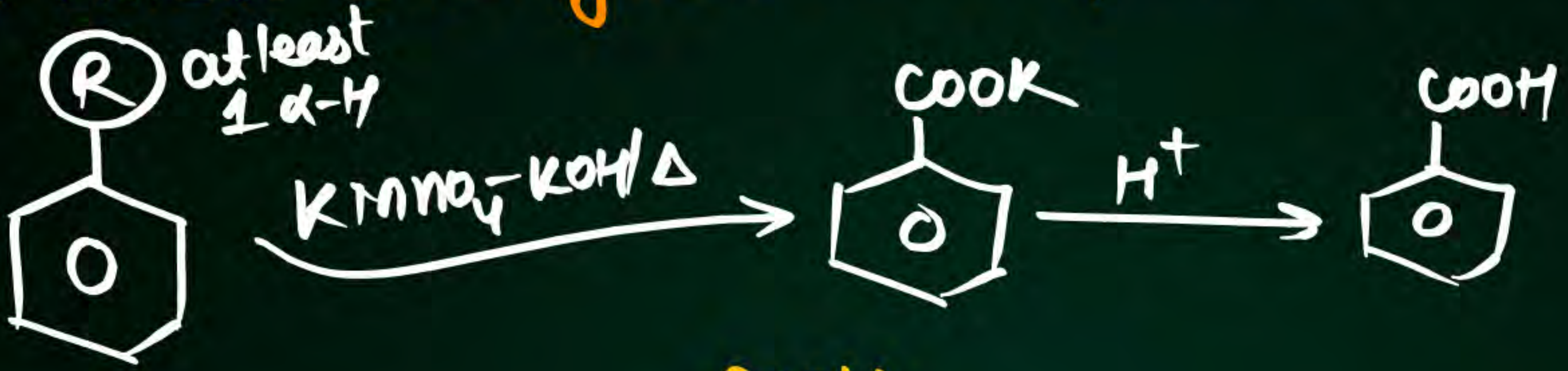
$$R-CHO \xrightarrow{SOA} R-COOH$$



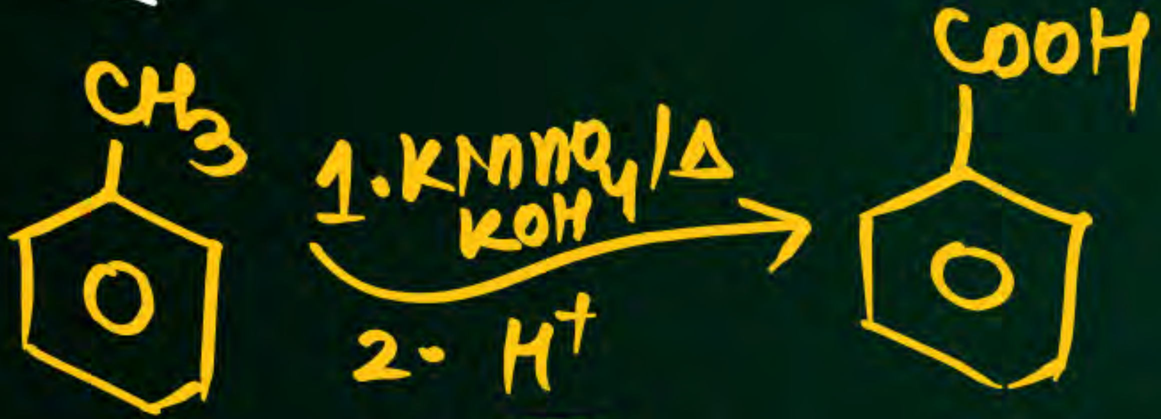
$$R-\overset{O}{\overset{\|}{C}}-R \xrightarrow[KMnO_4]{Hot}$$ popoff's rule

2. From alkyl benzene:

Req ÷ Atleast 1 Benzylic 'H' must be present


R
atleast
1 α-H
KMnO4-KOH/Δ
COOK
H+
COOH

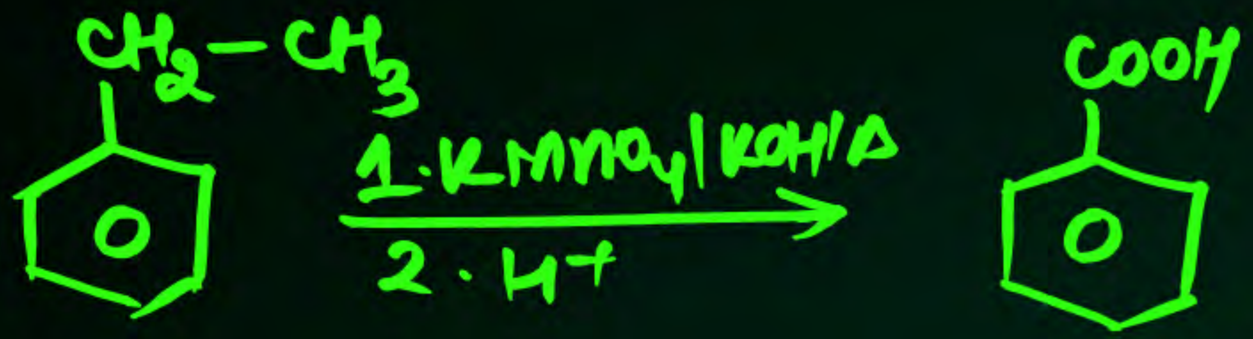
①


CH3
1. KMnO4/Δ
KOH
2. H+
COOH

$$Ph-CH_2-H \xrightarrow{[O]} Ph-\underbrace{CH_2-OH}_{} \xrightarrow{SOA} Ph-COOH$$

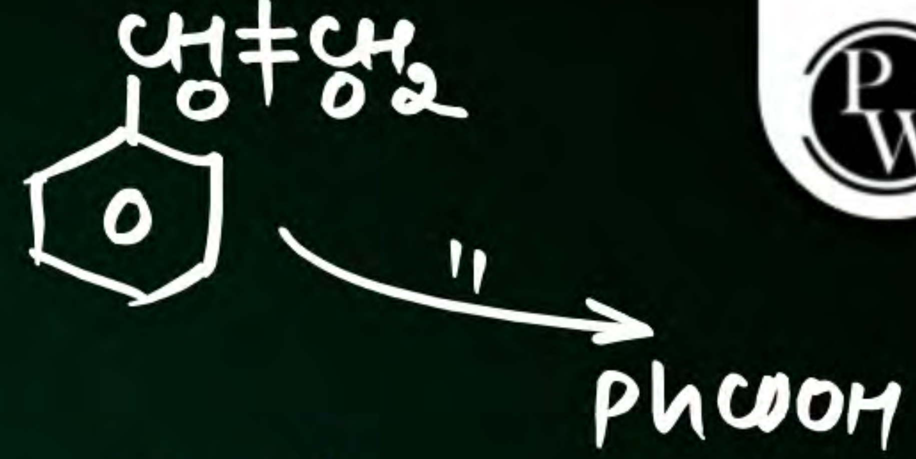
$$Ph-COOH \xrightarrow{KOH} PhCOOK \xrightarrow{H^+} PhCOOH$$

②



CH2-CH3
1. KMnO4|KOH/Δ
2. H+
COOH

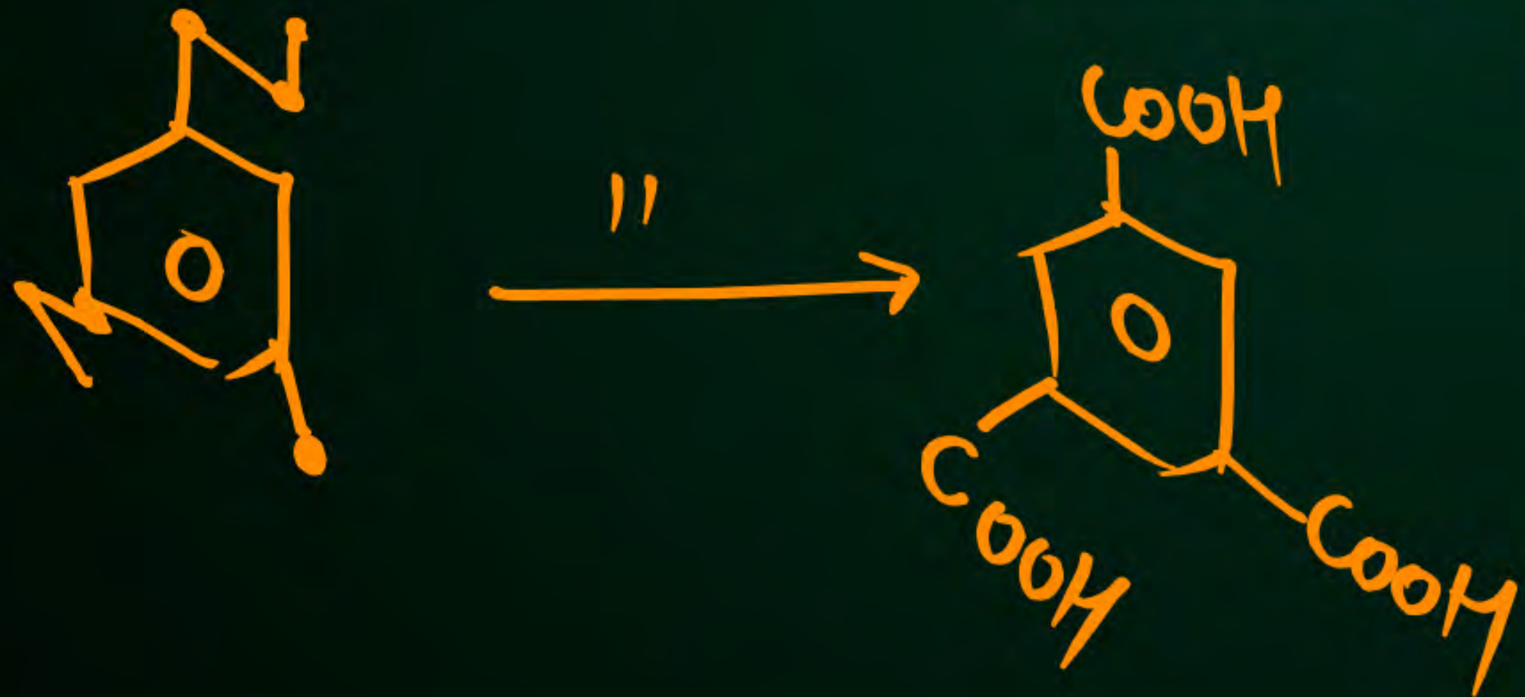
④



CH=CH2
″
PhCOOH

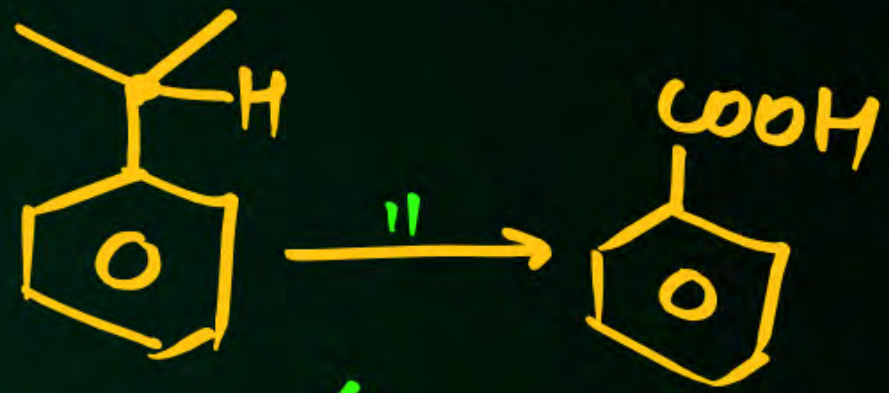
$$\begin{tikzcd} Ph-\overset{OH}{CH_2}\overset{OH}{CH_3} \arrow[r] & Ph-CH_2OH \arrow[d] & + & CH_3OH \arrow[d] \\ & \boxed{PhCOOH} & & HCHO \arrow[d] \\ & & & HCOOH \arrow[d] \\ & & & H_2CO_3 \arrow[d] \\ & & & \underline{CO_2 + H_2O} \end{tikzcd}$$

③

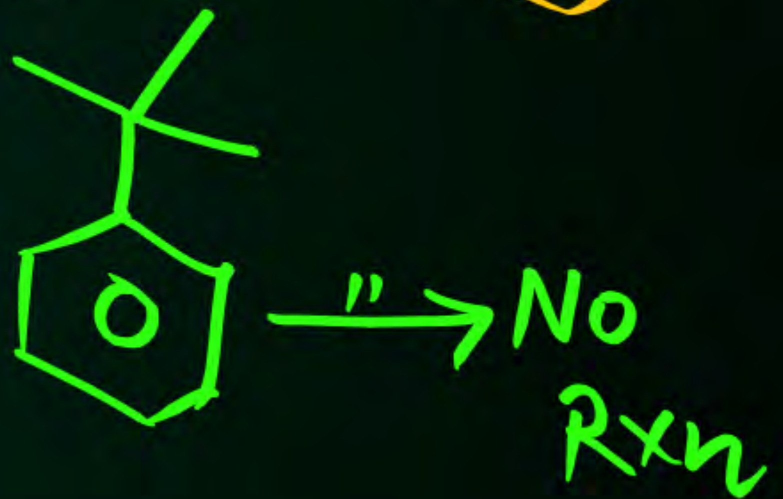


″
COOH
COOH
COOH

⑤

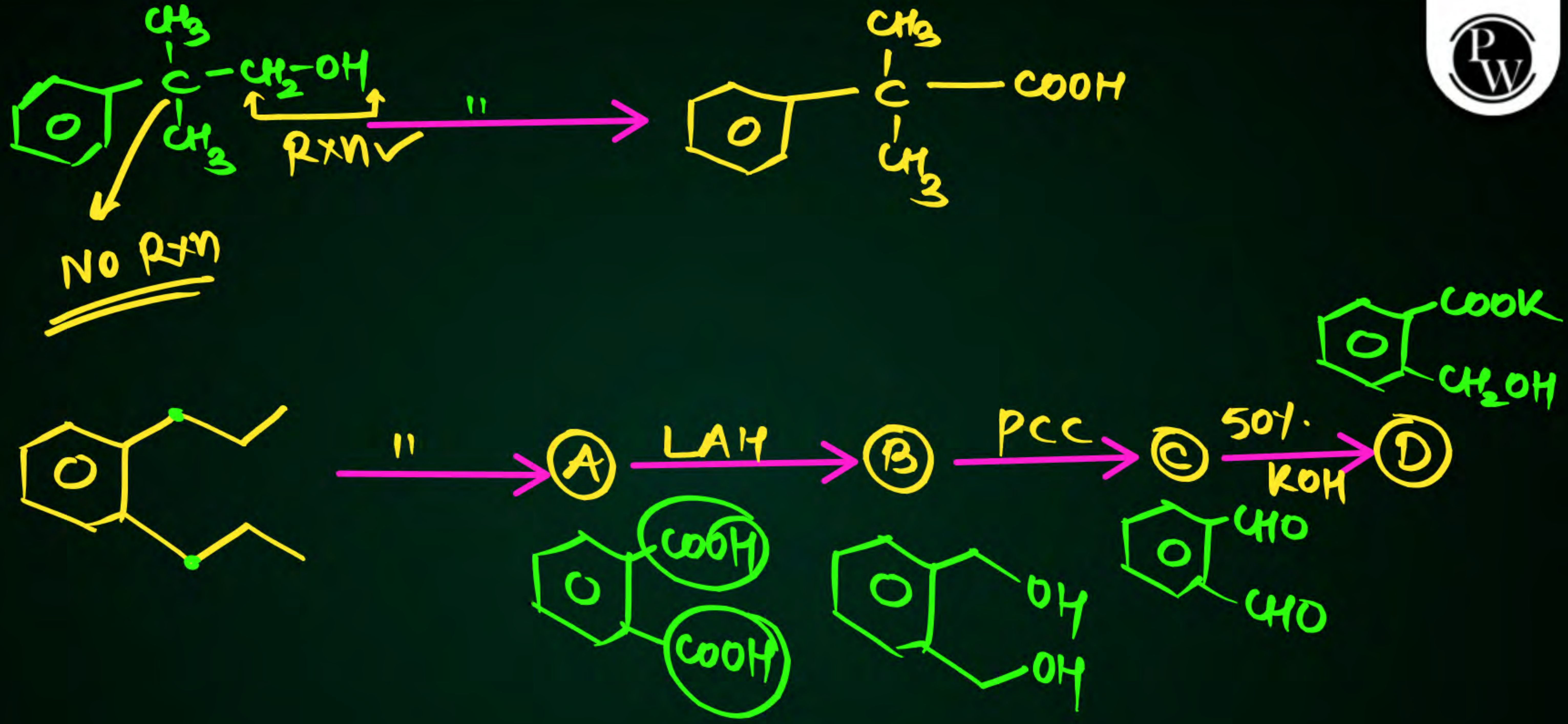


⑥



⑦

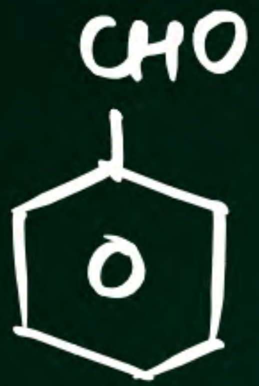
⑧


CH3
C
CH2-OH
CH3
Rxn ✓
"
CH3
C
COOH
CH3
No Rxn
"
A
LAH
B
PCC
C
50% KOH
D
COOK
CH2OH
COOH
COOH
OH
OH
CHO
CHO

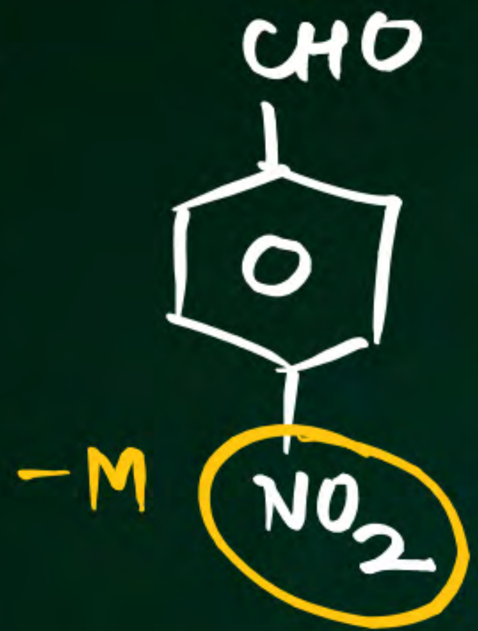
Q
JEE
main
24 Jan
S 1

Compare Rate of N·A·R

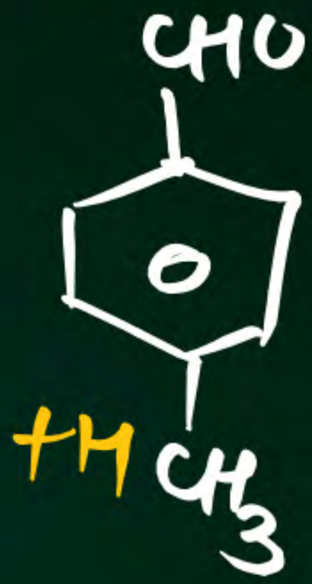
1



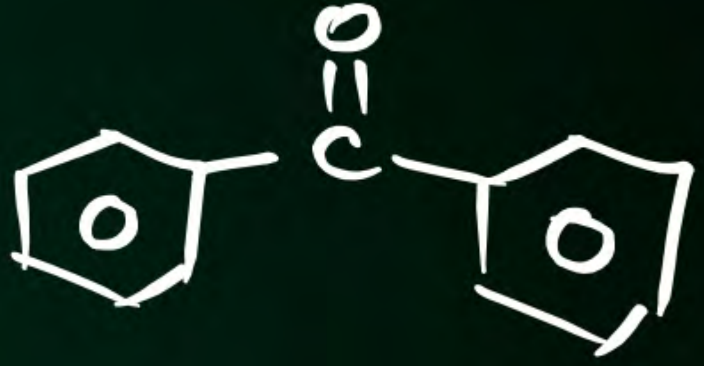
2



3

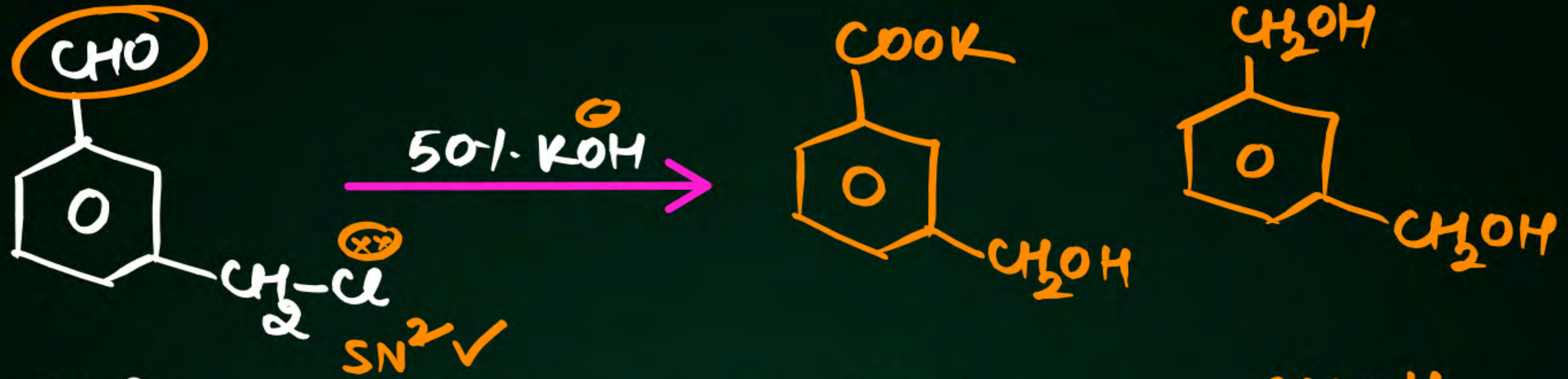


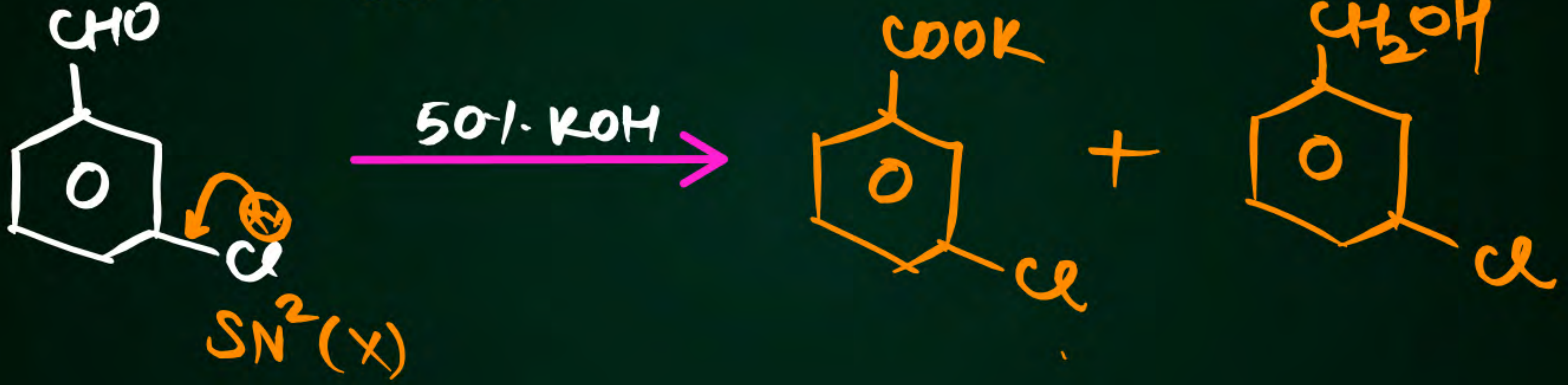
4



$$\underbrace{2 > 1 > 3}_{\text{Ald}} > \underbrace{4}_{\text{Ket}}$$

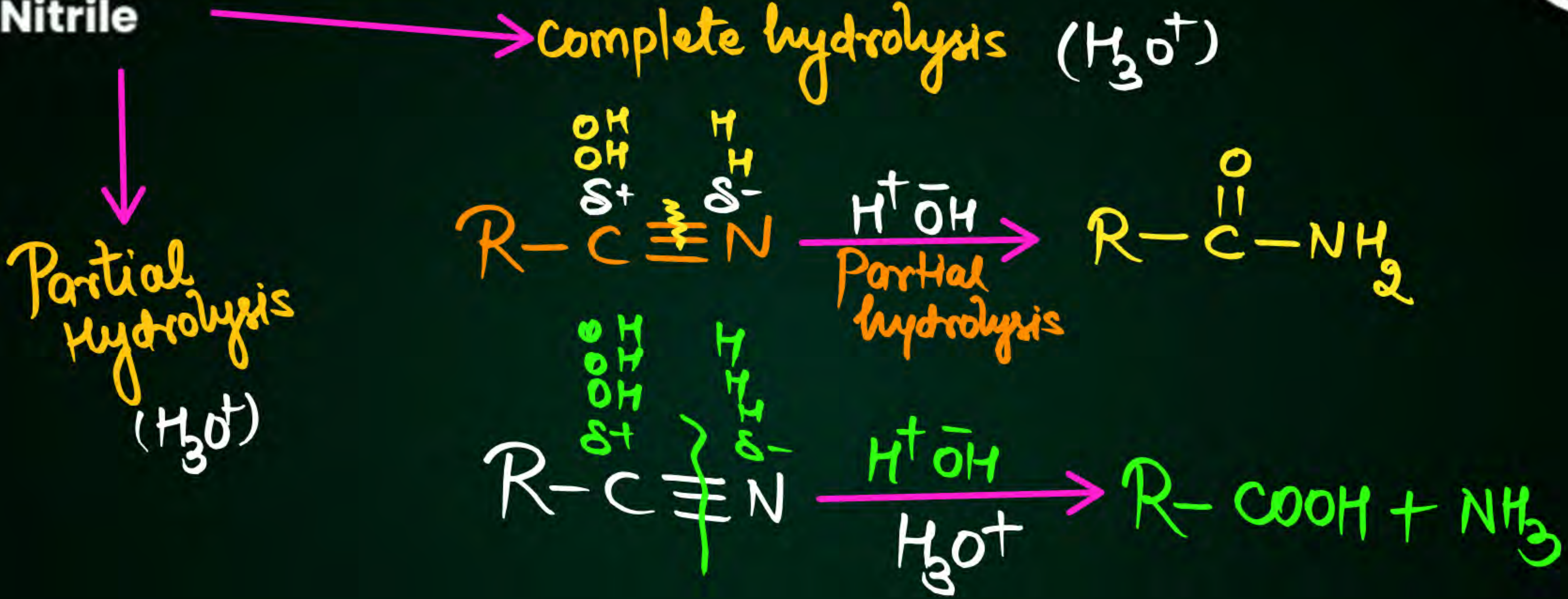
Q


CHO
CH_2-Cl
50% KOH
COOK
CH_2OH
CH_2OH
CH_2OH
SN^2 ✓


CHO
Cl
50% KOH
COOK
Cl
+
CH_2OH
Cl
SN^2 (X)

3. From hydrolysis of acid derivatives:

A. Nitrile



Complete hydrolysis (H_3O^+)

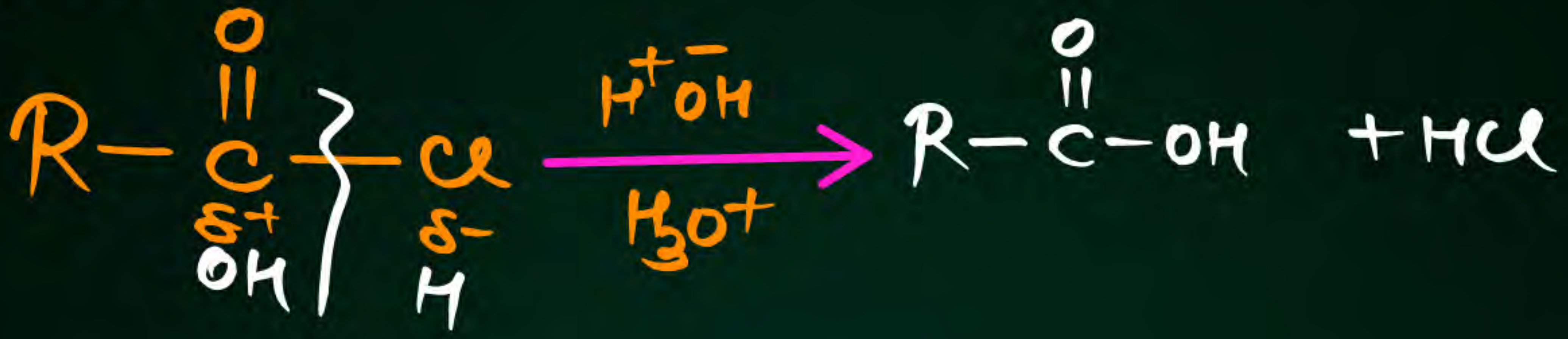
Partial Hydrolysis (H_3O^+)

$$R-\overset{OH}{\overset{OH}{\overset{\delta+}{C}}}\equiv\overset{H}{\overset{H}{\overset{\delta-}{N}}} \xrightarrow[\text{Partial hydrolysis}]{H^+\bar{O}H} R-\overset{O}{\overset{\|}{C}}-NH_2$$

$$R-\overset{OH}{\overset{OH}{\overset{OH}{\overset{\delta+}{C}}}}\equiv\overset{H}{\overset{H}{\overset{H}{\overset{\delta-}{N}}}} \xrightarrow[H_3O^+]{H^+\bar{O}H} R-COOH+NH_3$$

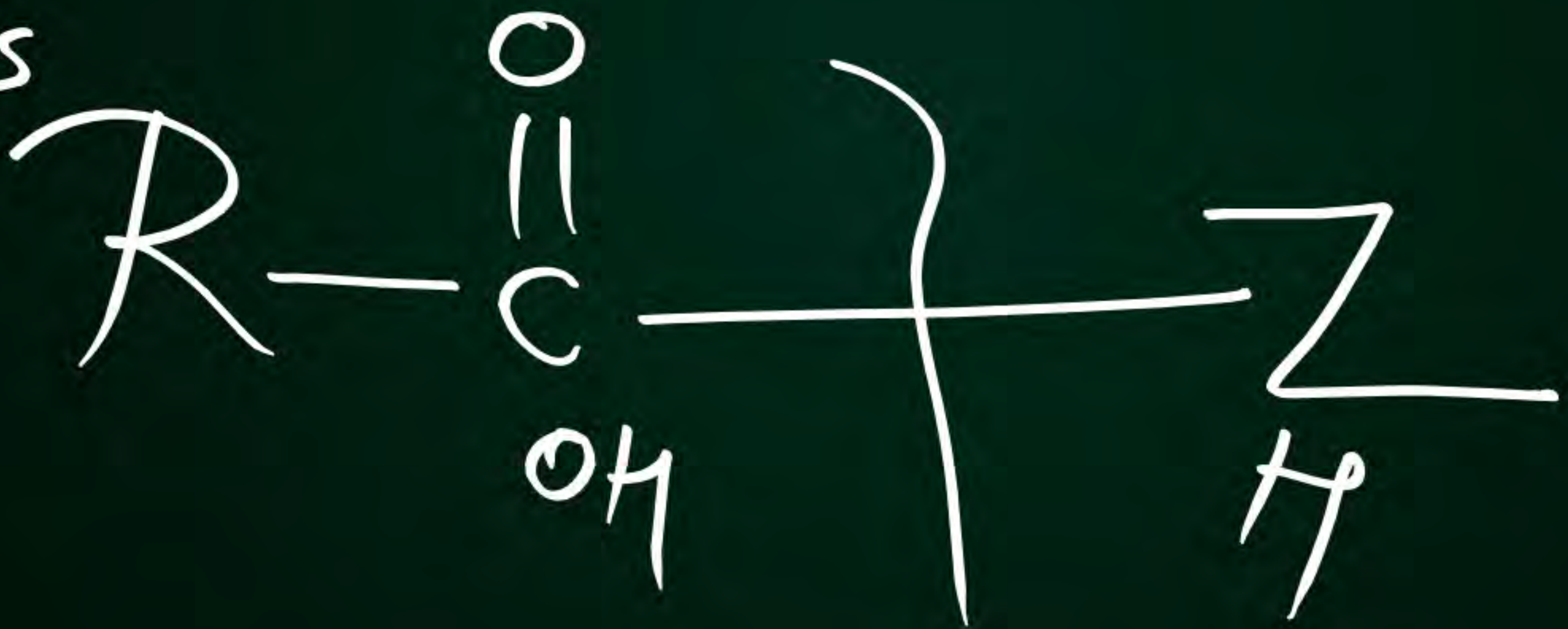
3. From hydrolysis of acid derivatives:

B. Acid chloride



$$R-\overset{\overset{O}{\|}}{\underset{\underset{OH}{\delta+}}{C}}-\underset{\underset{H}{\delta-}}{Cl}\xrightarrow[H_3O^+]{H^+\,\overset{-}{O}H}R-\overset{\overset{O}{\|}}{C}-OH+HCl$$

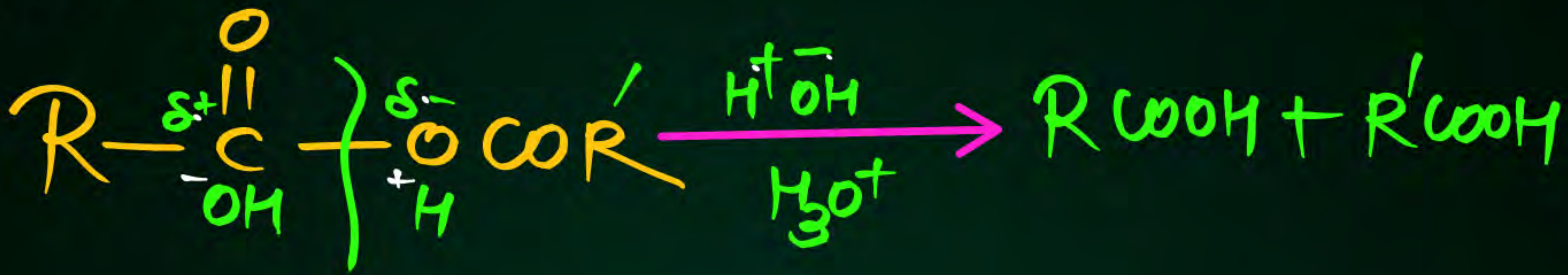
Hydrolysis



$$R-\underset{OH}{\overset{\overset{O}{\|}}{C}}-\underset{H}{Z}$$

3. From hydrolysis of acid derivatives:

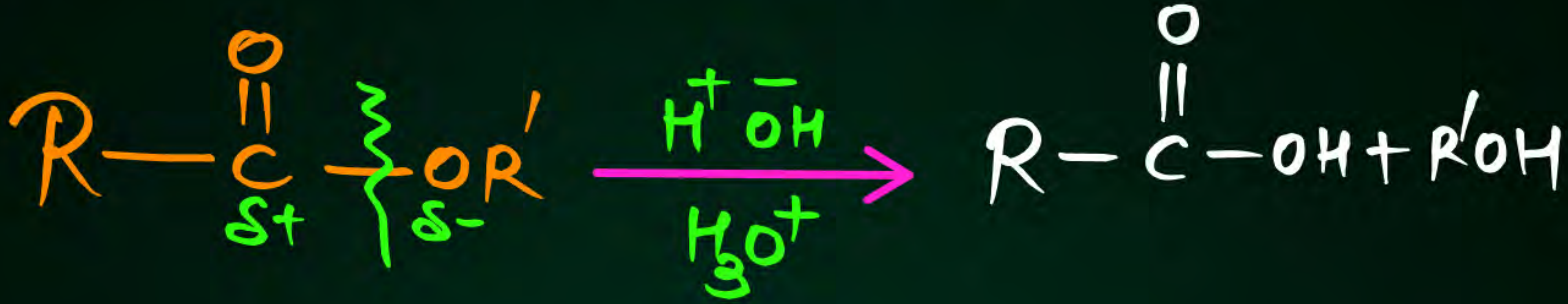
C. Anhydride



$$R-\underset{^{-}OH}{\overset{\overset{O}{\|}}{\overset{\delta+}{C}}}-\overset{\delta-}{\underset{^{+}H}{O}}COR' \xrightarrow[H_3O^+]{H^+\,^{-}OH} RCOOH + R'COOH$$

3. From hydrolysis of acid derivatives:

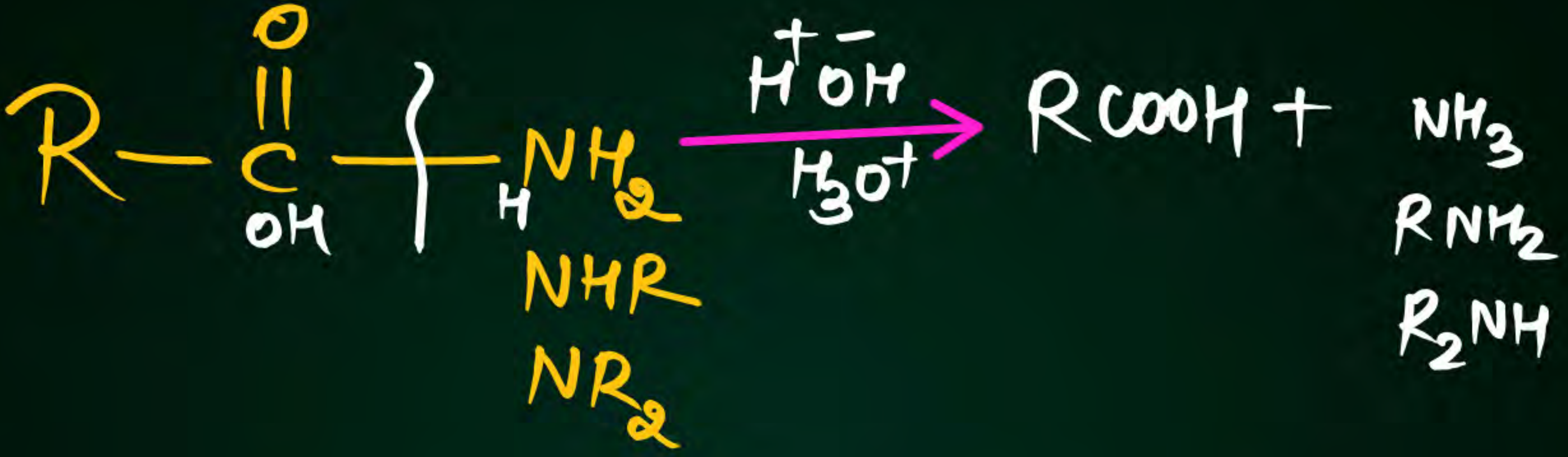
D. Ester



$$R-\underset{\delta+}{\overset{\overset{O}{\|}}{C}}-\underset{\delta-}{O}R' \xrightarrow[H_3O^+]{H^+\ \overset{-}{O}H} R-\overset{\overset{O}{\|}}{C}-OH+R'OH$$

3. From hydrolysis of acid derivatives:

E. Amides



$$R-\overset{\overset{O}{\|}}{\underset{OH}{C}}-\underset{H}{NH_2} \xrightarrow[H_3O^+]{\overset{+}{H}\overset{-}{OH}} RCOOH + NH_3$$

NHR → RNH_2

NR_2 → R_2NH

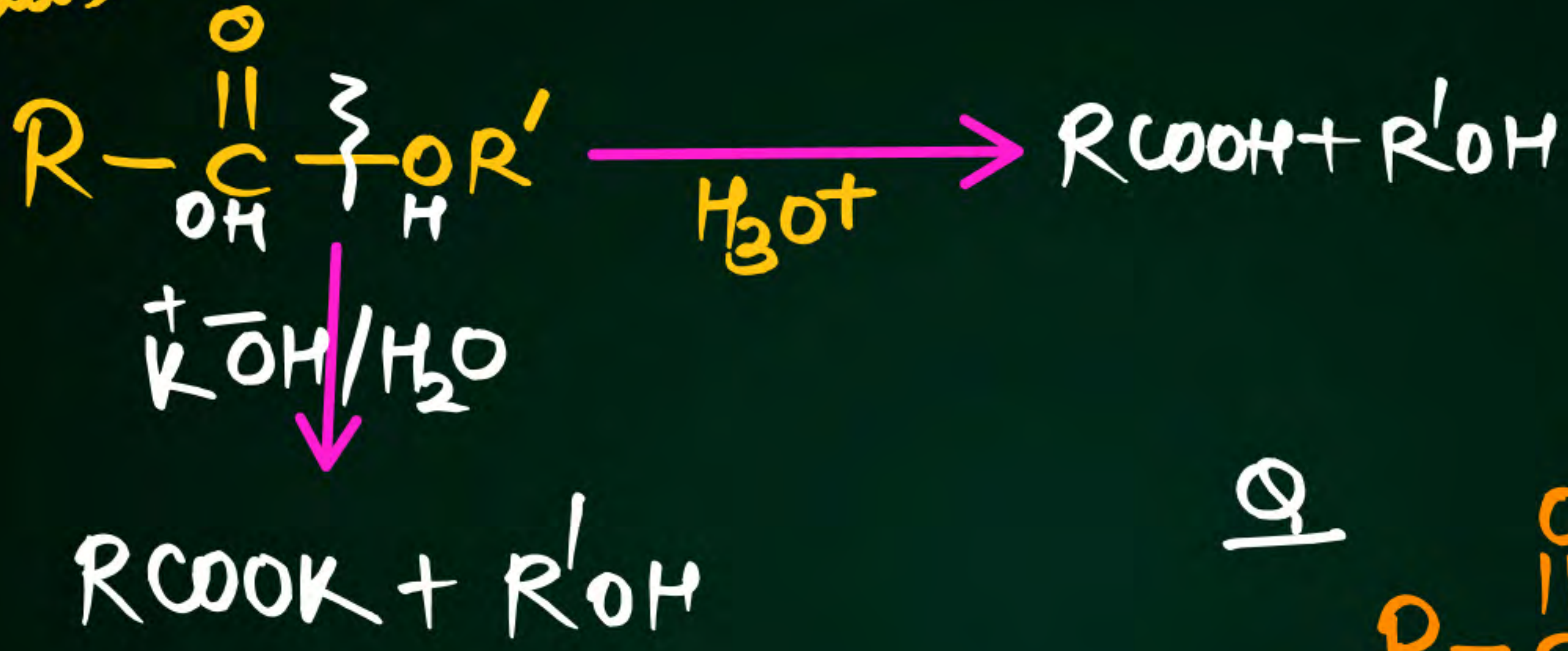
Alkaline hydrolysis $\overset{\ominus}{O}H/H_2O$

Saponification ↳

Acidic Hydrolysis

H^+/H_2O

H_3O^+

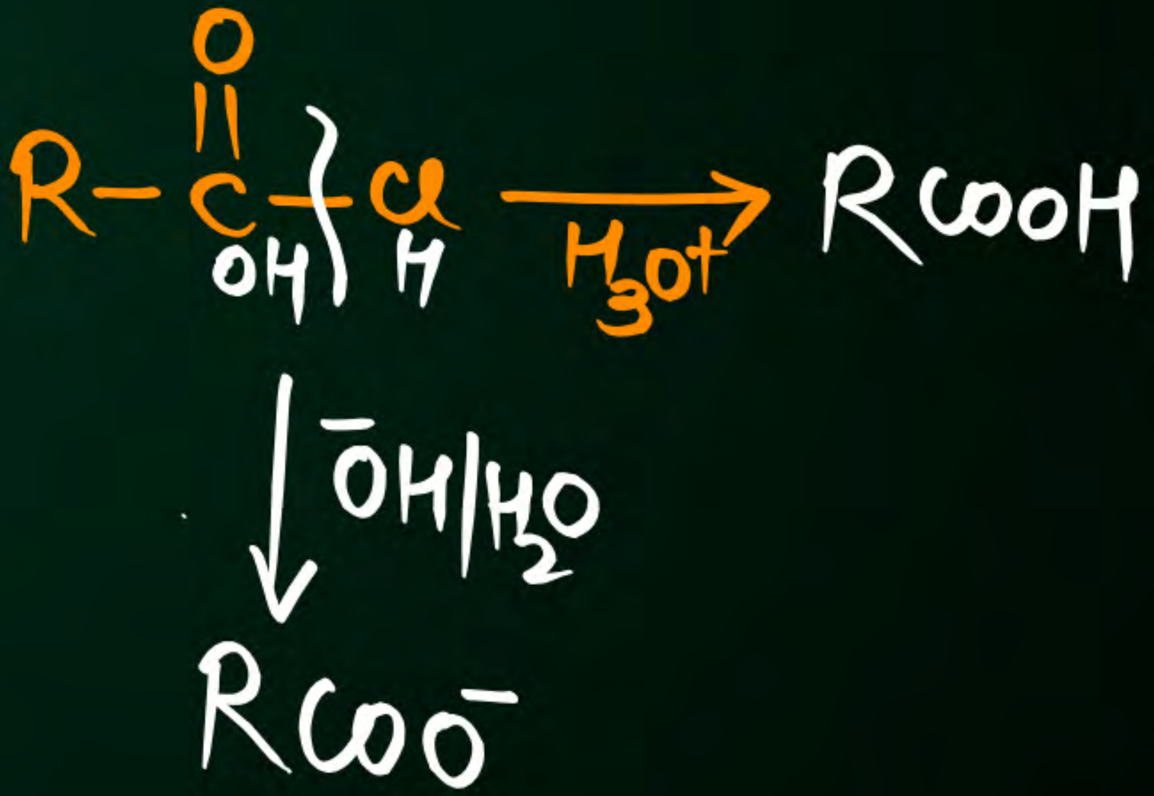


$$R-\overset{O}{\overset{\|}{\underset{OH}{C}}}\,\}\!-\underset{H}{O}R' \xrightarrow[H_3O^+]{} RCOOH + R'OH$$

$$\downarrow \overset{+}{K}\bar{O}H/H_2O$$

$$RCOOK + R'OH$$

Q

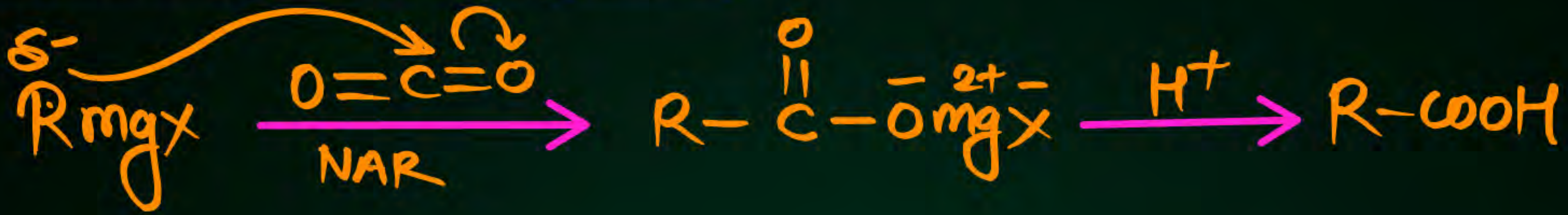


$$R-\overset{O}{\overset{\|}{\underset{OH}{C}}}\,\}\!-\underset{H}{Cl} \xrightarrow[H_3O^+]{} RCOOH$$

$$\downarrow \bar{O}H/H_2O$$

$$RCOO^-$$

4. From Grignard reagents:



$$\overset{\delta-}{R}MgX \xrightarrow[\text{NAR}]{O=C=O} R-\overset{O}{\overset{\|}{C}}-\overset{-}{O}\overset{2+}{Mg}\overset{-}{X} \xrightarrow{H^+} R-COOH$$

Q

$$\overset{\delta-}{CH_3}MgBr \xrightarrow[2.\ H^+]{1.\ CO_2} CH_3COOH$$

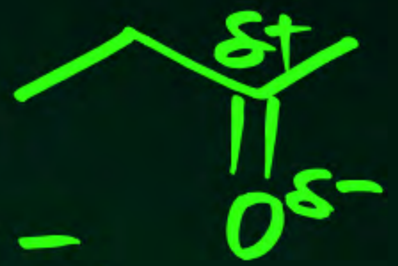
Q

$$\overset{\delta-}{Ph}MgBr \xrightarrow[2.\ H^+]{1.\ {}^{14}CO_2} Ph-\underset{14}{C}OOH$$

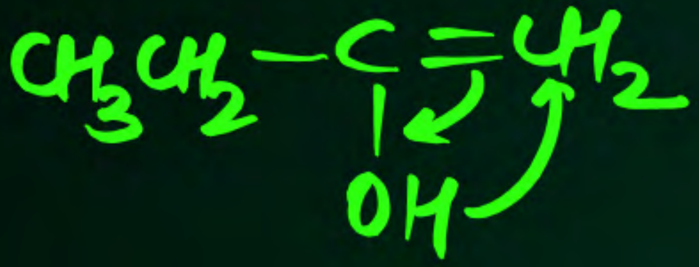
Q

JEE main 24 Jan S-1

$CH_3-CH_2-C\equiv CH \xrightarrow{Hg^{2+}/H_2O}$ Ⓐ

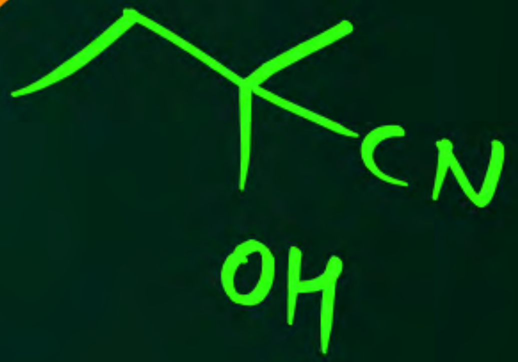


$\downarrow H^+\,\overset{-}{O}H$



$CH_3CH_2-\underset{OH}{\underset{|}{C}}=CH_2$

Ⓐ $\downarrow \overset{+}{H}\overset{-}{CN}$ Ⓑ



Home Work

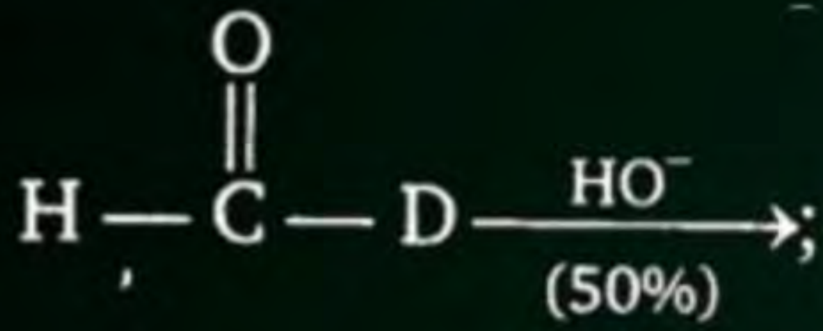
QUESTION 01

$2HCHO + NaOH \longrightarrow CH_3OH + HCOONa$

The above reaction is known as:

- Ⓐ Wurtz reaction
- Ⓑ Rosenmund's reaction
- Ⓒ Frankland reaction
- Ⓓ Cannizzaro's reaction

QUESTION 02

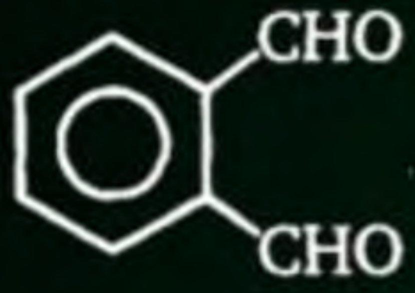


$H-\overset{\overset{O}{\|}}{C}-D \xrightarrow[(50\%)]{HO^{-}}$; Product of this Cannizzaro reaction is:

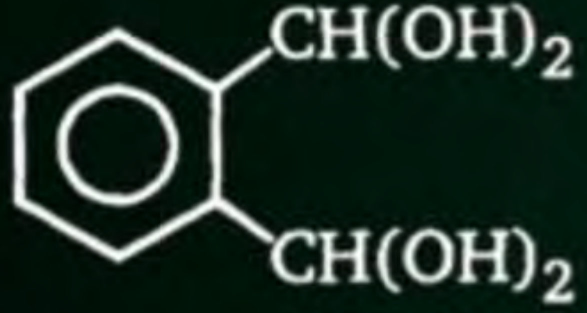
- **A** $D-CO_2^- + CH_2DOD$
- **B** $H-CO_2^- + D-CO_2^-$
- **C** $D-CO_2^- + CH_2DOH$
- **D** $D-CO_2^- + CHD_2OH$

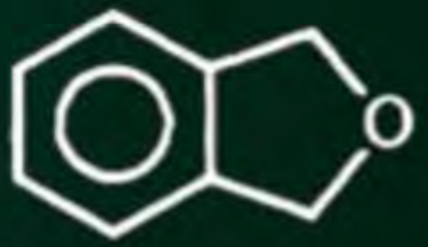
QUESTION 03

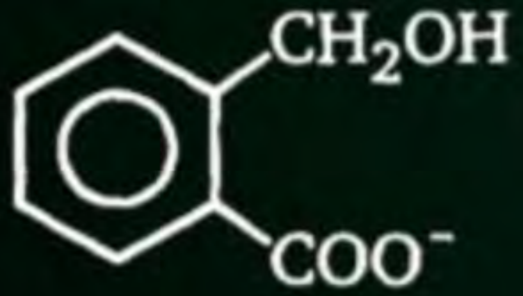
The reaction,

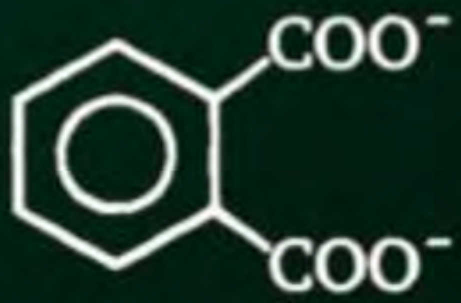


+ conc. NaOH $\xrightarrow{\text{heat}}$, Products identify the product.

A 

B 

C 

D 

QUESTION 04

The compound(s) that will undergo Cannizzaro reaction is/are:

i. CH_3CHO

ii. $(CH_3)_3CCHO$

iii. PhCHO

iii. CH_3COCH_3

(A) ii only

(B) ii and iii

(C) i and ii

(D) ii, iii and iv

QUESTION 05

$$PhCHO + HCHO \xrightarrow{Conc.KOH}$$

Correct statement regarding the above reaction will be:

Ⓐ It is an example of redox reaction.

Ⓑ HCHO is oxidized.

Ⓒ It is cross Cannizzaro reaction.

Ⓓ All of these

QUESTION 06

A mixture of benzaldehyde and formaldehyde on heating with aqueous NaOH solution gives:

(A) benzyl alcohol and solution formate

(B) sodium benzoate and methyl alcohol

(C) sodium benzoate and sodium formate

(D) benzyl alcohol and methyl alcohol

QUESTION 07

Which of these combinations will not produce benzoic acid?

A $C_6H_5CH_2OH + KMnO_4/OH^-/H_2O$, heat; then H_3O^+

B $C_6H_5CH_3 + KMnO_4/OH^-/H_2O$, heat; then H_3O^+

C $C_6H_6 + CO_2$, high pressure

D $C_6H_5COCH_3 + I_2/OH^-/H_2O$, then H_3O^+

QUESTION 08

R–CH_2–CH_2OH can be converted into RCH_2CH_2COOH. The correct sequence of reagent is:

A PBr_3, KCN, H^+

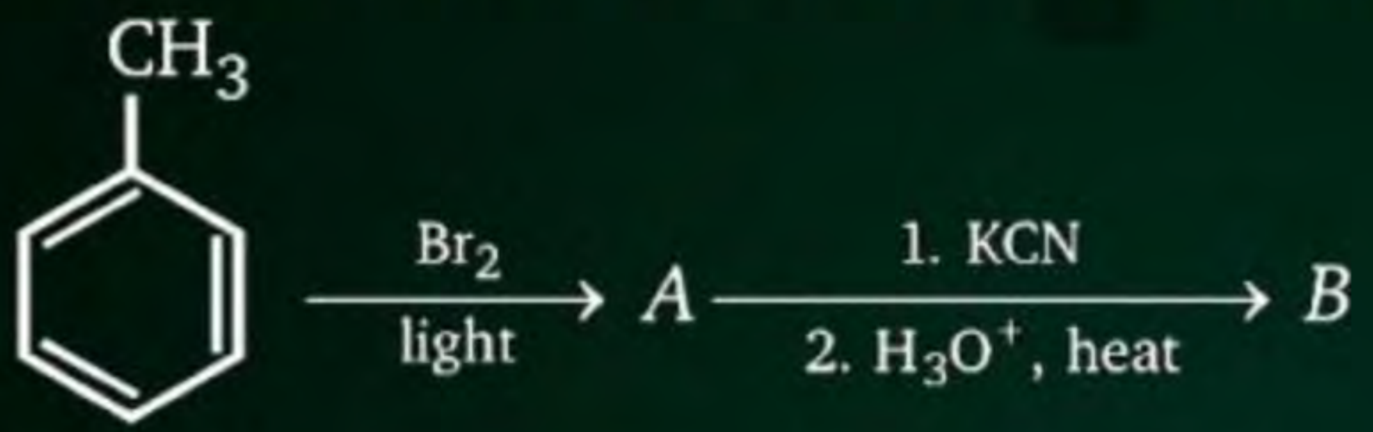
B PBr_3, KCN, H_2

C KCN, H^+

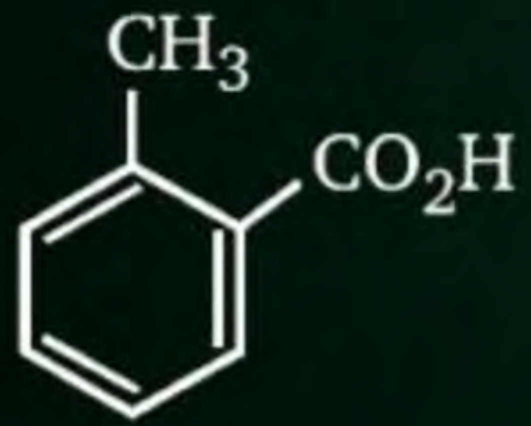
D HCN, PBr_3, H^+

QUESTION 09

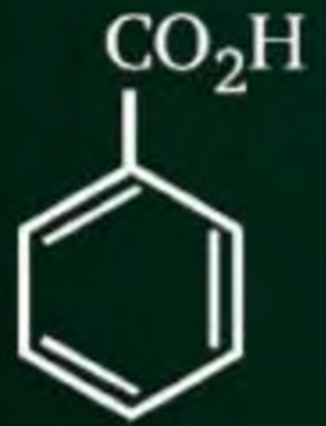
What is the final product (B) of this sequence?


CH$_3$
Br$_2$
light
A
1. KCN
2. H$_3$O$^+$, heat
B

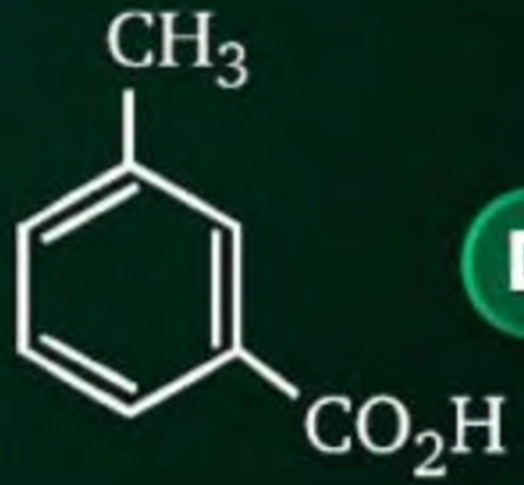
A



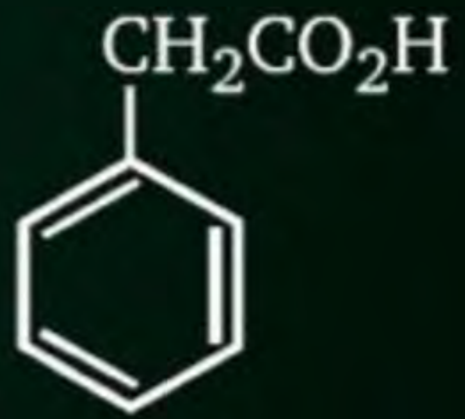
B



C



D



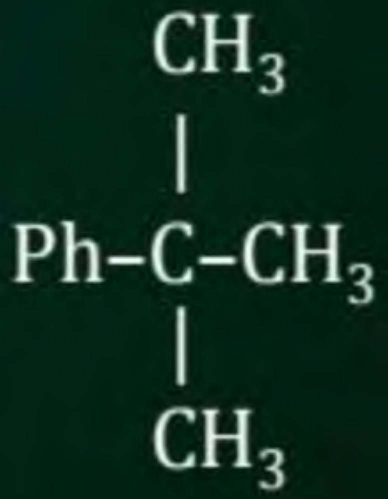
QUESTION 10

Which of the following will not product benzoic acid by oxidation with alkaline $KMnO_4$?

A $Ph{-}CH_3$

B $Ph{-}CH_2{-}Cl$

C $Ph{-}CH_2CH_3$

D 

$$Ph{-}\underset{\large CH_3}{\overset{\large CH_3}{\underset{|}{\overset{|}{C}}}}{-}CH_3$$

ANSWER KEY

1. D
2. C
3. C
4. B
5. D
6. A
7. C
8. A
9. D
10.D

Home Work From PW Module (Yakeen NEET)

Prarambh: Q 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59

Prabal: Q 31

CH
CH_2
SO_3
N
H_2O
PhysicsWallah
अनुगच्छतु प्रवाहं

PANKAJ SIR
JOIN MY OFFICIAL TELEGRAM CHANNEL
@PSCAA

Thank you!!

YAKEEN 2.0

FOR NEET 2025

Lecture- 08 Organic Chemistry

Aldehydes, Ketones and Carboxylic Acids

By- Pankaj Sir(POPU MAMA)

Physics Wallah

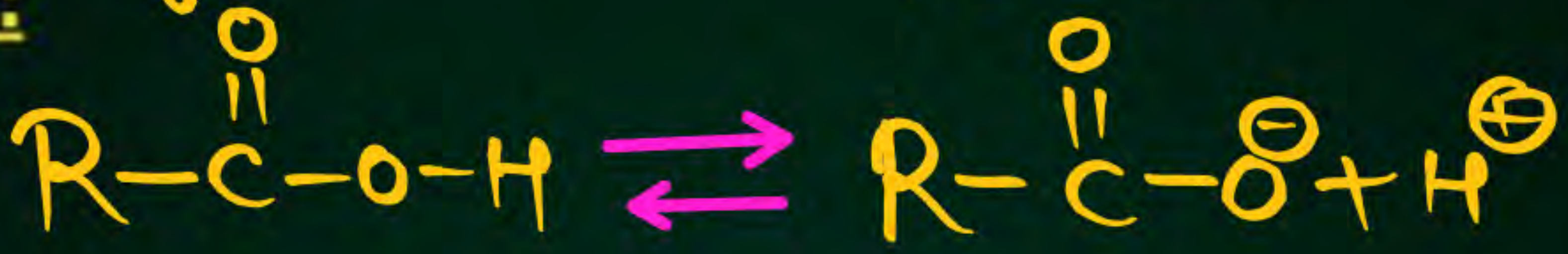
Topics *to be covered*

1. Chemical Properties of Carboxylic Acids ✓
2. Practice

Chemical Properties of Carboxylic Acids

1. Acidic Strength:

good acid Morestable



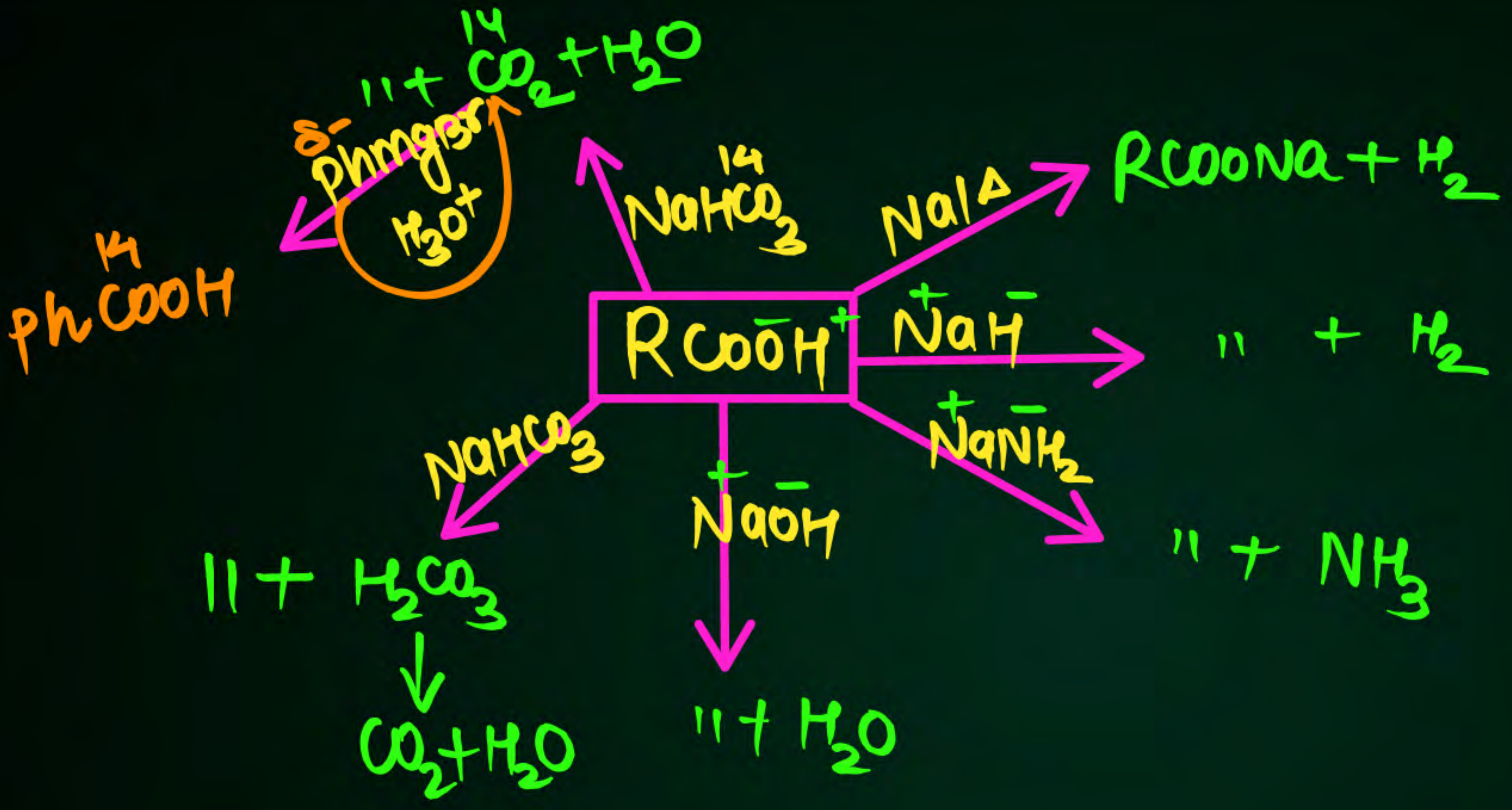
$$R-\overset{\overset{O}{\|}}{C}-O-H \rightleftharpoons R-\overset{\overset{O}{\|}}{C}-O^{\ominus} + H^{\oplus}$$

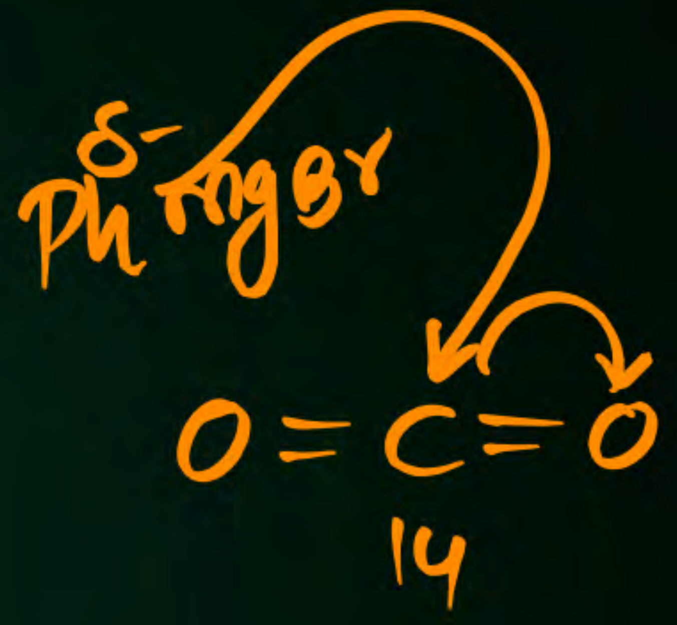
Ka

Pka↓ Ka↑ AS↑

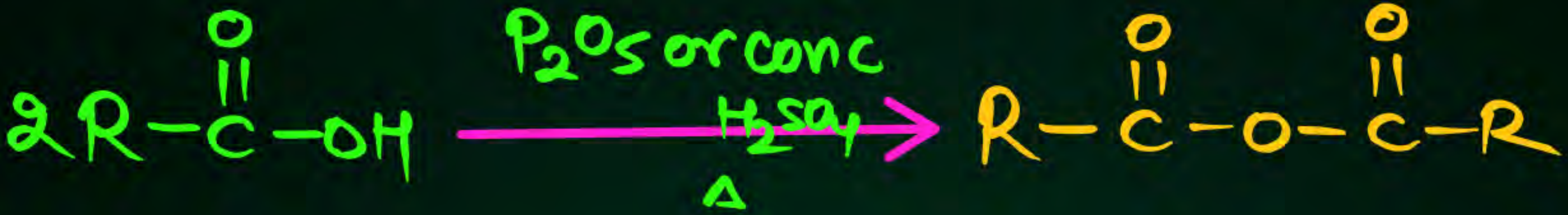
$A \cdot S \propto -M, -H, -I$

$\propto \dfrac{1}{+M, +H, +I}$

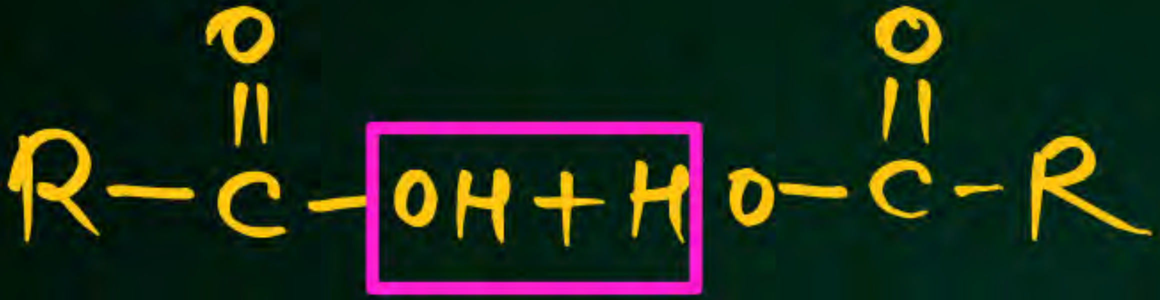

δ-
PhMgBr
'' + 14 CO2 + H2O
H3O+
14
PhCOOH
14
NaHCO3
Na/Δ
RCOONa + H2
RCOO-H+
Na+ H-
'' + H2
Na+ NH2-
'' + NH3
NaHCO3
'' + H2CO3
CO2 + H2O
Na+ OH-
'' + H2O


δ-
PhMgBr
O=C=O
14

2. Formation of anhydrides:

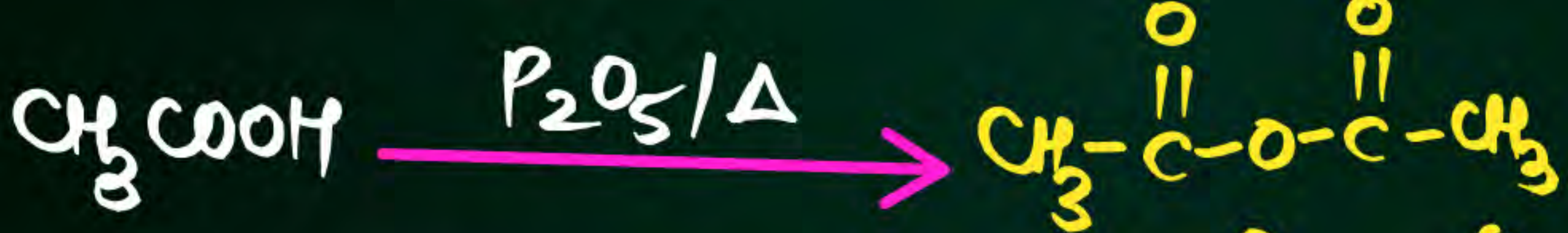


$$2R-\overset{O}{\overset{\|}{C}}-OH \xrightarrow[\Delta]{P_2O_5 \text{ or conc } H_2SO_4} R-\overset{O}{\overset{\|}{C}}-O-\overset{O}{\overset{\|}{C}}-R$$

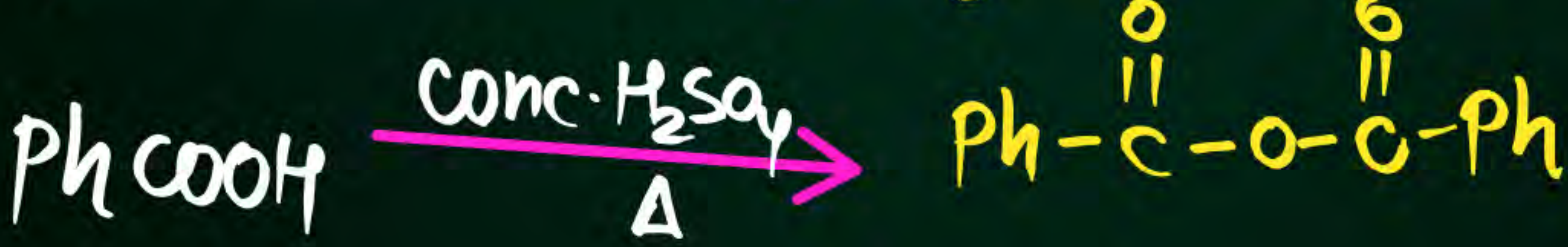


$$R-\overset{O}{\overset{\|}{C}}-\boxed{OH+H}O-\overset{O}{\overset{\|}{C}}-R$$

Q

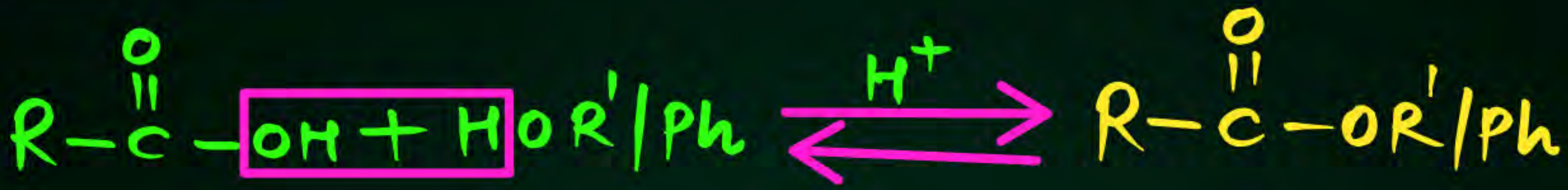
1) 

$$CH_3COOH \xrightarrow{P_2O_5/\Delta} CH_3-\overset{O}{\overset{\|}{C}}-O-\overset{O}{\overset{\|}{C}}-CH_3$$

2) 

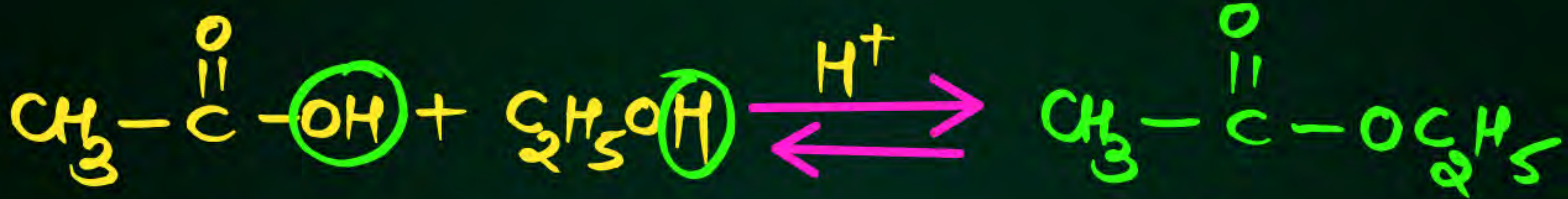
$$PhCOOH \xrightarrow[\Delta]{Conc.H_2SO_4} Ph-\overset{O}{\overset{\|}{C}}-O-\overset{O}{\overset{\|}{C}}-Ph$$

3. Esterification:



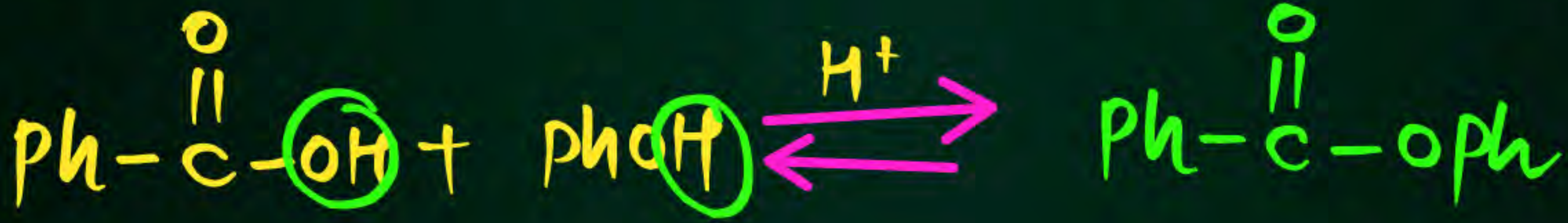
$$R-\overset{\overset{O}{\|}}{C}-\boxed{OH+H}OR'/Ph \underset{}{\overset{H^+}{\rightleftharpoons}} R-\overset{\overset{O}{\|}}{C}-OR'/Ph$$

Q 1)

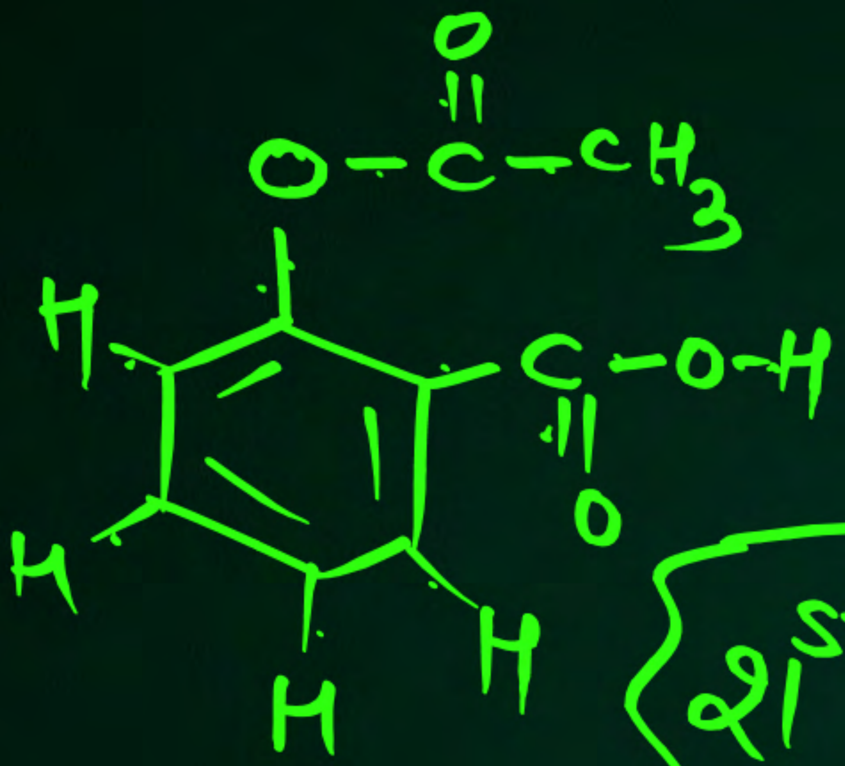


$$CH_3-\overset{\overset{O}{\|}}{C}-\textcircled{OH}+C_2H_5O\textcircled{H} \overset{H^+}{\rightleftharpoons} CH_3-\overset{\overset{O}{\|}}{C}-OC_2H_5$$

2)

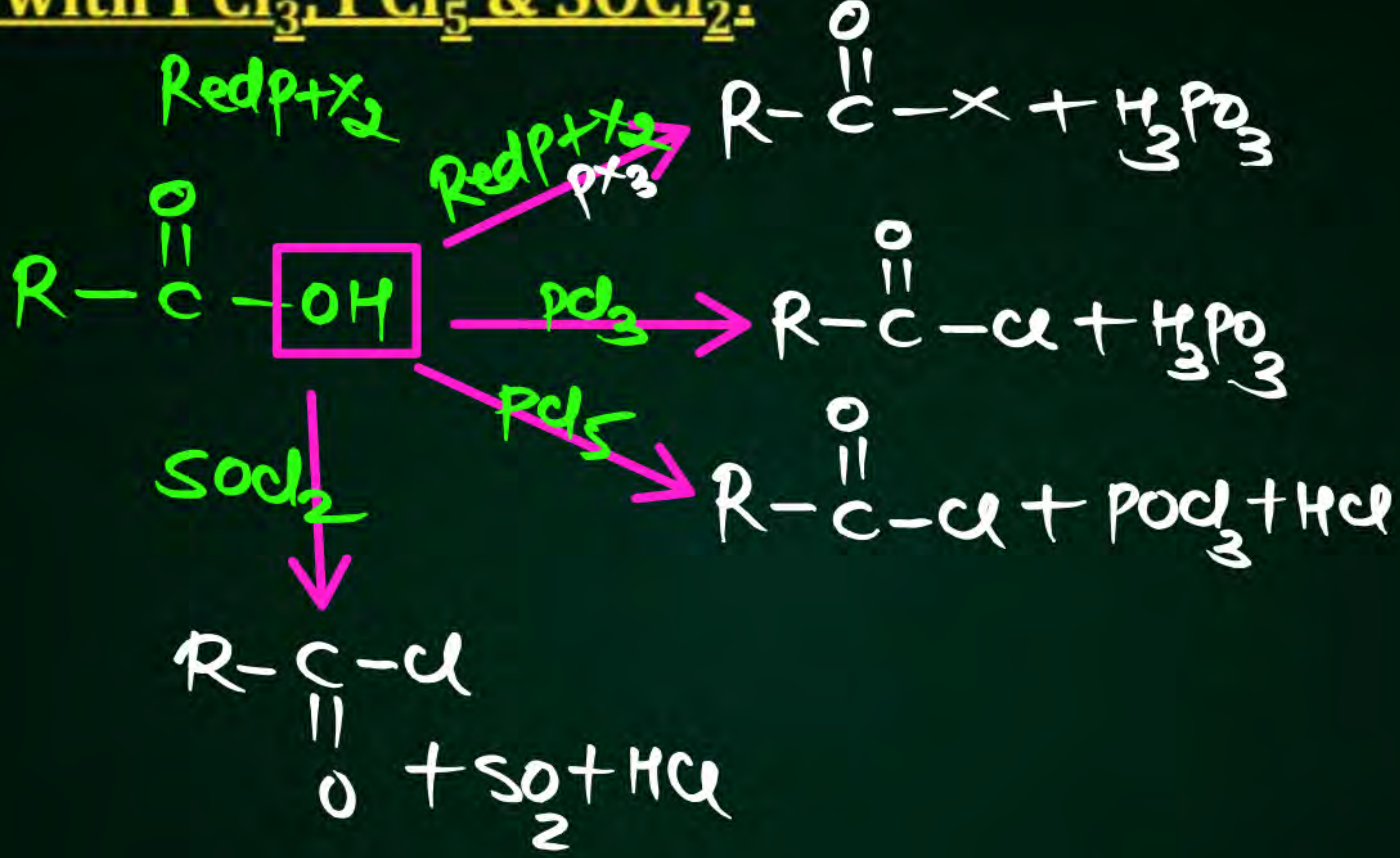


$$Ph-\overset{\overset{O}{\|}}{C}-\textcircled{OH}+PhO\textcircled{H} \overset{H^+}{\rightleftharpoons} Ph-\overset{\overset{O}{\|}}{C}-OPh$$



21st

4. Reaction with PCl_3, PCl_5 & $SOCl_2$:



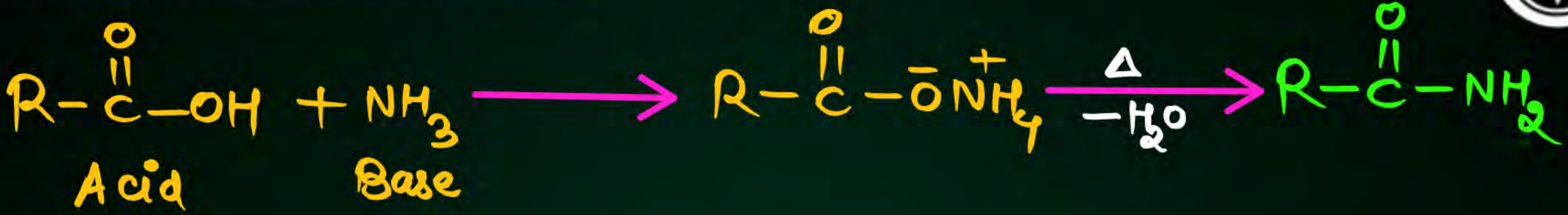
$$R-\overset{O}{\overset{\|}{C}}-\boxed{OH} \xrightarrow[PX_3]{Red\,P+X_2} R-\overset{O}{\overset{\|}{C}}-X + H_3PO_3$$

$$R-\overset{O}{\overset{\|}{C}}-\boxed{OH} \xrightarrow{PCl_3} R-\overset{O}{\overset{\|}{C}}-Cl + H_3PO_3$$

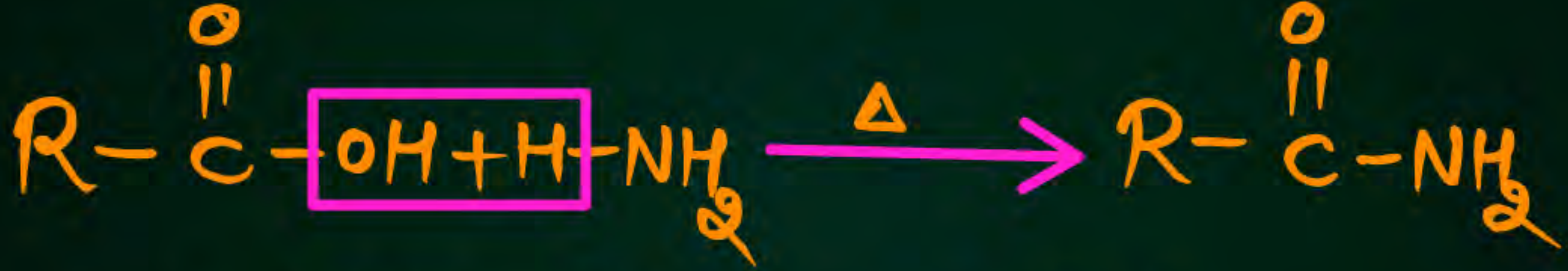
$$R-\overset{O}{\overset{\|}{C}}-\boxed{OH} \xrightarrow{PCl_5} R-\overset{O}{\overset{\|}{C}}-Cl + POCl_3 + HCl$$

$$R-\overset{O}{\overset{\|}{C}}-\boxed{OH} \xrightarrow{SOCl_2} R-\underset{O}{\underset{\|}{C}}-Cl + SO_2 + HCl$$

5. Reaction with ammonia:

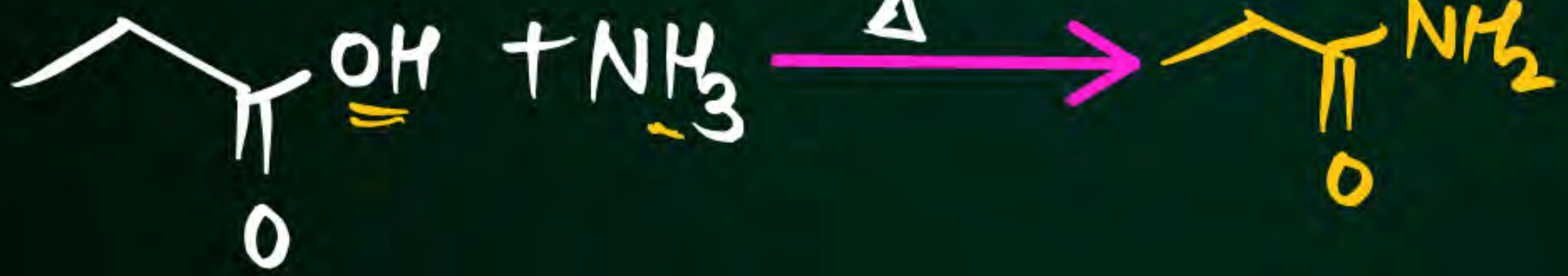


$$\underset{\text{Acid}}{R-\overset{O}{\overset{\|}{C}}-OH} + \underset{\text{Base}}{NH_3} \longrightarrow R-\overset{O}{\overset{\|}{C}}-\bar{O}\overset{+}{N}H_4 \xrightarrow[-H_2O]{\Delta} R-\overset{O}{\overset{\|}{C}}-NH_2$$



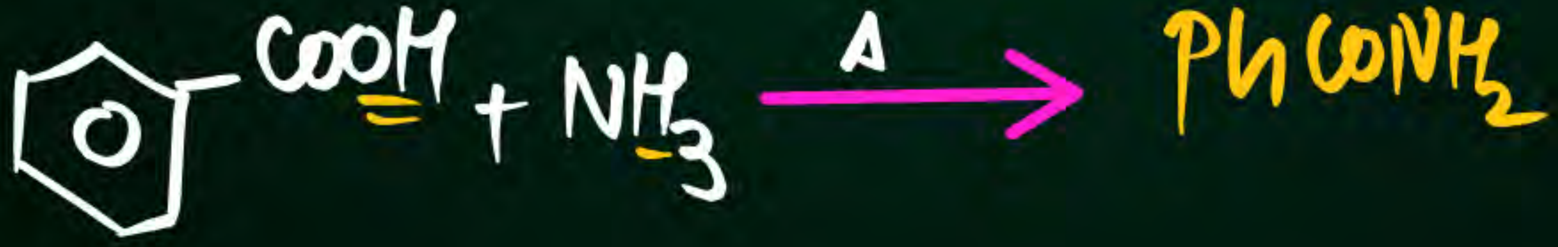
$$R-\overset{O}{\overset{\|}{C}}-\boxed{OH+H}-NH_2 \xrightarrow{\Delta} R-\overset{O}{\overset{\|}{C}}-NH_2$$

Q 1)



OH
$+ NH_3$
Δ
NH_2
O
O

2)



COOH
$+ NH_3$
Δ
PhCONH₂

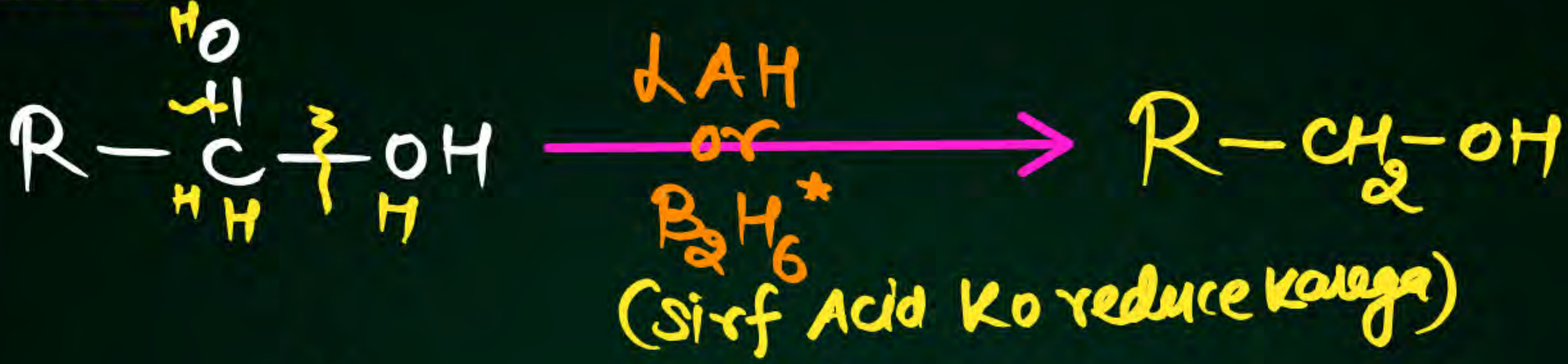
Q. What is the Birth month of Popu mama?

# Take first 3 Letter (in cap) of each month find pos?

Ans:- 2^{nd} and 3^{rd} Alphabate have Horizontal Pos.

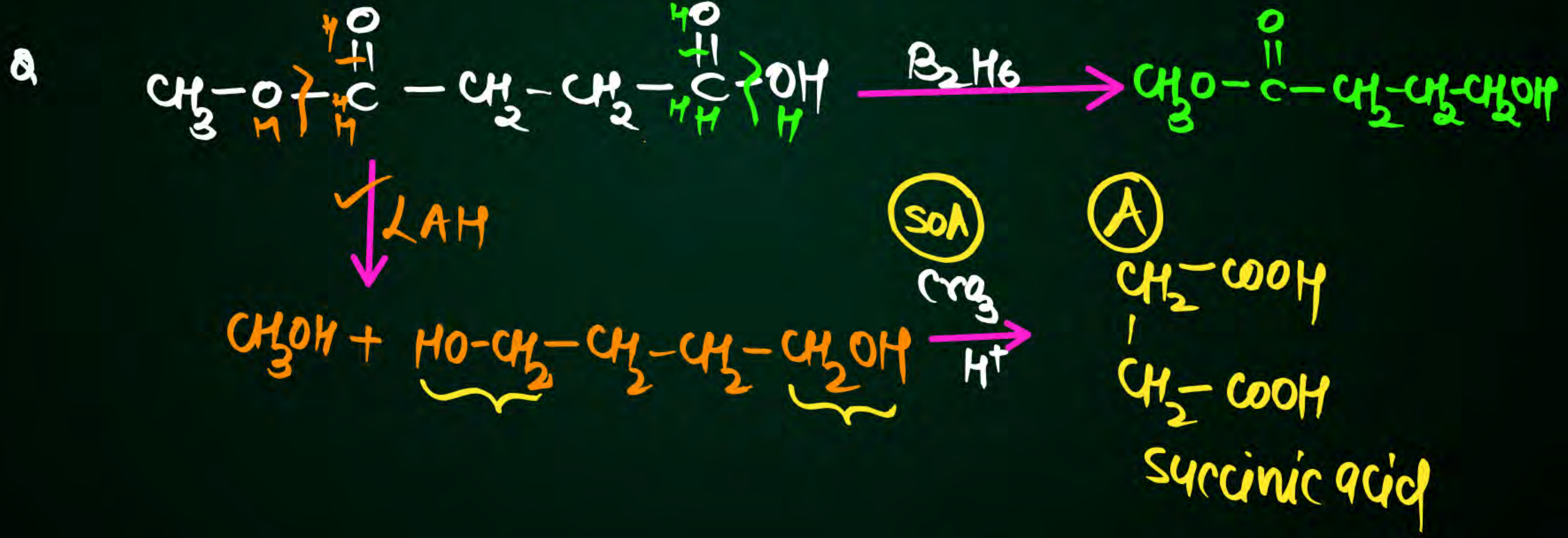
F	E	B
NO pos	Hori Pos	Hori POS

6. Reduction:



$$R-\overset{O}{\overset{\|}{C}}-OH \xrightarrow[B_2H_6^*]{LAH\ \text{or}} R-CH_2-OH$$

(Sirf Acid Ko reduce karega)



Q

$$CH_3-O-\overset{O}{\overset{\|}{C}}-CH_2-CH_2-\overset{O}{\overset{\|}{C}}-OH \xrightarrow{B_2H_6} CH_3O-\overset{O}{\overset{\|}{C}}-CH_2-CH_2-CH_2OH$$

$\downarrow$ LAH

$$CH_3OH + \underbrace{HO-CH_2}-CH_2-CH_2-\underbrace{CH_2OH} \xrightarrow[H^+]{CrO_3} \begin{matrix} CH_2-COOH \\ | \\ CH_2-COOH \end{matrix}$$

SOA

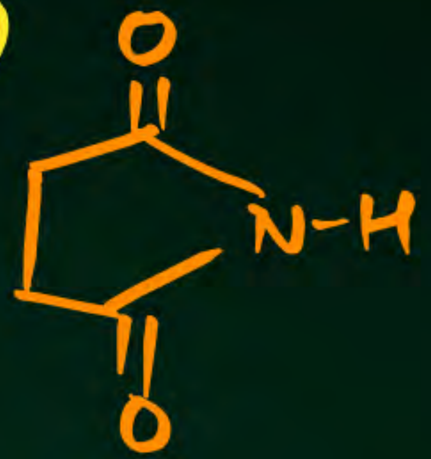
Ⓐ

Succinic acid

cyclization

$$Ⓐ \xrightarrow[\Delta]{NH_3(Excess)} Ⓑ \xrightarrow[Heat]{Strong} Ⓒ$$

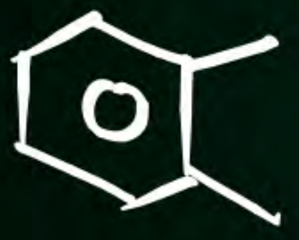
$$\begin{array}{l}CH_2-COOH\\ |\\ CH_2-COOH\end{array} \qquad \begin{array}{l}CH_2CONH_2\\ |\\ CH_2CONH_2\end{array}$$



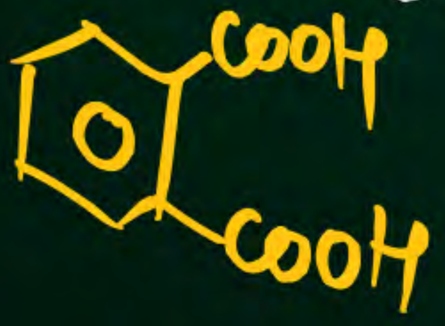
succinimide

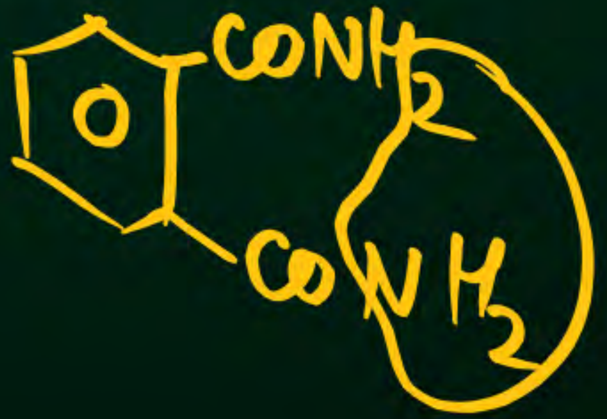
$$\begin{array}{l}CH_2-COONH_4\\ |\\ CH_2-COONH_4\end{array}$$

Q

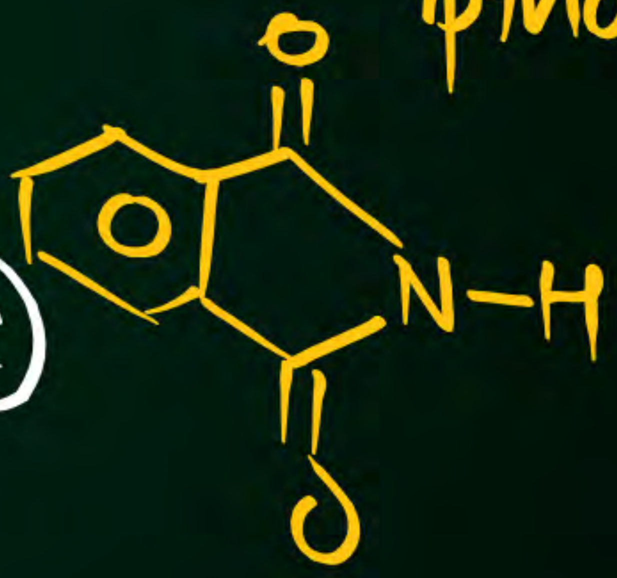


$$\xrightarrow[\substack{\Delta\\ H^+}]{\substack{KMnO_4\\ \cancel{KOH}}} Ⓐ \xrightarrow[NH_3/\Delta]{Excess} Ⓑ \xrightarrow[Heat]{Strong} Ⓒ$$

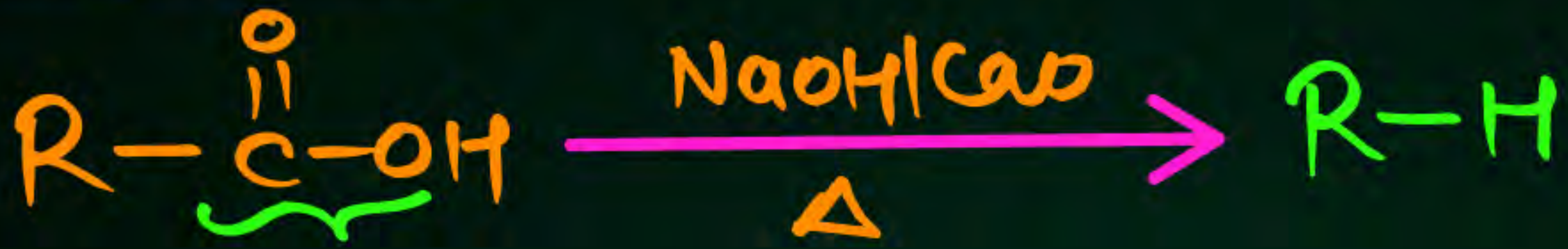




pthalimide

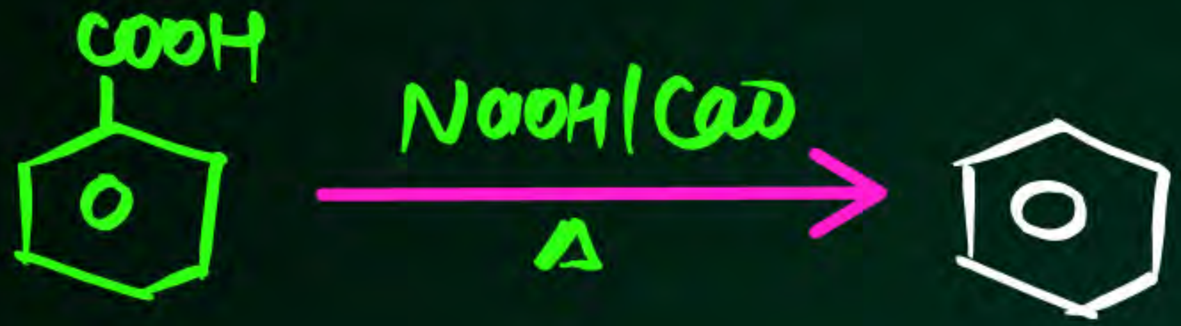


7. Decarboxylation:

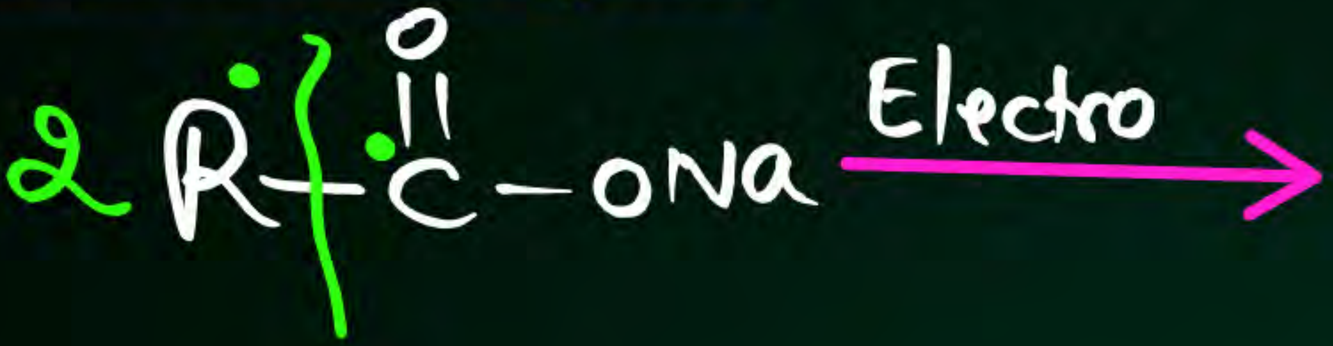


$$R-\underbrace{\overset{\overset{O}{\|}}{C}-OH} \xrightarrow[\Delta]{NaOH|CaO} R-H$$

Q


COOH
NaOH|CaO
Δ

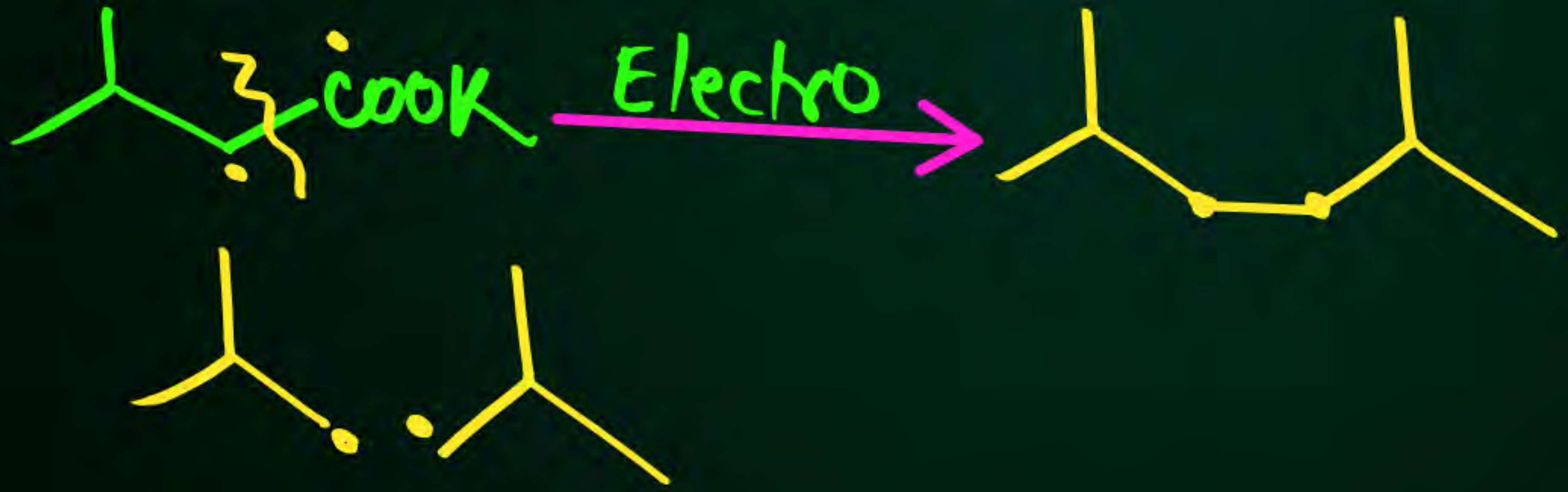
8. Kolbe's Electrolysis:



$2\,\dot{R}-\overset{\overset{O}{\|}}{\dot{C}}-ONa \xrightarrow{\text{Electro}}$

$\dot{R} + \dot{R} \longrightarrow R-R$

②

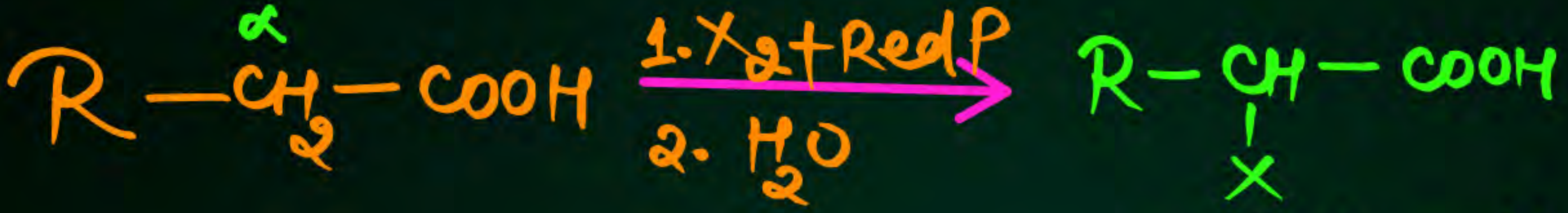

COOK
Electro

9. Halogenation (H.V.Z. Reaction):

(Hell-volhard-zeleinsky rxn)

Hamara vatan zindabad

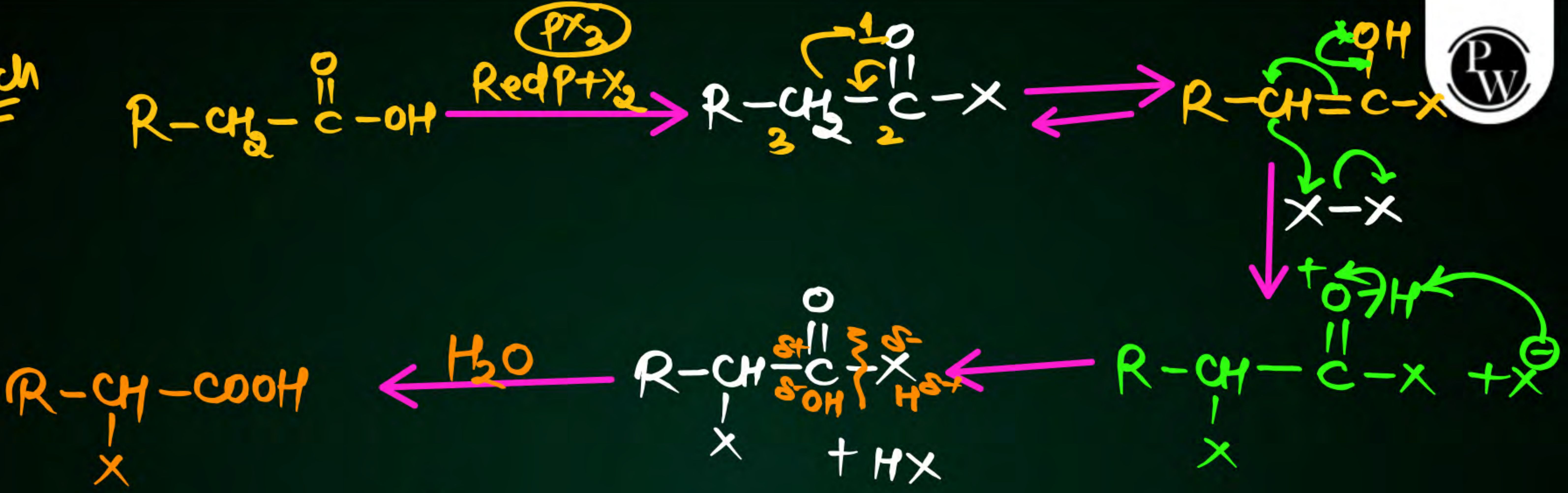
Req α-H ✓



$$R-\overset{\alpha}{C}H_2-COOH \xrightarrow[2.\ H_2O]{1.\ X_2+\text{Red P}} R-\underset{X}{\underset{|}{C}}H-COOH$$

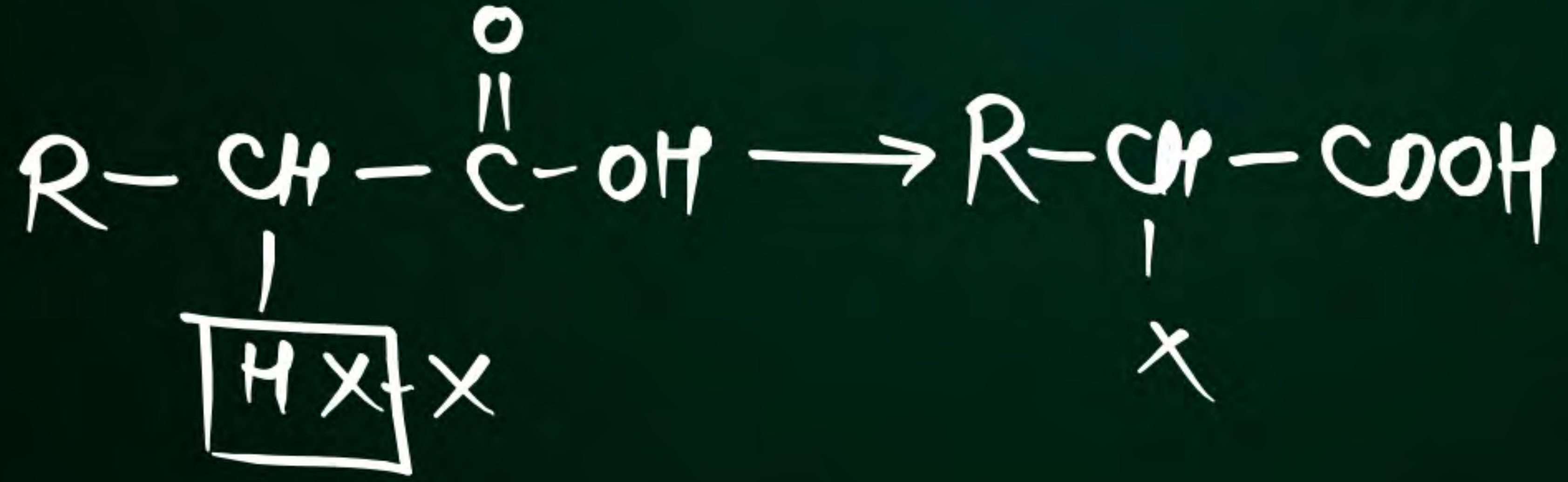
α-halo acid

Mech

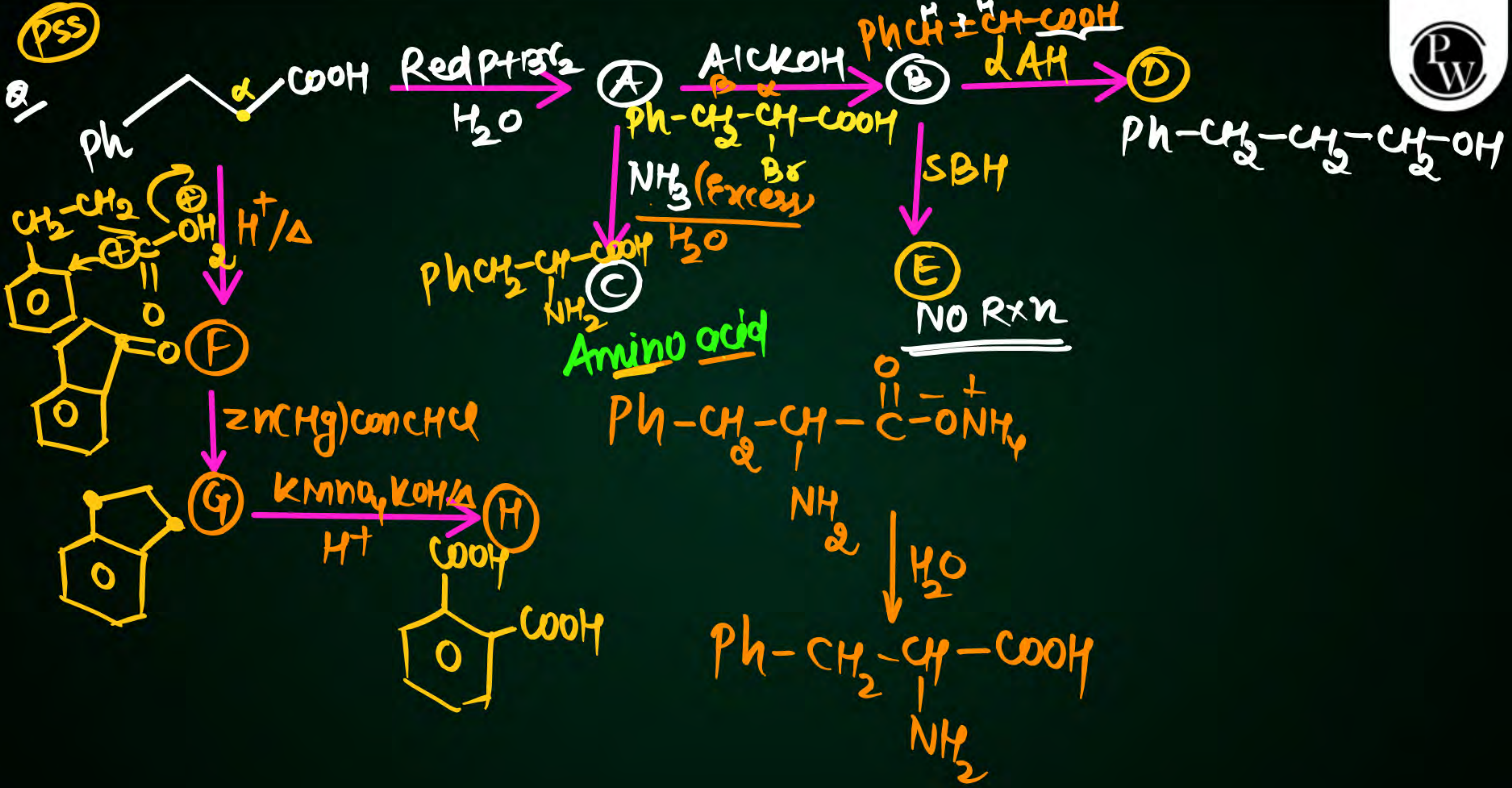


PX3
Red P+X2
1
3
2
2
OH
X–X
+X
δ+
δ−
δ−
δ+
+HX
H2O

D.M



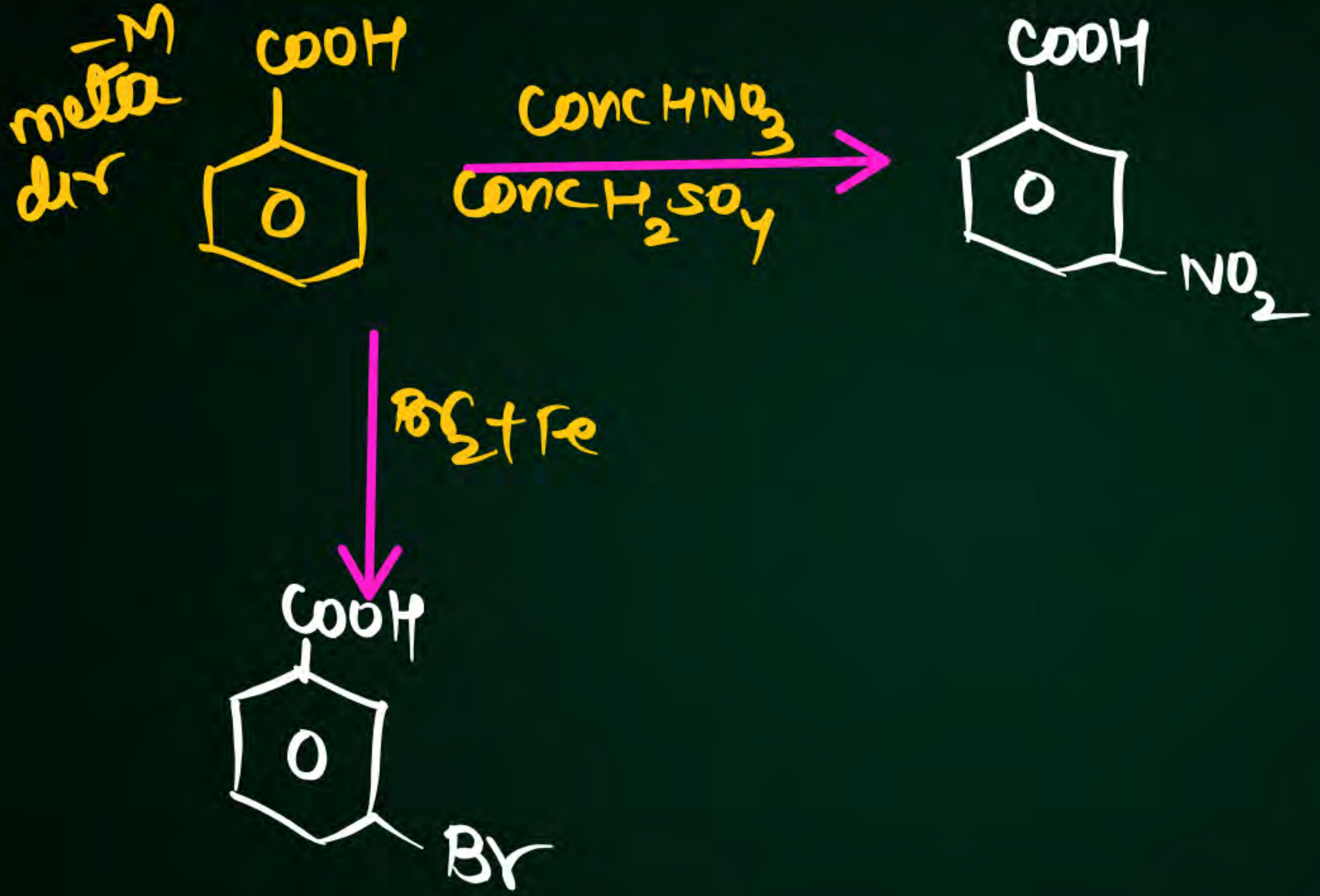
$$R-\underset{\substack{|\\ \boxed{HX}-X}}{CH}-\overset{\overset{O}{\|}}{C}-OH \longrightarrow R-\underset{\substack{|\\ X}}{CH}-COOH$$


PSS
Q/
Ph
α
COOH
Red P + Br_2
H_2O
A
Alc KOH
B
$PhCH=CH-COOH$
LAH
D
$Ph-CH_2-CH_2-CH_2-OH$
β α
$Ph-CH_2-CH(Br)-COOH$
NH_3 (Excess)
H_2O
C
$PhCH_2-CH(NH_2)-COOH$
Amino acid
SBH
E
NO Rxn
$Ph-CH_2-CH(NH_2)-C(=O)-\overset{-}{O}\overset{+}{N}H_4$
H_2O
$Ph-CH_2-CH(NH_2)-COOH$
H^+/Δ
CH_2-CH_2
⊕
$\oplus C-OH$
O
F
Zn(Hg) conc HCl
G
$KMnO_4$, KOH/Δ
H^+
H
COOH
COOH

PW ke Saare NEET ke Test Jo 31st JAN ke baad hone wale hai new pattern ke hisab se honge.

Section 'B' Nahi hoga

10. Electrophilic Aromatic Substitution Reaction:


−M
meta dir
COOH
conc HNO3
conc H2SO4
COOH
NO2
Br2 + Fe
COOH
Br

QUESTION (NCERT Example)

Which acid of each pair shown here would you expect to be stronger?

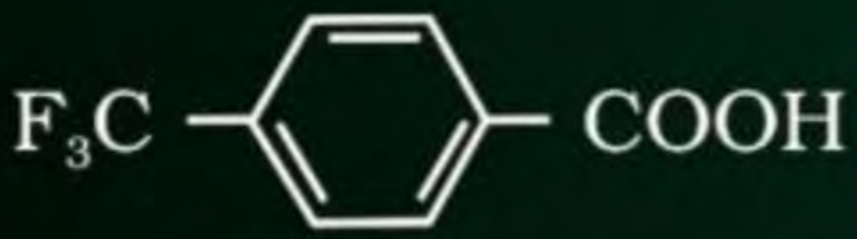
(i) CH_3CO_2H or CH_2FCO_2H

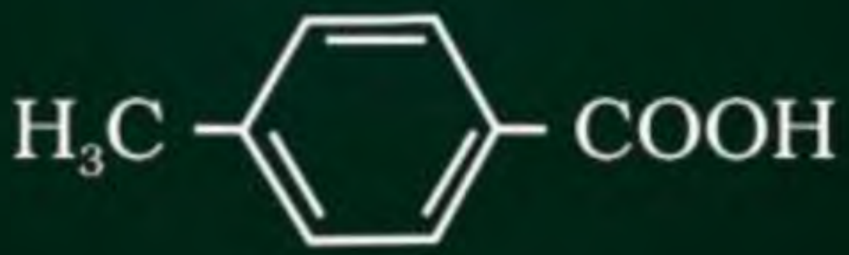
(ii) CH_2FCO_2H or CH_2ClCO_2H

QUESTION (NCERT Example)

Which acid of each pair shown here would you expect to be stronger?

(iii) $CH_2FCH_2CH_2CO_2H$ or $CH_3CHFCH_2CO_2H$

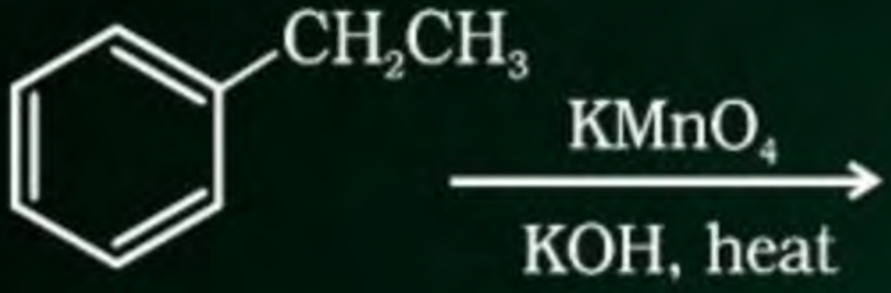
(iv) 

or 

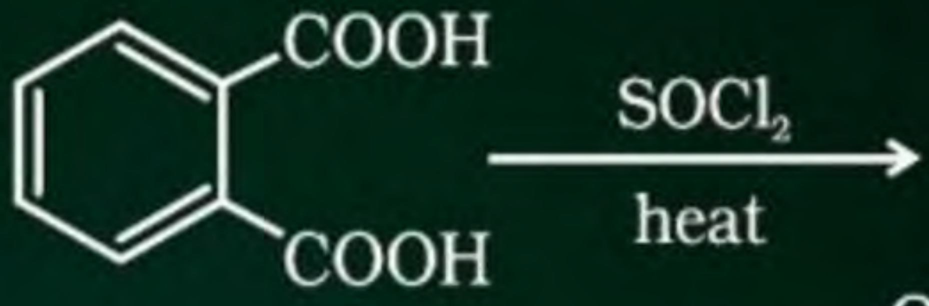
QUESTION (NCERT Exercise)

Complete each synthesis by giving missing starting material, reagent or products.

(i)

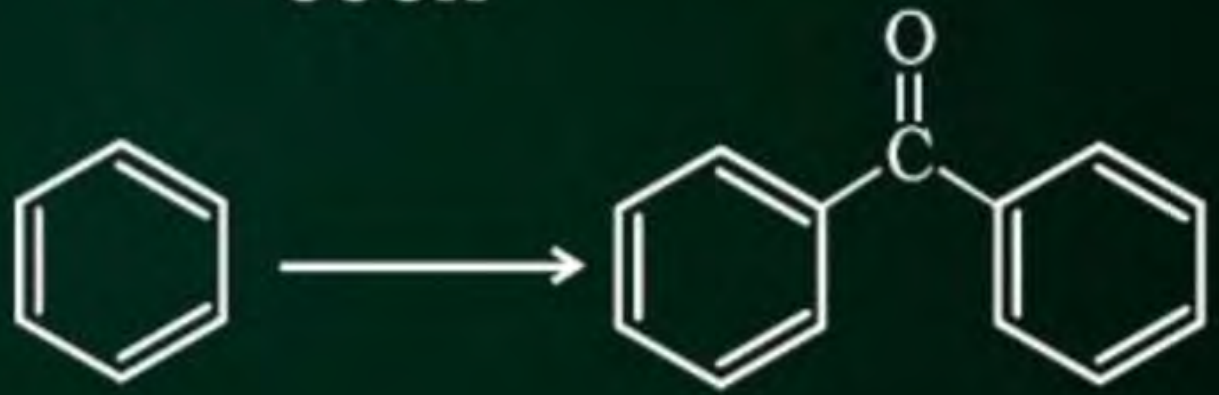

CH₂CH₃
KMnO₄
KOH, heat

(ii)

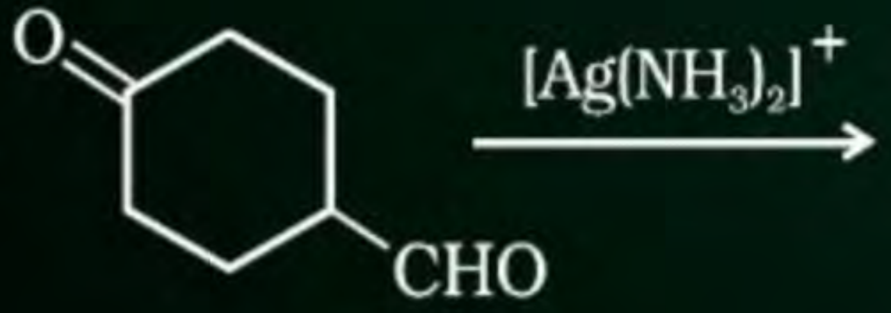

COOH
COOH
SOCl₂
heat

(iii) $C_6H_5CHO \xrightarrow{H_2NCONHNH_2}$

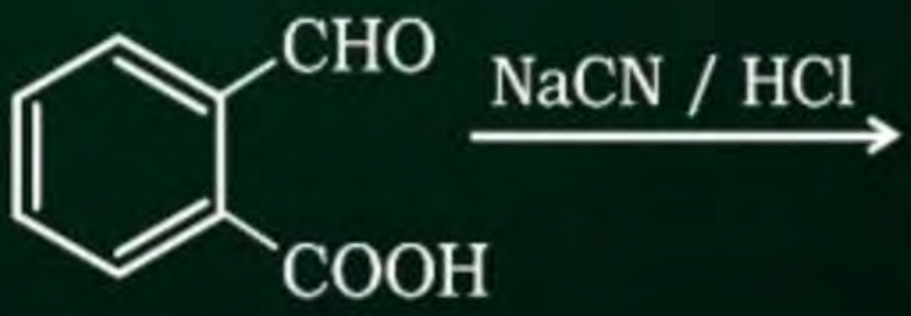
(iv)



(v)


O
CHO
[Ag(NH₃)₂]⁺

(vi)


CHO
COOH
NaCN / HCl

QUESTION (NCERT Exemplar)

Identify the compounds A, B and C in the following reaction.

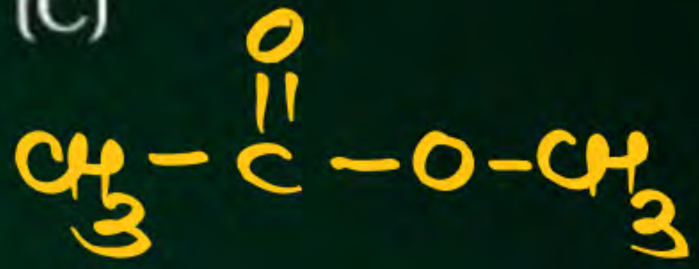
$O=C=O$

$$CH_3—Br \xrightarrow{Mg/ether} (A) \xrightarrow[(ii)\ Water]{(i)\ CO_2} (B) \xrightarrow[\Delta]{CH_3OH/H^+} (C)$$

$\delta-$

CH_3MgBr

CH_3COOH



$CH_3-\overset{O}{\overset{\|}{C}}-O-CH_3$

Q. Pattern change ho gya?

A Jo kar rahe they wahi karna hai.

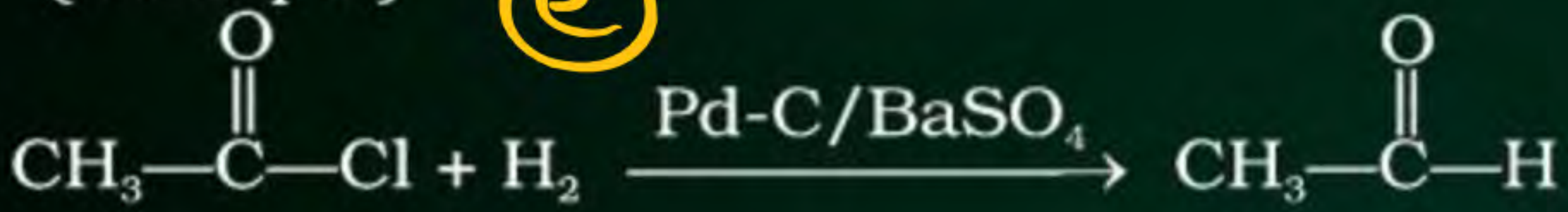
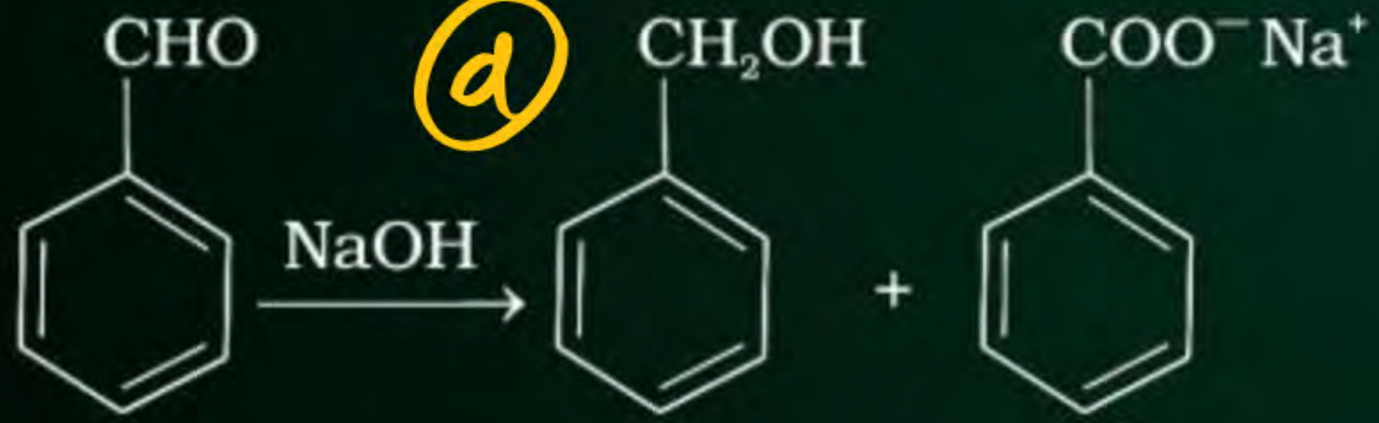
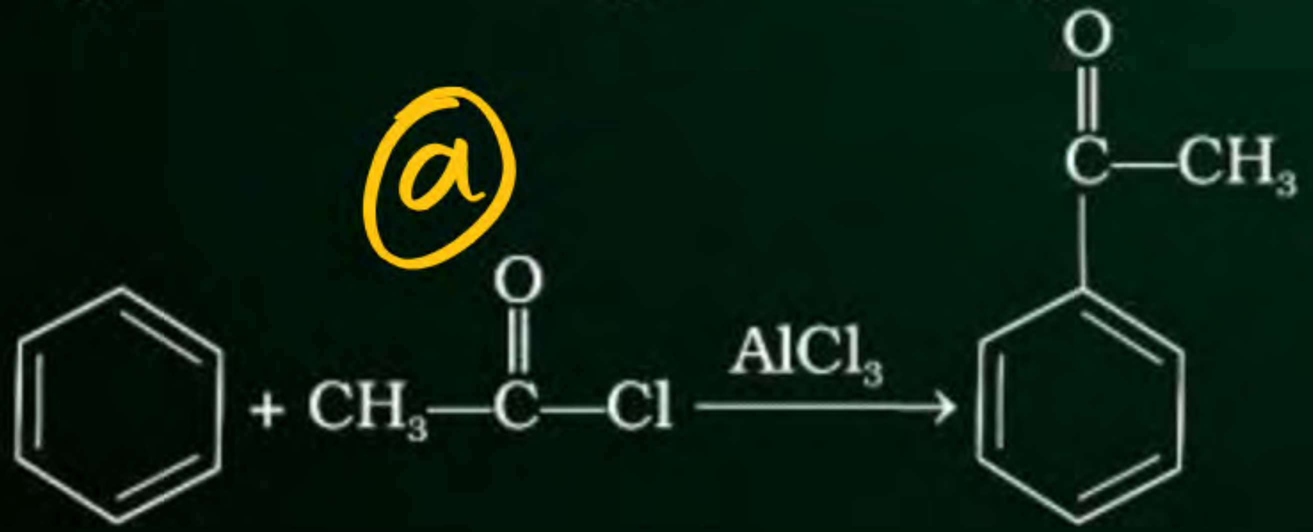
45 que

Utthaan series ✓ Practice

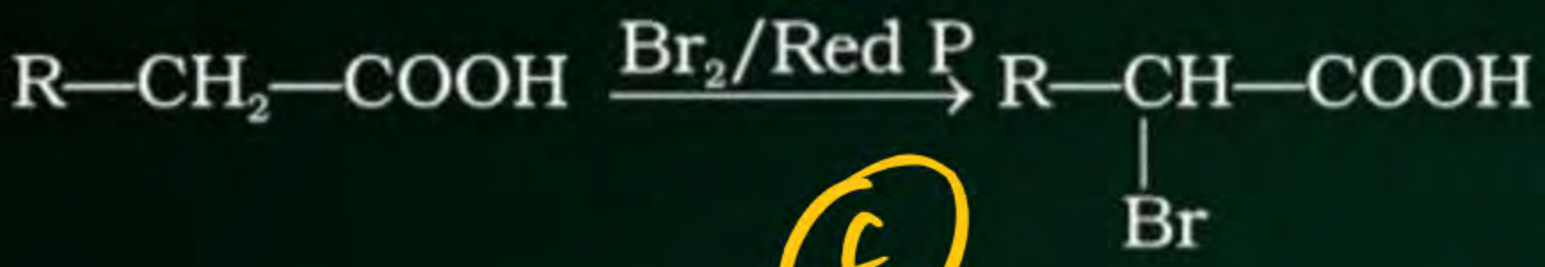
Extra

QUESTION (NCERT Exemplar)

Match the example given in Column I with the name of the reaction in Column II.

Column I (Example)	Column II (Reaction)
ⓔ (i)  $CH_3-\overset{O}{\overset{\|}{C}}-Cl + H_2 \xrightarrow{Pd\text{-}C/BaSO_4} CH_3-\overset{O}{\overset{\|}{C}}-H$	(a) Friedel Crafts acylation
ⓓ (ii)  CHO NaOH CH_2OH + COO^-Na^+	(b) HVZ reaction
ⓐ (iii)  + $CH_3-\overset{O}{\overset{\|}{C}}-Cl$ $AlCl_3$ $\overset{O}{\overset{\|}{C}}-CH_3$	(c) Aldol condensation

ⓑ



(iv) $R-CH_2-COOH \xrightarrow{Br_2/\text{Red P}} R-\underset{\underset{Br}{|}}{CH}-COOH$ (d) Cannizaro's reaction

ⓕ

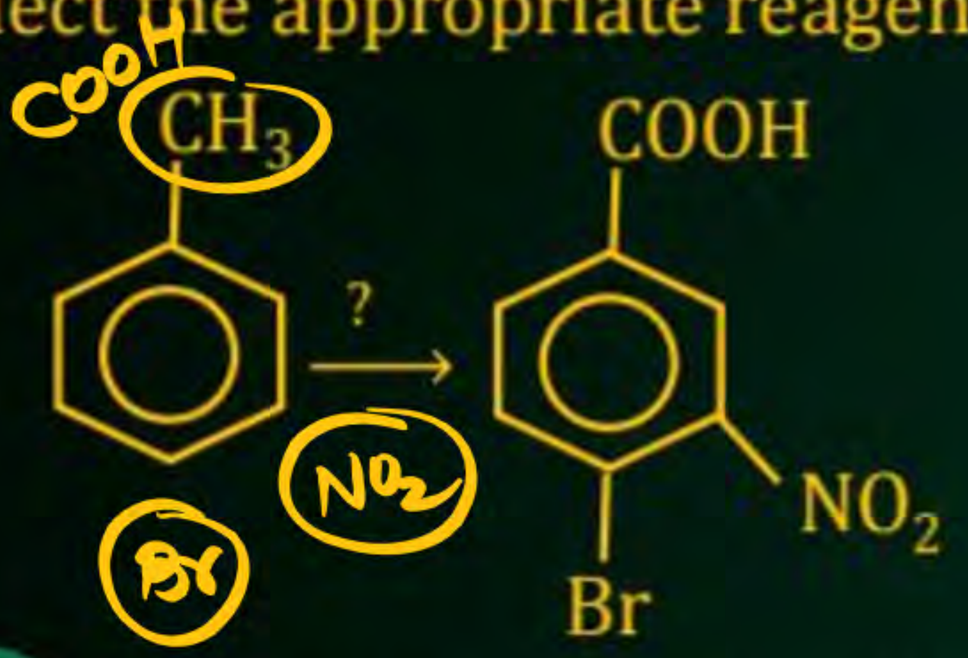
(v) $CH_3-CN \xrightarrow[\text{(ii) } H_2O/H^+]{\text{(i) } SnCl_2/HCl} CH_3CHO$ (e) Rosenmund's reduction

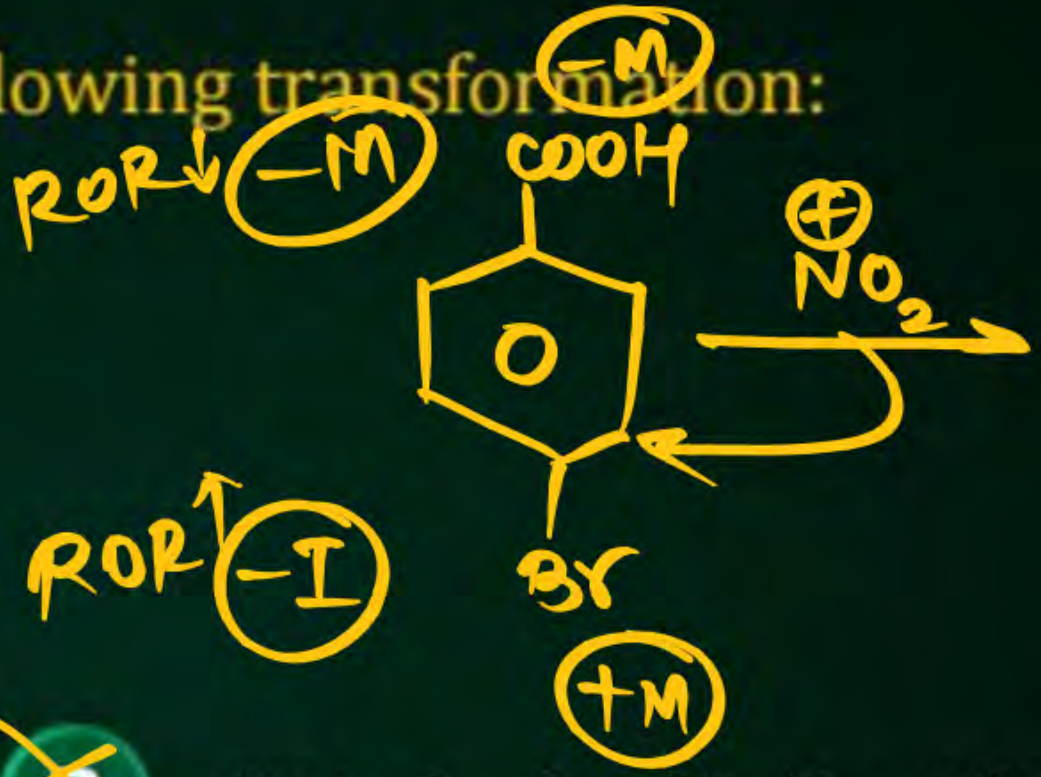
(vi) $2CH_3CHO \xrightarrow{NaOH} CH_3-CH=CHCHO$ (f) Stephen's reaction

ⓒ

QUESTION (AIIMS 27 May, 2018 (E))

Select the appropriate reagents for the following transformation:


COOH
CH3
?
NO2
Br
COOH
NO2
Br


ROR↓
−M
COOH
−M
⊕
NO2
ROR↑
−I
Br
+M

[✓ A] $Br_2/FeBr_3$, $KMnO_4$, HNO_3/H_2SO_4

B $KMnO_4$, $Br_2/FeBr_3$, HNO_3

C HNO_3, $Br_2/FeBr_3$, $KMnO_4$

D HNO_3, $KMnO_4$, $Br_2/FeBr_3$

QUESTION (AIIMS 2013, 2017) 25

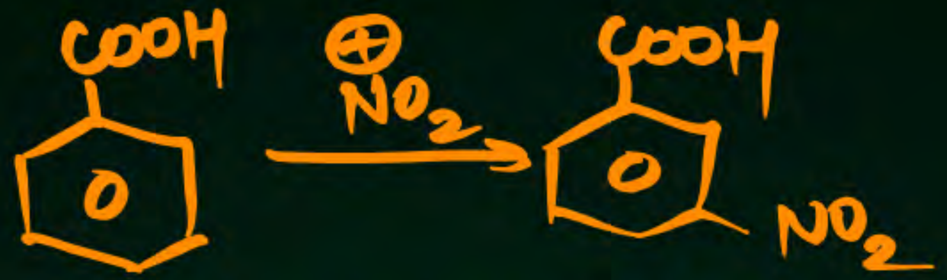
The reaction

$$RCH_2CH_2COOH \xrightarrow[Br_2]{Red\,P} R-CH_2-CHBr-COOH$$

is called as

- A Reimer-Tiemann reaction
- [✓ B] Hell-Volhard Zelinsky reaction
- C Cannizzaro reaction
- D Sandmeyer reaction

QUESTION (AIIMS 2009)

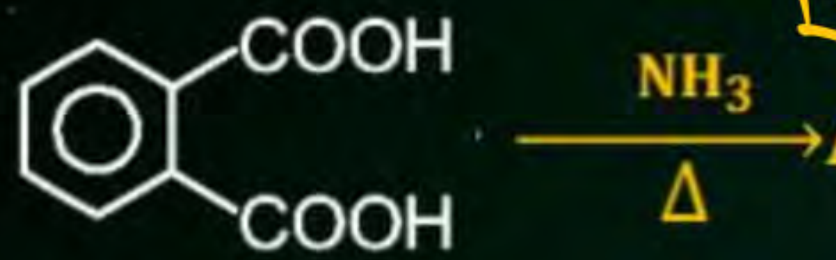


Assertion ✓: Nitration of benzoic acid gives *m*-nitrobenzoic acid.

Reason ✗: Carboxyl group increases the electron-density at *meta*-position.

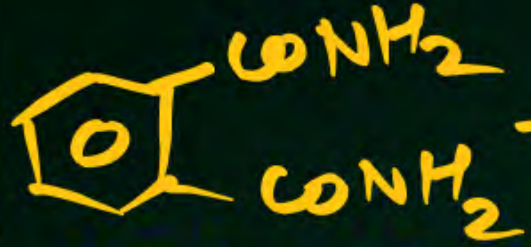
- **A** If both Assertion and Reason are correct and the Reason is the correct explanation of Assertion.
- **B** If both Assertion and Reason are correct but Reason is not the correct explanation of Assertion.
- [✓ **C**] If Assertion is correct but Reason is incorrect.
- **D** If both the Assertion and Reason are incorrect.

QUESTION



COOH
COOH
NH_3
Δ

A. Identify 'A'



$CONH_2$
$CONH_2$

Δ $-NH_3$

A Benzene

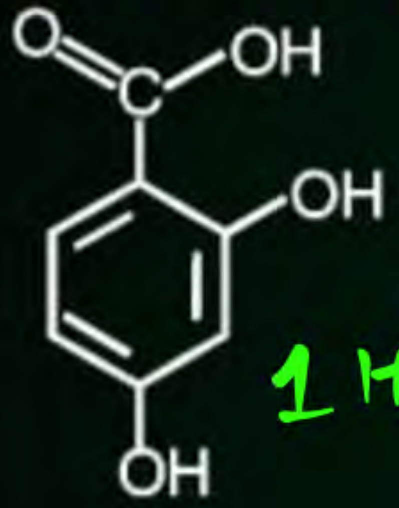
[✓ B Phthalimide]

C Benzamide

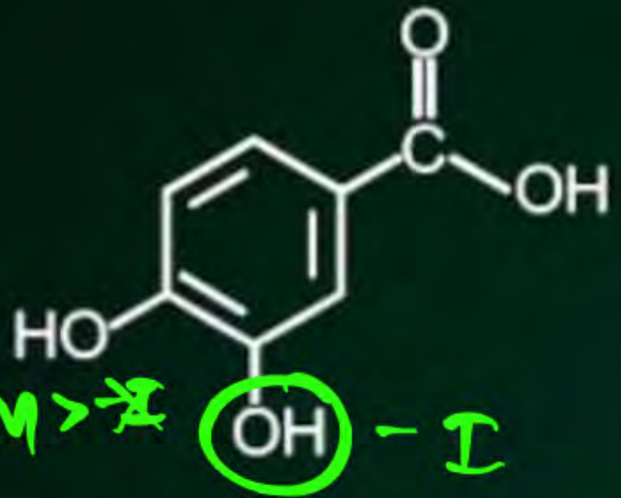
D Acetaldehyde

QUESTION

Among the given compounds

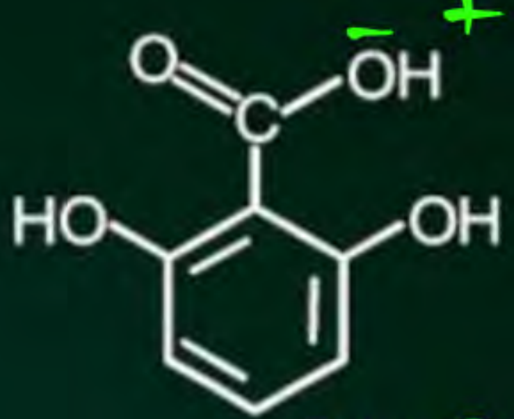

1 H.B

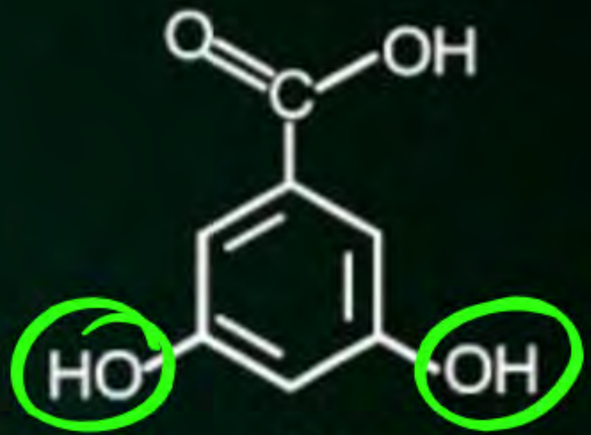
(I)


+M > -I

-I

(II)


(III) 2 H.B


-I

(IV)

-I

The order of decreasing acidity is:

A III > IV > I > II

B I > IV > II > III

C III > I > IV > II

D II > I > III > IV

QUESTION

Benzoic acid reacts with conc. HNO_3 and conc. H_2SO_4 to give major products as:

Ⓐ o-nitrobenzoic acid
Ⓑ p-nitrobenzoic acid
[✓ Ⓒ m-nitrobenzoic acid]
Ⓓ Both (A) and (B)

QUESTION

Which of the following doesn't give HVZ reaction?

A $CH_3CH_2\underline{COOH}$

B $CH_3C\underline{OOH}$

[✓ C] $(CH_3)_2CH\boxed{OH}$

Alcohol

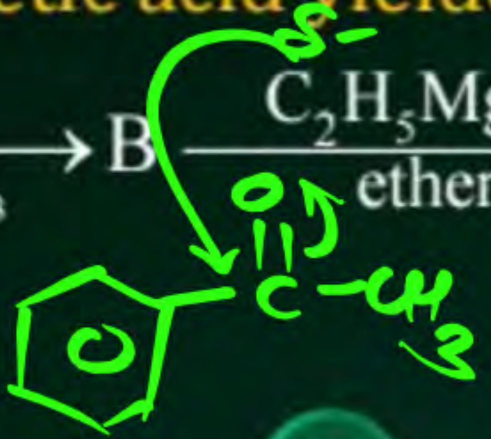
D None of these

QUESTION

In a set of the given reaction, acetic acid yielded a product C

$$CH_3CO\underline{\underline{OH}} + PCl_5 \rightarrow A \xrightarrow[\text{Anh. AlCl}_3]{C_6H_6} B \xrightarrow[\text{ether}]{C_2H_5MgBr} C$$

$CH_3-\underset{\underset{O}{\|}}{\overset{+}{C}}-Cl^{-}$

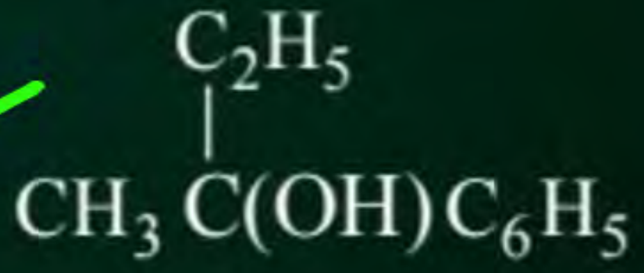


Product C would be

A $CH_3CH(OH)C_2H_5$

B $CH_3COC_6H_5$

C $CH_3CH(OH)C_6H_5$

D


$$CH_3\overset{\overset{C_2H_5}{|}}{C}(OH)C_6H_5$$

QUESTION

Identify A and B in the following reaction:

$$CH_3CH_3 \xleftarrow[\text{HI/Red P}]{B} CH_3COOH \xrightarrow[\text{LAH}]{A} CH_3CH_2OH$$

	A	B
A	HI + Red P	$LiAlH_4$
B	Ni/Δ	$LiAlH_4$
C	Pd-$BaSO_4$	Zn + HCl
[✓ D]	$LiAlH_4$	HI + Red P

Home Work

QUESTION 01

The carboxylic acid that does not undergo HVZ reaction is:

Ⓐ CH_3CH_2COOH

Ⓑ $(CH_3)_2CHCOOH$

Ⓒ $CH_3CH_2CH_2CH_2COOH$

Ⓓ $(CH_3)_3CCOOH$

QUESTION 02

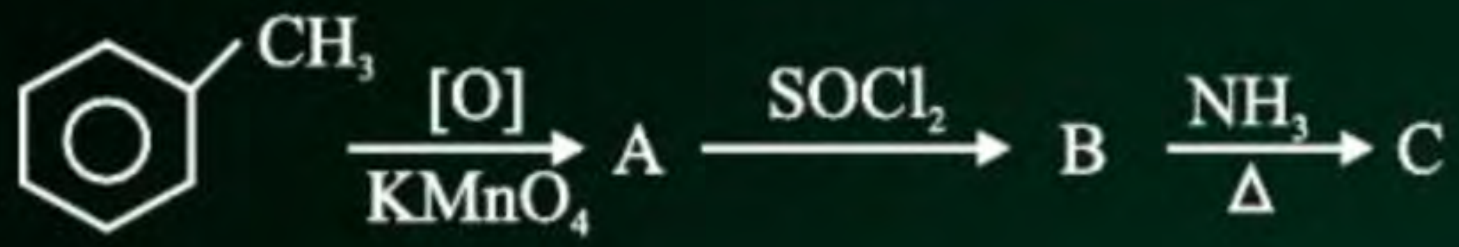
$$CH_3COOH \xrightarrow{LiAlH_4} (A) \xrightarrow[300°C]{Cu} (B) \xrightarrow[NaOH/\Delta]{\text{dilute}} (C) \xrightarrow{O_3/Zn/H_2O} D + E$$

In the above reaction, D and E are respectively:

- A CH_3CHO and $CHO–CHO$
- B CH_3COOH and $CHO–CHO$
- C CH_3CHO and $CH_3–CH_2OH$
- D none of these

QUESTION 03

In the following sequence of reactions, what is C?


CH3
[O]
KMnO4
A
SOCl2
B
NH3
Δ
C

- **A** An amide
- **B** Phenyl isocyanate
- **C** Primary amine
- **D** A chain lengthened hydrocarbon

QUESTION 04

In the given reaction, major product will be:

$$CH_3{-}COOH \xrightarrow[\text{(ii) NaCN} \\ \text{(iii) } H_2O/H^{\oplus}/\Delta]{\text{(i) } Br_2/\text{redP}}$$

(A) CH_3COOH

(B) $COOH{-}CH_2{-}CH_2{-}COOH$

(C) Succinic anhydride

(D) Malonic anhydride

QUESTION 05

Acetic acid reacts with PCl_5 to form:

Ⓐ $CHCl_2COOH$

Ⓑ CH_3COOH

Ⓒ CH_3COCl

Ⓓ $CH_2ClCOOH$

QUESTION 06

Benzoic acid reacts with bromine to give

- (A) o-bromobenzoic acid
- (B) m-bromobenzoic acid
- (C) p-bromobenzoic acid
- (D) 3, 4-dibromobenzoic acid

QUESTION 07

Which of the following carboxylic acids give HVZ reaction?

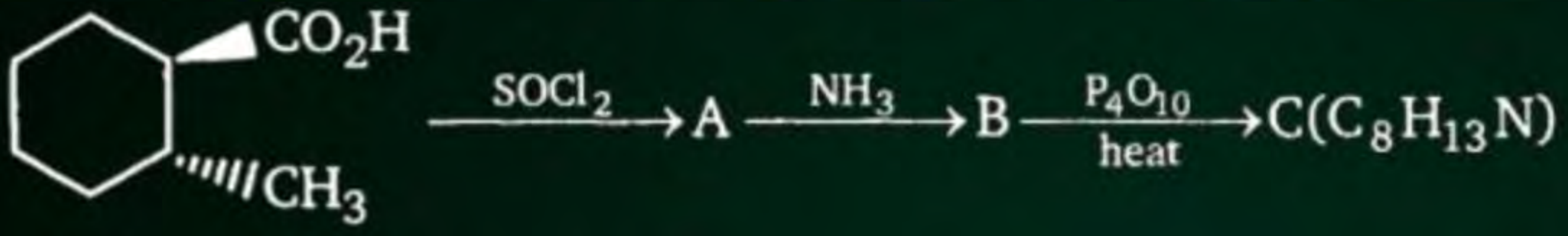
I = CH_3COOH, II = $HCOOH$, III = CH_3CH_2COOH, IV = $(CH_3)_3CCOOH$

V = $(CH_3)_2CHCOOH$

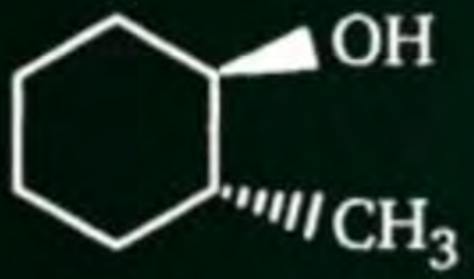
- A I, II, III
- B I, III, V
- C III, IV, V
- D II, III, IV

QUESTION 08

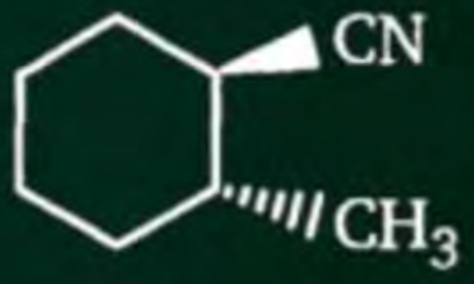
Identify C in the following sequence of reactions:


CO2H
CH3
SOCl2
A
NH3
B
P4O10
heat
C(C8H13N)

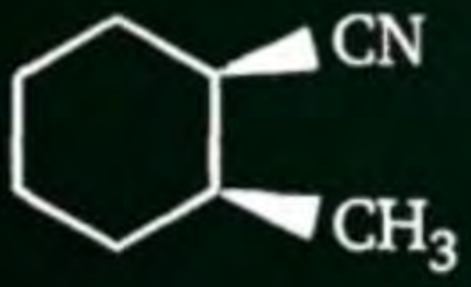
(A)



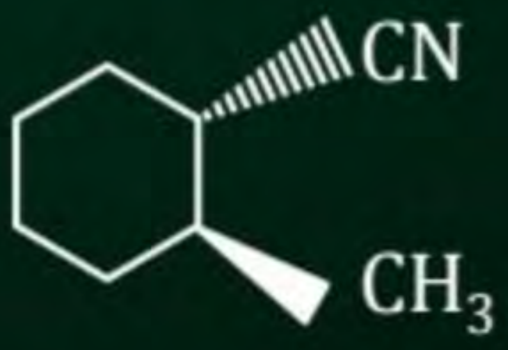
(B)



(C)



(D)



QUESTION 09

The organic product formed in the reaction, $C_6H_5COOCH_3 \xrightarrow{LiAlH_4,\ H^+}$ are:

Ⓐ $C_6H_5CH_2OH$ and CH_3OH

Ⓑ C_6H_5COOH and CH_4

Ⓒ $C_6H_5CH_3$ and CH_3OH

Ⓓ $C_6H_5CH_3$ and CH_4

QUESTION 10

$CH_3COOH \xrightarrow{\text{Red P}/Br_2} CH_2BrCOOH$. The reaction is called

A Schotten-Baumann reaction

B Hell-Volhard-Zelinsky reaction

C Finkelstein reaction

D none of the above

ANSWER KEY

1. D
2. A
3. A
4. A
5. C
6. B
7. B
8. B
9. A
10.B

Home Work From PW Module (Yakeen NEET)

Prarambh: Q 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89

PhysicsWallah
अनुगच्छतु प्रवाहं

PANKAJ SIR

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@PSCAA

Thank you!"

YAKEEN 2.0

FOR NEET 2025

Lecture- 09 **Organic Chemistry**

Aldehydes, Ketones and Carboxylic Acids

By- Pankaj Sir(POPU MAMA)

Physics Wallah

Topics *to be covered*

1. NEET/AIPMT & JEE Mains PYQs Discussion

NEET/AIPMT

PYQs

QUESTION [NEET 2024]

Fehling's solution 'A' is:

- **A** ✗ Alkaline solution of sodium potassium tartrate (Rochelle's salt)

Fehling B

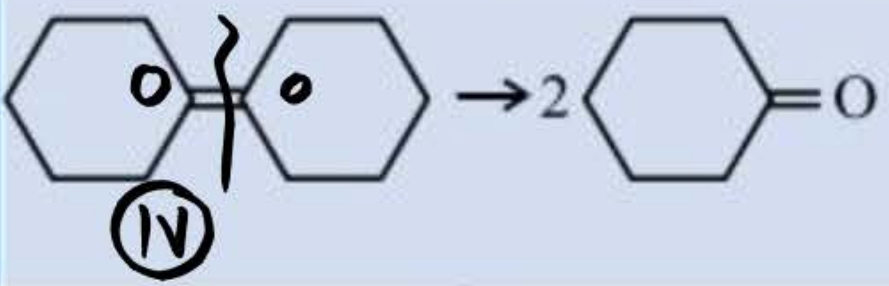
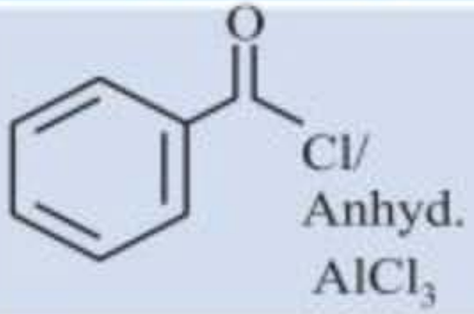
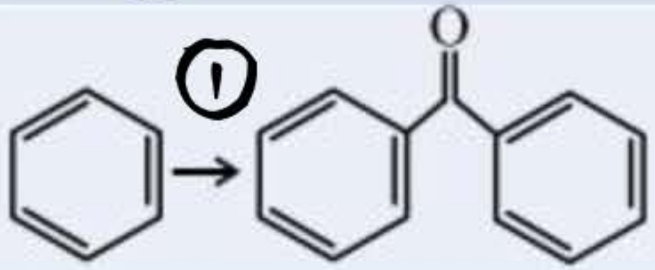
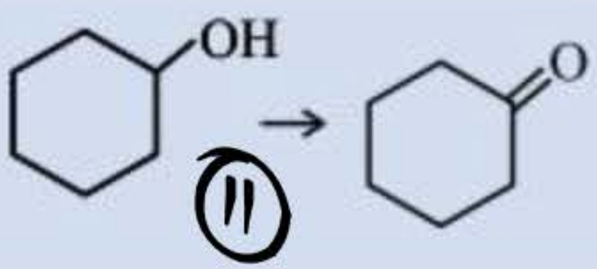
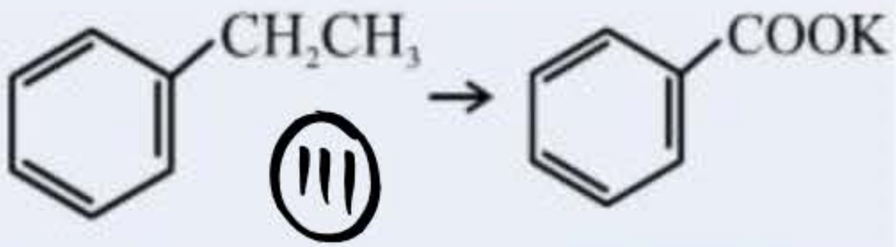
- **B** ✗ Aqueous sodium citrate

aq $\overset{2+}{Cu}SO_4 \rightarrow \overset{+1}{Cu_2}O$

- [✓ **C**] Aqueous copper sulphate
- **D** ✗ Alkaline copper sulphate

QUESTION [NEET 2024]

Match List I with List II.

List-I (Reaction)		List-II (Reagents/Condition)	
A.		I.	 O Cl/ Anhyd. $AlCl_3$
B.		II.	CrO_3
C.		III.	$KMnO_4$/ KOH, Δ
D.	 CH_2CH_3 COOK III	IV.	(i) O_3 (ii) Zn-H_2O

Choose the correct answer from the option given below:

[✓ A] A-IV, B-I, C-II, D-III

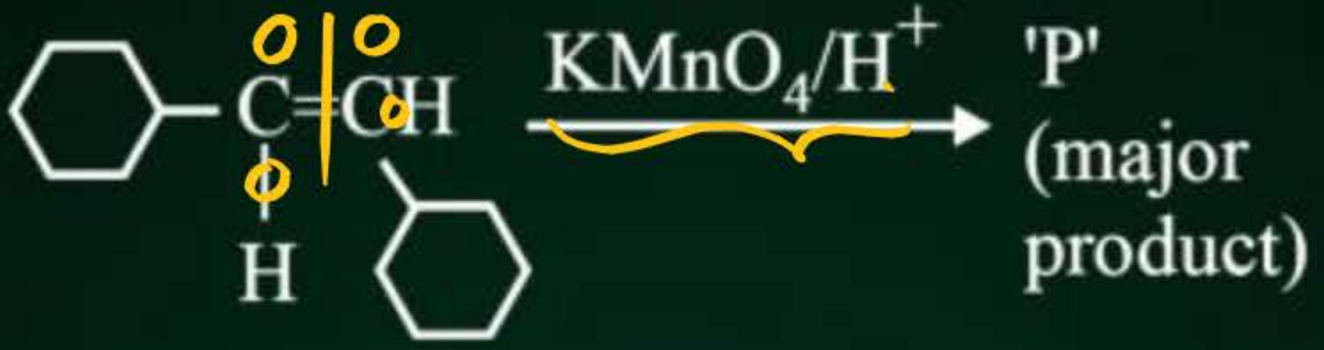
B A-I, B-IV, C-II, D-III

C A-IV, B-I, C-III, D-II

D A-III, B-I, C-II, D-IV

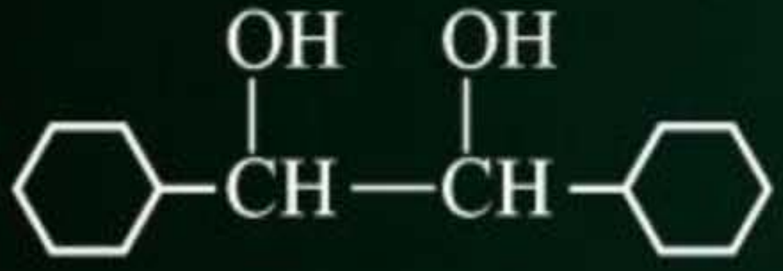
QUESTION [NEET 2024]

For the given reaction:

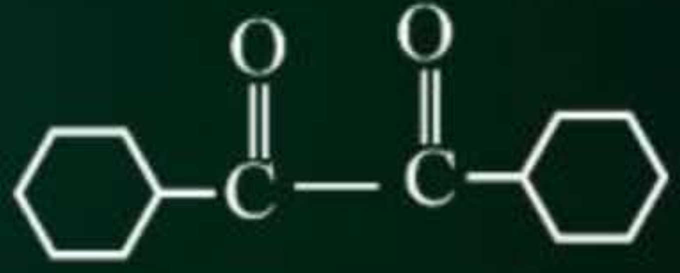

C=CH
H
O | O
O
KMnO4/H+
'P'
(major
product)

‘P’ is:

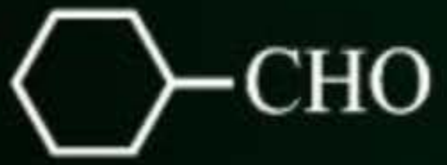
(A)



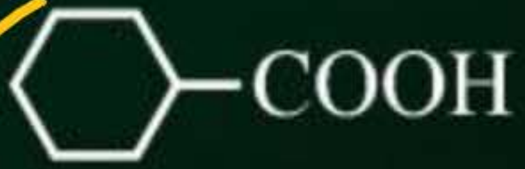
(B)



(C)

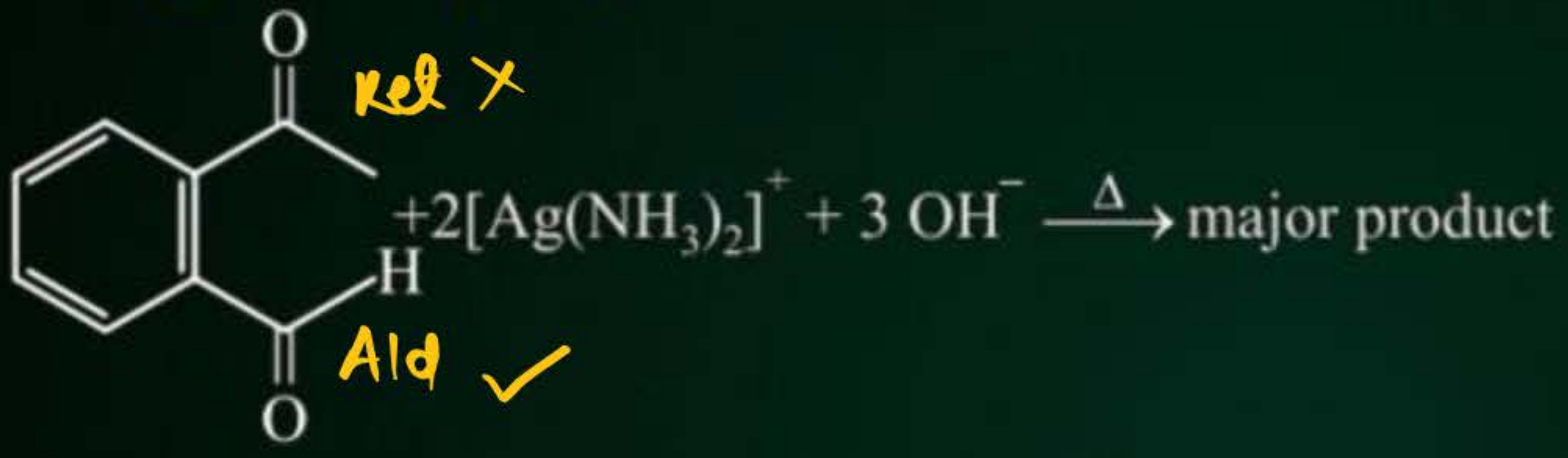


(D) ✓

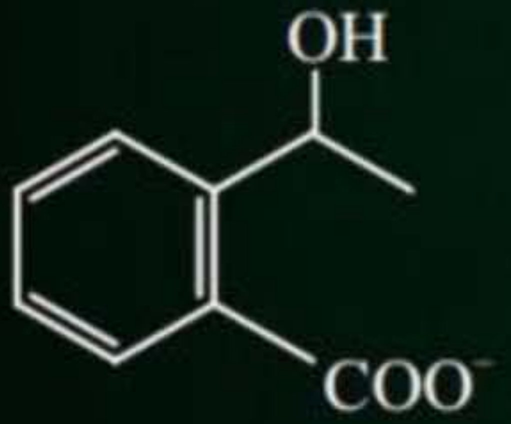


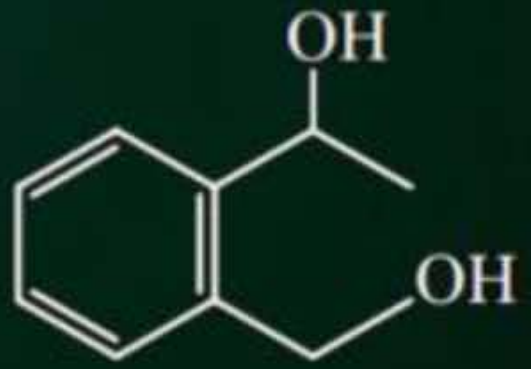
QUESTION [NEET 2023]

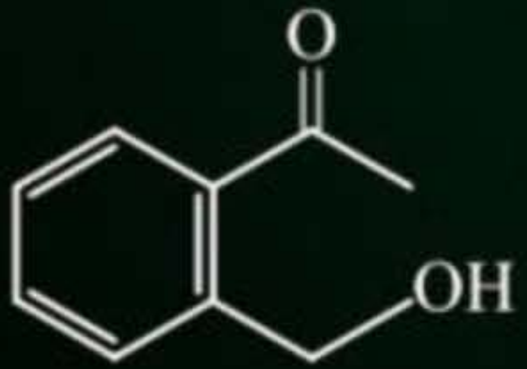
Identify the major product obtained in the following reaction:

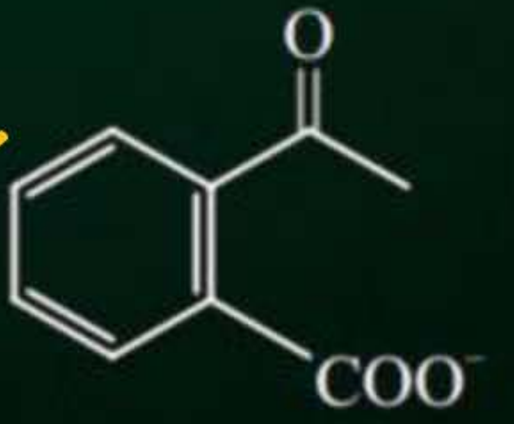


$+2[Ag(NH_3)_2]^+ + 3\,OH^- \xrightarrow{\Delta}$ major product

(A)


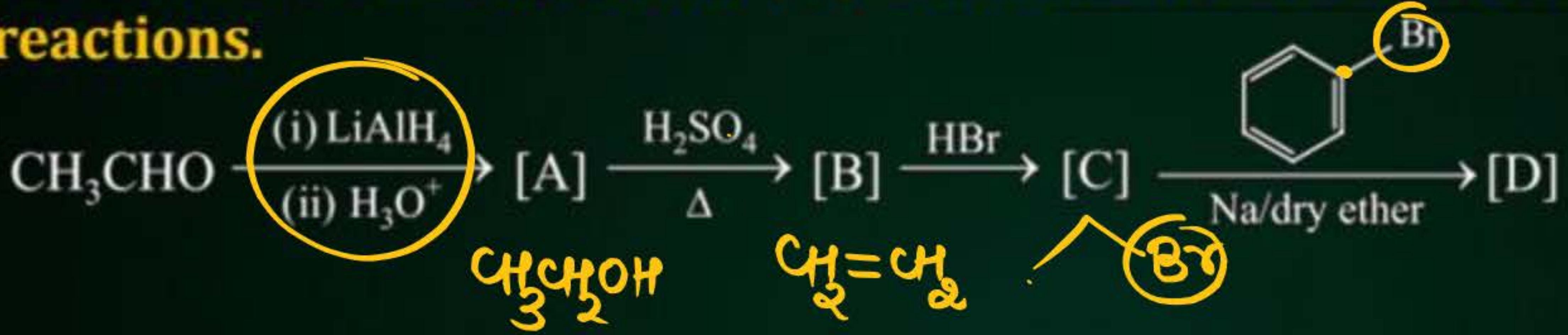
(B)


(C)


✓ (D)


QUESTION [NEET 2023]

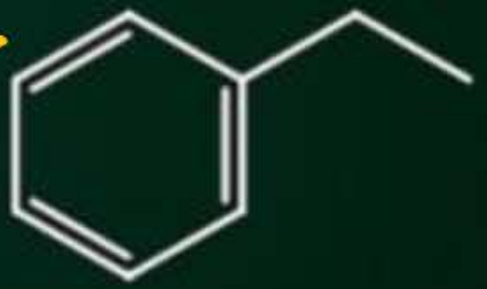
Identify the final product [D] obtained in the following sequence of reactions.



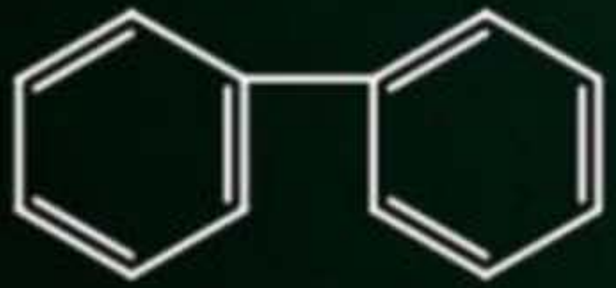
$$CH_3CHO \xrightarrow[\text{(ii) } H_3O^+]{\text{(i) } LiAlH_4} [A] \xrightarrow[\Delta]{H_2SO_4} [B] \xrightarrow{HBr} [C] \xrightarrow[\text{Na/dry ether}]{} [D]$$

A $HC \equiv C^-Na^+$

B ✓



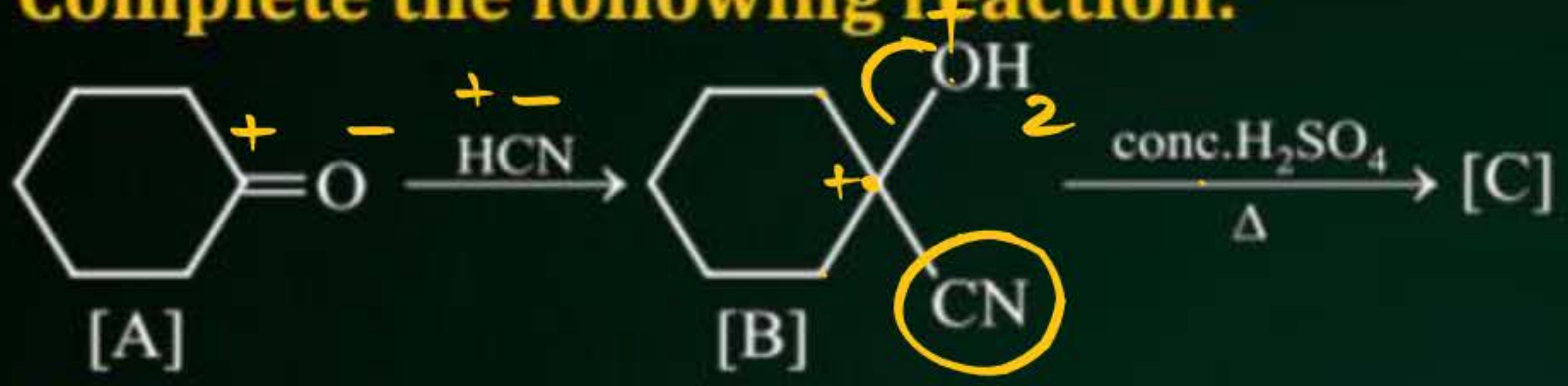
C



D C_4H_{10}

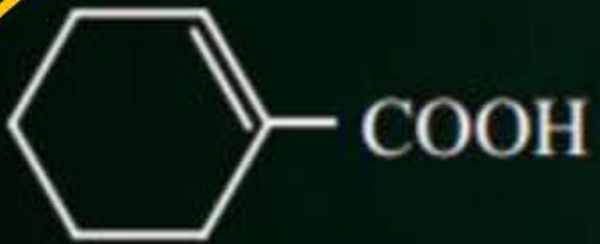
QUESTION [NEET 2023]

Complete the following reaction:

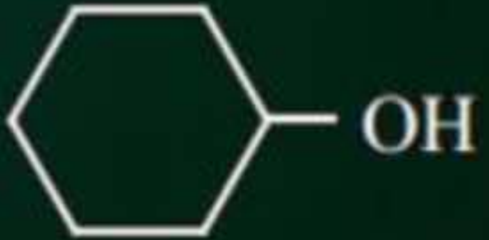

O
HCN
OH
CN
conc.H_2SO_4
Δ
[C]
[A]
[B]

[C] is __________.

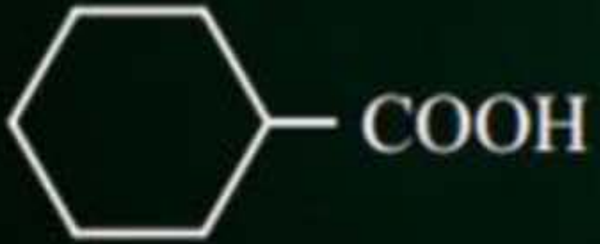
[✓ A]



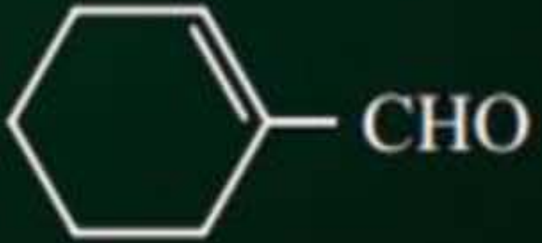
B



C

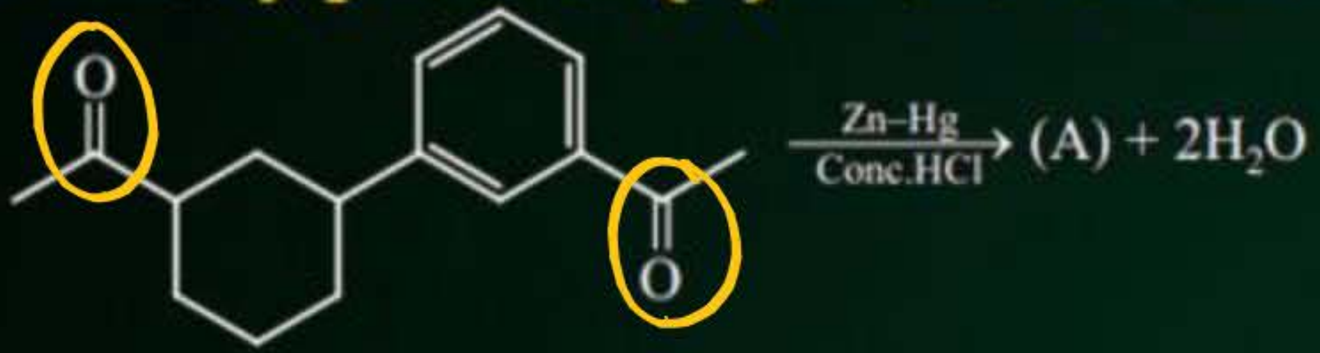


D

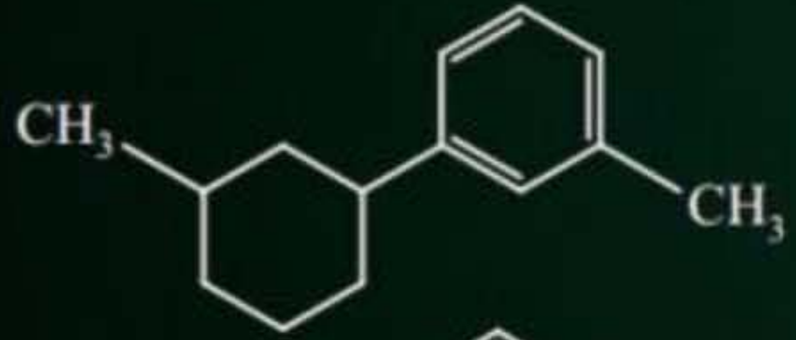


QUESTION [NEET 2023]

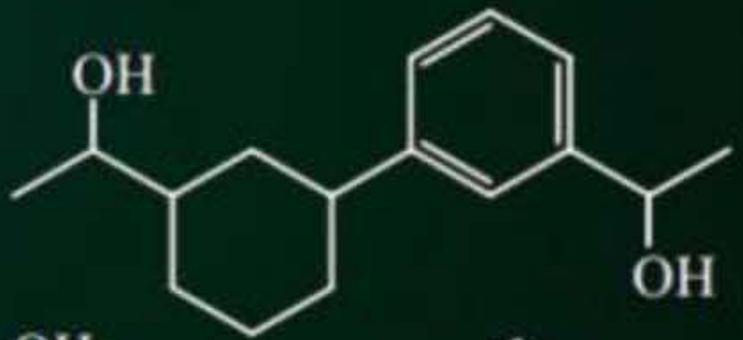
Identify product (A) in the following reaction.


O
O
Zn–Hg
Conc.HCl
(A) + 2H₂O

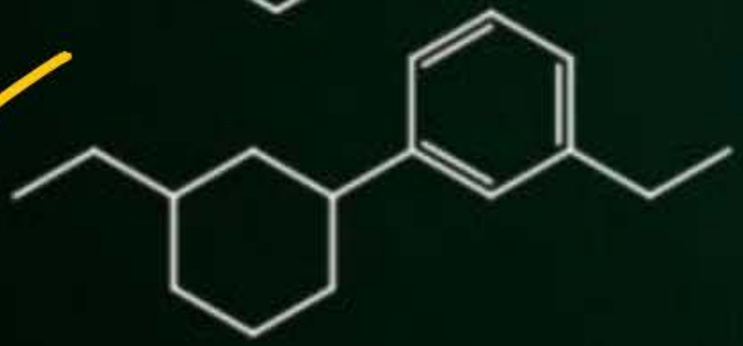
A



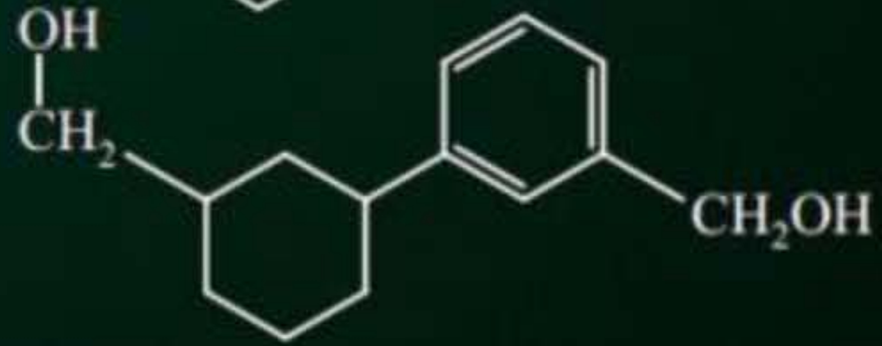
B



[✓ C]



D


OH
CH₂
CH₂OH

QUESTION [NEET 2022]

$$\overset{\delta-}{R}MgX + CO_2 \xrightarrow[\text{ether}]{\text{dry}} Y \xrightarrow{H_3O^+} RCOOH$$

$R-\underset{\underset{O}{\|}}{C}-\bar{O}\overset{2+}{Mg}\overset{-}{X}$

What is Y in the above reaction?

$R-\underset{\underset{O}{\|}}{C}-\bar{O}\overset{+}{Mg}X$

Ⓐ $(RCOO)_2Mg$

[✓ Ⓑ] $RCOO^-Mg^+X$

Ⓒ $R_3CO^-Mg^+X$

Ⓓ $RCOO^-X^+$

QUESTION [NEET 2022]

Match the List I with List II

	List-I (Products formed)		List-II (Reaction of carbonyl compound with)
(a)	Cyanohydrin (iv)	(i)	NH_2OH
(b)	Acetal (iii)	(ii)	RNH_2
(c)	Schiff's base (ii)	(iii)	alcohol
(d)	Oxime (i)	(iv)	HCN

Choose the correct answer from the options given below:

[✓ A] (a)-(iv), (b)-(iii), (c)-(ii), (d)-(i)

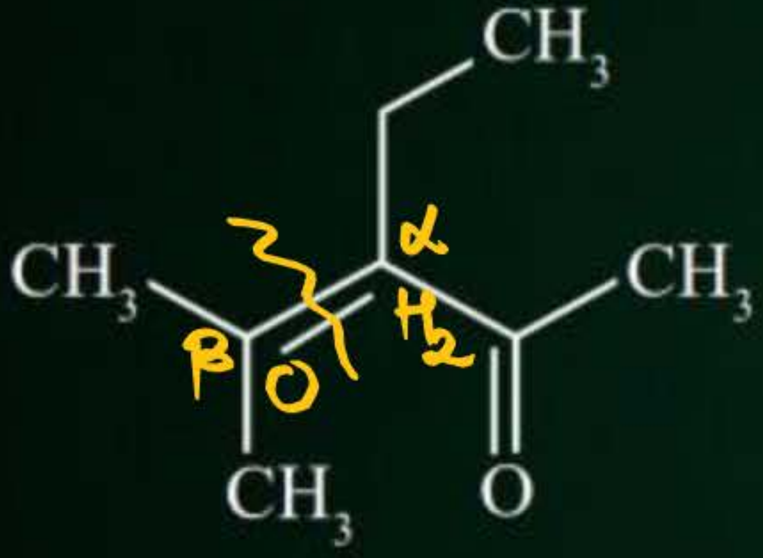
B (a)-(iii), (b)-(iv), (c)-(ii), (d)-(i)

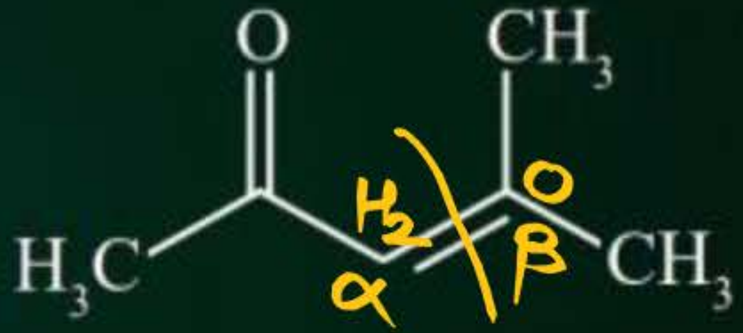
C (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)

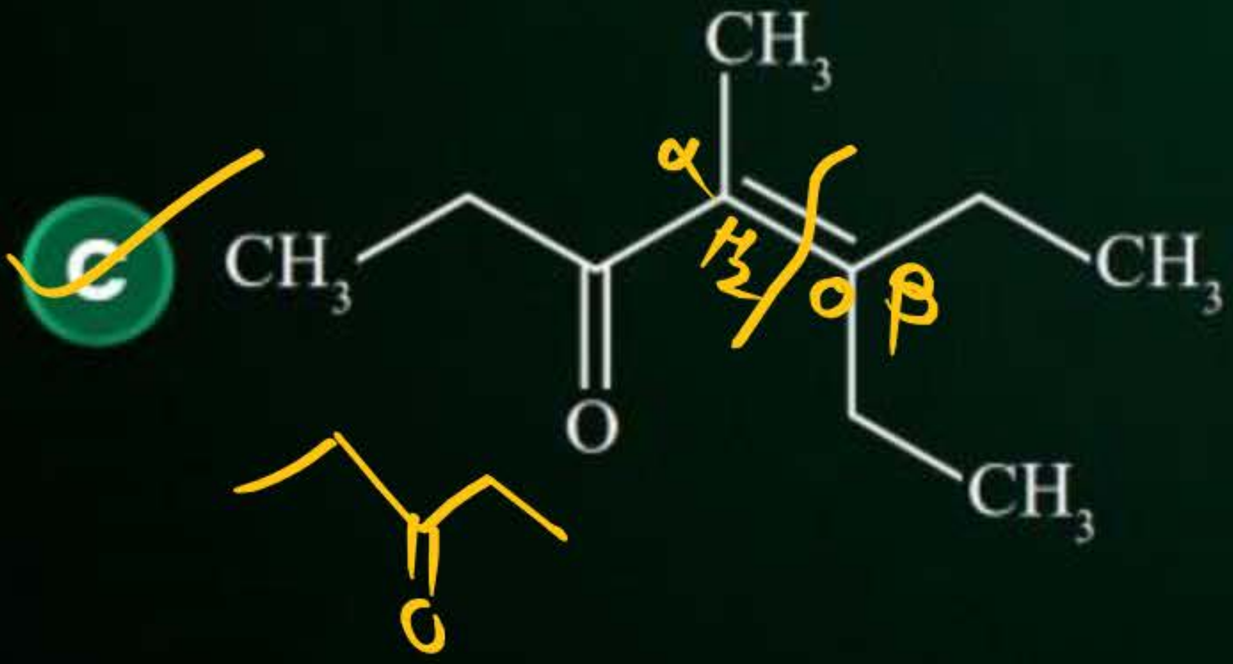
D (a)-(i), (b)-(iii), (c)-(ii), (d)-(iv)

QUESTION [NEET 2022]

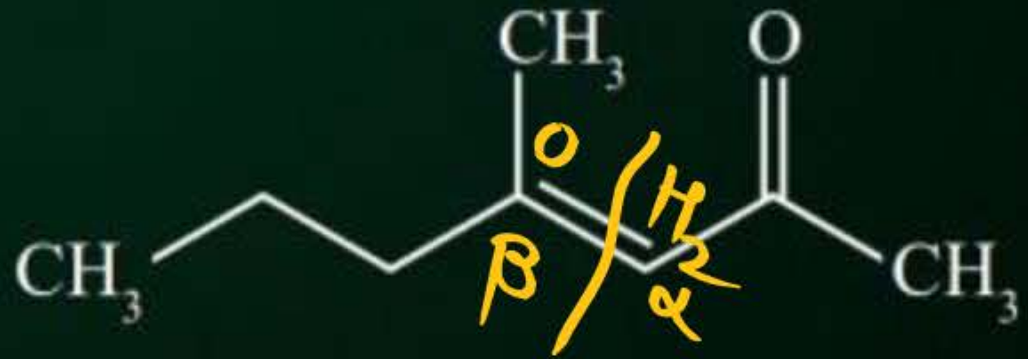
Which one of the following is not formed when acetone reacts with 2-pentanone in the presence of dilute NaOH followed by heating?

A

CH3
CH3
CH3
CH3
O
α
β
O
H2

B

O
CH3
H3C
CH3
H2
O
α
β

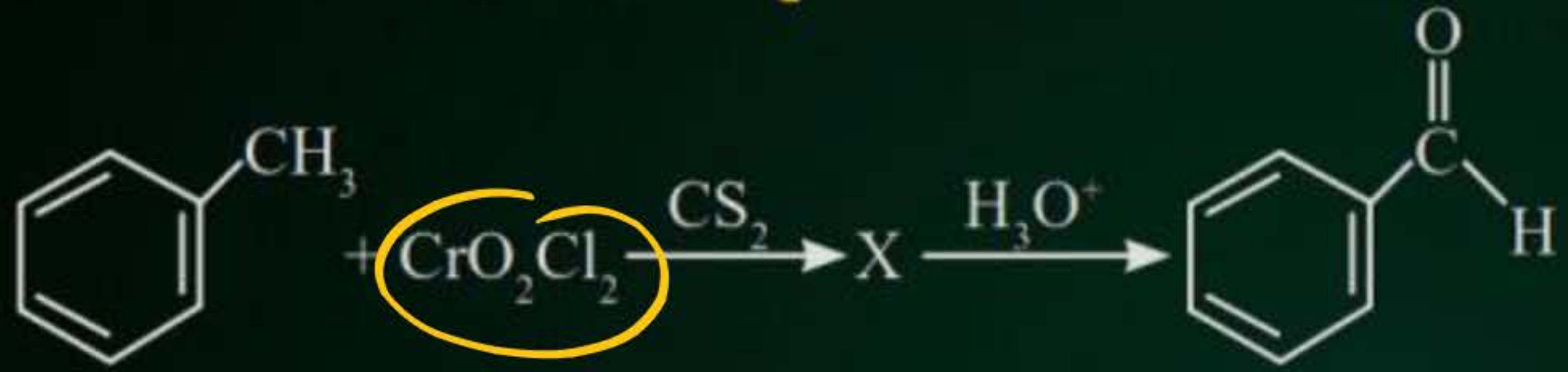
C

CH3
CH3
CH3
CH3
O
α
H2
O
β

O

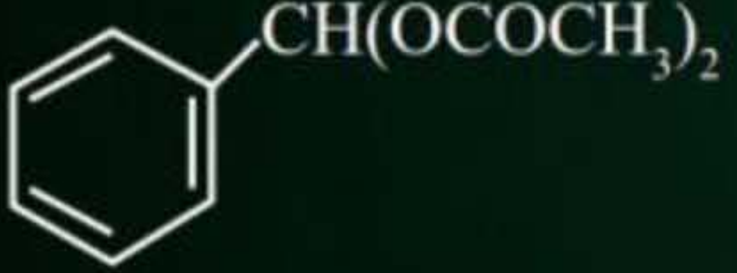
D

CH3
O
CH3
CH3
O
H2
β
α

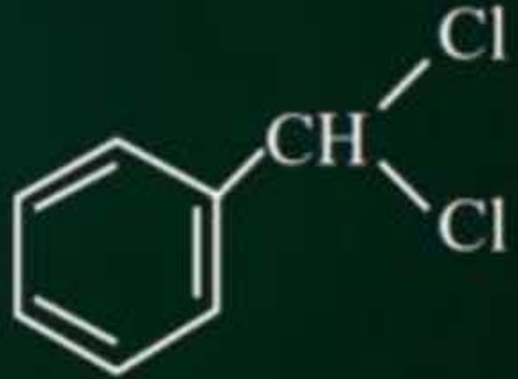
QUESTION [NEET 2021]

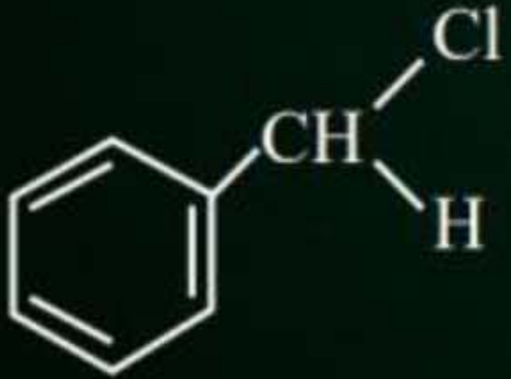
The intermediate compound 'X' in the following chemical reaction is:

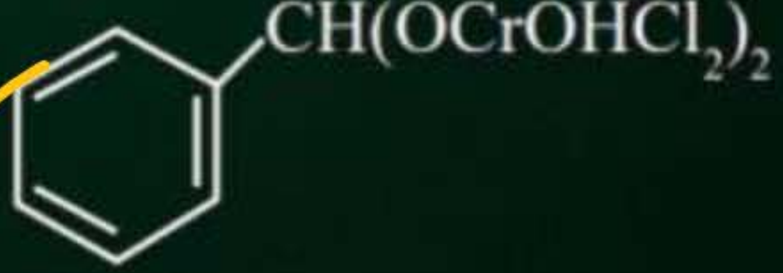


CH3
+ CrO2Cl2
CS2
X
H3O+
O
C
H

(A)


(B)


(C)


[✓ (D)]


CH(OCrOHCl2)2

QUESTION [NEET 2021]

$$CH_3CH_2COO^-Na^+ \xrightarrow[\text{Heat}]{\overset{\text{CaO}}{\text{NaOH}, +?}} CH_3CH_3 + Na_2CO_3.$$

Consider the above reaction and identify the missing reagent/chemical.

Ⓐ Red Phosphorus

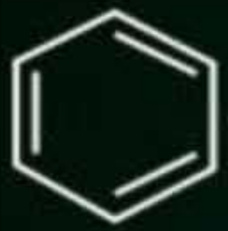
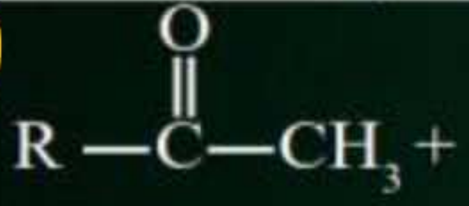
[✓ Ⓑ CaO]

Ⓒ DIBAL-H

Ⓓ B_2H_6

QUESTION [NEET 2021]

Match List-I with List-II.

	List-I		List-II
ii (A)	 $\xrightarrow[\text{Anhyd. AlCl}_3/\text{CuCl}]{\text{CO, HCl}}$	(i)	Hell-Volhard-Zelinsky reaction
iii (B)	 $R-\overset{O}{\overset{\|}{C}}-CH_3 +$ NaOX →	(ii)	Gattermann-Koch reaction
(C) iv	$R-CH_2-OH$ $+ R'COOH$ $\xrightarrow{\text{Conc. } H_2SO_4}$	(iii)	Haloform reaction
(D) i	$R-CH_2COOH$ $\xrightarrow[\text{(ii) } H_2O]{\text{(i) } X_2/\text{Red P}}$	(iv)	Esterification

Choose the correct answer from the options given below.

A A-iii, B-ii, C-i, D-iv

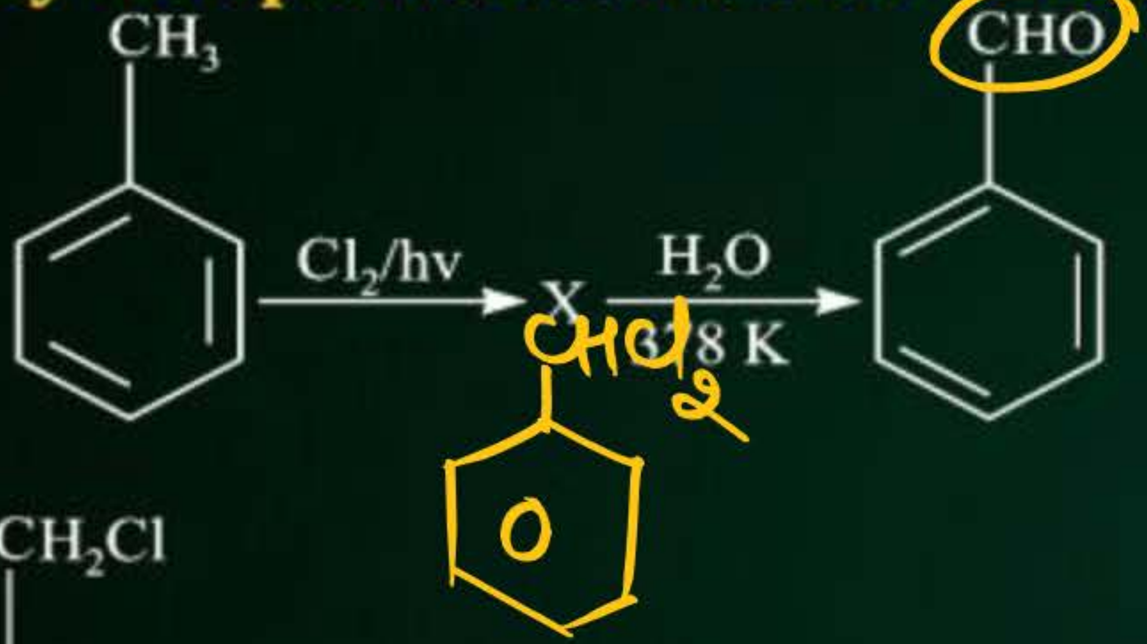
B A-i, B-iv, C-iii, D-ii

[✓ C A-ii, B-iii, C-iv, D-i]

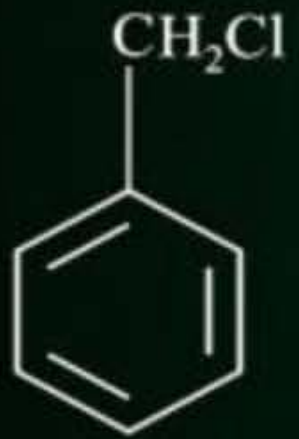
D A-iv, B-i, C-ii, D-iii

QUESTION [NEET 2020]

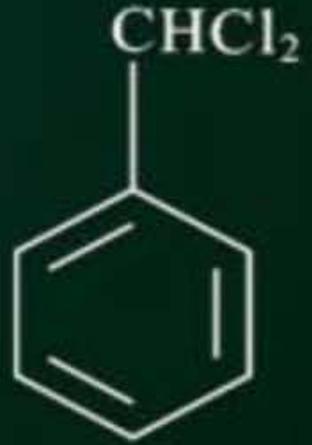
Identify compound X in the following sequence of reactions:


CH₃
Cl₂/hν
X
H₂O
3[illegible]8 K
CHO
CHCl₂

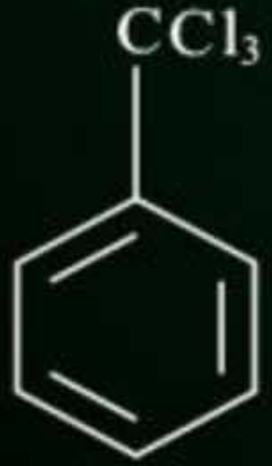
A



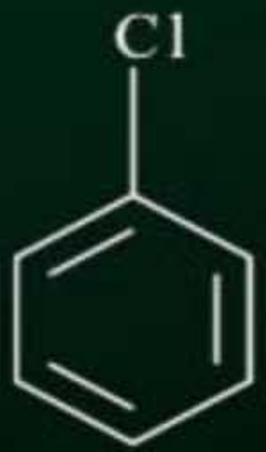
[✓ B]



C

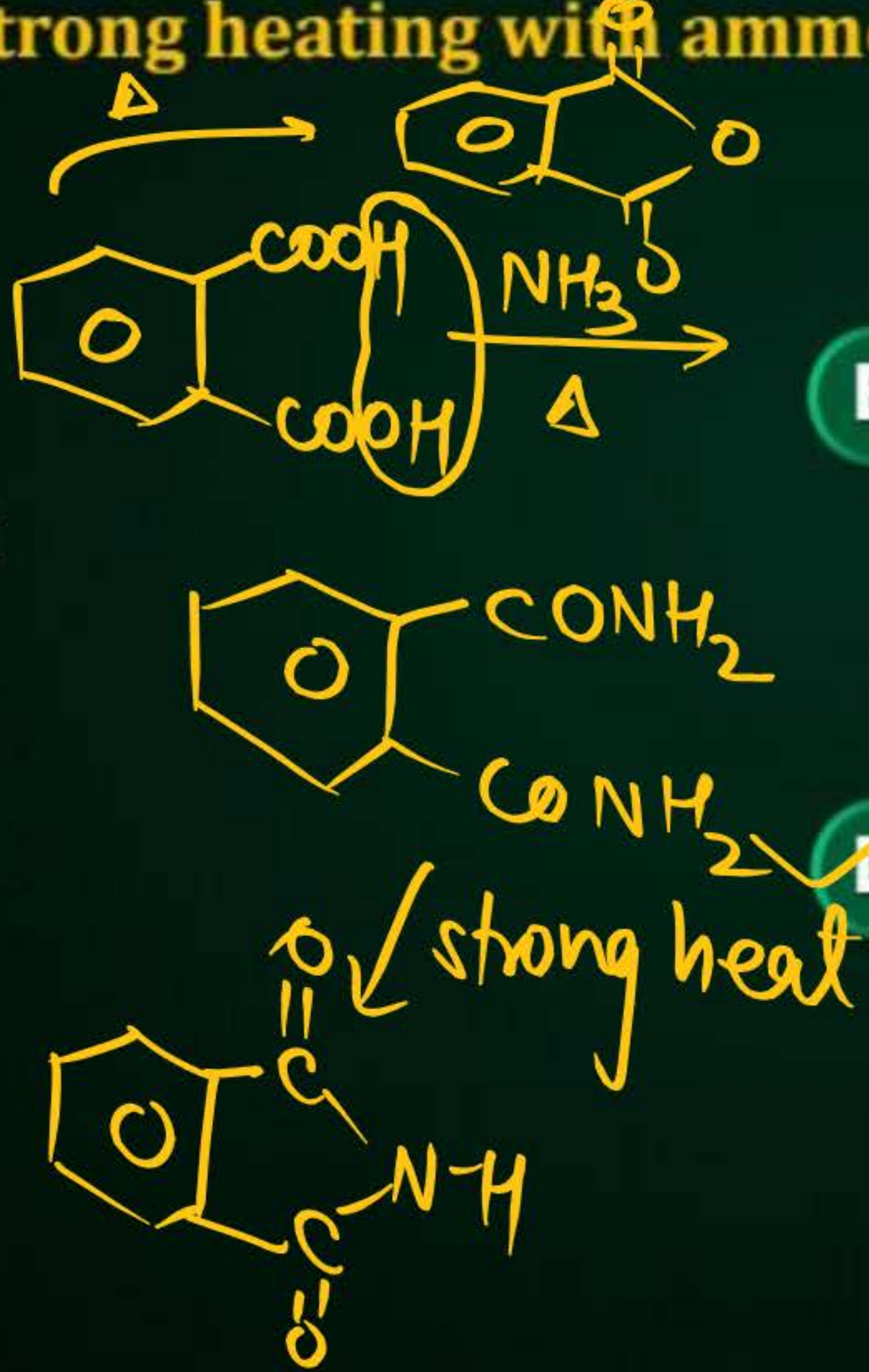


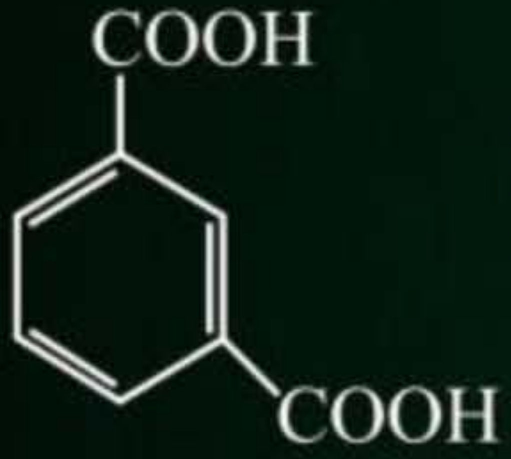
D

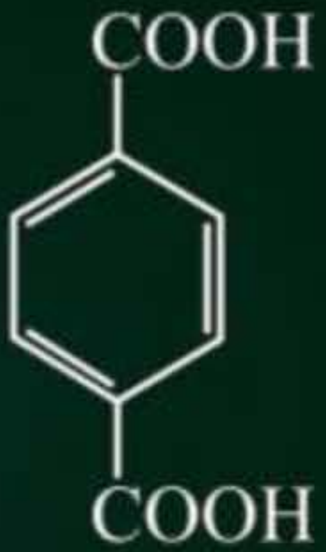


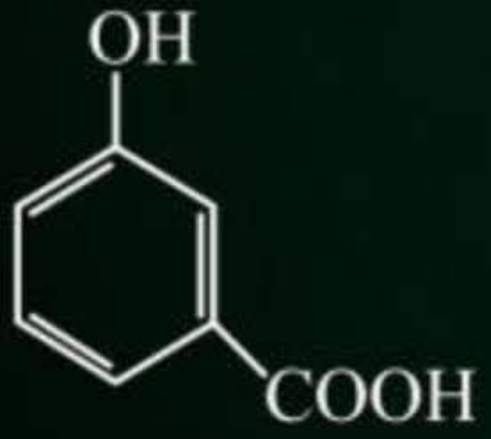
QUESTION [2020-Covid]

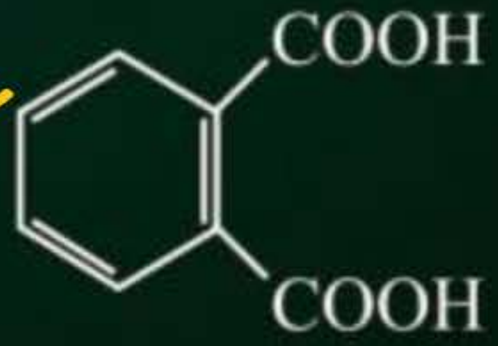
Which of the following acid will form an (i) Anhydride on heating and (ii) Acid imide on strong heating with ammonia?


Δ
O
COOH
COOH
NH3
Δ
CONH2
CONH2
strong heat
O
C
N-H
C
O

(A)


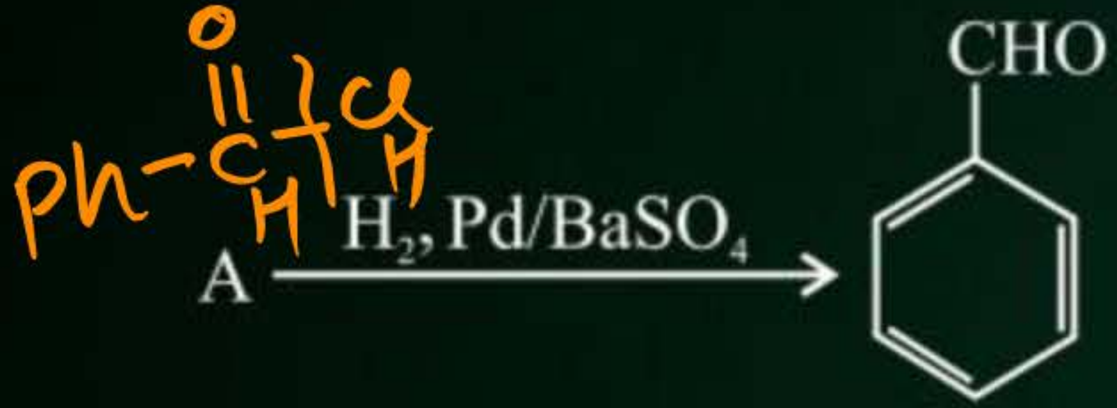
(B)


(C)


(D)


QUESTION [2020-Covid]

Identify compound (A) in the following reaction:


Ph-C(=O)-Cl
H H
A
H_2, Pd/$BaSO_4$
CHO

A Toluene

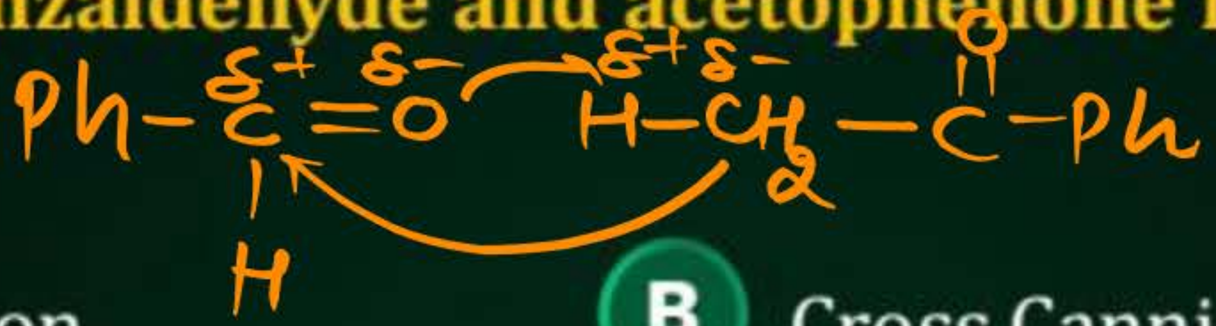
B Acetophenone

C Benzoic acid

[✓ **D**] Benzoyl chloride

QUESTION [NEET 2020]

Reaction between benzaldehyde and acetophenone in presence of dilute NaOH is known as:



$\mathrm{Ph}-\underset{\underset{H}{|}}{\overset{\delta+}{C}}=\overset{\delta-}{O} \quad \overset{\delta+}{H}-\underset{\alpha}{\overset{\delta-}{C}H_2}-\overset{\overset{O}{\|}}{C}-\mathrm{Ph}$

A Cannizzaro's reaction

B Cross Cannizzaro's reaction

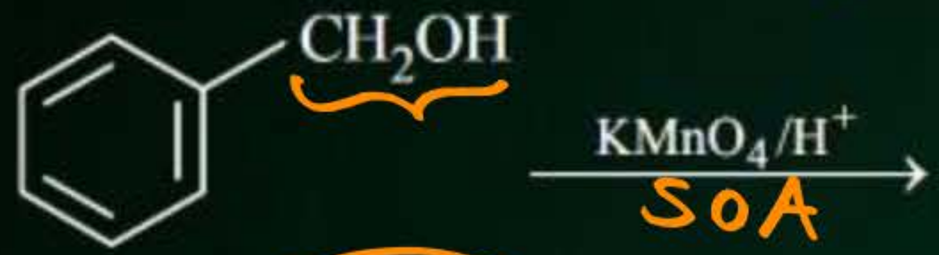
[✓ C] Cross Aldol condensation

D Aldol condensation

QUESTION [NEET Odisha 2019]

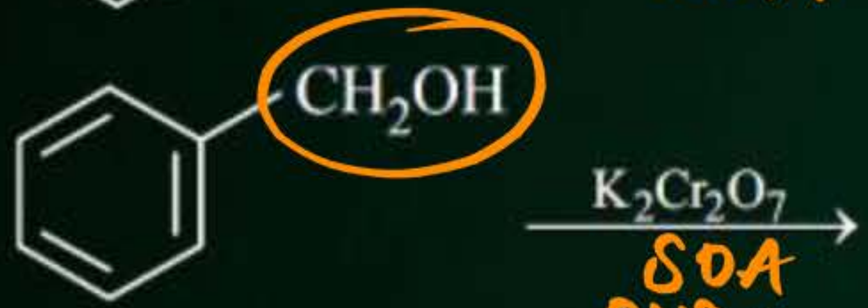
The reaction that does not give benzoic acid as the major product is:

A



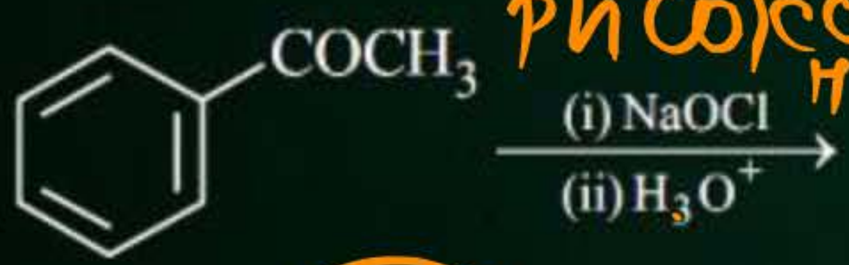
$C_6H_5CH_2OH \xrightarrow[\text{SOA}]{KMnO_4/H^+}$ Ph-COOH

B



$C_6H_5CH_2OH \xrightarrow[\text{SOA}]{K_2Cr_2O_7}$ Ph-COOH

C



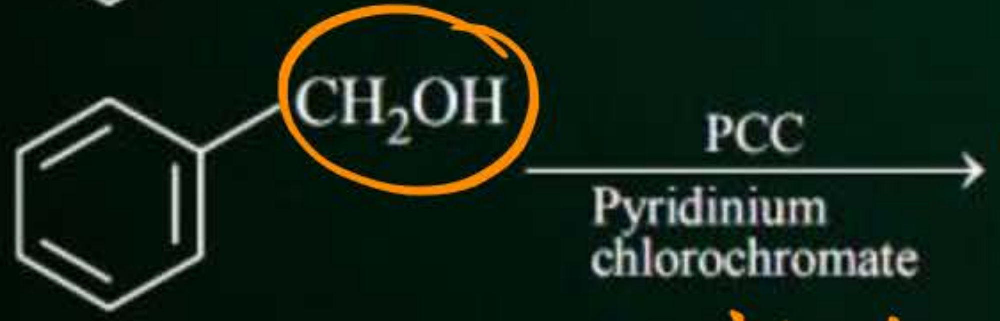
$C_6H_5COCH_3 \xrightarrow[\text{(ii) } H_3O^+]{\text{(i) NaOCl}}$

$Ph\overset{ONa}{CO}CCl_3 \rightarrow CHCl_3 + PhCOONa$

$\downarrow H^+$

PhCOOH

D

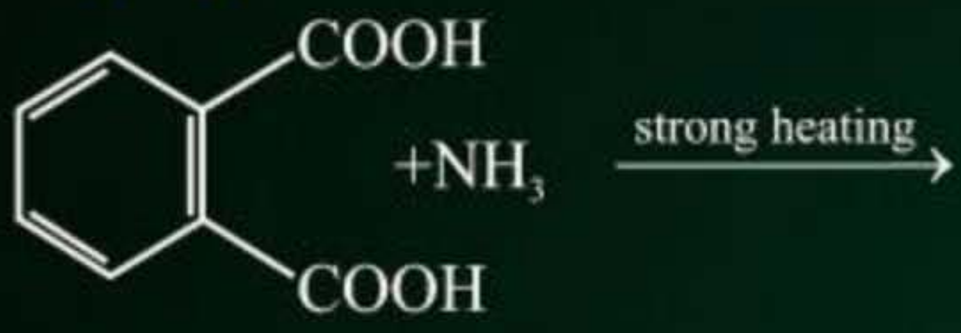


$C_6H_5CH_2OH \xrightarrow[\text{Pyridinium chlorochromate}]{\text{PCC}}$ PhCHO

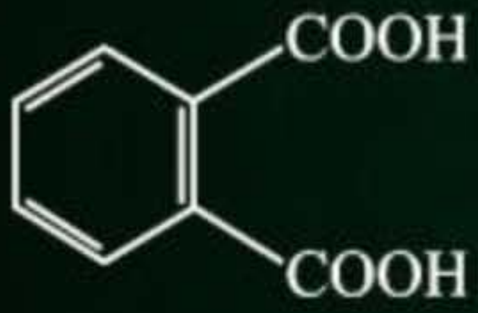
MOA

QUESTION [NEET 2019]

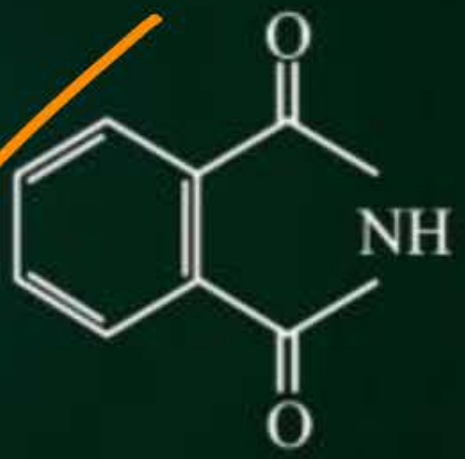
The major product of the following reaction is:


COOH
COOH
+NH3
strong heating

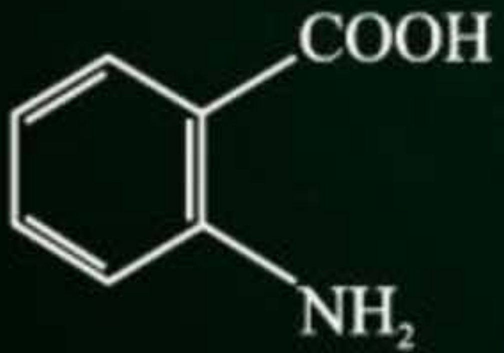
(A)



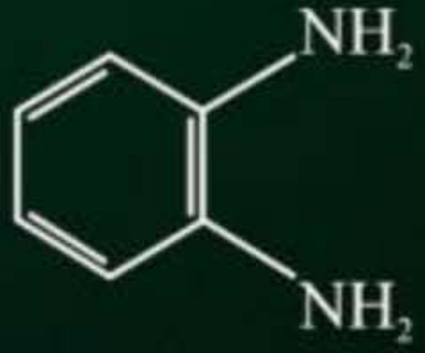
[✓ (B)]



(C)

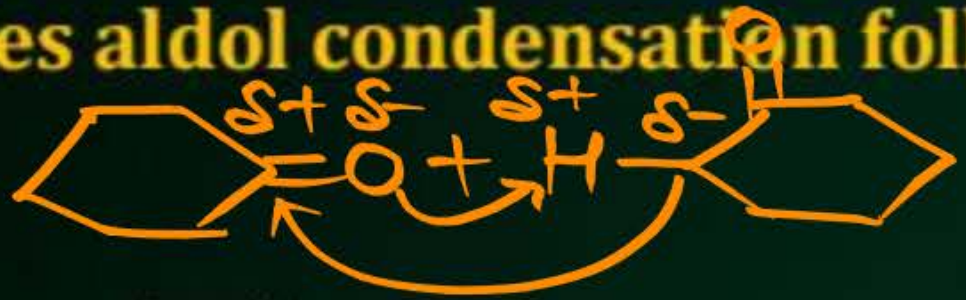


(D)

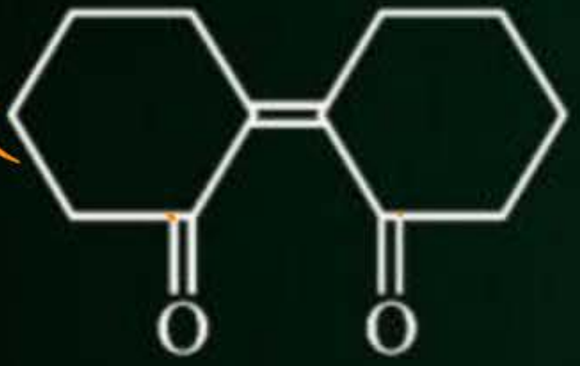


QUESTION [2017-Delhi]

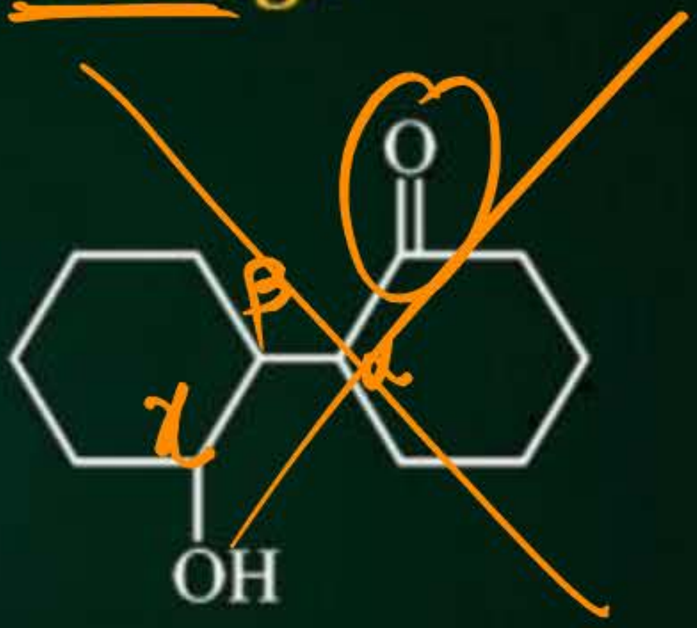
Which of the following product is formed when cyclohexanone undergoes aldol condensation followed by heating?



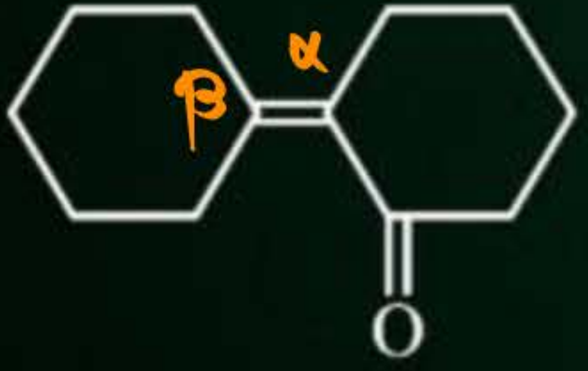
A ×



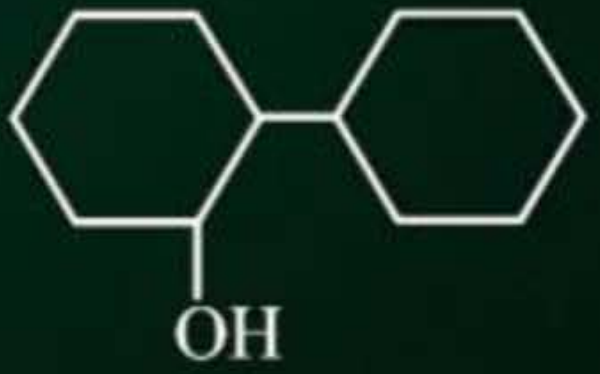
B ×



C ✓

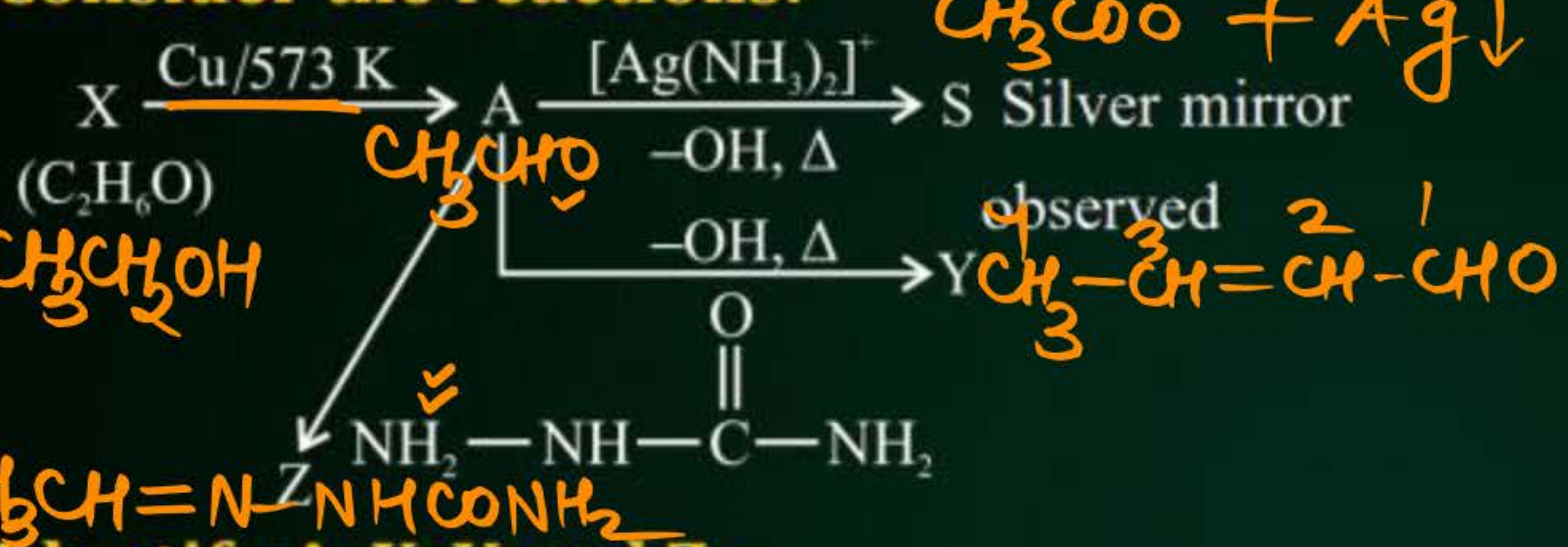


× D



QUESTION [2017-Delhi]

Consider the reactions:



$X \xrightarrow{Cu/573\ K} A \xrightarrow[-OH,\ \Delta]{[Ag(NH_3)_2]^+} S$ Silver mirror observed

(C_2H_6O)

$A \xrightarrow{-OH,\ \Delta} Y$

$A \xrightarrow{NH_2-NH-\overset{O}{\overset{\|}{C}}-NH_2} Z$

$CH_3COO^- + Ag\downarrow$

CH_3CHO

CH_3CH_2OH

$\overset{4}{C}H_3-\overset{3}{C}H=\overset{2}{C}H-\overset{1}{C}HO$

$CH_3CH=N-NHCONH_2$

Identify A, X, Y and Z.

A A-Ethanol, X-Acetaldehyde, Y-Butanone, Z-Hydrazone

B A-Methoxymethane, X-Ethanoic acid, Y-Acetate ion, Z-hydrazine

C A-Methoxymethane, X-Ethanol, Y-Ethanoic acid, Z-Semicarbazide

[✓ D] A-Ethanal, X-Ethanol, Y-But-2-enal, Z-Semicarbazone

QUESTION [NEET 2016-I]

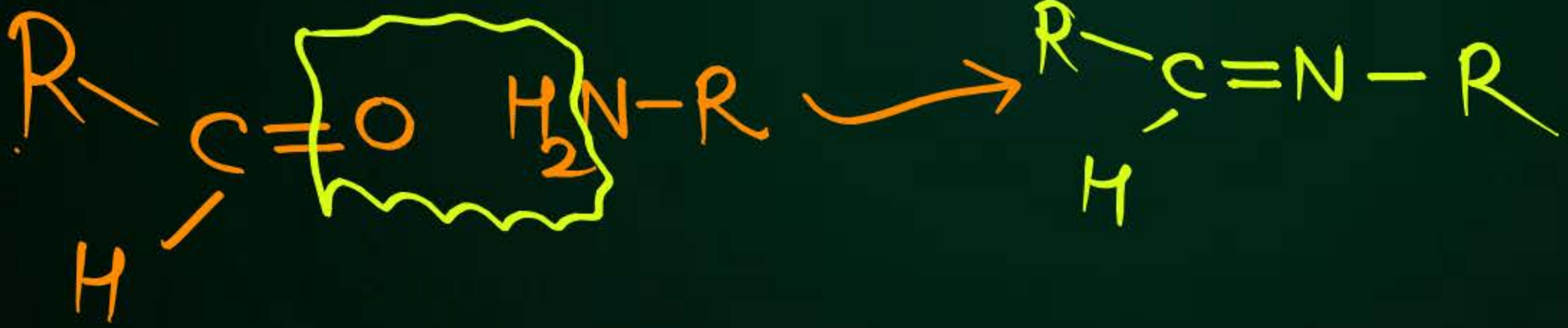
The product formed by the reaction of an aldehyde with a primary amine is:

Ⓐ Aromatic acid

[✓ Ⓑ Schiff base]

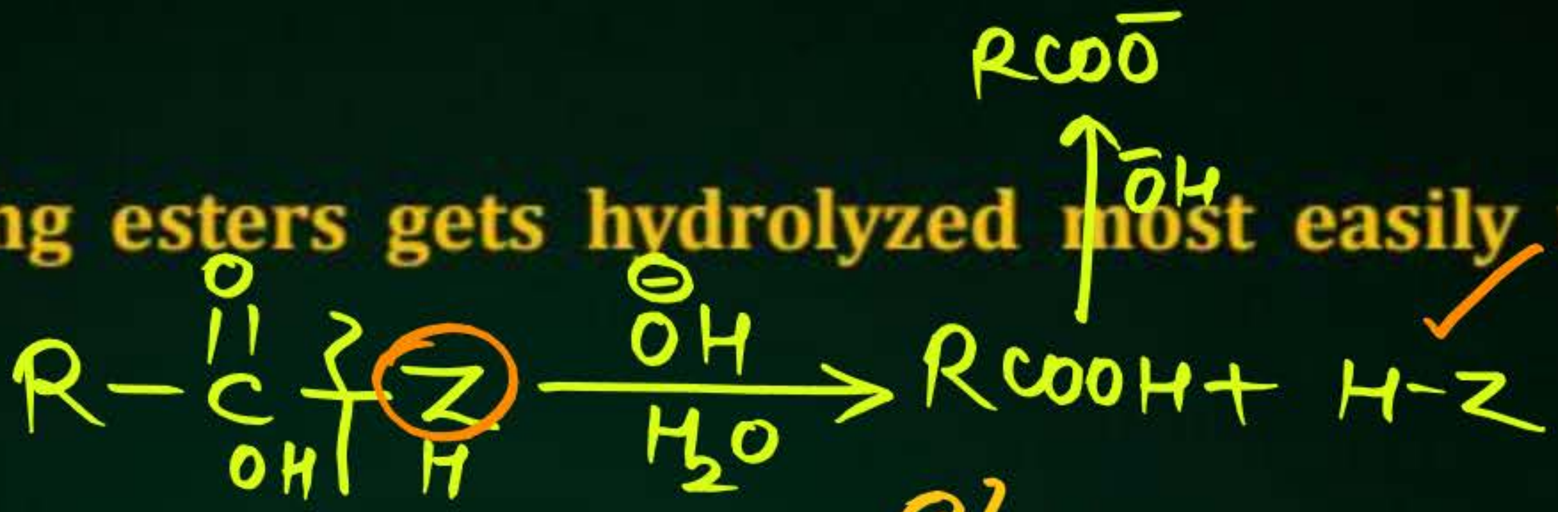
Ⓒ Ketone

Ⓓ Carboxylic acid



QUESTION [NEET 2015 Re]

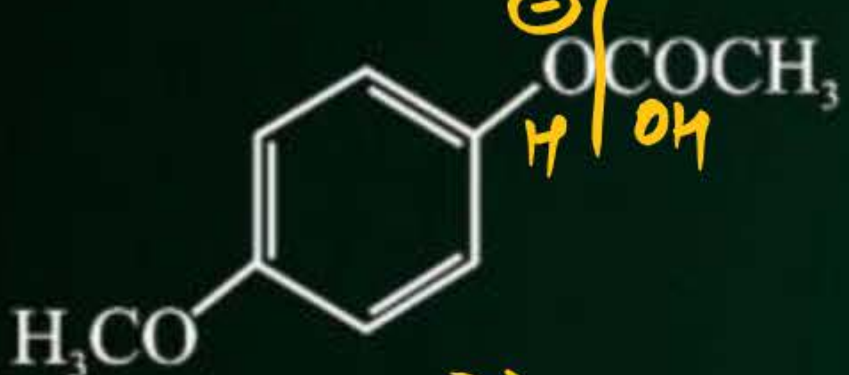
Which one of the following esters gets hydrolyzed most easily under alkaline conditions?



$$R-\overset{O}{\underset{OH}{\overset{\|}{C}}}-Z \xrightarrow[H_2O]{\overset{\ominus}{O}H} RCOOH + H-Z$$

$$RCOOH \xrightarrow{\overset{-}{O}H} RCO\overset{-}{O}$$

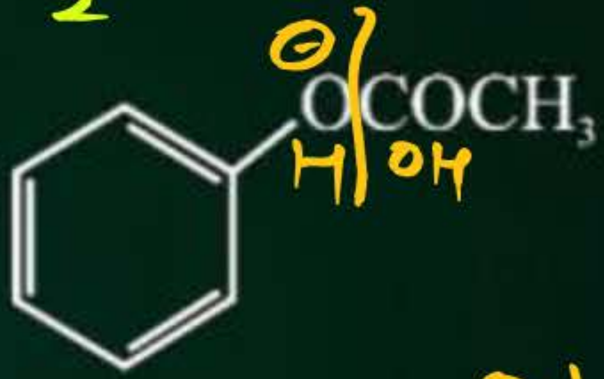
A



⊖
H
OH
OCOCH₃
H₃CO

+M > ~~M~~

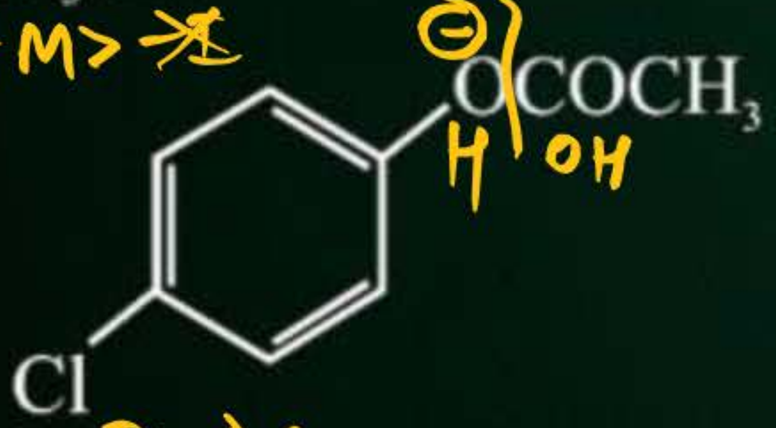
B



Stronger conju acid

better L.G

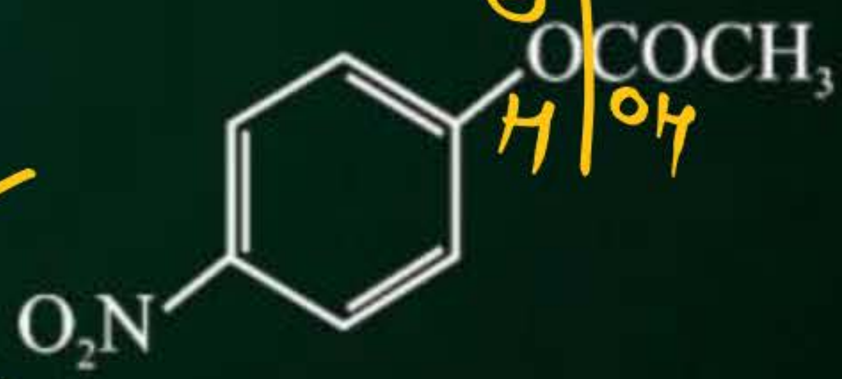
C



⊖
H
OH
OCOCH₃
Cl

-I > ~~M~~

D ✓



⊖
H
OH
OCOCH₃
O₂N

-M > ~~M~~

QUESTION [NEET 2015 Re]

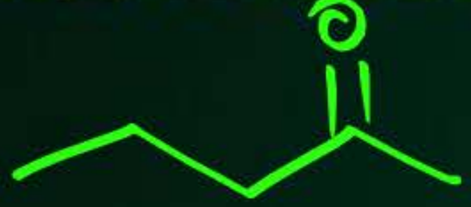
Reaction of a carbonyl compound with one of the following reagents involves nucleophilic addition followed by elimination of water. The reagent is:

- (A) Sodium hydrogen sulphite
- (B) A Grignard reagent
- [✓ (C)] Hydrazine in presence of feebly acidic solution
  weekly
- (D) Hydrocyanic acid

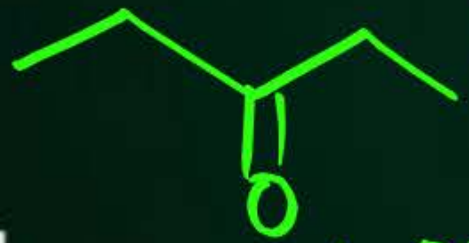
QUESTION [NEET 2015]

An organic compound 'X' having molecular formula $C_5H_{10}O$ yields phenyl hydrazone and gives negative response to the Iodoform test and Tollen's test. It produces n-pentane on reduction. 'X' could be:

- A ✗ 2-pentanone

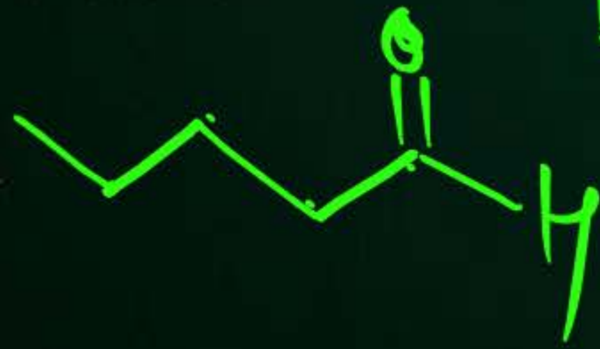


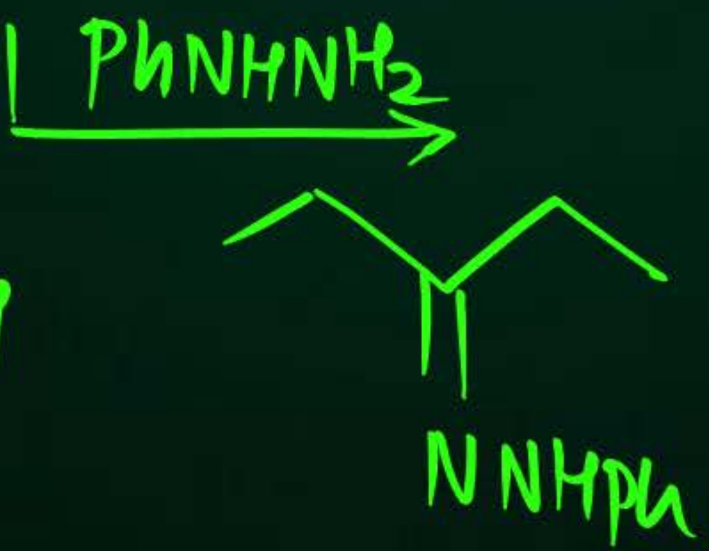
- B ✓ 3-pentanone



Tollens ×
Haloform ×

- C ✗ n-pentyl alcohol
- D ✗ Pentanal



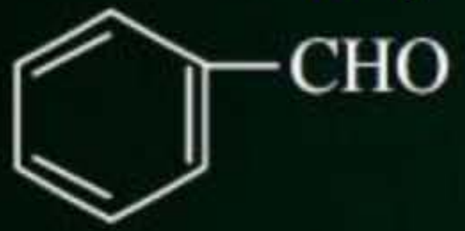


QUESTION [NEET 2014]

Which one is most reactive towards Nucleophilic addition reaction?

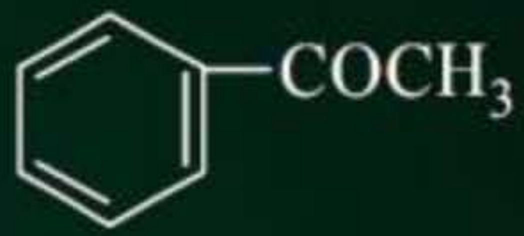
Ald

A



Ket

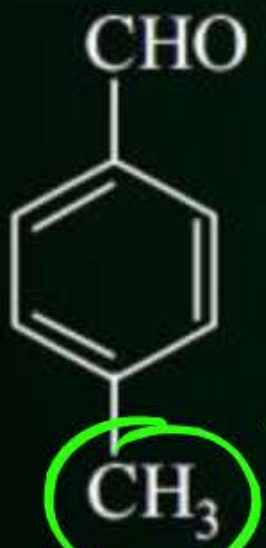
~~B~~



$D > A > C > B$

Ald

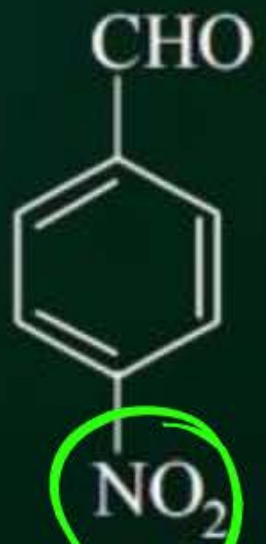
C



+H>~~+I~~

Ald

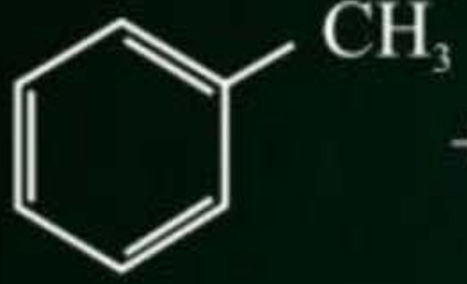
✓ **D**

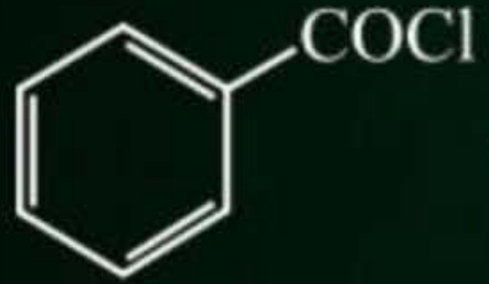


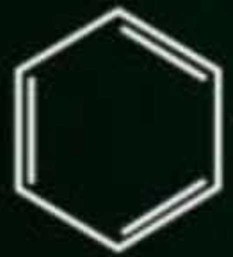
−M>~~−I~~

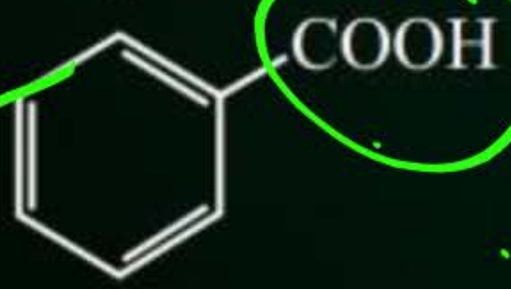
QUESTION [NEET 2013]

Reaction by which Benzaldehyde cannot be prepared?

(A) 
+ CrO_2Cl_2 in CS_2 followed by H_3O^+

(B) 
+ H_2 in presence of Pd-$BaSO_4$

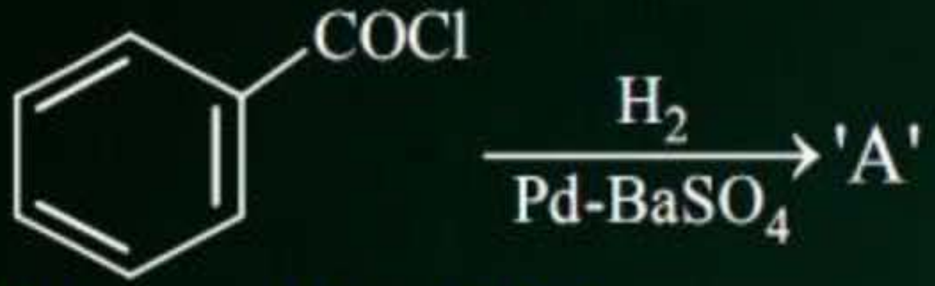
(C) 
+ CO + HCl in presence of anhydrous + $AlCl_3$

[✓ (D)] 
+ Zn/Hg and concentration HCl

✗

QUESTION [AIPMT 2012 M]

Consider the following reaction:


COCl
H2
Pd-BaSO4
'A'

The product 'A' is:

[✓ (A) C_6H_5CHO]

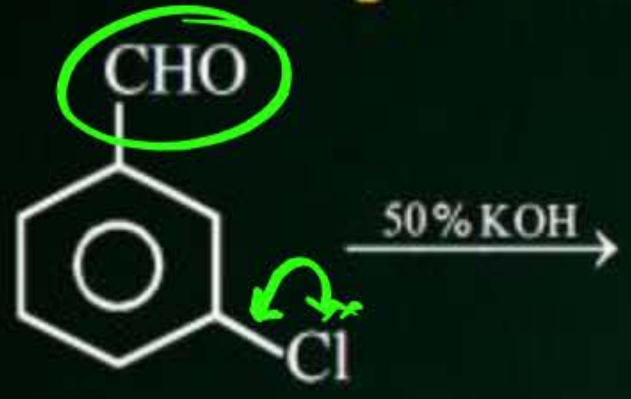
(B) C_6H_5OH

(C) $C_6H_5COCH_3$

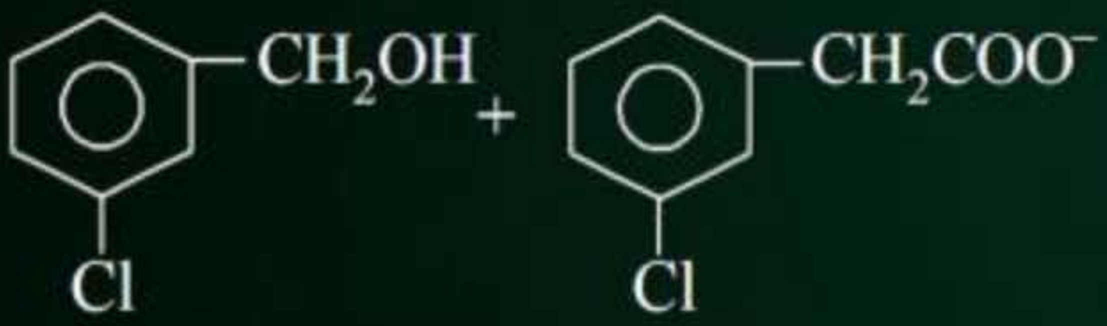
(D) C_6H_5Cl

QUESTION [AIPMT 2012]

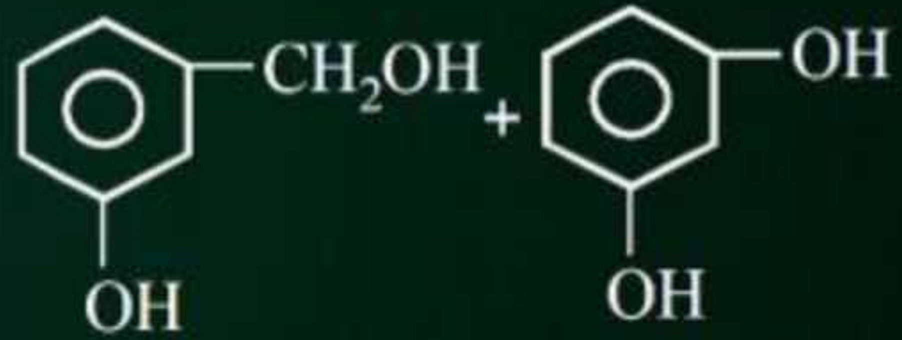
Predict the product in the given reaction.


CHO
50% KOH
Cl

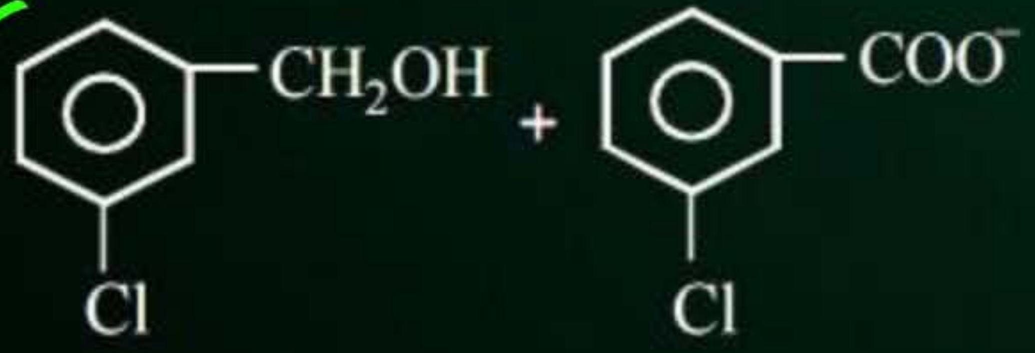
A


CH₂OH
+
CH₂COO⁻
Cl
Cl

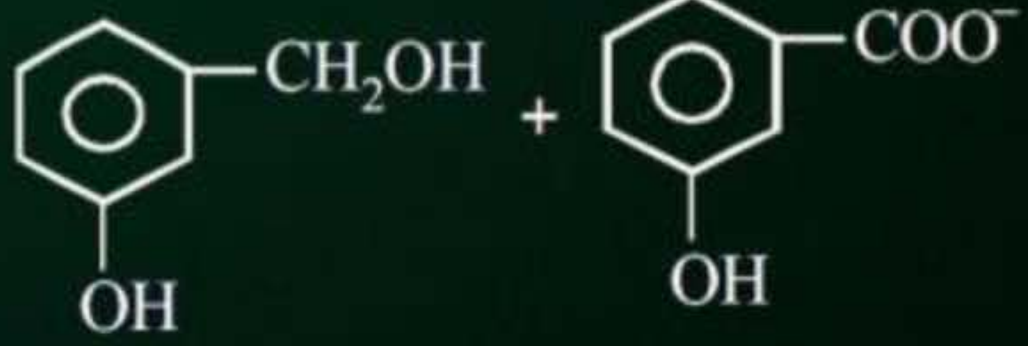
B


CH₂OH
+
OH
OH
OH

[✓ C]


CH₂OH
+
COO⁻
Cl
Cl

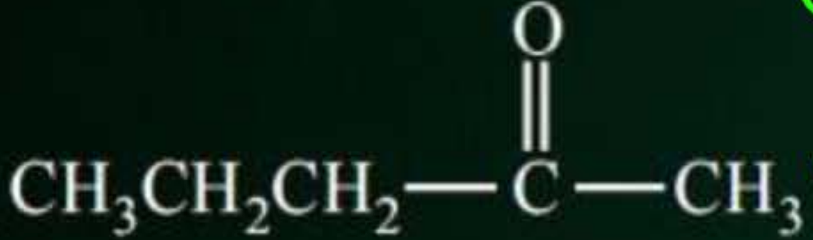
D

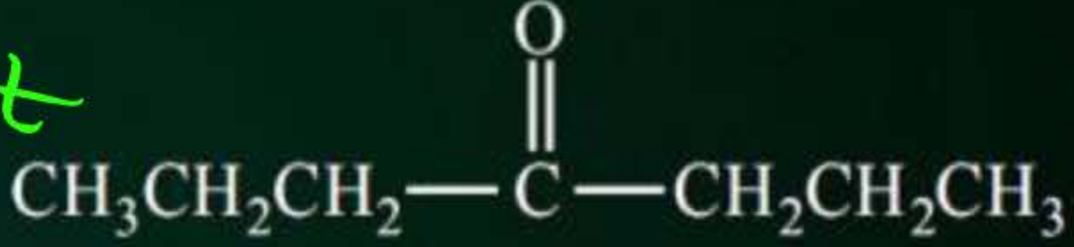

CH₂OH
+
COO⁻
OH
OH

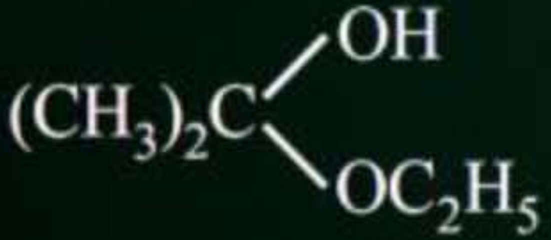
QUESTION [AIPMT 2012]

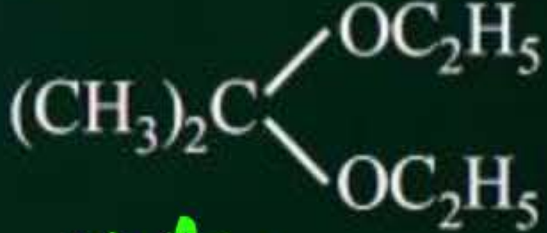
Acetone is treated with excess of ethanol in the presence of hydrochloric acid. The product obtained is:

CH_3 — C = O HOEt
CH_3 HOEt

(A) 
$CH_3CH_2CH_2-\overset{\overset{O}{\|}}{C}-CH_3$

(B) 
$CH_3CH_2CH_2-\overset{\overset{O}{\|}}{C}-CH_2CH_2CH_3$

(C) 
$(CH_3)_2C(OH)(OC_2H_5)$

[✓ (D)] 
$(CH_3)_2C(OC_2H_5)_2$

Ketal

QUESTION [AIPMT 2012]

$Ph-CHO$ Fehling ×

$Ph-CH_2-CHO$ Fehling ✓

sp^3

CH_3CHO and $C_6H_5CH_2CHO$ can be distinguished chemically by:

Iodo ✓ Iodo ×

A Benedict test

[✓ B] Iodoform test

C Tollen's reagent test

D Fehling solution test

QUESTION [AIPMT 2012 M]

Consider the reaction:

$RCHO + NH_2NH_2 \rightarrow RCH = N{-}NH_2$

Which type of reaction is?

Ⓐ Electrophilic addition – elimination reaction

Ⓑ Free radical addition – elimination reaction

Ⓒ Electrophilic substitution – elimination reaction

[✓ Ⓓ Nucleophilic addition – elimination reaction]

JEE Mains PYQs

QUESTION (JEE Mains 1st Feb 2024, Evening Shift)

$$C_2H_5Br \xrightarrow{\text{alc. KOH}} A \xrightarrow[CCl_4]{Br_2} B \xrightarrow[\text{Excess}]{KCN} C \xrightarrow[\text{Excess}]{H_3O^+} D$$

A: $CH_2=CH_2$

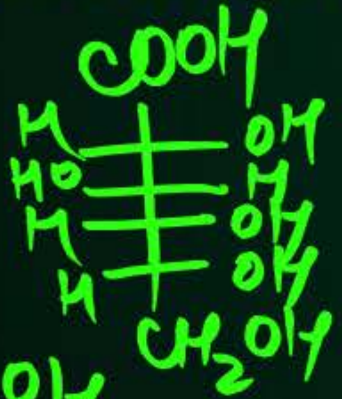
B: $\underset{Br}{\underset{|}{CH_2}}-CH_2-Br$

C: $\begin{matrix} CH_2-CN \\ | \\ CH_2-CN \end{matrix}$

D: $\begin{matrix} CH_2-COOH \\ | \\ CH_2-COOH \end{matrix}$

Acid D formed in above reaction is:

(A) Gluconic acid



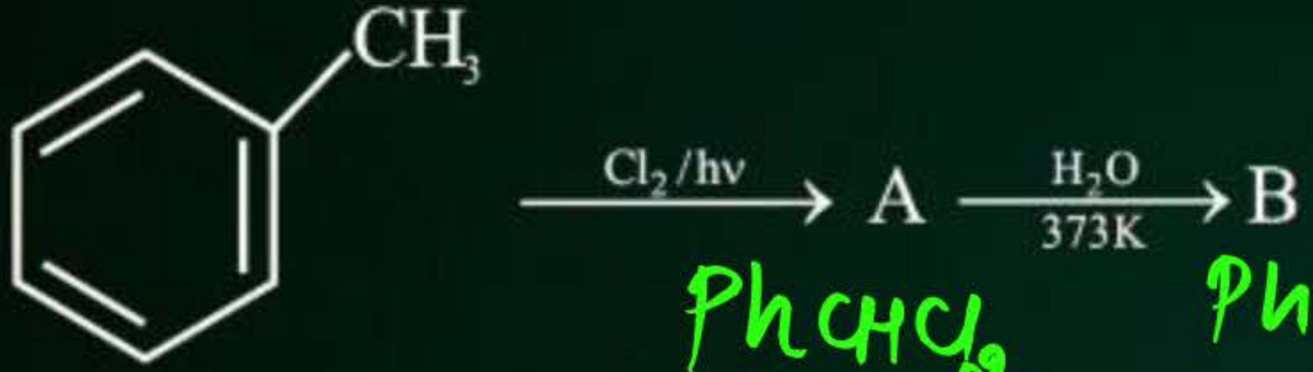
[✓ (B)] Succinic acid

(C) Oxalic acid $\begin{matrix} COOH \\ | \\ COOH \end{matrix}$

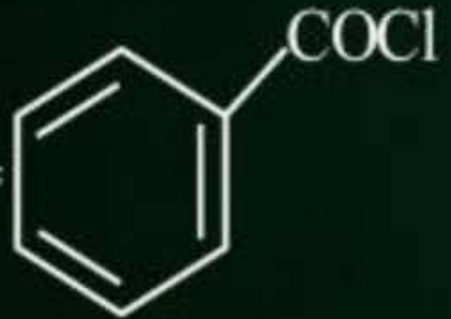
(D) Malonic acid $CH_2\begin{matrix} -COOH \\ \diagdown COOH \end{matrix}$

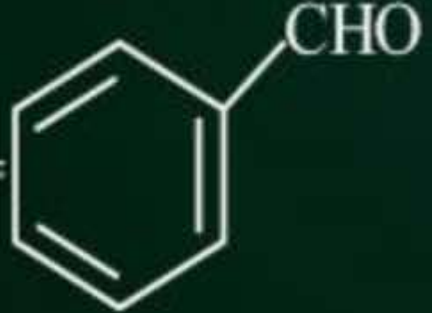
QUESTION (JEE Mains 1st Feb 2024, Morning Shift)

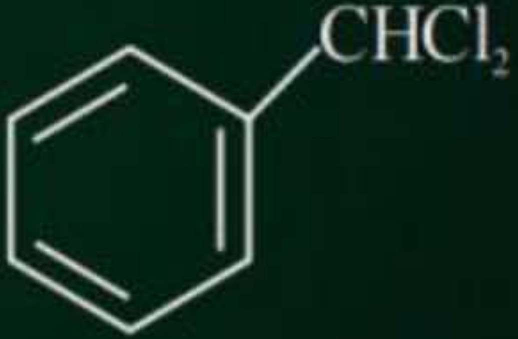
Identify A and B in the following sequence of reaction.

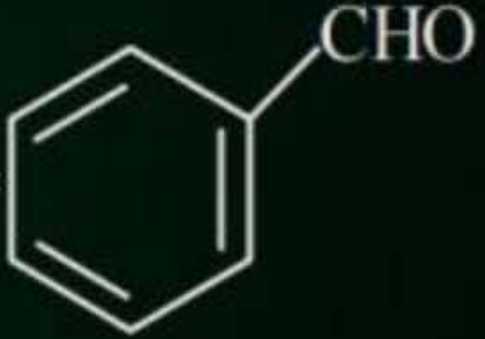

CH_3
$Cl_2/h\nu$
A
H_2O
373K
B

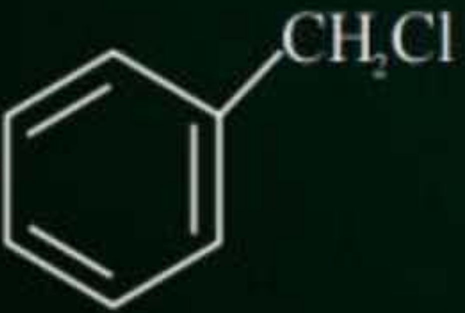
PhCHCl2 PhCHO

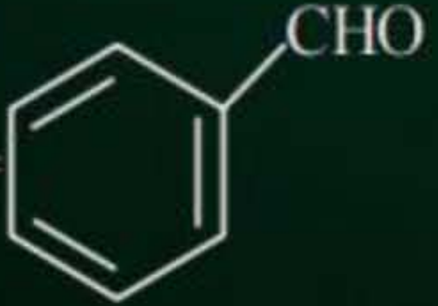
A (A) =


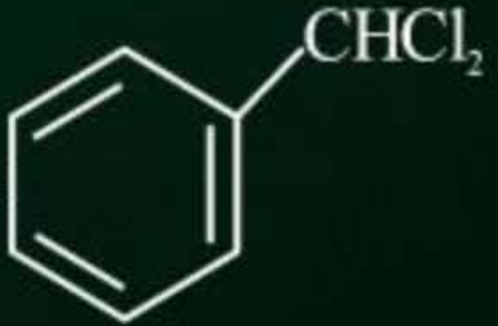
(B) =


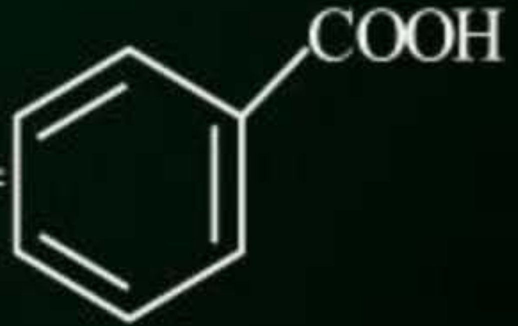
[✓ B] (A) =


(B) =


C (A) =


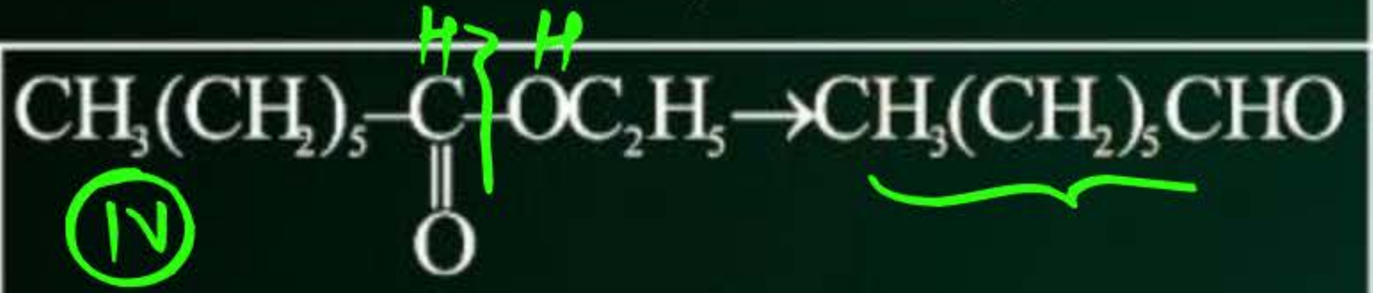
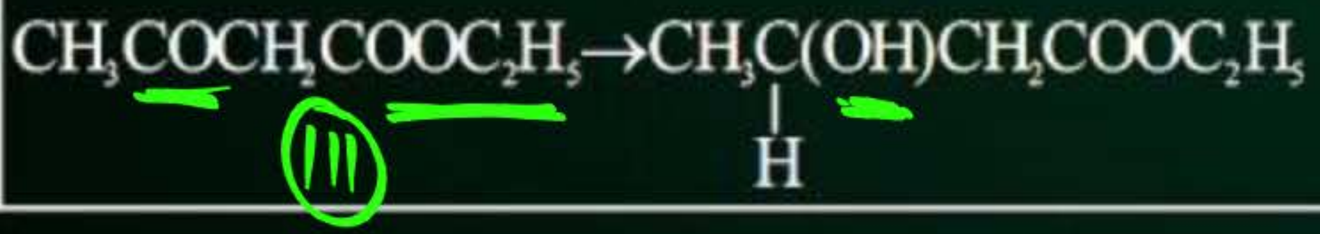
(B) =


D (A) =


(B) =


QUESTION (JEE Mains 1st Feb 2024, Morning Shift)

Match List-I with List-II.

	List – I (Reactions)		List – II (Reagents)
(A)	 $CH_3(CH_2)_5-\underset{\underset{O}{\Vert}}{C}-OC_2H_5 \rightarrow \underbrace{CH_3(CH_2)_5CHO}$ (IV)	(I)	CH_3MgBr, H_2O
(B)	$C_6H_5COC_6H_5 \rightarrow C_6H_5CH_2C_6H_5$ (II)	(II)	Zn(Hg) and conc. HCl
(C)	$C_6H_5CHO \rightarrow C_6H_5CH(OH)CH_3$ (I)	(III)	$NaBH_4$, H^+
(D)	 $CH_3COCH_2COOC_2H_5 \rightarrow CH_3\underset{\underset{H}{\vert}}{C}(OH)CH_2COOC_2H_5$ (III)	(IV)	DIBAL-H, H_2O

Choose the correct answer from otpins given below:

A A-(III), (B)-(IV), C-(I), (D)-(II)

[✓ **B** A-(IV), (B)-(II), C-(I), (D)-(III)]

C A-(IV), (B)-(II), C-(III), (D)-(I)

D A-(III), (B)-(IV), C-(II), (D)-(I)

QUESTION (JEE Mains 4th April 2024, Morning Shift)

Given below are two statements:

Statement I: ✓ Acidity of α-hydrogens of aldehydes and ketones is responsible for Aldol reaction.

Statement II: ✗ Reaction between benzaldehyde and ethanal will NOT give Cross–Aldol product.

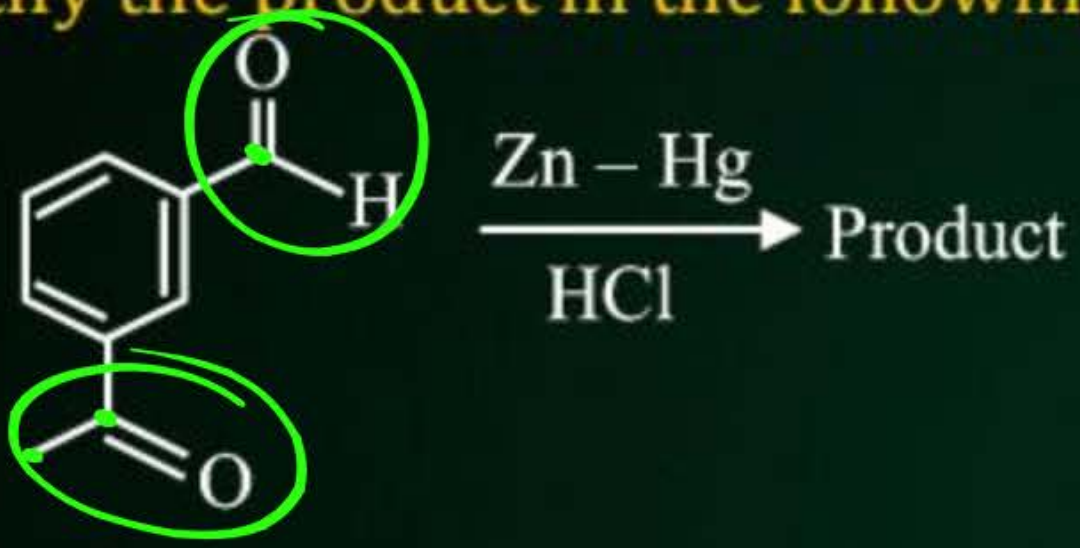
$\underset{H}{Ph-C}=O \quad H-CH_2CHO$

In the light of above statements, choose the most appropriate answer from the options given below.

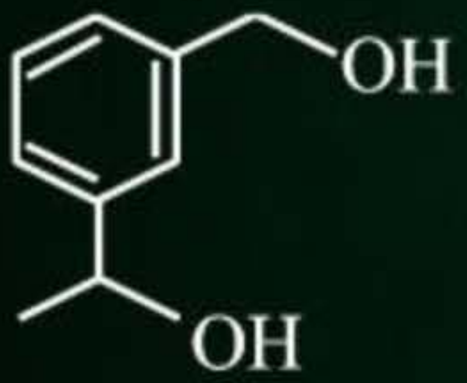
- **A** Both Statement I and Statement II are correct.
- **B** Both Statement I and Statement II are incorrect.
- **C** Statement I is incorrect but Statement II is correct.
- [✓ **D**] Statement I is correct but Statement II is incorrect.

QUESTION (JEE Mains 4th April 2024, Morning Shift)

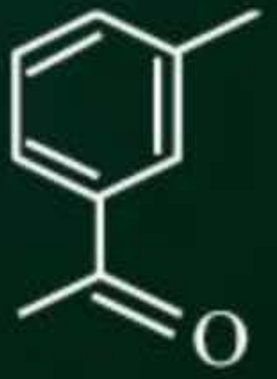
Identify the product in the following reaction:


O
H
O
Zn – Hg
HCl
Product

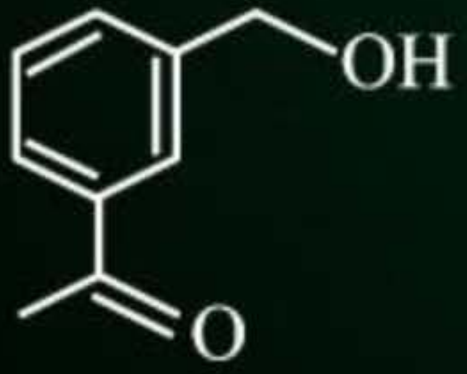
A



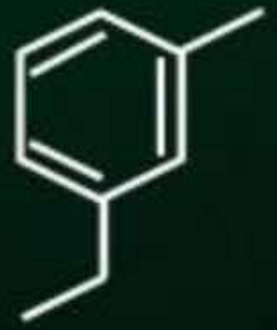
B



C



[✓ **D**]

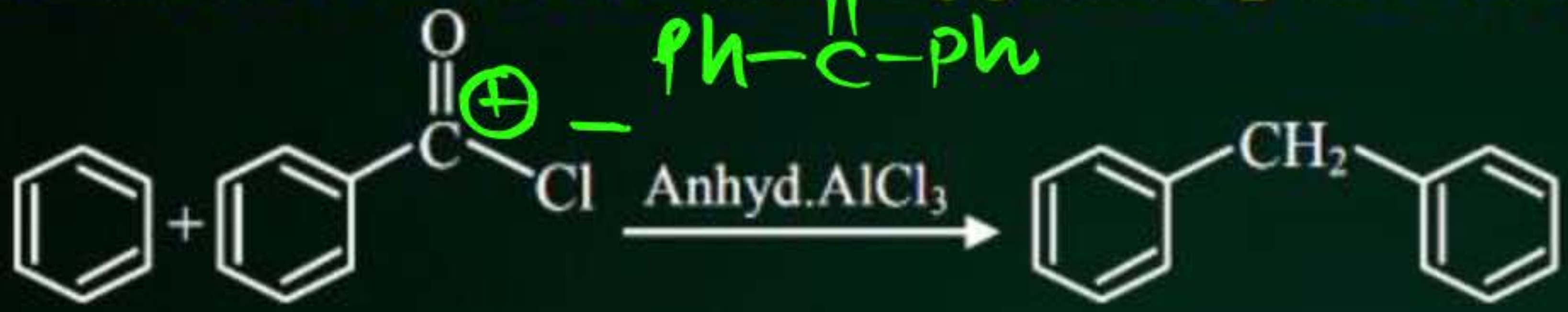


QUESTION (JEE Mains 4th April 2024, Morning Shift)

The number of correct reaction(s) among the following is $\underline{\;1\;}$.

$Ph-\overset{O}{\overset{\|}{C}}-Ph$

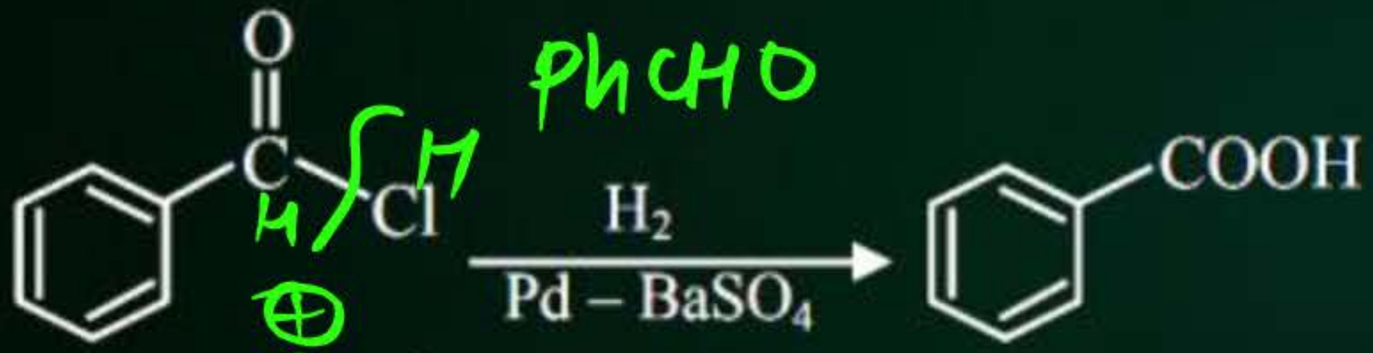
A



O
C
Cl
⊕
–
Anhyd.AlCl$_3$
CH$_2$

B

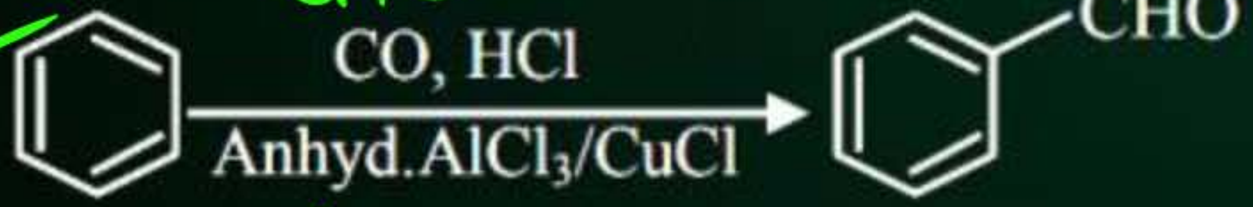
PhCHO



O
C
H
H
Cl
H$_2$
Pd – BaSO$_4$
COOH
⊕

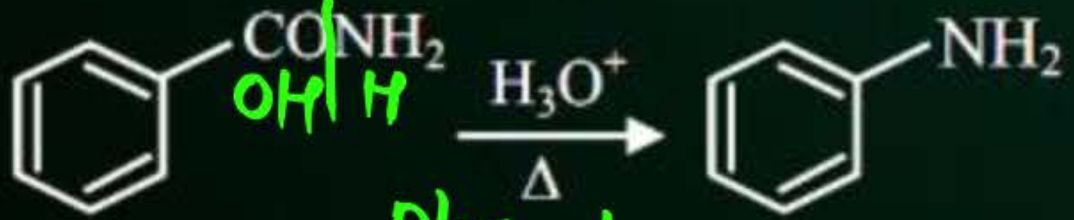
CHO

C ✓



CO, HCl
Anhyd.AlCl$_3$/CuCl
CHO

D

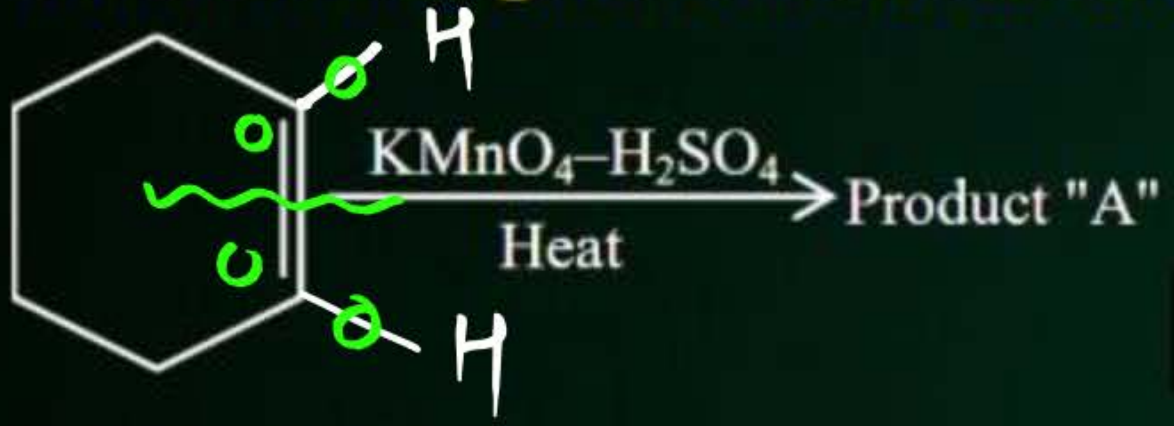


CONH$_2$
OH H
H$_3$O$^+$
Δ
NH$_2$

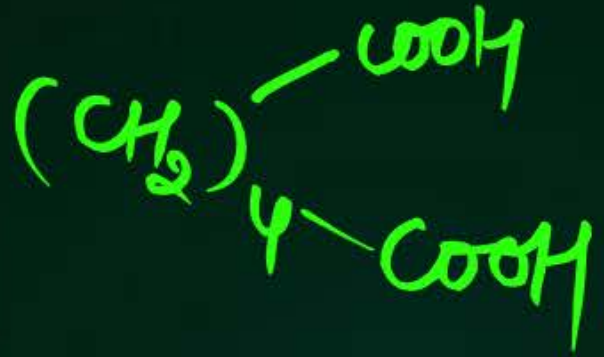
PhCOOH

QUESTION (JEE Mains 5th April 2024, Evening Shift)

Consider the given chemical reaction:

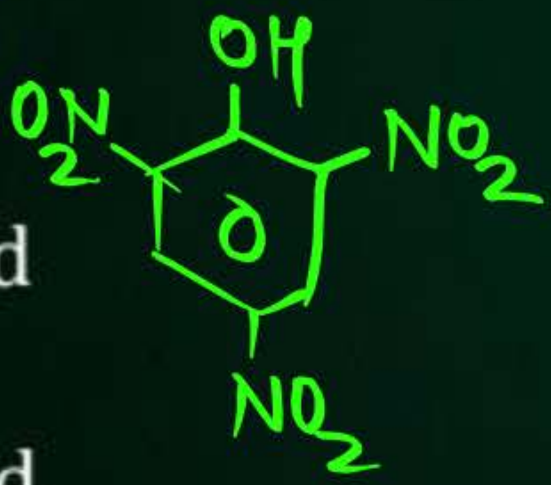


H
O
O
KMnO4–H2SO4
Heat
Product "A"
H



$(CH_2)_4(COOH)_2$

Product "A" is:



OH
O2N
NO2
NO2

$COOH-COOH$

(A) ✗ picric acid

(B) ✗ oxalic acid

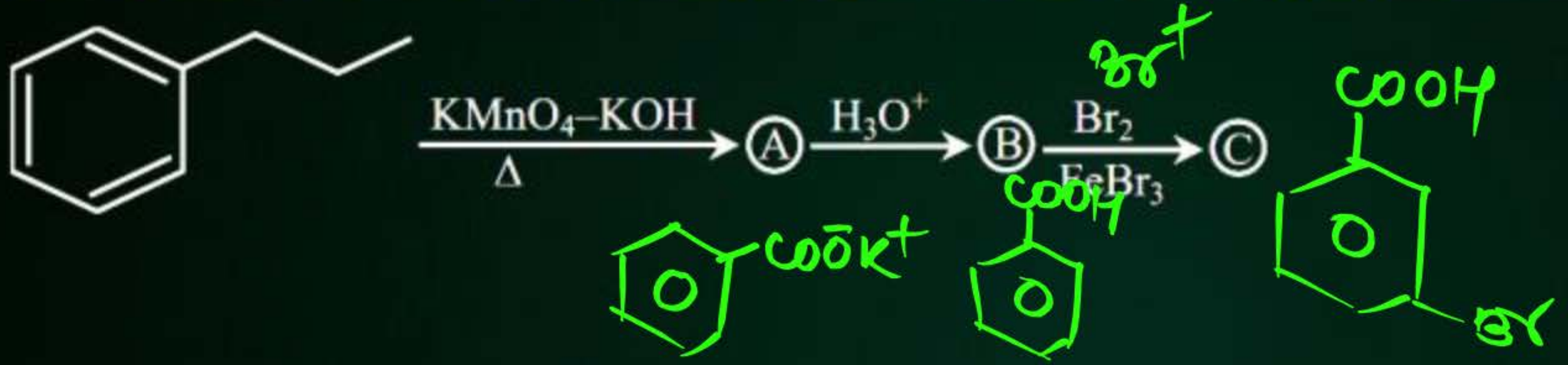
(C) ✗ acetic acid

CH_3COOH

(D) ✓ adipic acid

QUESTION (JEE Mains 5th April 2024, Evening Shift)

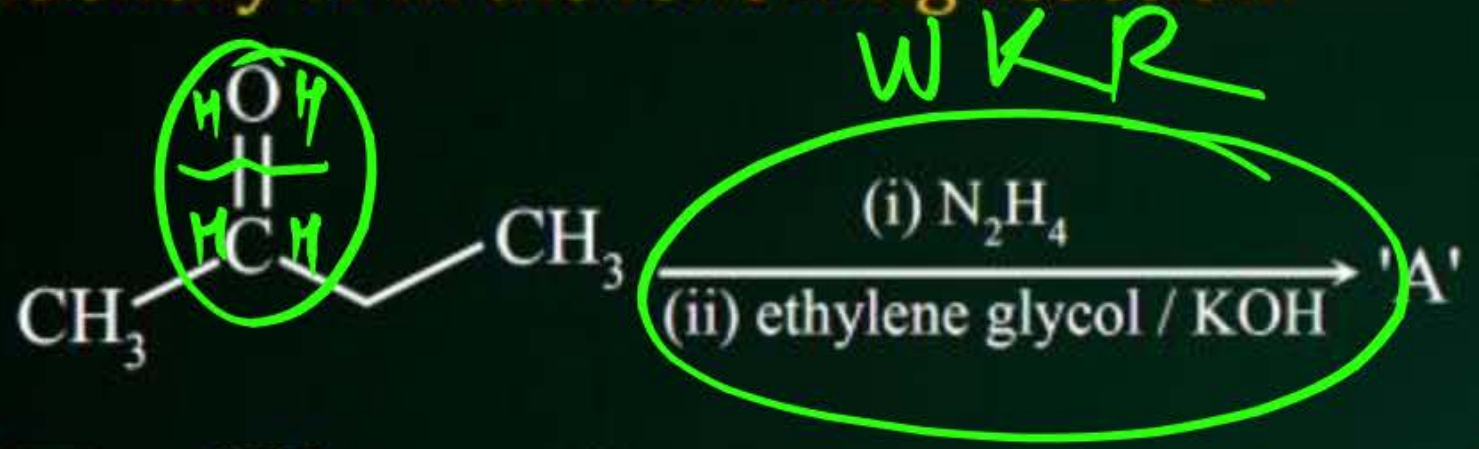
The product C in the following sequence of reactions has __4__ π bonds.



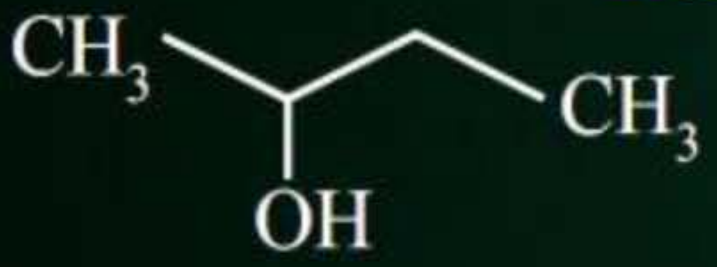
KMnO4–KOH
Δ
Ⓐ
H3O+
Ⓑ
Br2
FeBr3
Ⓒ
Br+
COO⁻K+
COOH
COOH
Br

QUESTION (JEE Mains 5th April 2024, Morning Shift)

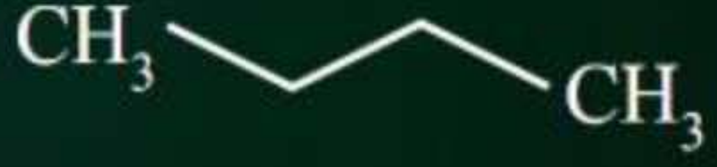
Identify 'A' in the following reaction:


WKR
O
CH3
CH3
(i) N2H4
(ii) ethylene glycol / KOH
'A'

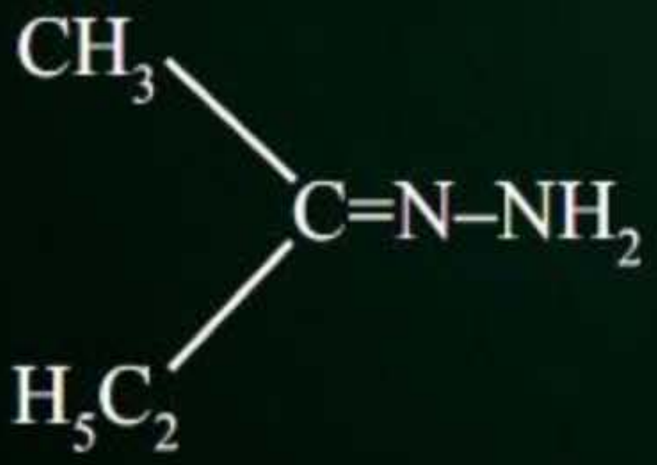
A



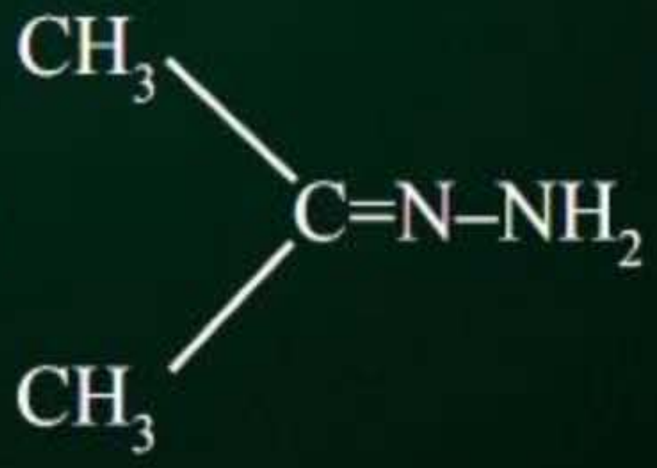
[✓ **B**]



C


CH3
C=N–NH2
H5C2

D


CH3
C=N–NH2
CH3

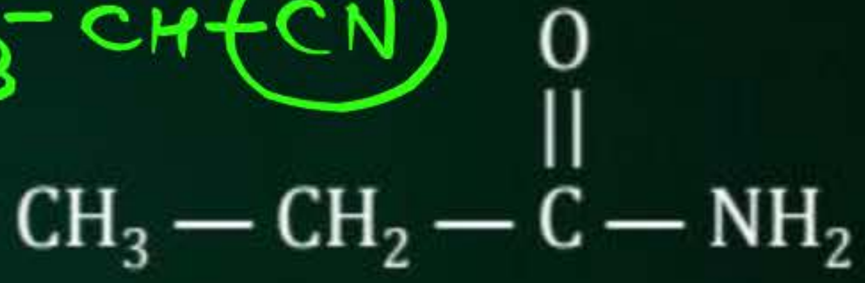
QUESTION (JEE Mains 6th April 2024, Evening Shift)

Consider the given reaction, identify the major product P.

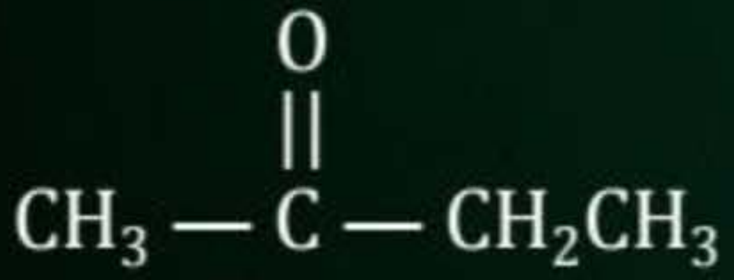
$$CH_3-\underline{COOH} \xrightarrow[\text{(iv) } H_2O/\bar{O}H,\Delta]{\text{(i) } LiAlH_4 \quad \text{(ii) PCC} \quad \text{(iii) } HCN/\bar{O}H} \text{"P"}$$

CH_3CH_2OH $\quad CH_3-\overset{O}{\overset{\|}{C}}-H \xrightarrow{HCN} CH_3-\overset{OH}{\overset{|}{C}}H-\boxed{CN} \quad COOH$

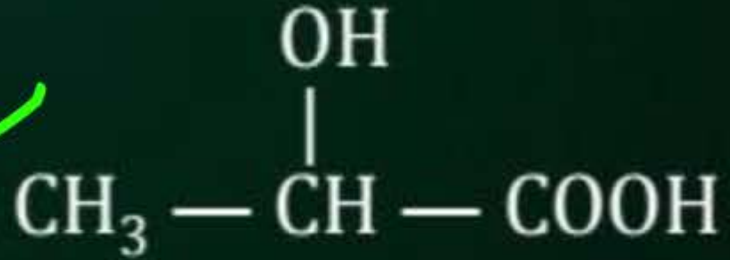
(A) $CH_3-CH_2-CH_2-OH$

(B) 

$CH_3-CH_2-\overset{O}{\overset{\|}{C}}-NH_2$

(C) 

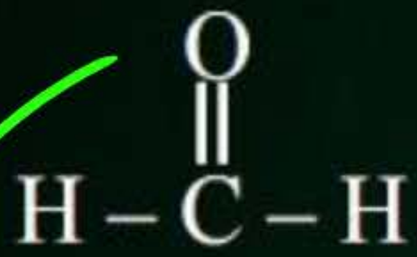
$CH_3-\overset{O}{\overset{\|}{C}}-CH_2CH_3$

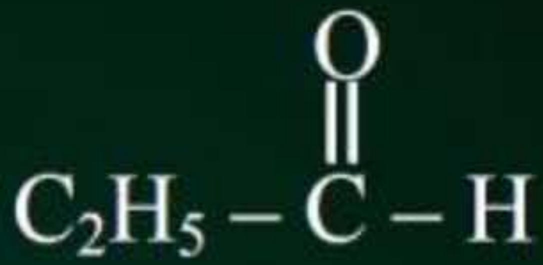
✓ (D) 

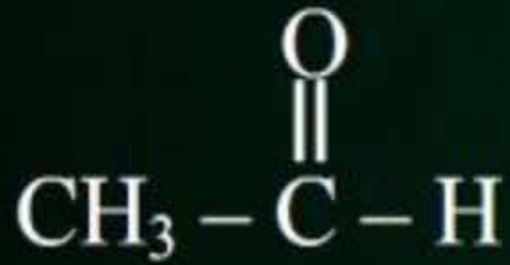
$CH_3-\overset{OH}{\overset{|}{C}}H-COOH$

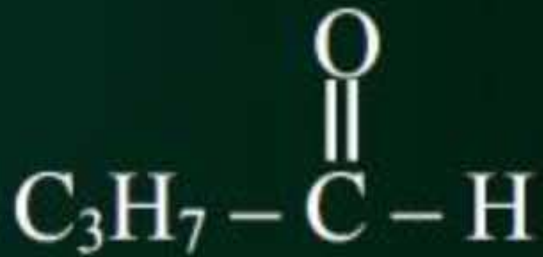
QUESTION (JEE Mains 6th April 2024, Morning Shift)

Which among the following aldehydes is most reactive towards nucleophilic addition reactions?

[✓ (A)] 
$H-\overset{\overset{O}{\|}}{C}-H$

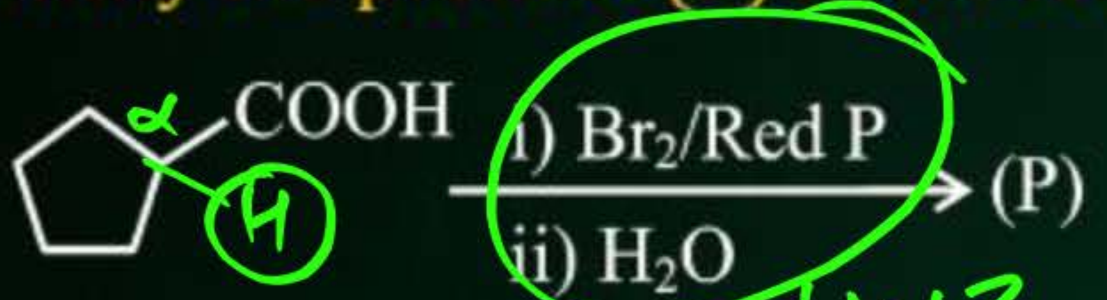
(B) 
$C_2H_5-\overset{\overset{O}{\|}}{C}-H$

(C) 
$CH_3-\overset{\overset{O}{\|}}{C}-H$

(D) 
$C_3H_7-\overset{\overset{O}{\|}}{C}-H$

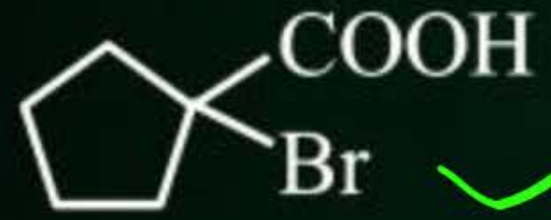
QUESTION (JEE Mains 8th April 2024, Morning Shift)

Identify the product (P) in the following reaction:


α
COOH
H
i) Br$_2$/Red P
ii) H$_2$O
(P)

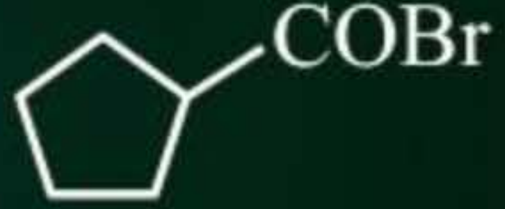
HVZ

A

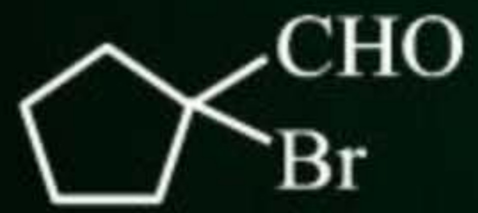


✓

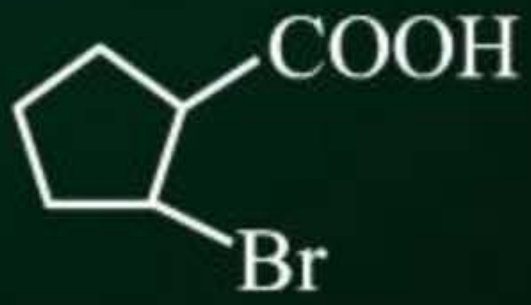
B



C

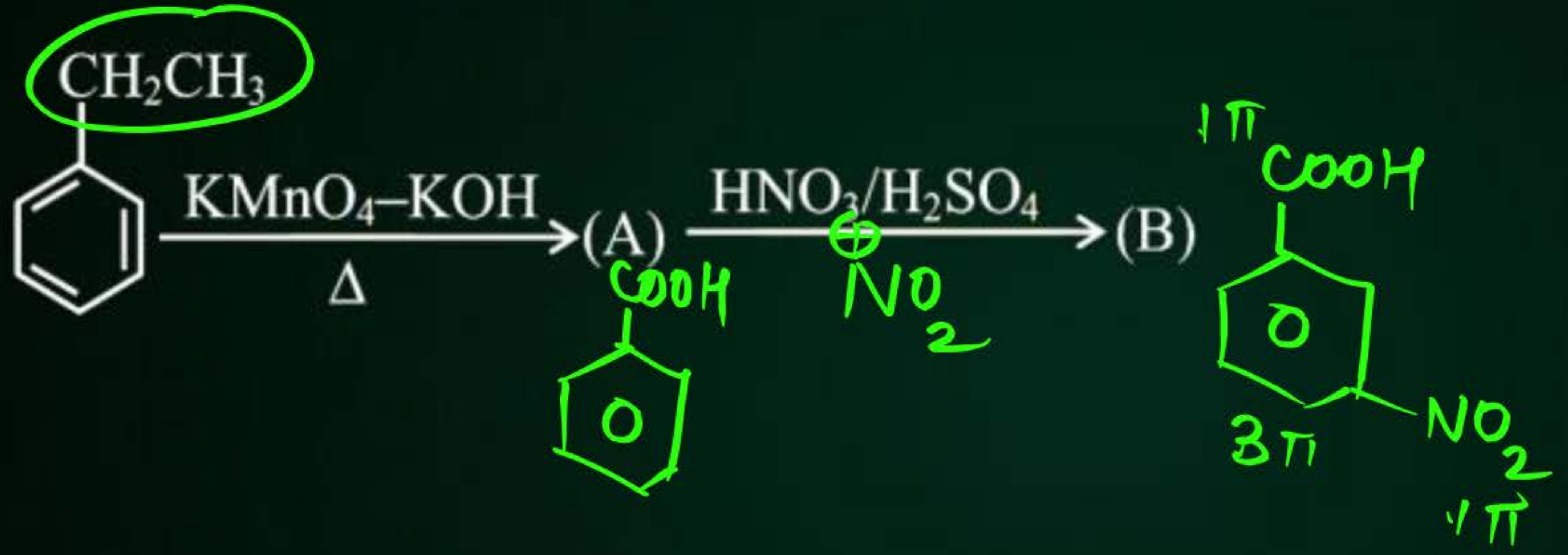


D



QUESTION (JEE Mains 8th April 2024, Morning Shift)

Major product B of the following reaction has 5 π-bond.



CH_2CH_3
$KMnO_4$–KOH
Δ
(A)
HNO_3/H_2SO_4
(B)
COOH
NO_2
1π
COOH
3π
NO_2
1π

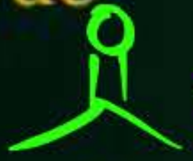
QUESTION (JEE Mains 9th April 2024, Evening Shift)

Which of the following compounds will give silver mirror with ammoniacal silver nitrate?

(A) Formic acid HCOOH ✓

(B) Formaldehyde HCHO ✓

(C) Benzaldehyde PhCHO ✓

(D) Acetone  ×

Choose the correct answer from the options given below:

(A) C and D only

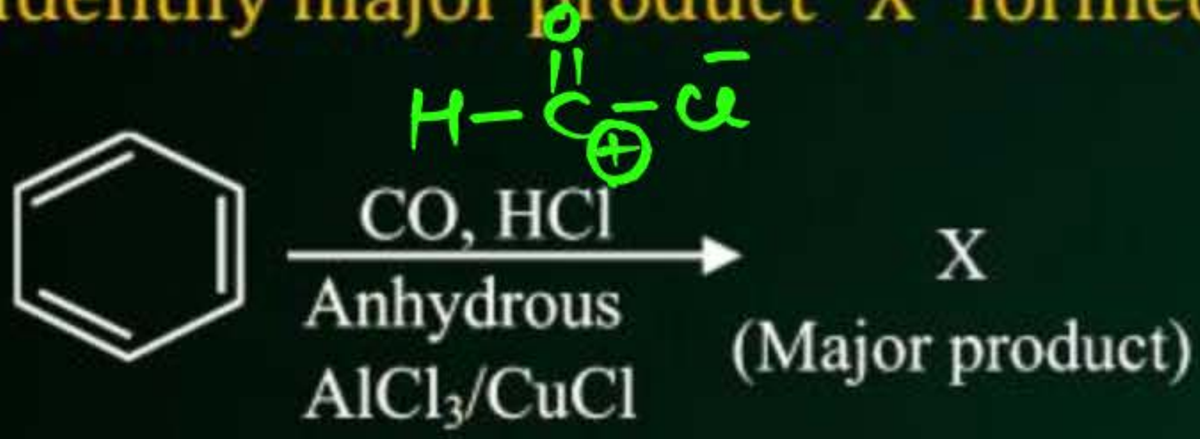
[✓ (B)] A, B and C only

(C) A only

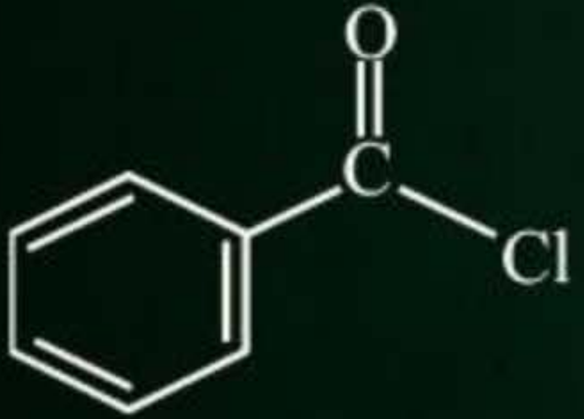
(D) B and C only

QUESTION (JEE Mains 9th April 2024, Morning Shift)

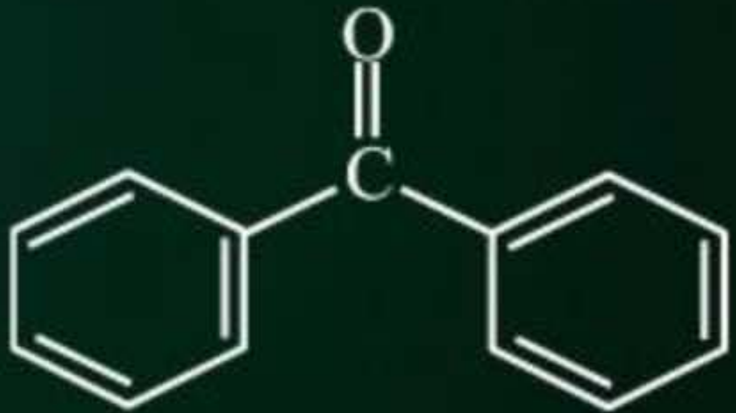
Identify major product "X" formed in the following reaction:


H−C(=O)⊕ −Cl⁻
CO, HCl
Anhydrous
AlCl₃/CuCl
X
(Major product)

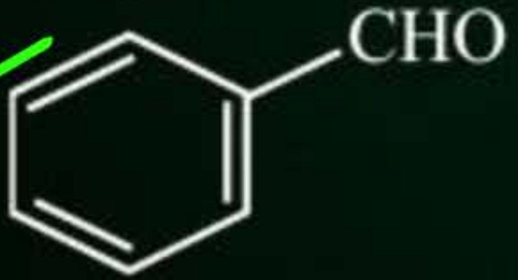
(A)



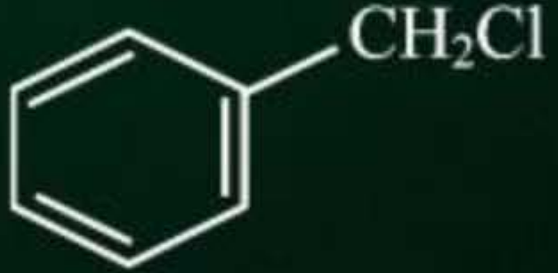
(B)



[✓ (C)]



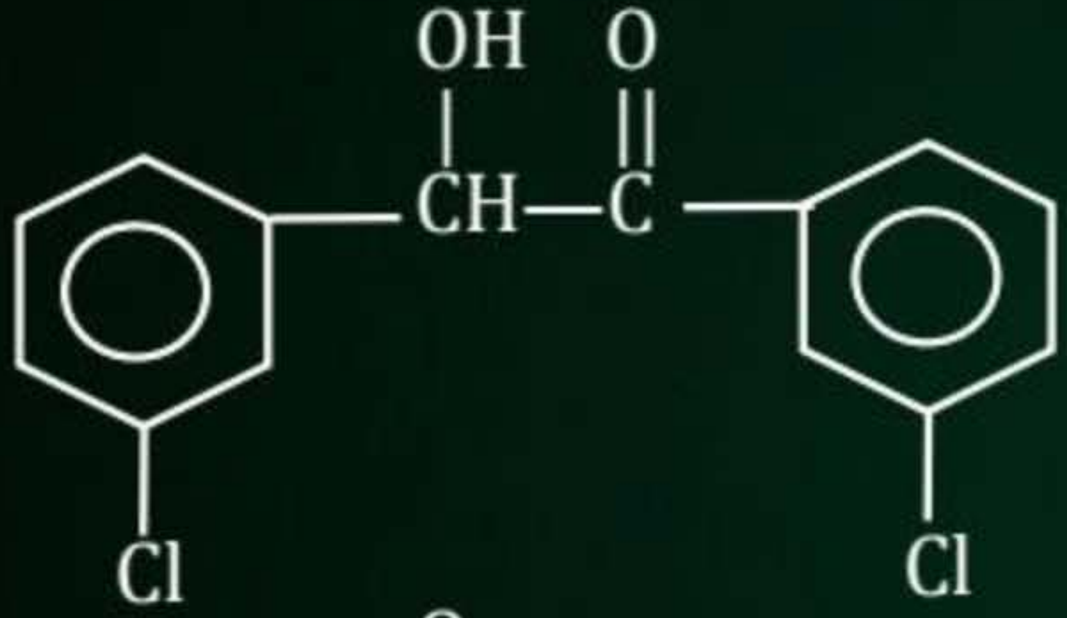
(D)



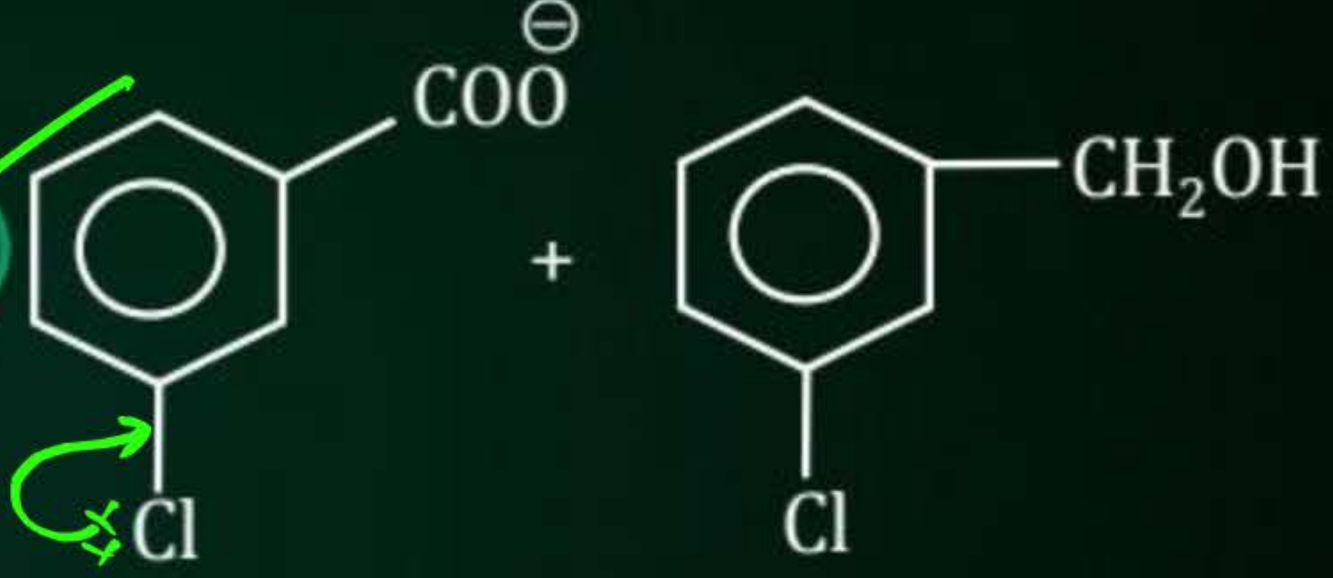
QUESTION (JEE Mains 30th January 2024, Evening Shift)

m–chlorobenzaldehyde on treatment with 50% KOH solution yields

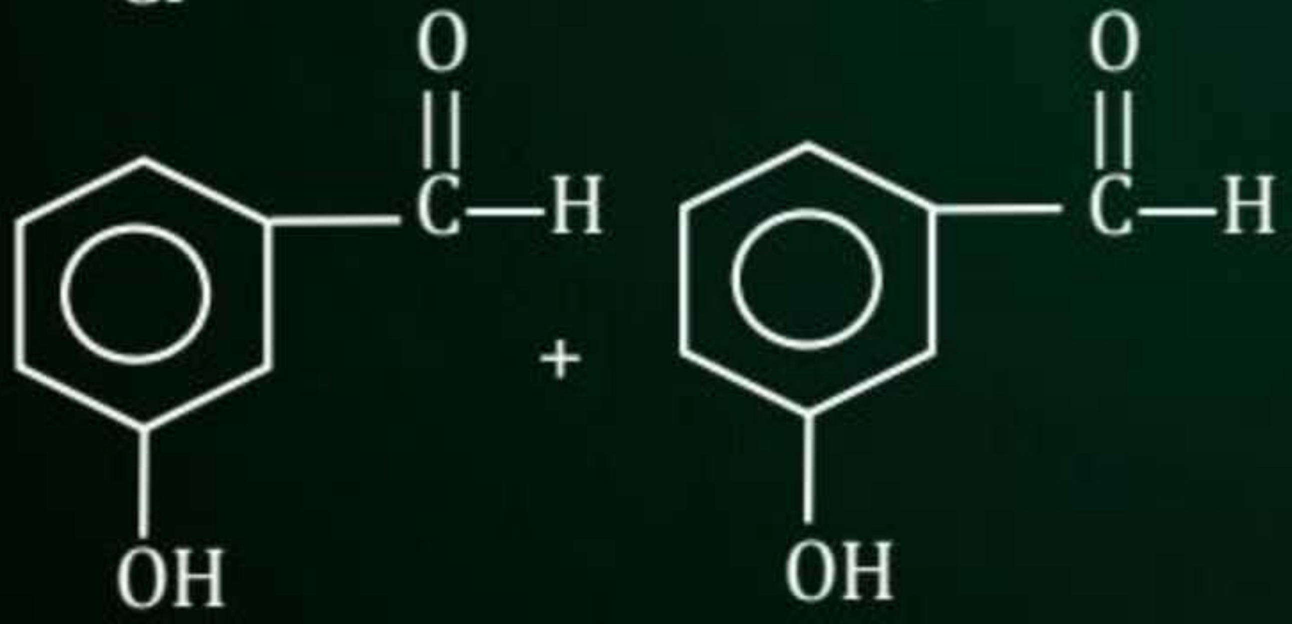
A


OH
O
CH
C
Cl
Cl

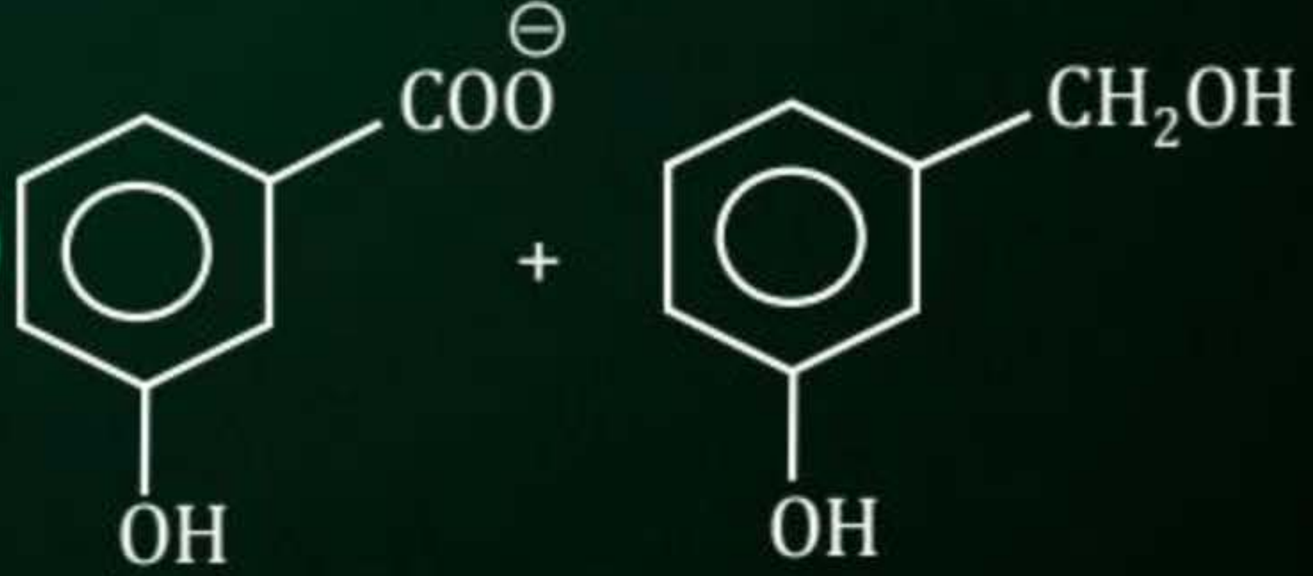
B


COO⊖
CH₂OH
+
Cl
Cl

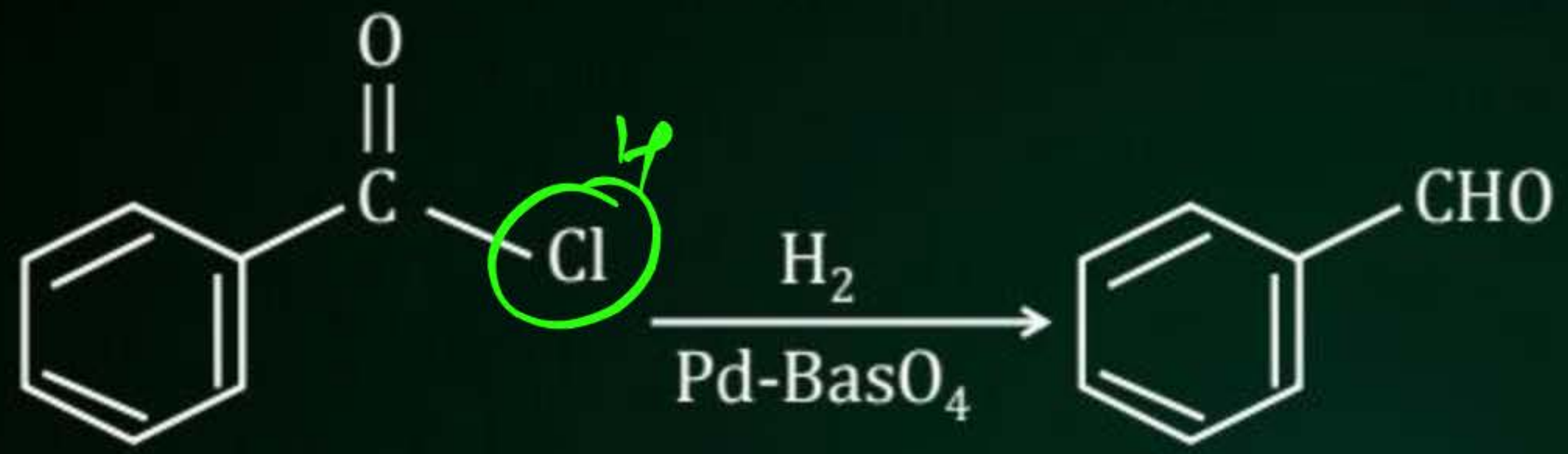
C


O
C
H
+
O
C
H
OH
OH

D


COO⊖
CH₂OH
+
OH
OH

QUESTION (JEE Mains 30th January 2024, Morning Shift)


O
C
Cl
H
H₂
Pd-BasO₄
CHO

This reduction reaction is known as:

[✓ A] Rosenmund reduction

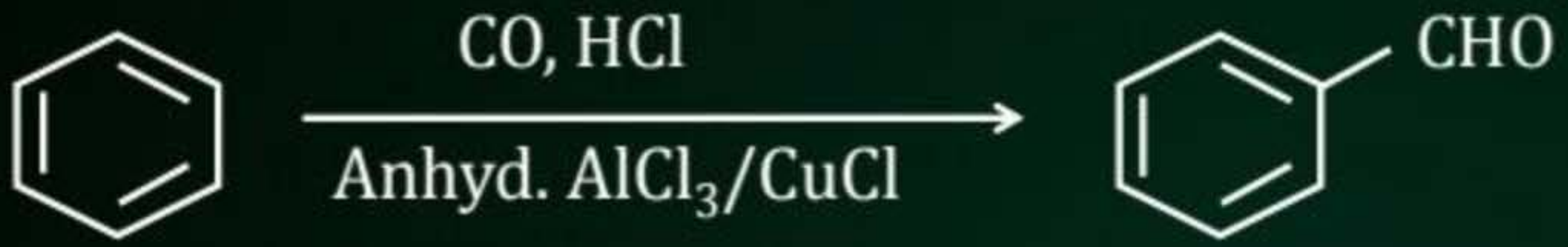
B Wolff-Kishner reduction

C Stephen reduction

D Etard reduction

QUESTION (JEE Mains 31 January 2024, Evening Shift)

Identify the name reaction.


CO, HCl
Anhyd. AlCl3/CuCl
CHO

A Stephen reaction

B Etard reaction

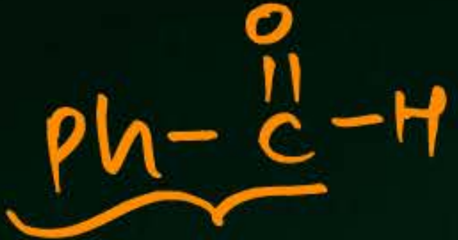
[✓ C Gatterman-koch reaction]

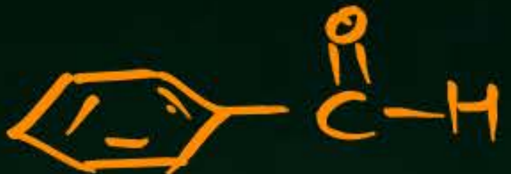
D Rosenmund reduction

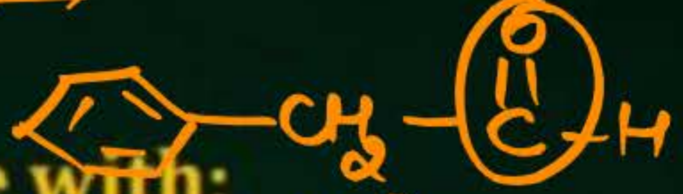
Home Work

Discussion of L-04

QUESTION 01


$\underbrace{Ph-\overset{\overset{O}{\|}}{C}}-H$


Fehling ✗


sp3 ✓

Fehling solution gives red precipitate with:

A Aromatic aldehyde ✗

B Saturated aliphatic aldehyde

C Unsaturated aliphatic aldehyde

[✓ **D** Both (B) and (C)]

QUESTION 02

Which of the given compounds will give positive test with Tollens' reagent?

A Acetamide ✗

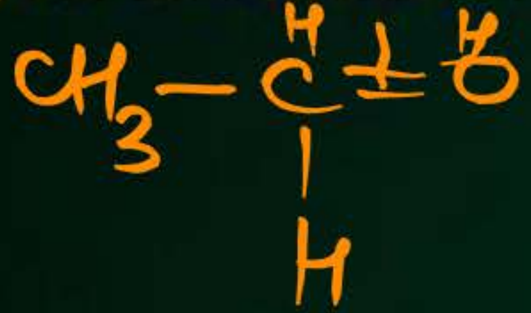
[✓ B] Acetaldehyde CH_3CHO

C Acetone ✗

D ✗ Acetic acid

QUESTION 03

When acetaldehyde is reacted with $LiAlH_4$, the product formed is?



$CH_3-\overset{H}{\underset{H}{C}}\cancel{=}\overset{H}{O}$

(A) CH_3COOH

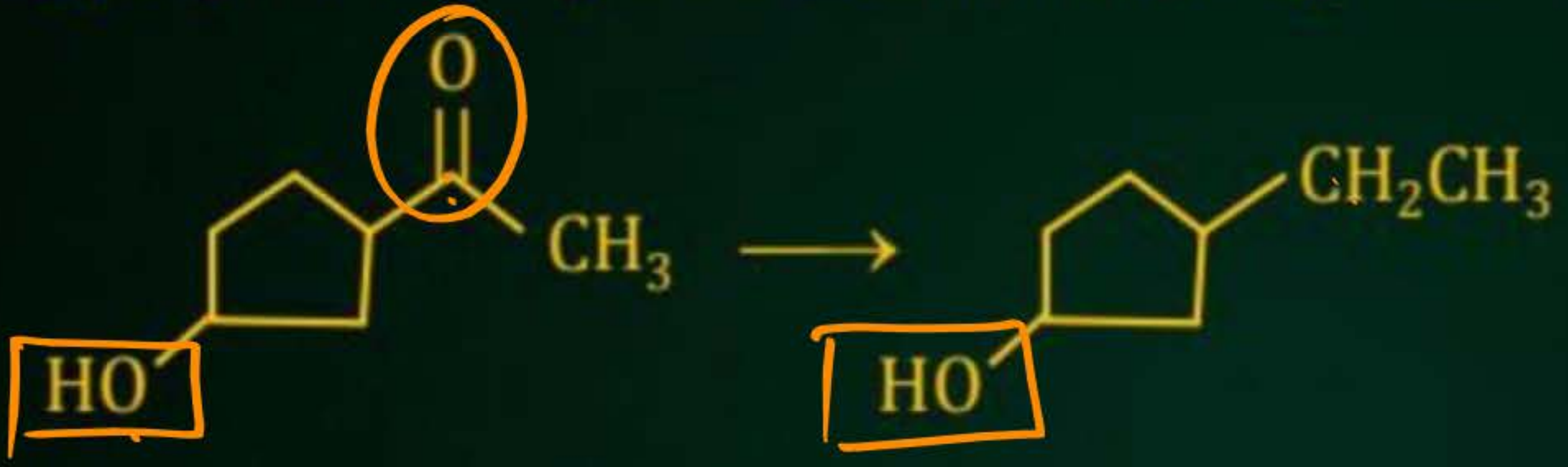
[✓ (B)] CH_3CH_2OH

(C) CH_3OH

(D) $HCOOH$

QUESTION 04

The appropriate reagent for the following transformation



is:

A $Zn(Hg), HCl$

[✓ B] NH_2NH_2, OH^-

C H_2/Ni

D $NaBH_4$

QUESTION 05

When acetaldehyde is treated with ammoniacal silver nitrate solution, we get:

[✓ **A** silver mirror]

B a brown precipitate

C red colouration

D no precipitate

QUESTION 06

Match the following lists:

(A) Grignard reagent ③

(B) Clemmensen's reduction ④

(C) Rosenmund's reduction ①

(D) Wolff-Kishner reduction ②

(1) $H_2/Pd\text{-}BaSO_4$

(2) $N_2H_4/KOH/CH_2OH\text{-}CH_2OH$

(3) CH_3MgX

(4) $Zn\text{-}Hg/\text{conc. }HCl$

(5) H_2/Ni

the correct answer is:

[✓ A] A-3, B-4, C-1, D-2

B A-3, B-4, C-2, D-1

C A-2, B-1, C-4, D-5

D A-5, B-3, C-2, D-1

QUESTION 07

When acetaldehyde is heated with Fehling's solution, it gives a red precipitate of:

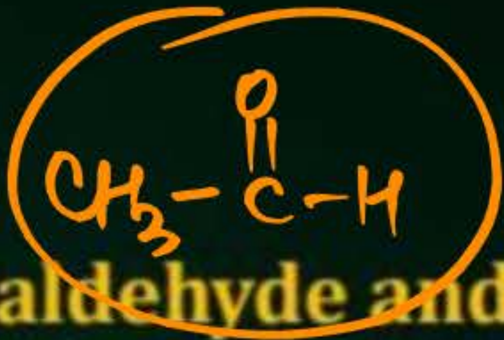
Ⓐ Cu

Ⓑ CuO

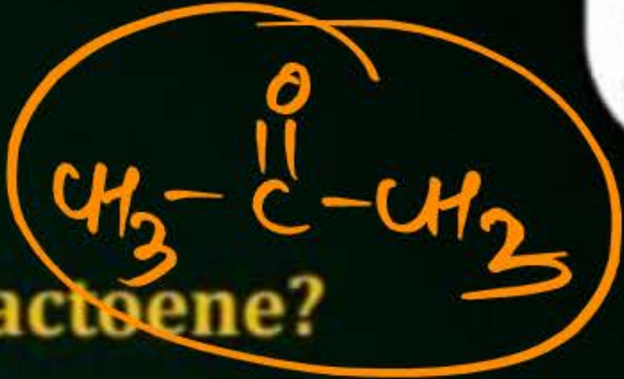
Ⓒ $CuSO_4$

[✓ Ⓓ $\overset{+1}{Cu}_2O$]

QUESTION 08



$CH_3-\overset{O}{\overset{\parallel}{C}}-H$



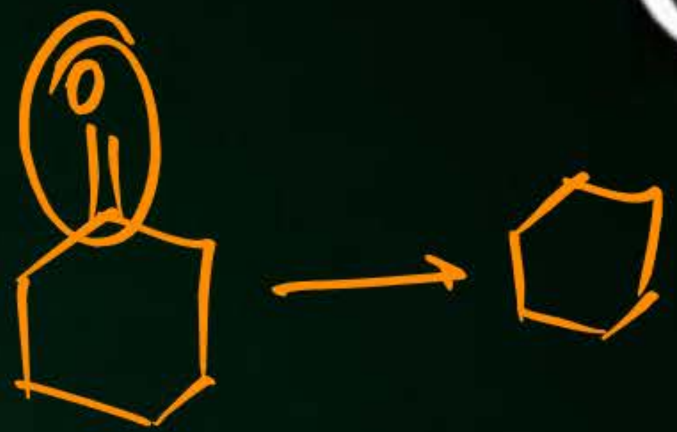
$CH_3-\overset{O}{\overset{\parallel}{C}}-CH_3$

Which statement is incorrect in the case of acetaldehyde and actoene?

- **A** Both react with hydroxylamine
- **B** Both react with $NaHSO_3$
- **C** Both react with hydrazine
- [✓ **D**] Both reduce ammoniacal silver nitrate

QUESTION 09

Clemmensen's reduction will convert cyclohexanone into:



- **A** *n*-hexane
- **B** benzene
- **C** [✓ cyclohexane]
- **D** cyclohexanol

QUESTION 10

Acetaldehyde is converted to ethane by Wolff-Kishner reduction, Acetaldehyde is treated with:

Ⓐ $LiAlH_4$

Ⓑ $NaBH_4$

[✓ Ⓒ NH_2NH_2 and $NaOC_2H_5$]

Ⓓ H_2 with $Pd/BaSO_4$

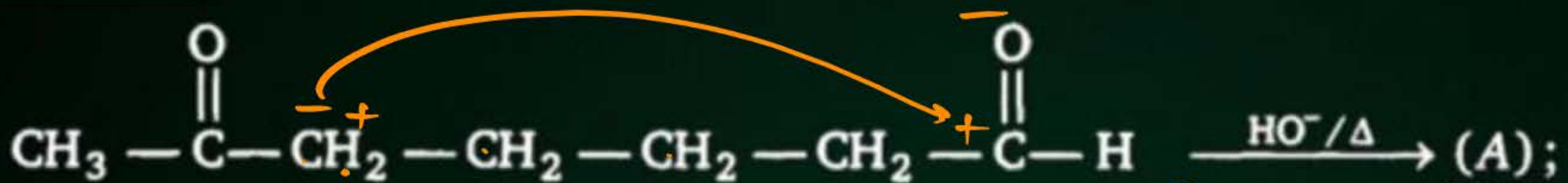
ANSWER KEY

1. D
2. B
3. B
4. B
5. A
6. A
7. D
8. D
9. C
10. C

Home Work

Discussion of L-06

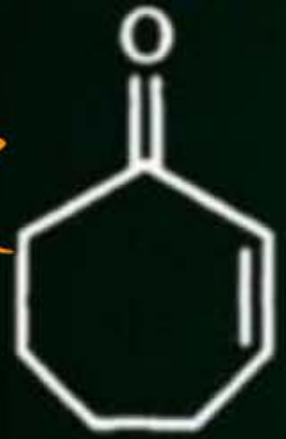
QUESTION 01

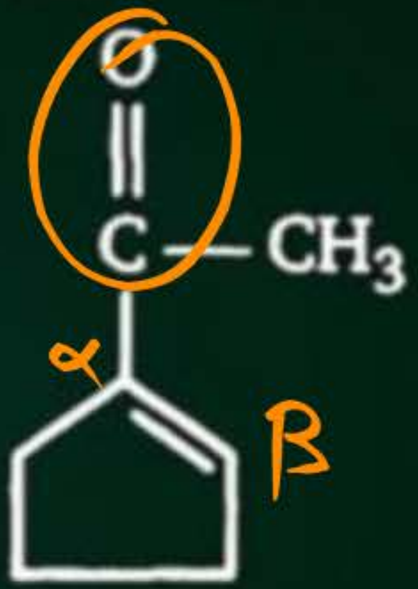


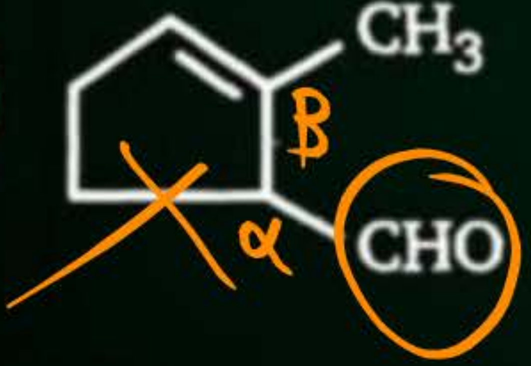
$$CH_3-\overset{O}{\overset{\|}{C}}-CH_2-CH_2-CH_2-CH_2-\overset{O}{\overset{\|}{C}}-H \xrightarrow{HO^-/\Delta} (A);$$

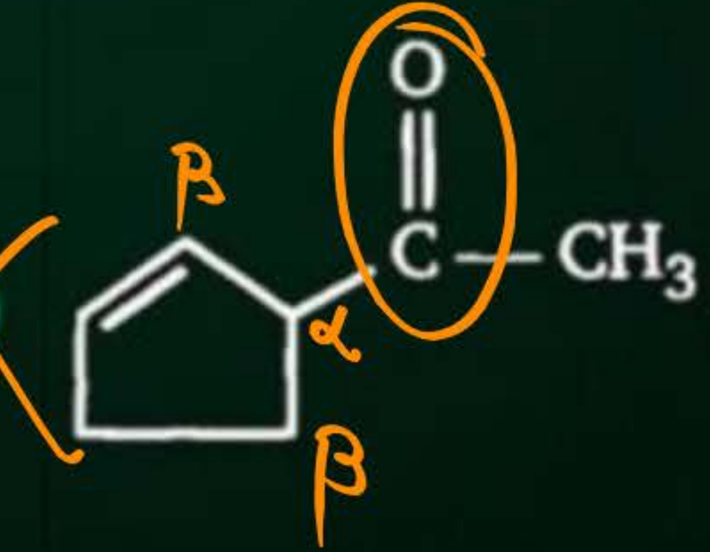
(73%)

Product (A) is:

A 

B 

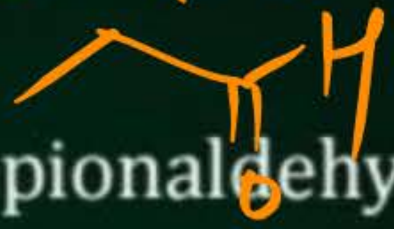
C 

D 

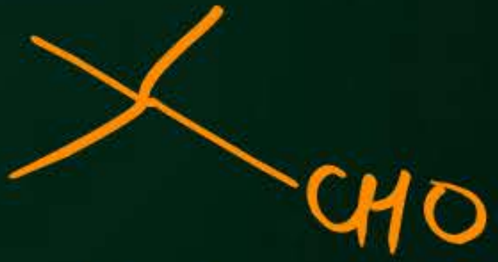
QUESTION 02

Base-catalysed aldol condensation will occur with αH(✓)

- (A) Benzaldehyde PhCHO ×
- ✓ (B) Propionaldehyde

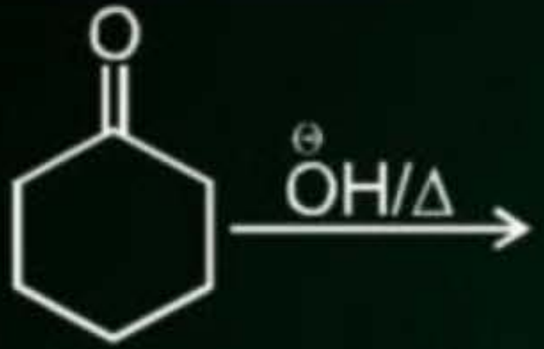


- (C) Formaldehyde HCHO×
- (D) 2, 2-Dimethylpropionaldehyde



×

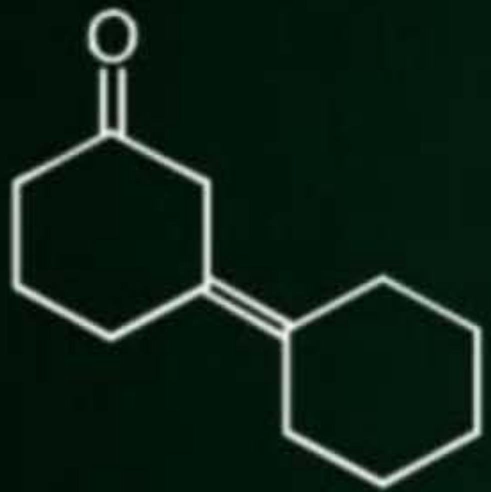
QUESTION 03



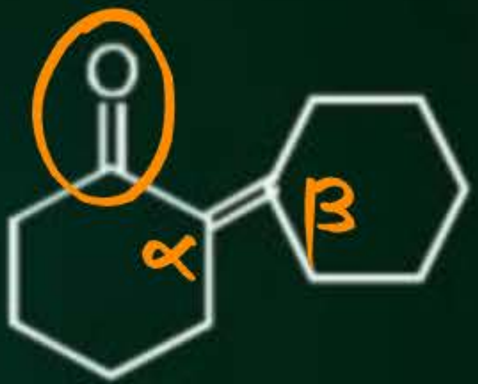
$\overset{\ominus}{O}H/\Delta$

Product is:

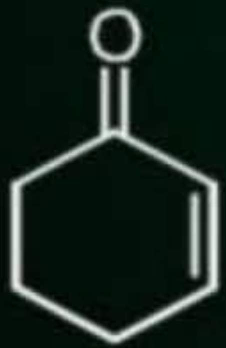
A



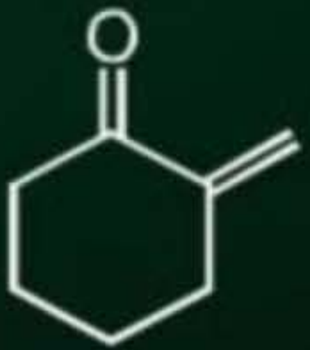
[✓ B]



C

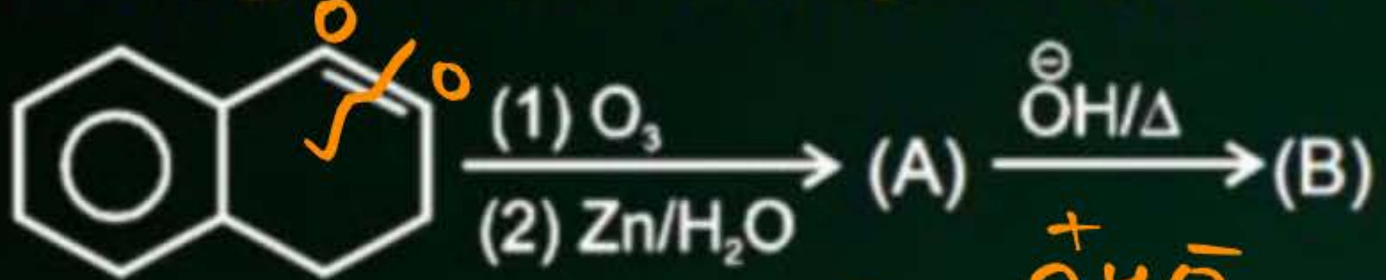


D

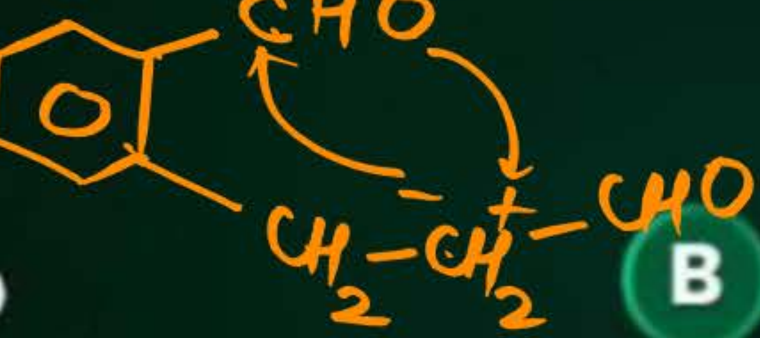


QUESTION 04

In the given reaction sequence, B is:

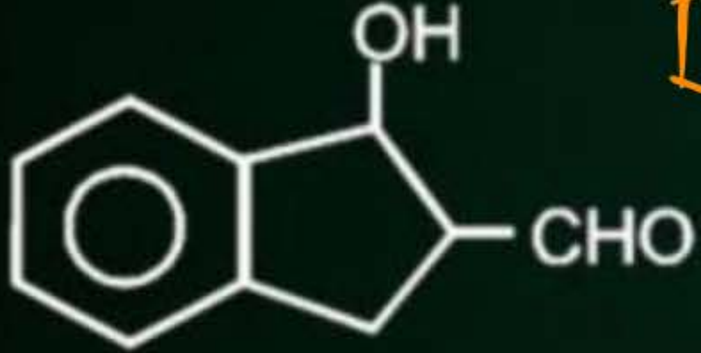


(1) O₃
(2) Zn/H₂O
(A)
OH⁻/Δ
(B)

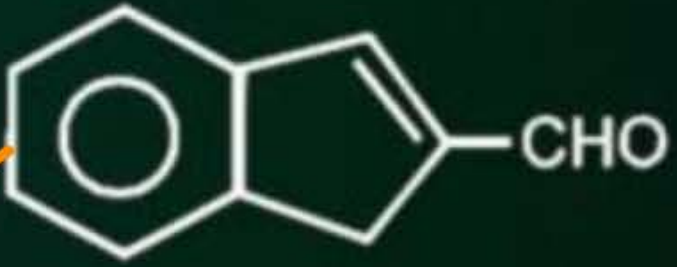


CHO
CH₂–CH₂–CHO

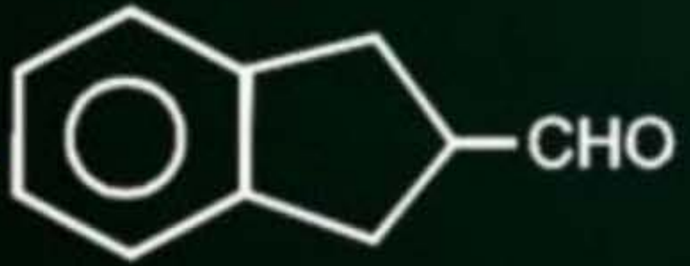
(A) ✗



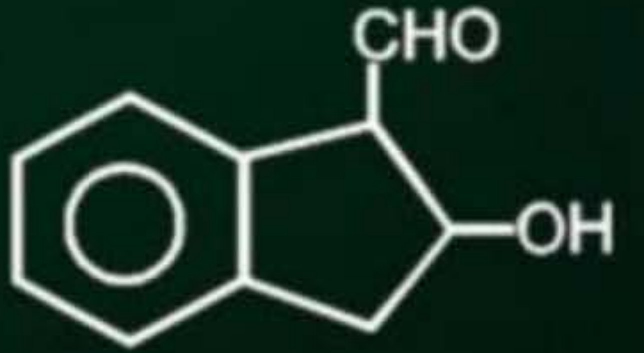
(B) ✓



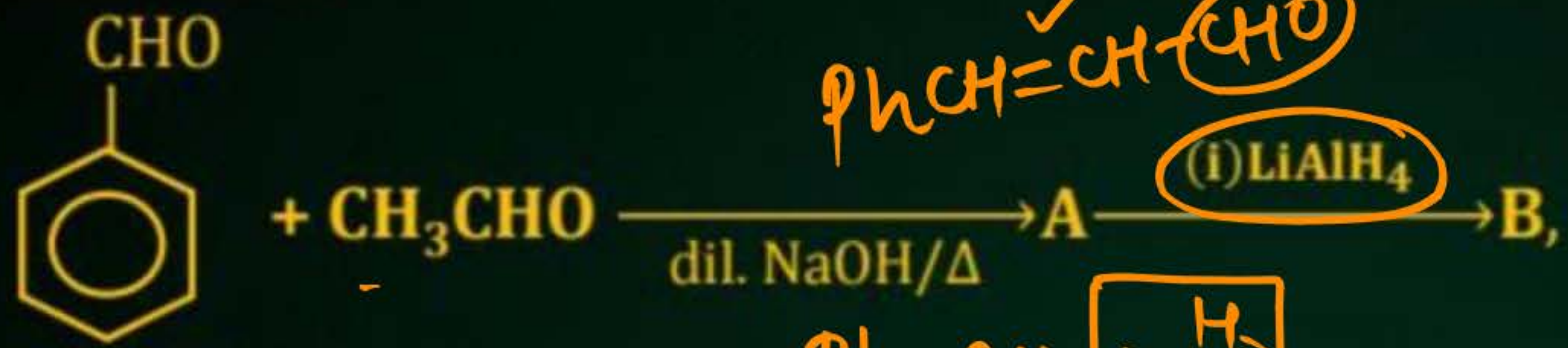
(C) ✗



(D) ✗



QUESTION 05



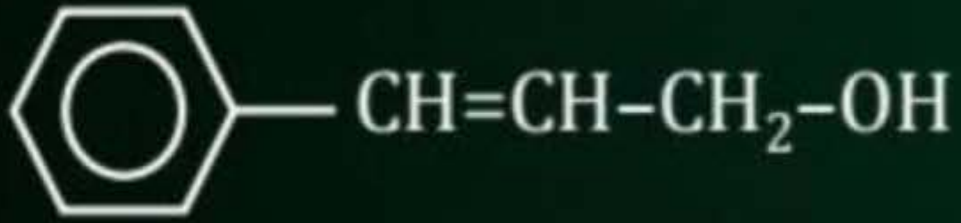
$C_6H_5CHO + CH_3CHO \xrightarrow[\text{dil. NaOH}/\Delta]{} A \xrightarrow{\text{(i)LiAlH}_4} B$,

$\overset{\checkmark}{PhCH=CH-CHO}$

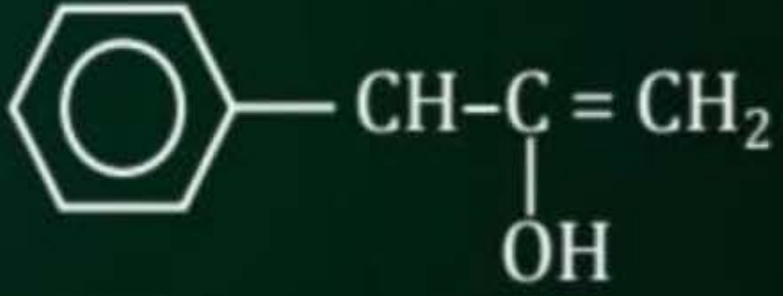
$Ph-CH_2-CH_2-CH_2OH$

$Ph-CH=O \boxed{\begin{matrix} H \\ H \end{matrix}} CH-CHO$

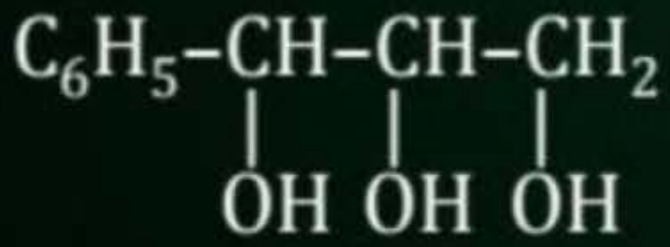
Copound 'B' is:

A 

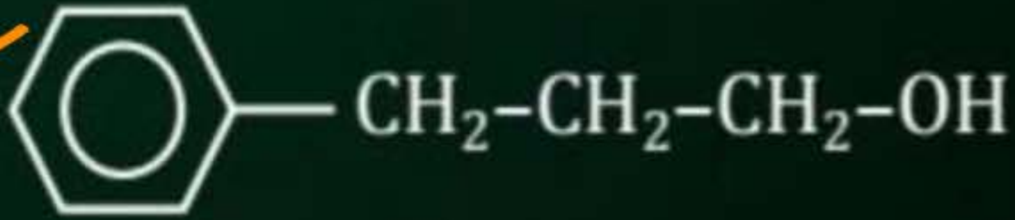
$C_6H_5-CH=CH-CH_2-OH$

B 

$C_6H_5-CH(OH)-C=CH_2$

C 

$C_6H_5-\underset{OH}{CH}-\underset{OH}{CH}-\underset{OH}{CH_2}$

✓ **D** 

$C_6H_5-CH_2-CH_2-CH_2-OH$

QUESTION 06

The end product of the reaction is:

$$2CH_3\text{-}CHO \xrightarrow{OH^-} \underset{CH_3-\underset{OH}{CH}-CH_2CHO}{A} \xrightarrow{\Delta} \underset{CH_3CH=CH-\boxed{CHO}}{B} \xrightarrow{[Ag(NH_3)_2]NO_3}$$

(A) $Me-CH_2-CH_2-COOH$

[✓ (B)] $Me-CH=CH-COOH$

(C) $Me-CH=CH-CH_2OH$

(D) $MeCH_2CH_2CHO$

QUESTION 07

Which of the following would undergo aldol condensation?

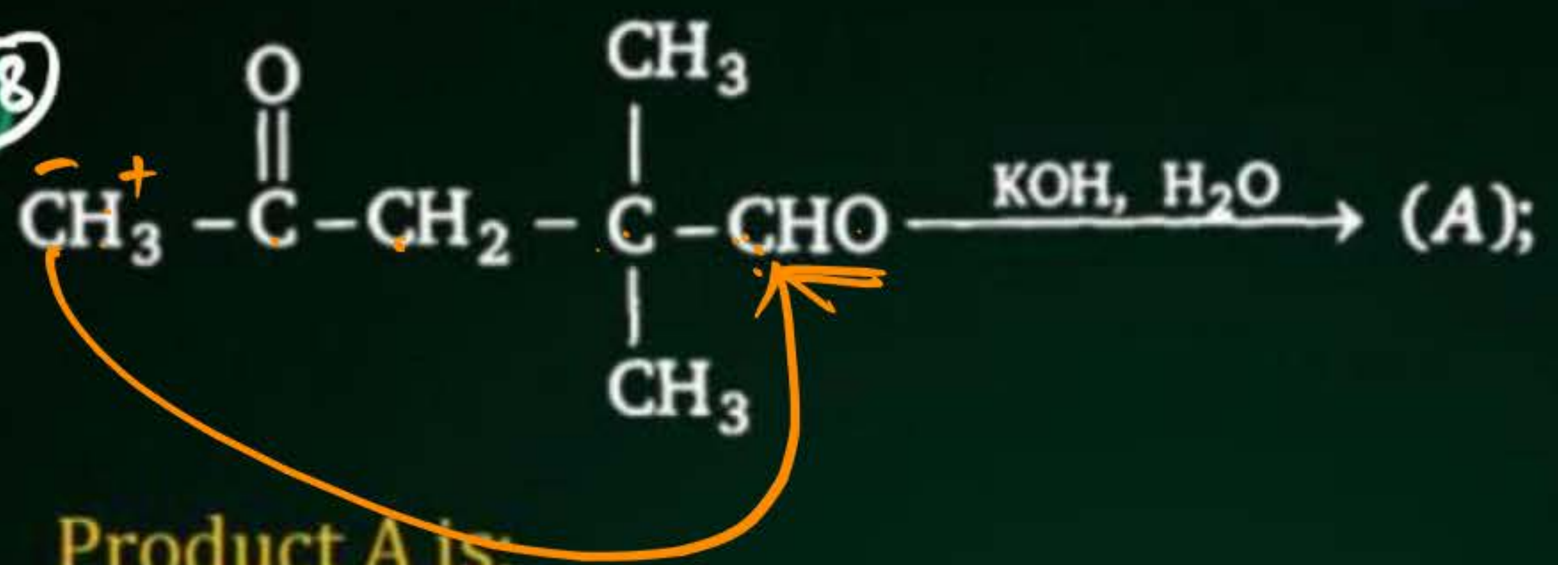
[✓ (A) CH_3CHO]

(B) CCl_3CHO

(C) $HCHO$

(D) $(CH_3)_3CCHO$

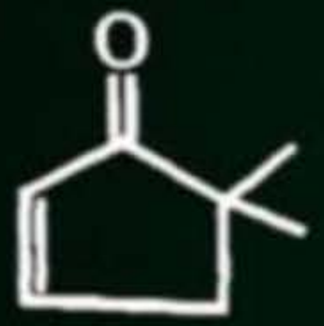
QUESTION 08

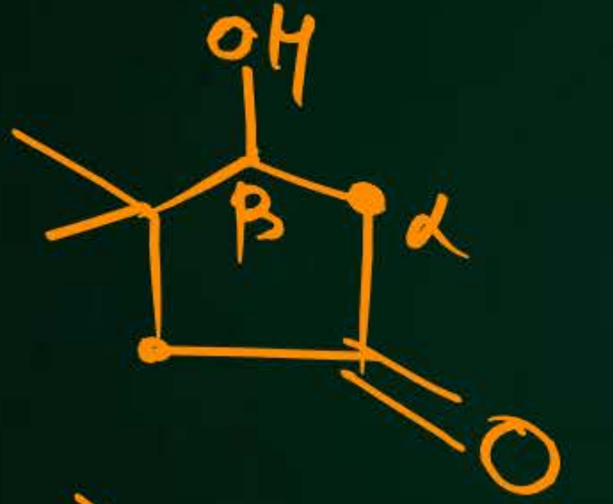


$CH_3-\overset{O}{\overset{\|}{C}}-CH_2-\overset{CH_3}{\underset{CH_3}{C}}-CHO \xrightarrow{KOH,\ H_2O} (A);$

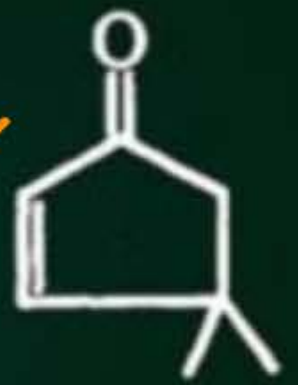
Product A is:

A

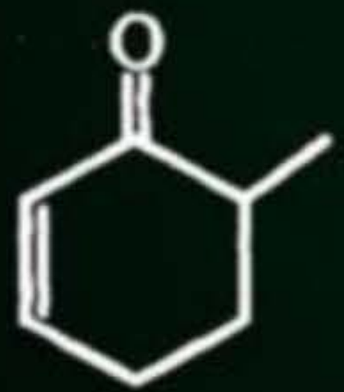


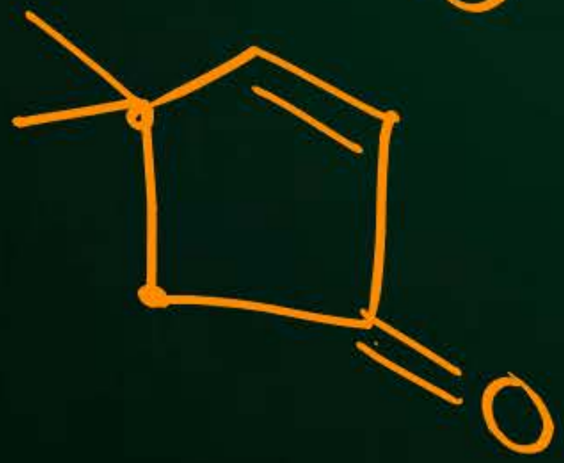


[✓ B]

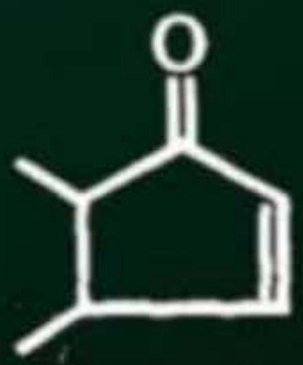


C

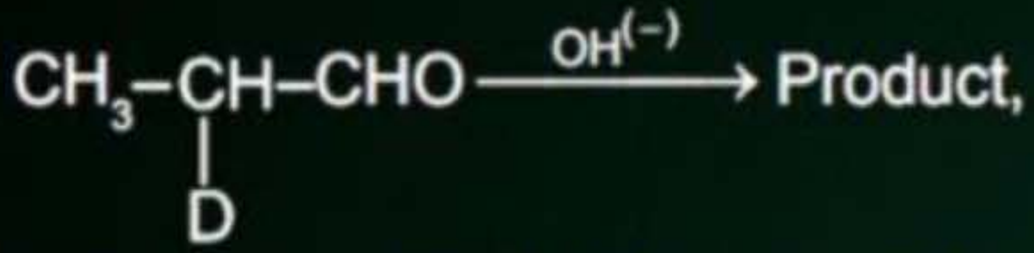




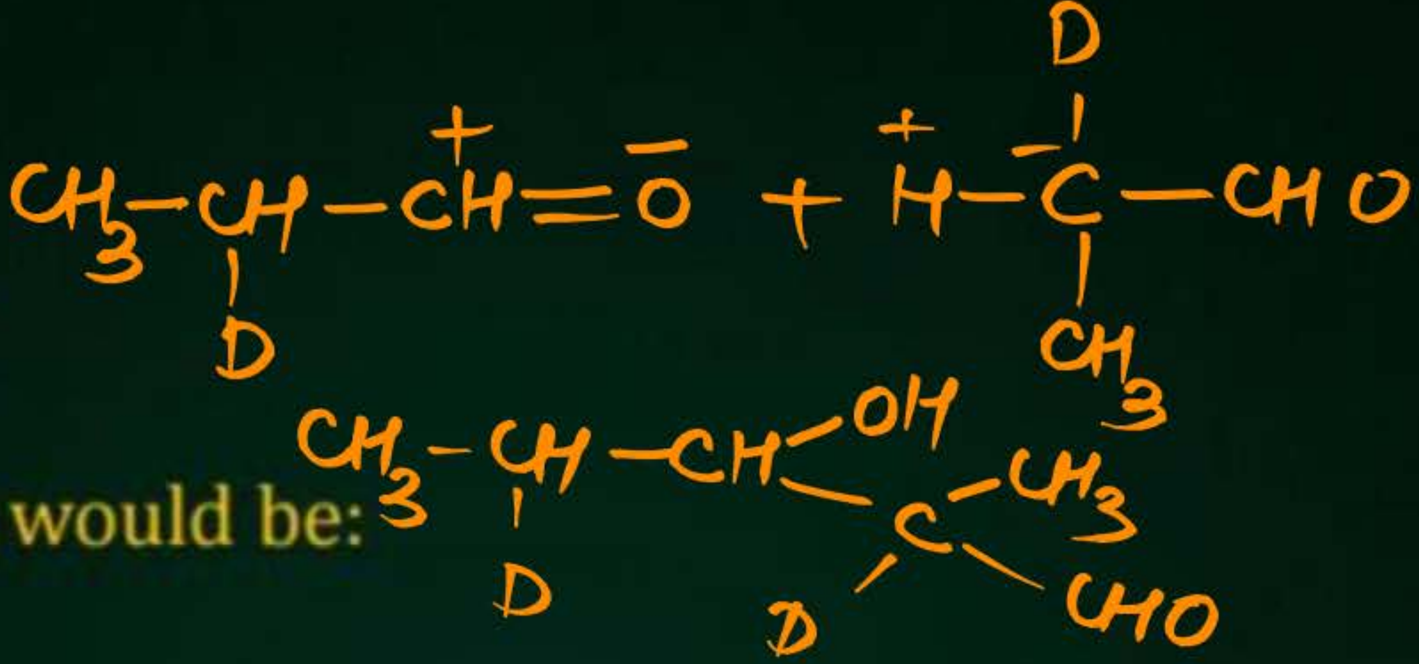
D



QUESTION 09

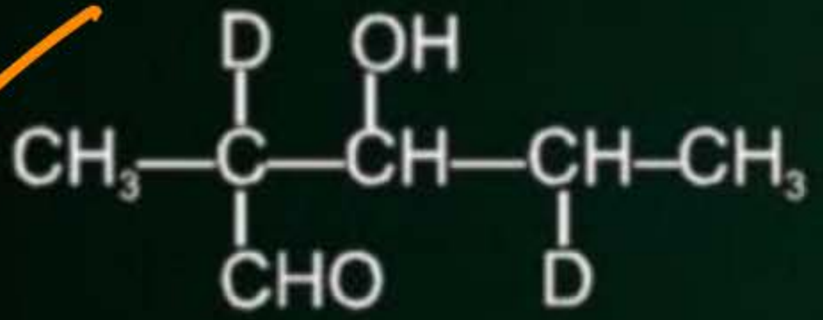


$CH_3-\underset{D}{\underset{|}{C}}H-CHO \xrightarrow{OH^{(-)}}$ Product,



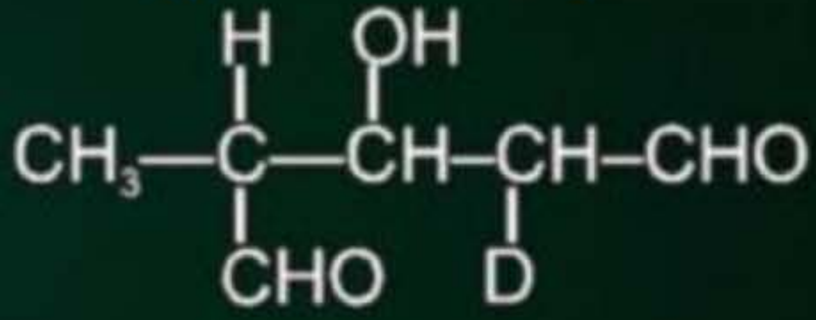
The product of this reaction would be:

A



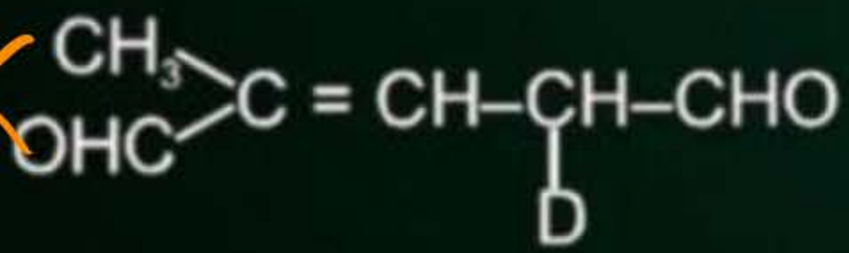
$CH_3-\overset{D}{\overset{|}{\underset{CHO}{\underset{|}{C}}}}-\overset{OH}{\overset{|}{C}}H-\underset{D}{\underset{|}{C}}H-CH_3$

B

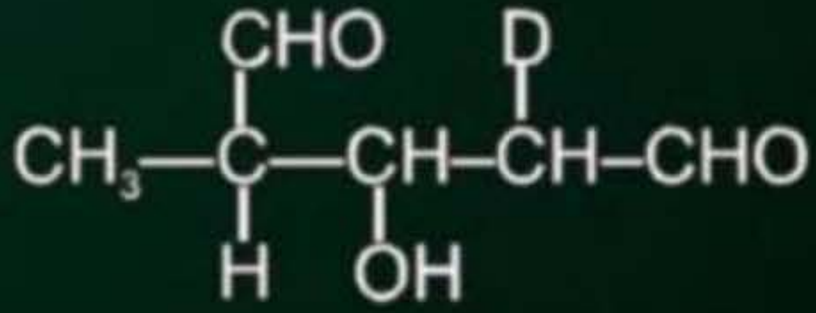


$CH_3-\overset{H}{\overset{|}{\underset{CHO}{\underset{|}{C}}}}-\overset{OH}{\overset{|}{C}}H-\underset{D}{\underset{|}{C}}H-CHO$

C



D

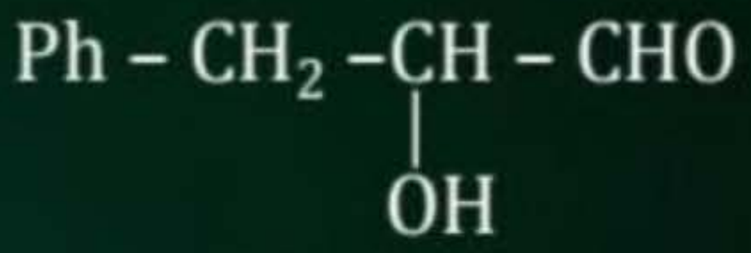


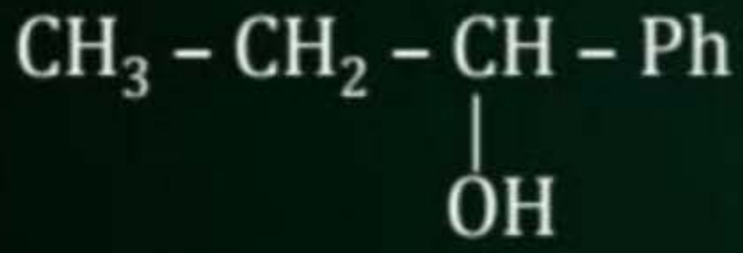
$CH_3-\overset{CHO}{\overset{|}{\underset{H}{\underset{|}{C}}}}-\underset{OH}{\underset{|}{C}}H-\overset{D}{\overset{|}{C}}H-CHO$

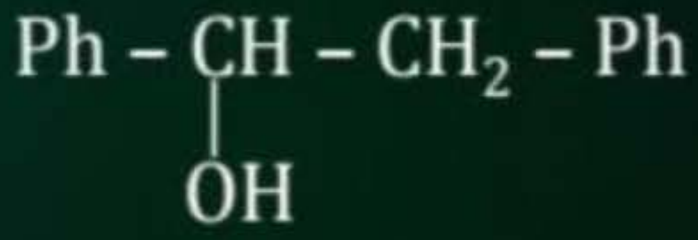
QUESTION ⑩

$Ph-\underline{CHO}+\underline{CH_3}-CHO \xrightarrow{\overset{\ominus}{O}H/\Delta}$ Product is:

Ⓐ $Ph-CH=CH-\underline{CHO}$ ✓

Ⓑ 
$Ph-CH_2-\underset{\displaystyle OH}{\underset{|}{CH}}-CHO$

Ⓒ 
$CH_3-CH_2-\underset{\displaystyle OH}{\underset{|}{CH}}-Ph$

Ⓓ 
$Ph-\underset{\displaystyle OH}{\underset{|}{CH}}-CH_2-Ph$

ANSWER KEY

1. B
2. B
3. B
4. B
5. D
6. B
7. A
8. B
9. A
10. A

Home Work

discussion of L-07

QUESTION 01

$2HCHO + NaOH \longrightarrow CH_3OH + HCOONa$

The above reaction is known as:

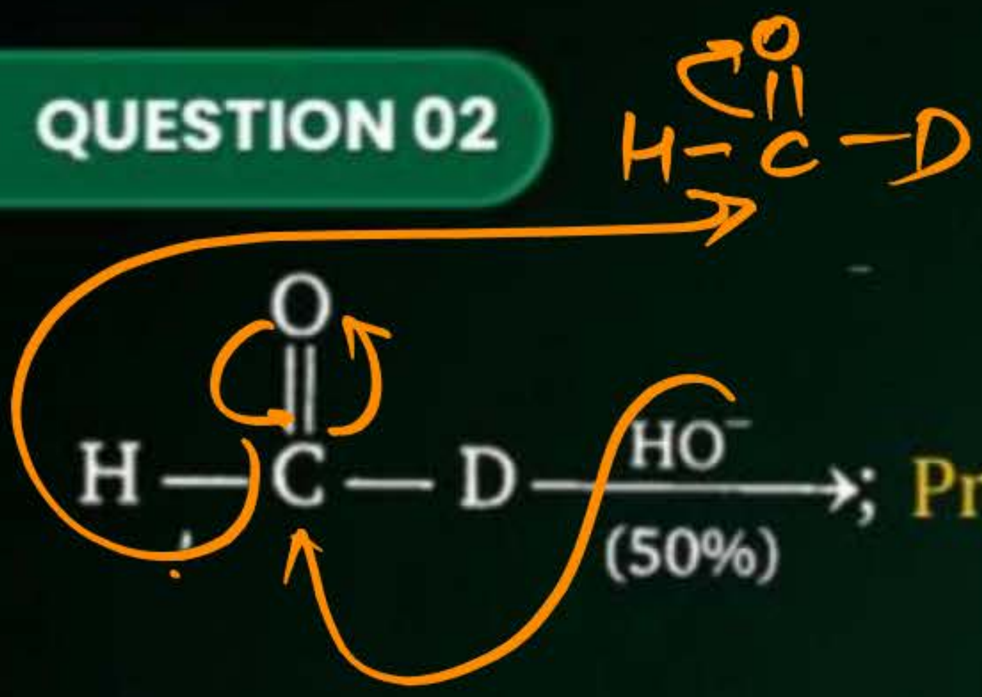
Ⓐ Wurtz reaction

Ⓑ Rosenmund's reaction

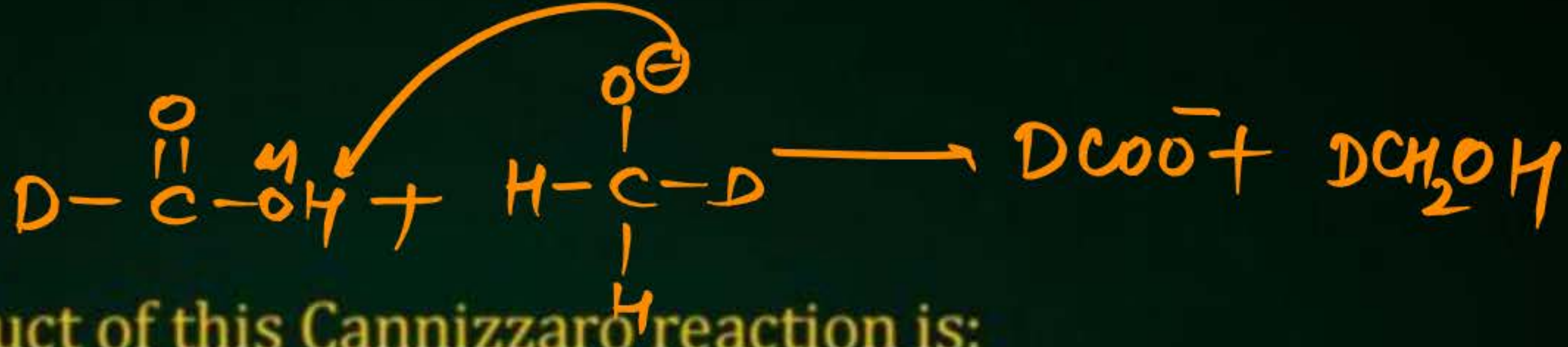
Ⓒ Frankland reaction

[✓ Ⓓ Cannizzaro's reaction]

QUESTION 02



$\mathrm{H-\overset{O}{\overset{\|}{C}}-D \xrightarrow[(50\%)]{HO^-}}$; Product of this Cannizzaro reaction is:



$\mathrm{D-\overset{O}{\overset{\|}{C}}-OH + H-\overset{O^{\ominus}}{\overset{|}{\underset{H}{\underset{|}{C}}}}-D \longrightarrow DCOO^- + DCH_2OH}$

A $\mathrm{D-CO_2^- + CH_2DOD}$

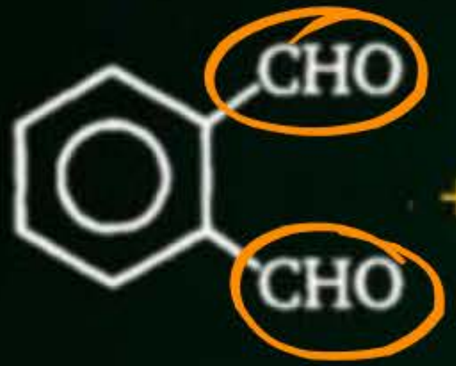
B $\mathrm{H-CO_2^- + D-CO_2^-}$

C $\mathrm{D-CO_2^- + CH_2DOH}$ ✓

D $\mathrm{D-CO_2^- + CHD_2OH}$

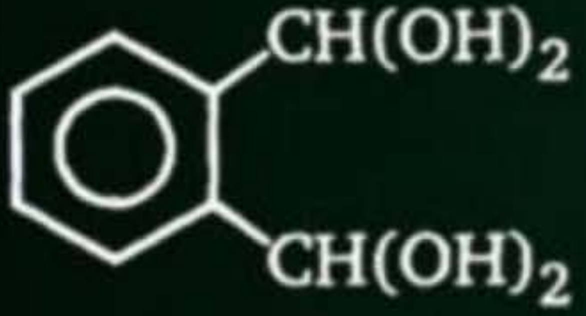
QUESTION 03

The reaction,

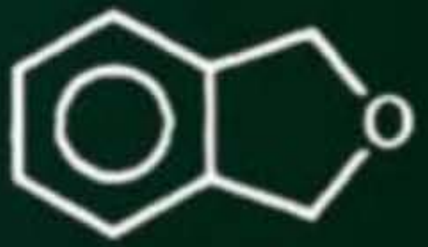


+ conc. NaOH $\xrightarrow{\text{heat}}$, Products identify the product.

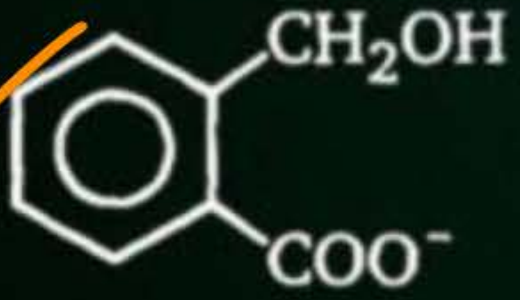
(A)


CH(OH)2
CH(OH)2

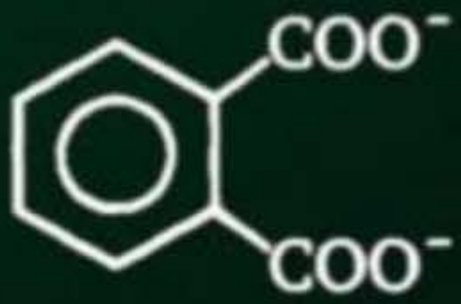
(B)



[✓ (C)]



(D)



QUESTION 04

The compound(s) that will undergo Cannizzaro reaction is/are:

i. CH_3CHO ✗

ii. $(CH_3)_3CCHO$ ✓

iii. PhCHO ✓

iii. CH_3COCH_3 ✗

(A) ii only

[✓ (B)] ii and iii

(C) i and ii

(D) ii, iii and iv

QUESTION 05

$\underline{\mathrm{PhCHO}} + \boxed{\mathrm{HCHO}} \xrightarrow{Conc.KOH}$

Correct statement regarding the above reaction will be:

A It is an example of redox reaction.

B HCHO is oxidized.

C It is cross Cannizzaro reaction.

[✓ D] All of these

QUESTION 06

A mixture of benzaldehyde and formaldehyde on heating with aqueous NaOH solution gives:

- (A) ✓ benzyl alcohol and ~~solution~~ dium formate
- (B) sodium benzoate and methyl alcohol
- (C) sodium benzoate and sodium formate
- (D) benzyl alcohol and methyl alcohol

$PhCHO + \boxed{HCHO}$

$PhCH_2OH + HCOO^-$

QUESTION 07

Which of these combinations will not produce benzoic acid?

A $C_6H_5\underline{CH_2OH} + \underbrace{KMnO_4/OH^-/H_2O}_{}$, heat; $\underline{\text{then } H_3}O^+$

B $C_6H_5\underline{CH_3} + \underbrace{KMnO_4/OH^-/H_2O}_{}$, heat; then H_3O^+

C $C_6H_6 + CO_2$, high pressure

D $C_6H_5COCH_3 + I_2/OH^-/H_2O$, then $\underline{H_3}O^+$

$\mathrm{ONa}\left\{\begin{matrix}\mathrm{CI}_3\\ \mathrm{H}_3\end{matrix}\right.$

QUESTION 08

$R-CH_2-CH_2OH$ can be converted into RCH_2CH_2COOH. The correct sequence of reagent is:

Br

CN COOH

[✓ A] PBr_3, KCN, H^+/H_2O

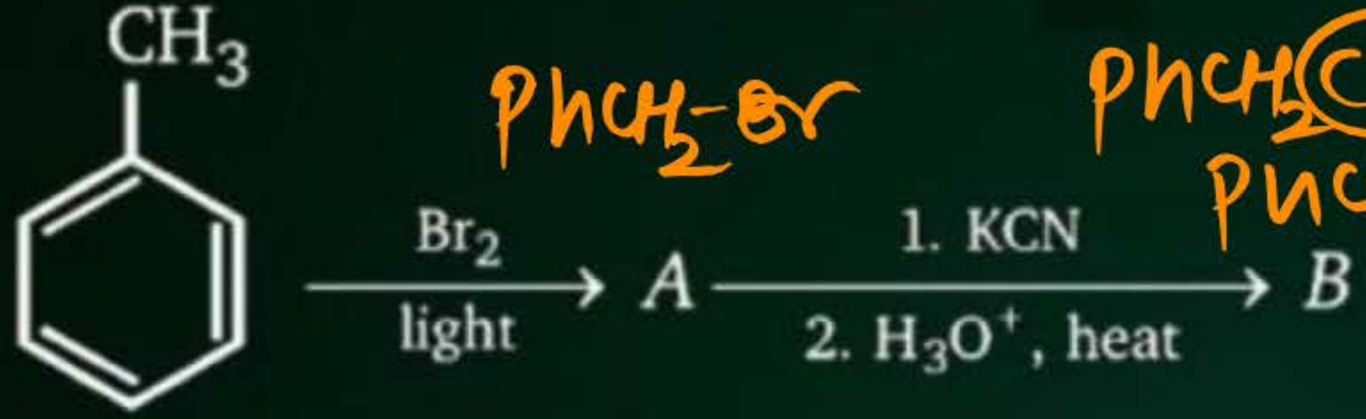
B PBr_3, KCN, H_2

C ✗ KCN, H^+

D ✗ HCN, PBr_3, H^+

QUESTION 09

What is the final product (B) of this sequence?

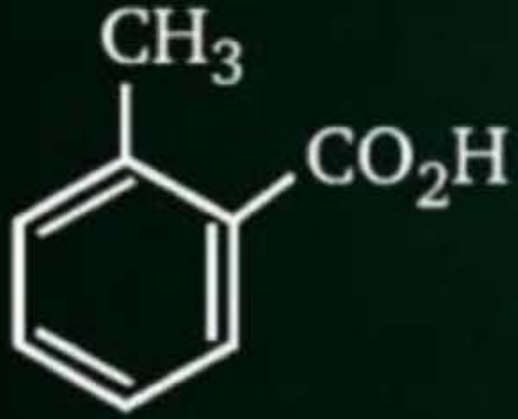

CH3
Br2
light
A
1. KCN
2. H3O+, heat
B

$PhCH_2-Br$

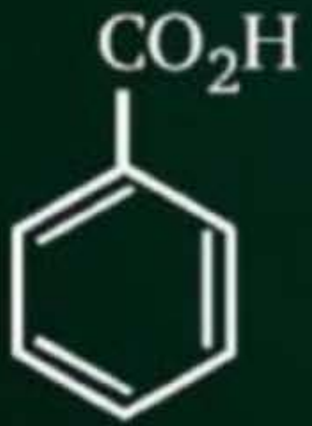
$PhCH_2CN$

$PhCH_2COOH$

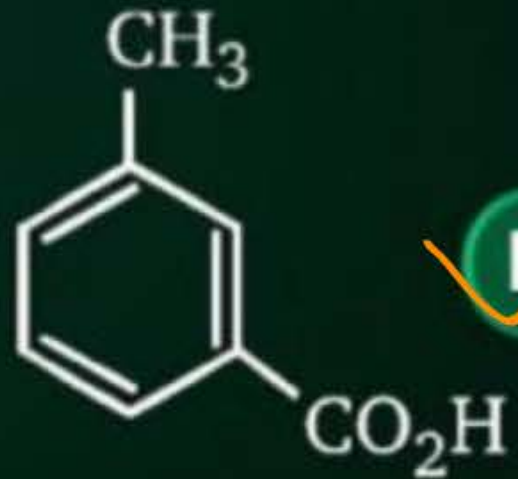
A



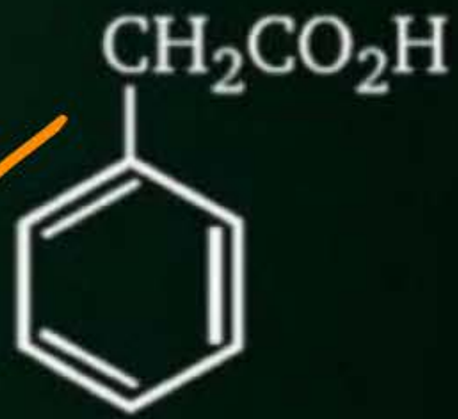
B



C



[✓ **D**]



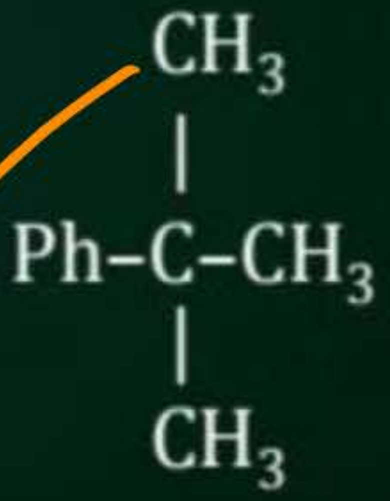
QUESTION 10

Which of the following will not product benzoic acid by oxidation with alkaline $KMnO_4$?

(A) $Ph{-}CH_3$

(B) $Ph{-}CH_2{-}Cl$

(C) $Ph{-}CH_2CH_3$

[✓ (D)] 

$$Ph{-}\underset{\displaystyle CH_3}{\overset{\displaystyle CH_3}{\underset{|}{\overset{|}{C}}}}{-}CH_3$$

αH ✗

ANSWER KEY

1. D
2. C
3. C
4. B
5. D
6. A
7. C
8. A
9. D
10. D

Home Work

Discussion of L-08

QUESTION 01

The carboxylic acid that does not undergo HVZ reaction is:

A CH_3CH_2COOH

B $(CH_3)_2CHCOOH$

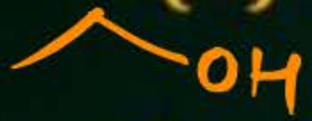
C $CH_3CH_2CH_2CH_2COOH$

[✓ **D**] $(CH_3)_3CCOOH$

αH ✗

QUESTION 02

$$CH_3COOH \xrightarrow{LiAlH_4} (A) \xrightarrow[300°C]{Cu} \underset{CH_3CHO}{(B)} \xrightarrow[NaOH/\Delta]{dilute} \underset{CH_3-\overset{O}{CH}=\overset{O}{CH}-CHO}{(C)} \xrightarrow{O_3/Zn/H_2O} D + E \quad CH_3CHO + \begin{matrix}CHO\\ |\\ CHO\end{matrix}$$

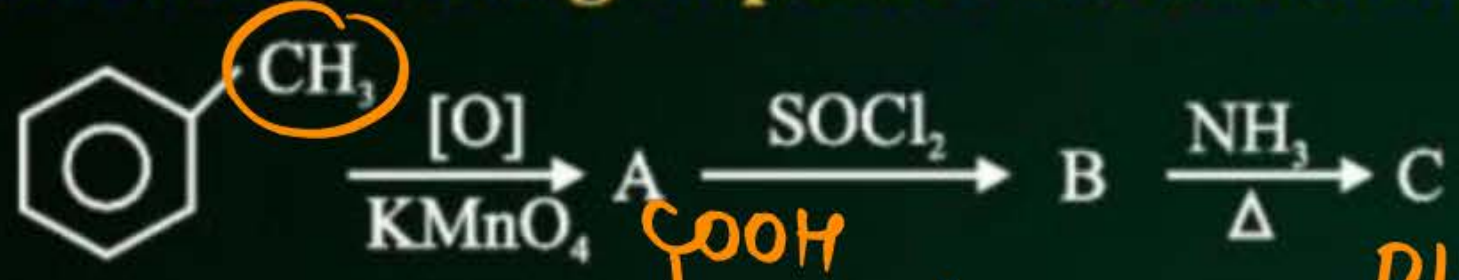


In the above reaction, D and E are respectively:

- **A** CH_3CHO and CHO–CHO ✓
- **B** CH_3COOH and CHO–CHO
- **C** CH_3CHO and $CH_3–CH_2OH$
- **D** none of these

QUESTION 03

In the following sequence of reactions, what is C?


CH$_3$
[O]
KMnO$_4$
A
COOH
SOCl$_2$
B
NH$_3$
Δ
C

PhCOCl

PhCONH$_2$

[✓ A] An amide

B Phenyl isocyanate

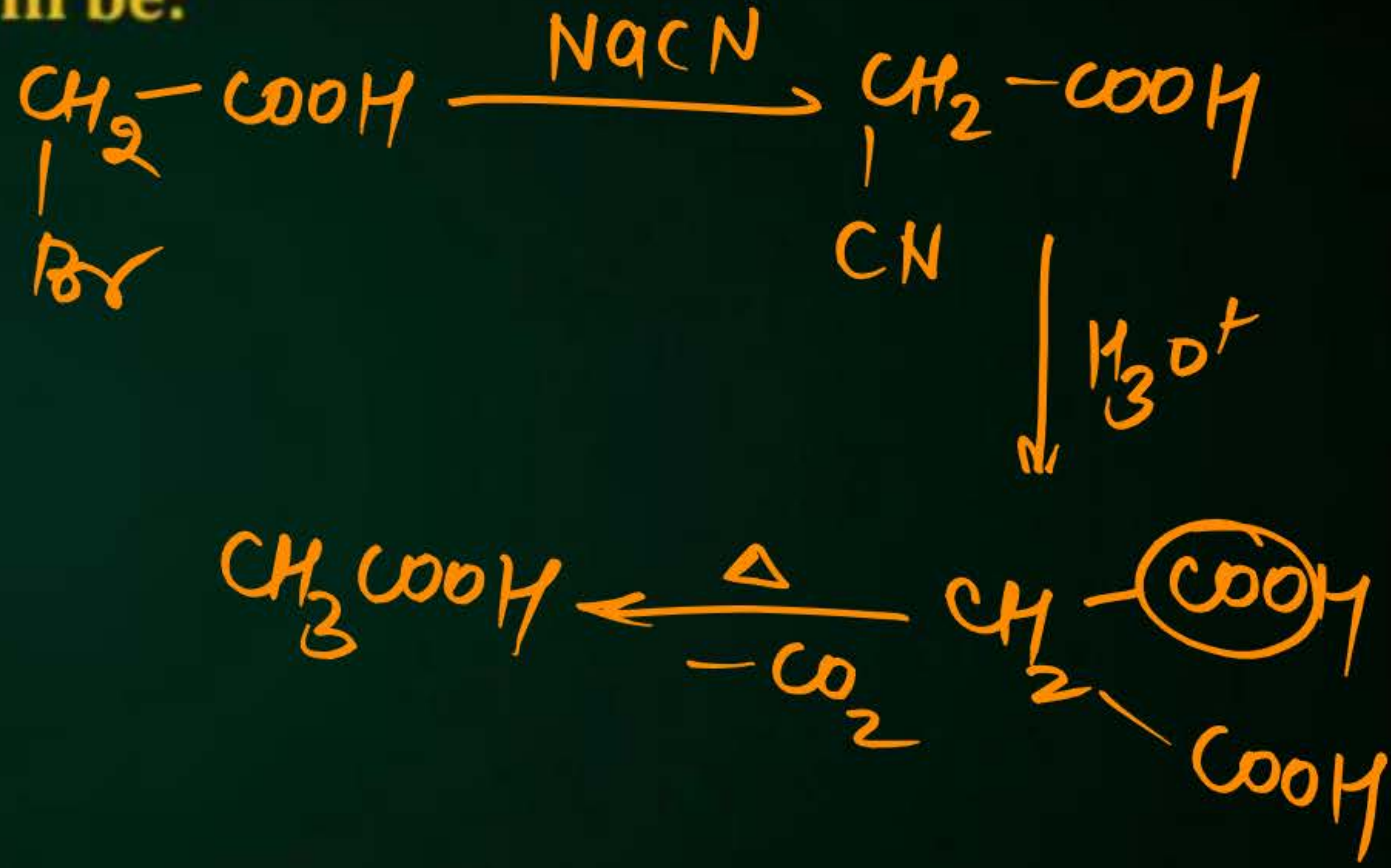
C Primary amine

D A chain lengthened hydrocarbon

QUESTION 04

In the given reaction, major product will be:

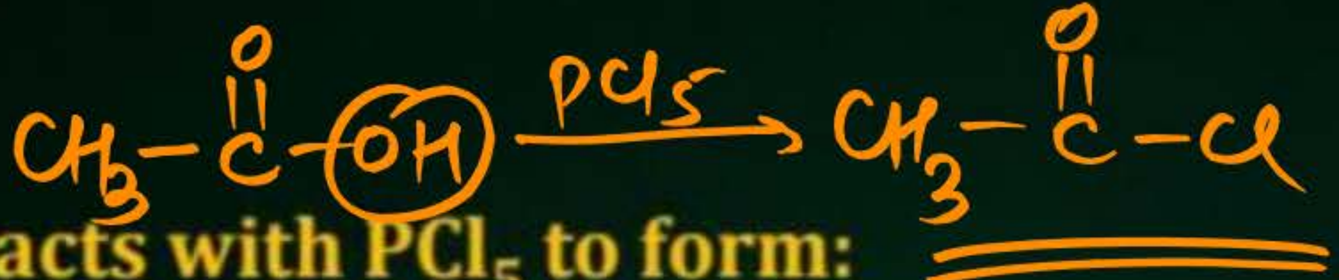
$$\underset{\alpha\text{-H} \checkmark}{CH_3-COOH} \xrightarrow[\text{(ii) NaCN} \\ \text{(iii) } H_2O/H^{\oplus}/\Delta]{\text{(i) } Br_2/\text{redP}}$$



$$\underset{\underset{Br}{|}}{CH_2}-COOH \xrightarrow{NaCN} \underset{\underset{CN}{|}}{CH_2}-COOH \xrightarrow{H_3O^+} CH_2\begin{matrix}-\boxed{COOH} \\ -COOH\end{matrix} \xrightarrow[-CO_2]{\Delta} CH_3COOH$$

- [✓ A] CH_3COOH
- B $COOH-CH_2-CH_2-COOH$
- C Succinic anhydride
- D Malonic anhydride

QUESTION 05



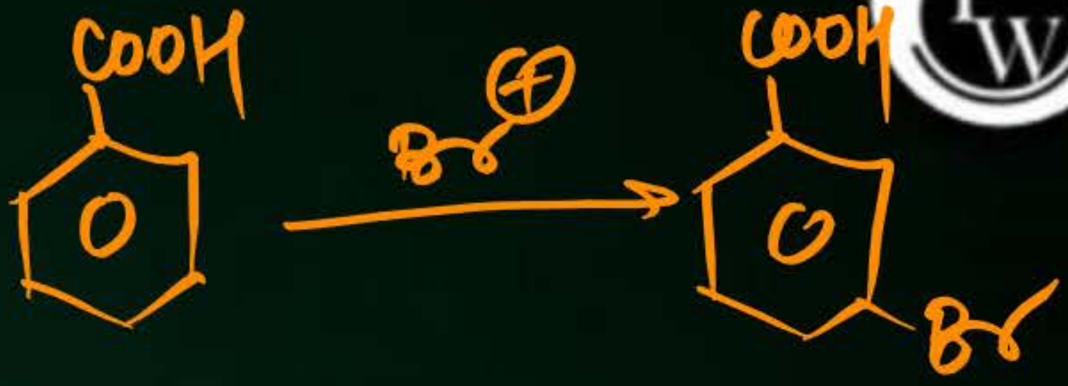
$$\boxed{CH_3-\overset{O}{\overset{\|}{C}}-OH \xrightarrow{PCl_5} \underline{\underline{CH_3-\overset{O}{\overset{\|}{C}}-Cl}}}$$

Acetic acid reacts with PCl_5 to form:

- **A** $CHCl_2COOH$
- **B** CH_3COOH
- **C** CH_3COCl ✓
- **D** $CH_2ClCOOH$

QUESTION 06

Benzoic acid reacts with bromine to give



- **A** o-bromobenzoic acid
- **B** [✓ m-bromobenzoic acid]
- **C** p-bromobenzoic acid
- **D** 3, 4-dibromobenzoic acid

QUESTION 07

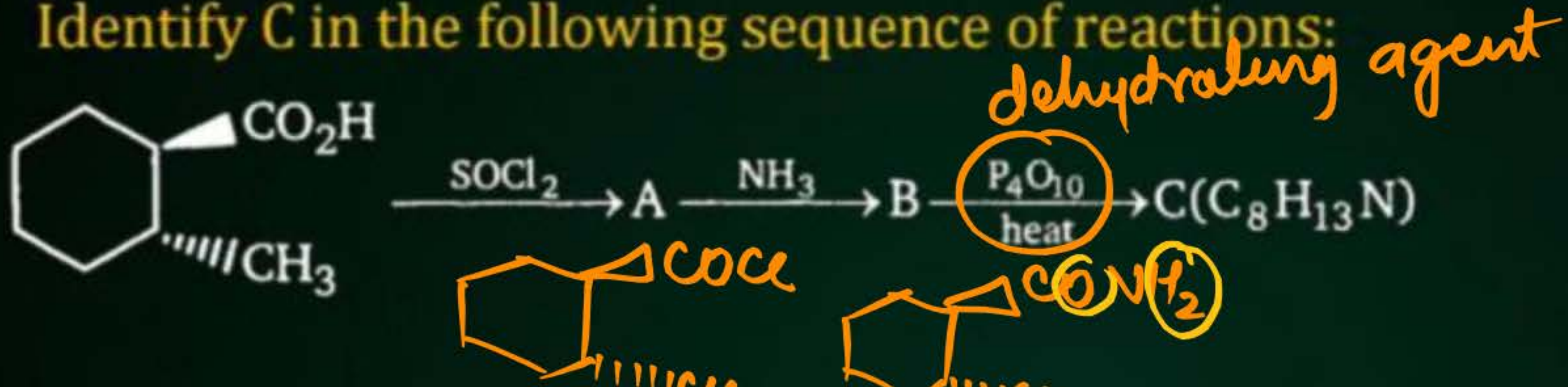
Which of the following carboxylic acids give HVZ reaction?

I = CH_3COOH ✓, II = $HCOOH$ ✗, III = CH_3CH_2COOH ✓, IV = $(CH_3)_3CCOOH$ ✗
V = $(CH_3)_2CHCOOH$ ✓

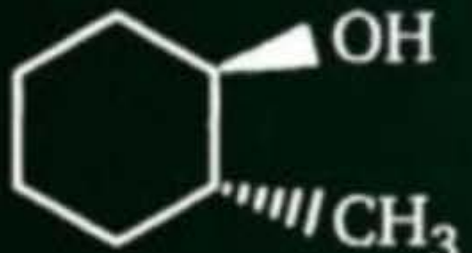
- **A** I, II, III
- **B** [✓ I, III, V]
- **C** III, IV, V
- **D** II, III, IV

QUESTION 08

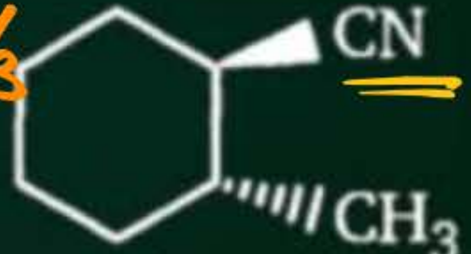
Identify C in the following sequence of reactions:


CO$_2$H
CH$_3$
SOCl$_2$
A
NH$_3$
B
P$_4$O$_{10}$
heat
C(C$_8$H$_{13}$N)
dehydrating agent
COCl
CH$_3$
CONH$_2$
CH$_3$

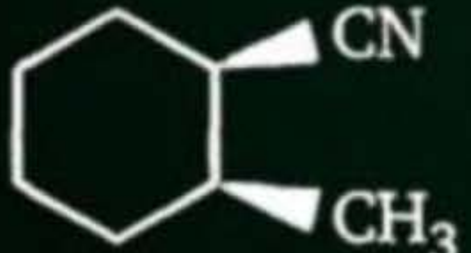
A



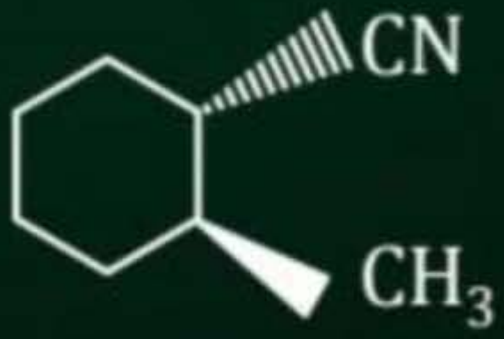
B ✓



C



D



QUESTION 09

The organic product formed in the reaction, $C_6H_5COOCH_3 \xrightarrow{LiAlH_4,\, H^+}$ are:

$H \mid H$

$PhCH_2OH + CH_3OH$

- A [✓ $C_6H_5CH_2OH$ and CH_3OH]
- B C_6H_5COOH and CH_4
- C $C_6H_5CH_3$ and CH_3OH
- D $C_6H_5CH_3$ and CH_4

QUESTION 10

HVZ

$CH_3COOH \xrightarrow{\text{Red } P/Br_2} CH_2BrCOOH$. The reaction is called

A Schotten-Baumann reaction

[✓ B Hell-Volhard-Zelinsky reaction]

C Finkelstein reaction

D none of the above

ANSWER KEY

1. D
2. A
3. A
4. A
5. C
6. B
7. B
8. B
9. A
10. B

PANKAJ SIR
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@PSCAA
PhysicsWallah
अनुगच्छतु प्रवाहं

Thankyou!!

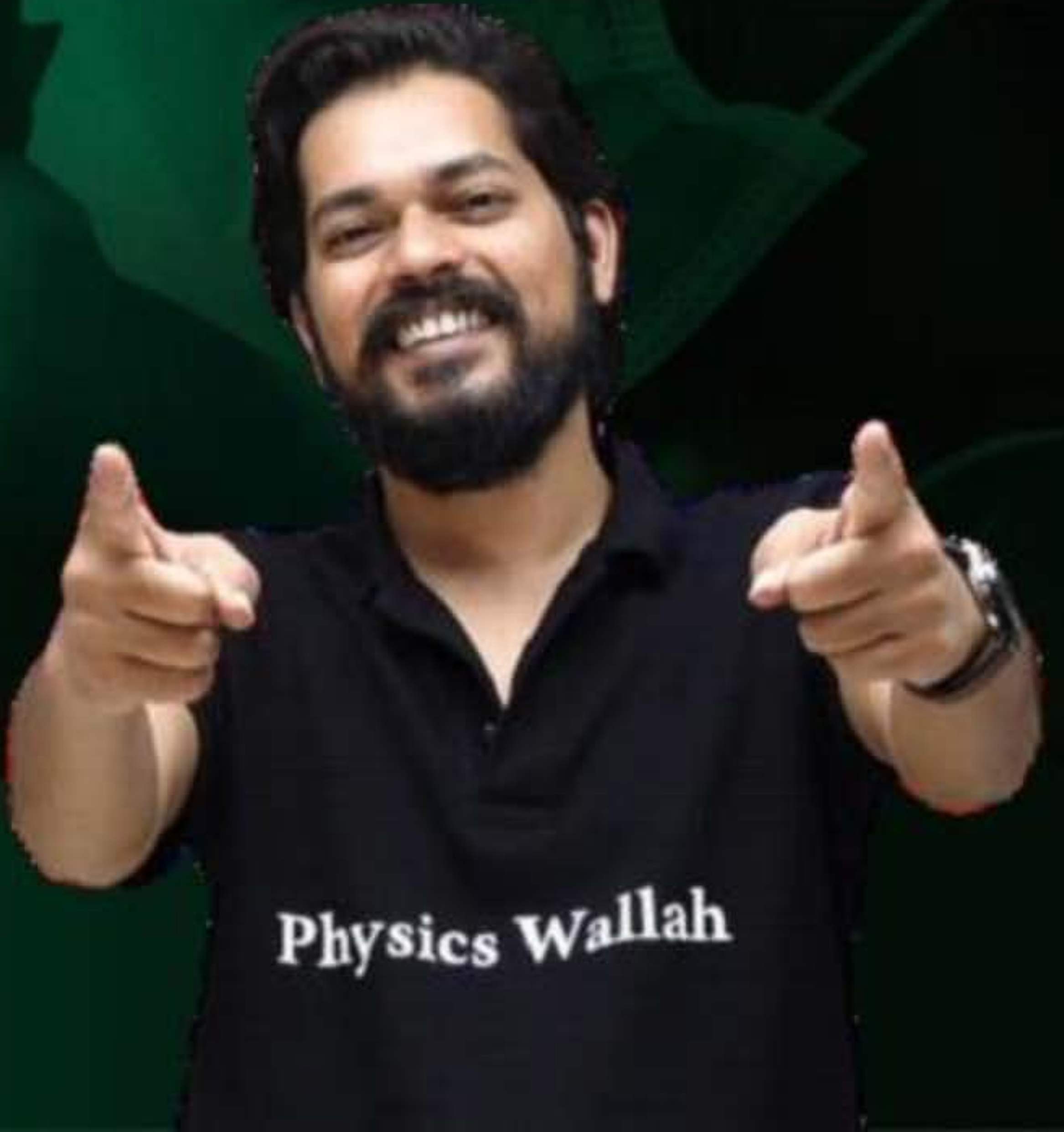
YAKEEN 2.0

FOR NEET 2025

Lecture- 01 | **Organic Chemistry**

Amines

By- Pankaj Sir(POPU MAMA)


Physics Wallah

Topics *to be covered*

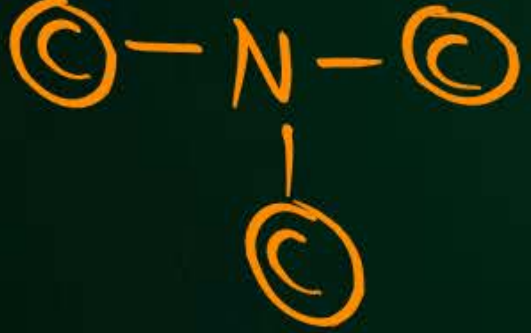
1. Introduction
2. Methods of Preparation of Amines
3. Practice

Classification of Amines

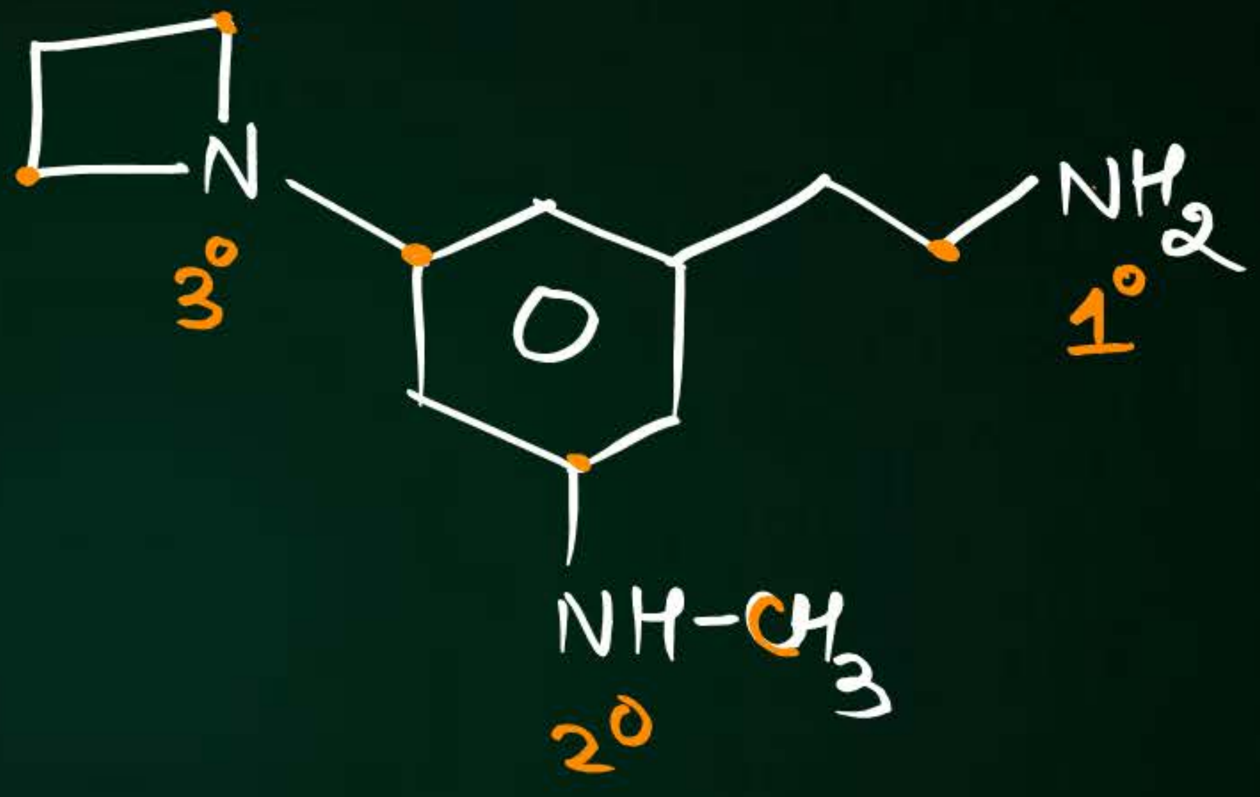
1° Ⓝ—C

2° Ⓒ—N—Ⓒ

3°



$$\text{Ⓒ}-\underset{\text{Ⓒ}}{\underset{|}{N}}-\text{Ⓒ}$$


N
3°
NH2
1°
NH-CH3
2°

Methods of Preparation of Amines

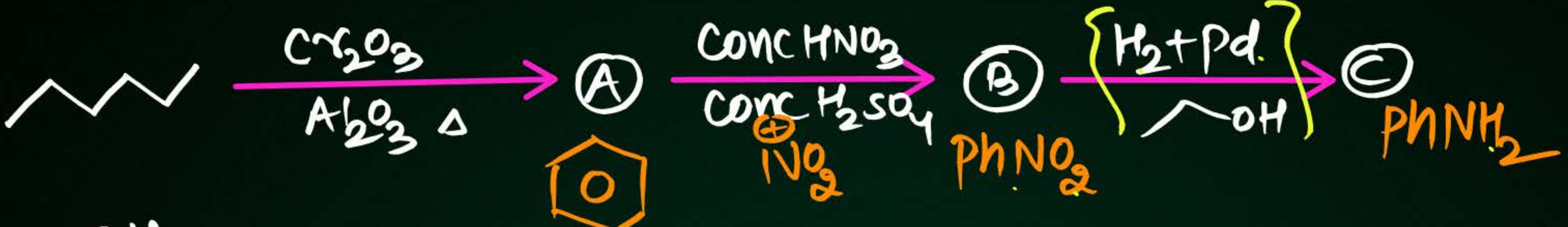
1. By reduction of nitro compounds:

$$Ph-NO_2 \xrightarrow[\text{Fe|HCl or } H_2 + \text{Cat}]{\text{Sn|HCl or}} Ph-NH_2$$

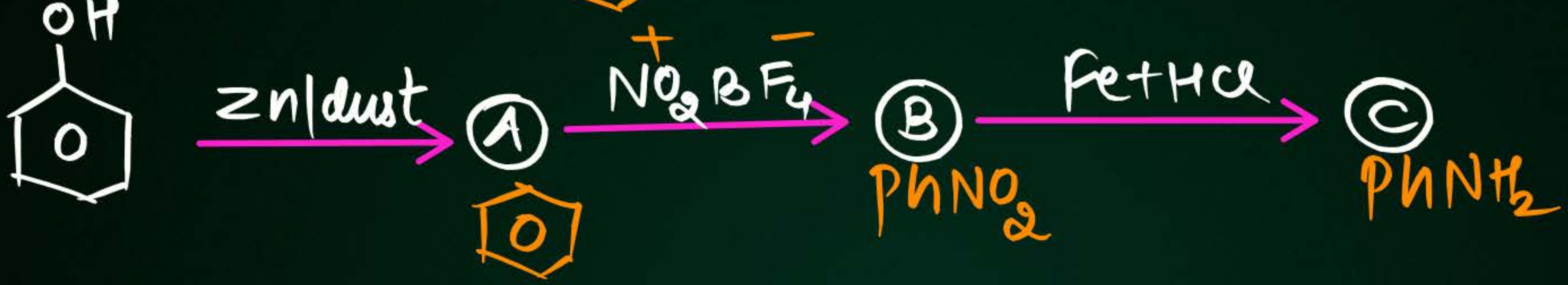
Best Method

$$\begin{gathered} Fe + HCl \\ \downarrow \\ FeCl_2 + H_2 \\ \downarrow H_2O \\ Fe(OH)_2 + \boxed{HCl} \end{gathered}$$

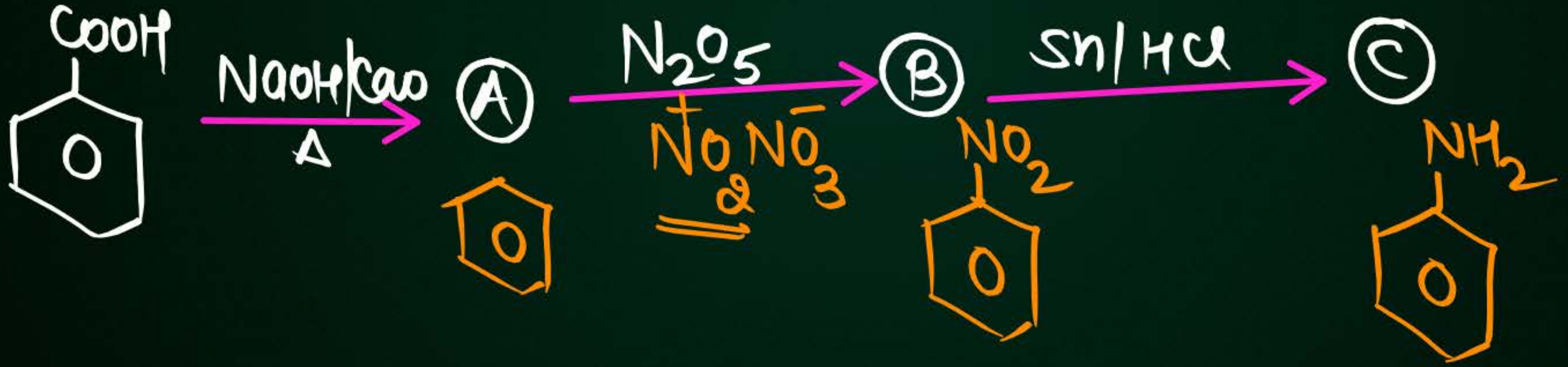
①


Cr_2O_3
Al_2O_3 Δ
A
Conc HNO_3
Conc H_2SO_4
$\overset{\oplus}{N}O_2$
B
$PhNO_2$
H_2+Pd.
OH
C
$PhNH_2$

②


OH
Zn|dust
A
$\overset{+}{N}O_2\overset{-}{B}F_4$
B
$PhNO_2$
Fe+HCl
C
$PhNH_2$

③


COOH
NaOH|CaO
Δ
A
N_2O_5
$\overset{+}{N}O_2\overset{-}{N}O_3$
B
NO_2
Sn/HCl
C
NH_2

(Alkylation)

2. By ammonolysis of alkyl halides: (SN^2)

$$\ddot{N}H_3 \xrightarrow[1^\circ \quad SN^2]{R-X} R-\overset{\oplus}{N}H_3 + X^{\ominus}$$

$$\downarrow$$

$$\boxed{R-NH_2 + HX}$$

$$R\overset{+}{N}H_3\overset{-}{X} \xrightarrow{\overset{+}{Na}\overset{-}{OH}} NaX + H_2O + \boxed{R-NH_2}$$

$$NH_3 \xrightarrow{R-X} \textcircled{A} \xrightarrow{R-X} \textcircled{B} \xrightarrow{R-X} \textcircled{C} \xrightarrow{R-X} \textcircled{D}$$

$\textcircled{A}$: $R-NH_2$

$\textcircled{B}$: R_2NH

$\textcircled{C}$: $R_3\ddot{N}$

$\textcircled{D}$: $R_4\overset{+}{N}X^-$

Quaternary Ammonium Salt

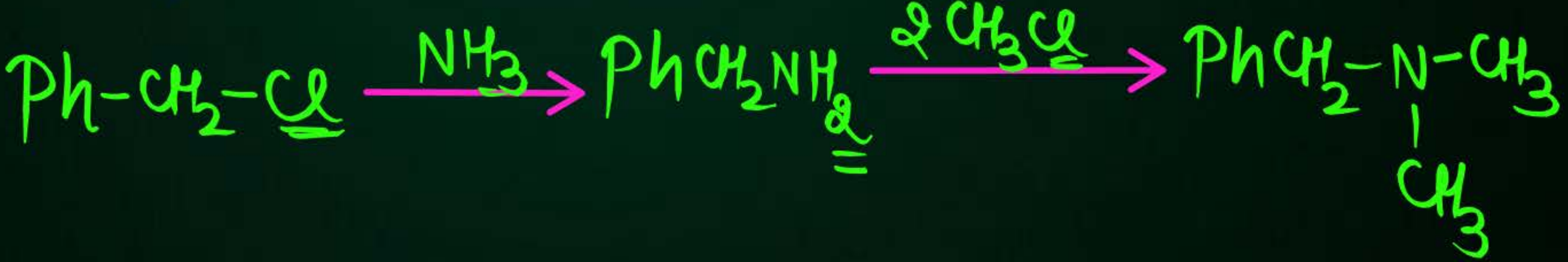
QUESTION (NCERT Example)

Write chemical equations for the following reactions:

(i) Reaction of ethanolic NH_3 with C_2H_5Cl.

$$NH_{\underline{3}} \xrightarrow{C_2H_5\underline{Cl}} C_2H_5-NH_2$$

(ii) Ammonolysis of benzyl chloride and reaction of amine so formed with two moles of CH_3Cl.



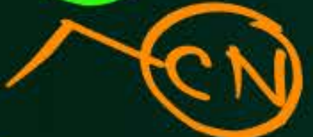
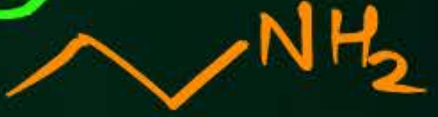
$$Ph-CH_2-\underline{Cl} \xrightarrow{NH_3} PhCH_2NH_{\underline{\underline{2}}} \xrightarrow{2CH_3\underline{Cl}} PhCH_2-\underset{CH_3}{\underset{|}{N}}-CH_3$$

3. By reduction of nitriles:

[1° amine]

$$R-\overset{H}{\overset{H}{C}}\equiv\overset{H}{\overset{H}{N}} \xrightarrow[\substack{H_2+Cat\\ \text{or}\\ Na(Hg)+ROH}]{LAH\ \text{or}} R-CH_2-NH_2$$

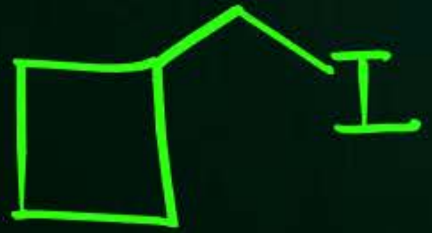
Q ① $CH_3-CH_2-Cl \xrightarrow[SN^2]{\overset{\oplus\ \ominus}{KCN}} Ⓐ \xrightarrow{LAH} Ⓑ$

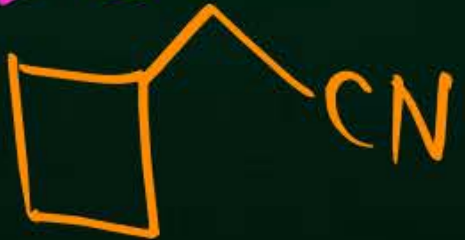
② $Ph-CH_2-Br \xrightarrow[SN^2]{\overset{\oplus\ \ominus}{NaCN}} Ⓐ \xrightarrow{H_2+Ni} Ⓑ\ PhCH_2CH_2NH_2$

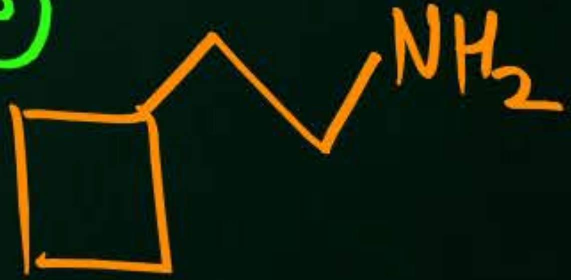
Ⓐ $PhCH_2CN$

③



$\xrightarrow[SN^2]{\overset{\oplus\ \ominus}{KCN}} Ⓐ \xrightarrow{Na(Hg)/ROH} Ⓑ$



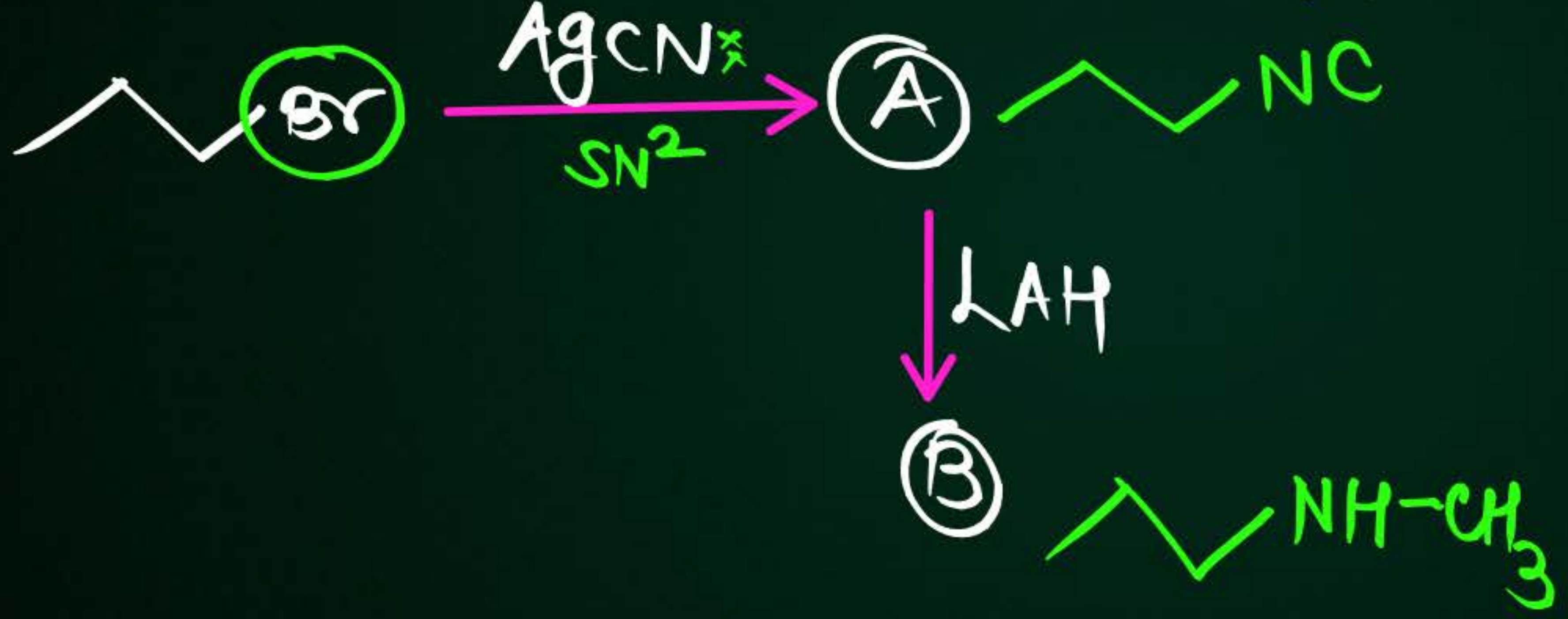


Red^n of Isocyanide

$$R-\overset{+}{N}\equiv\overset{-}{C} \xrightarrow{LAH} R-\underset{\underset{H}{|}}{N}-CH_3$$

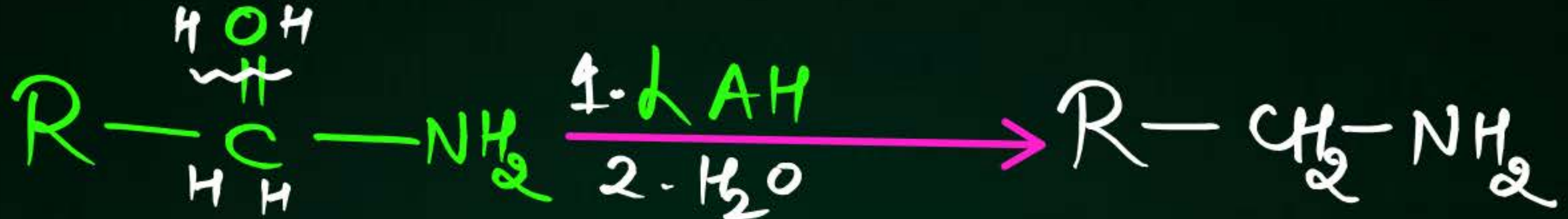
(2° amine)

Q



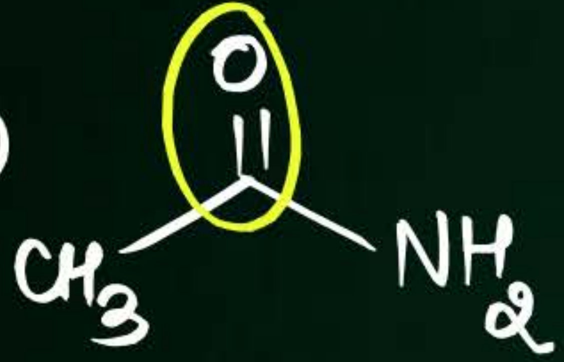
Br
AgCN
SN2
A
NC
LAH
B
NH–CH3

4. By reduction of amides:



$$R-\overset{\overset{O}{\|}}{C}-NH_2 \xrightarrow[2.\ H_2O]{1.\ LAH} R-CH_2-NH_2$$

Q 1)

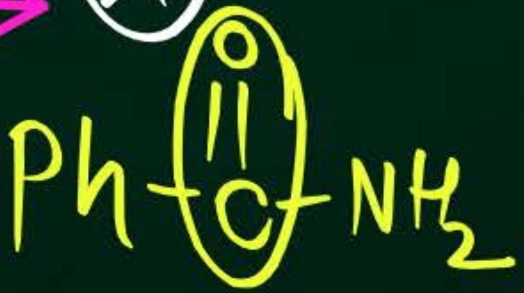


$$\xrightarrow{LAH} Ⓐ\ CH_3-CH_2-NH_2$$

2) $PhCOOH \xrightarrow{NH_3/\Delta} Ⓐ \xrightarrow{LAH} Ⓑ$

$+$

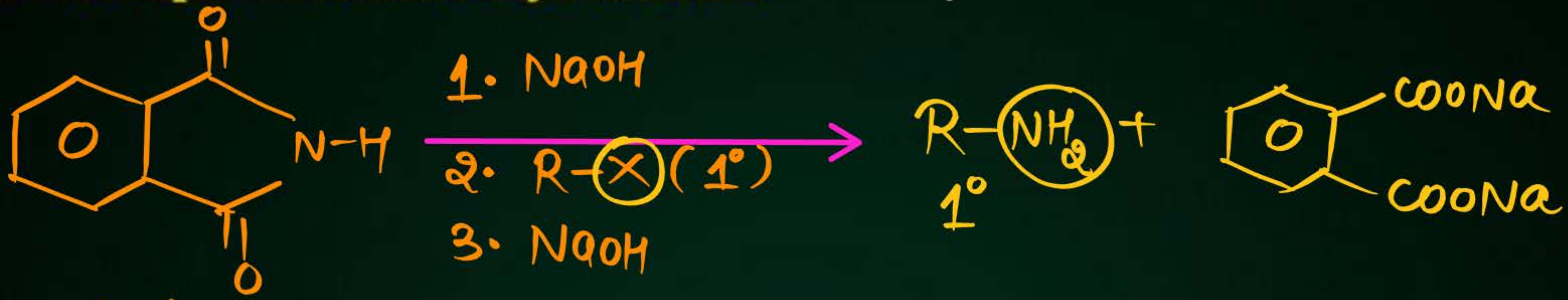
$PhCOO\overset{+}{N}H_4$



$$Ph-\overset{\overset{O}{\|}}{C}-NH_2$$

$PhCH_2NH_2$

5. Gabriel phthalimide synthesis: Mop of ali 1° amine

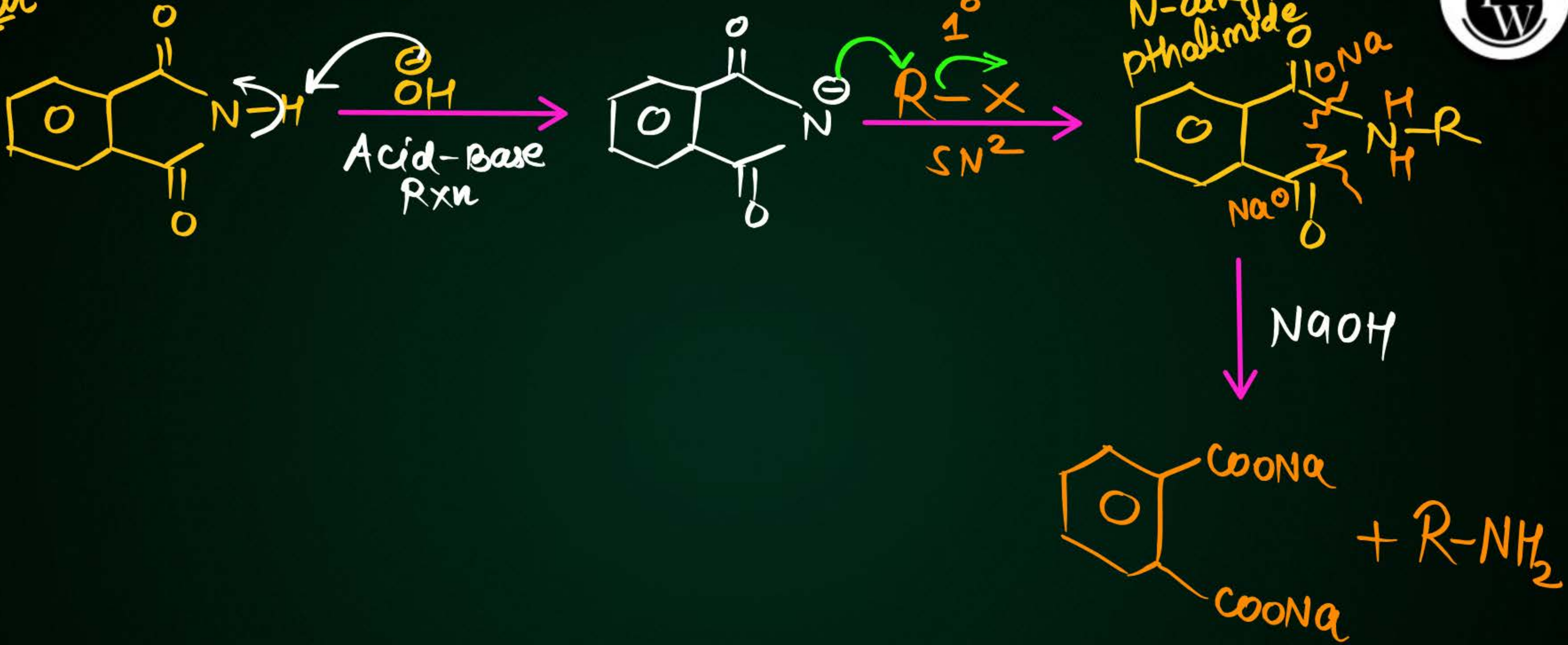

N-H
1. NaOH
2. R-X (1°)
3. NaOH
R-NH2 +
1°
COONa
COONa

Pthalimide

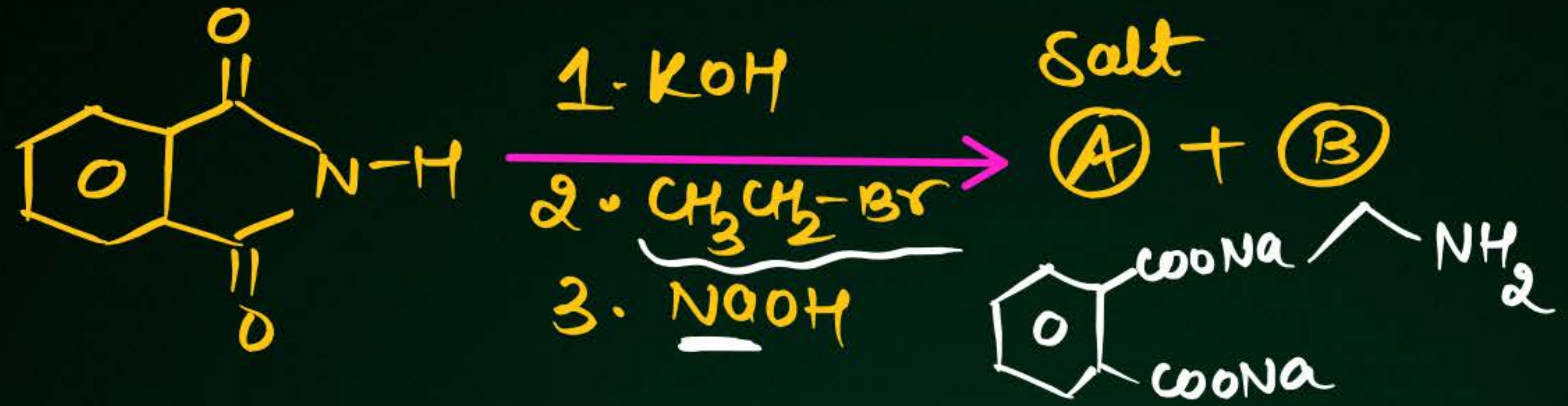
D.M $R-\textcircled{X} \longrightarrow R-\textcircled{NH_2}$

Mech

$NaOH \longrightarrow Na^+ + \bar{O}H$

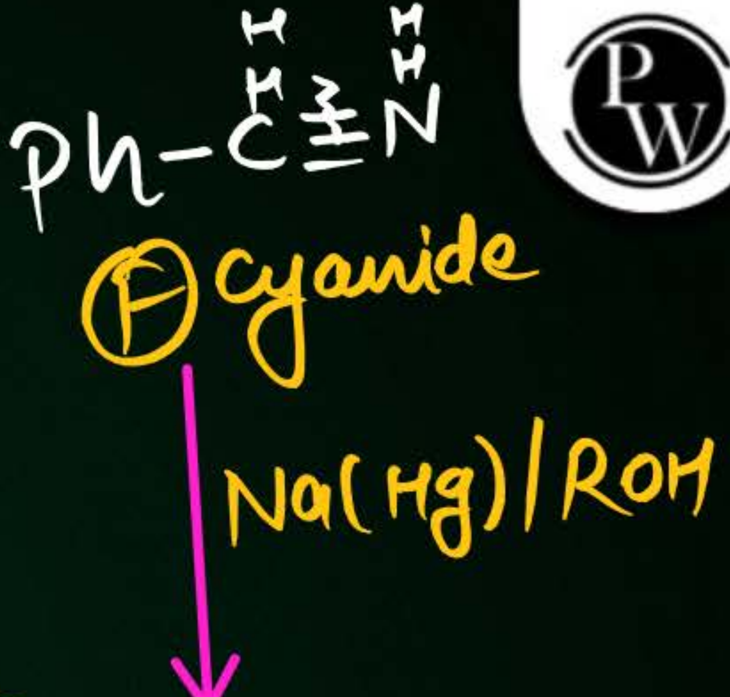

O
N–H
O
$\overset{\ominus}{O}H$
Acid-Base Rxn
O
$N^{\ominus}$
O
1°
R–X
SN^2
N-alkylated pthalimide
O
ONa
$N\overset{H}{\underset{H}{-}}R$
NaO
O
NaOH
COONa
COONa
+ R-NH_2

Q.

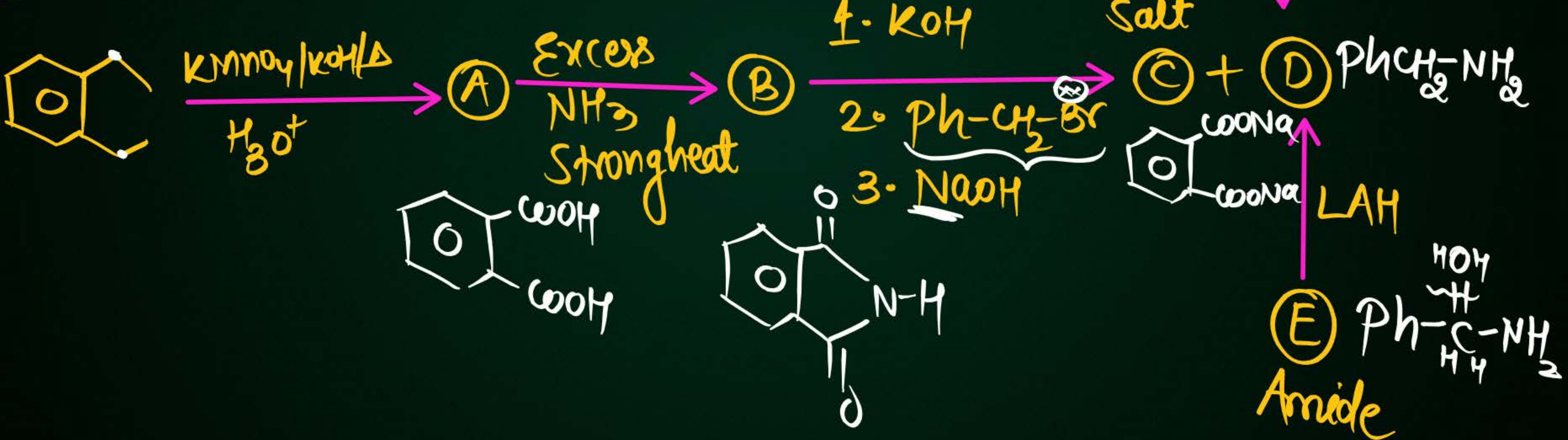


O
O
N-H
1. KOH
2. CH$_3$CH$_2$-Br
3. NaOH
Salt
Ⓐ + Ⓑ
COONa
COONa
NH$_2$

PSS



H H
H H
Ph-C≡N
Ⓕ cyanide
Na(Hg)/ROH



KMnO$_4$/KOH/Δ
H$_3$O$^+$
Ⓐ
COOH
COOH
Excess
NH$_3$
Strongheat
Ⓑ
O
O
N-H
1. KOH
2. Ph-CH$_2$-Br
3. NaOH
Salt
Ⓒ + Ⓓ
PhCH$_2$-NH$_2$
COONa
COONa
LAH
HOH
Ⓔ Ph-C-NH$_2$
H H
Amide

QUESTION (NCERT Exemplar)

The source of nitrogen in Gabriel synthesis of amines is __________.

- A Sodium azide, NaN_3
- B Sodium nitrite, $NaNO_2$
- C Potassium cyanide, KCN
- [✓ D] Potassium phthalimide, $C_6H_4(CO)_2N^-K^+$

Backlog ho gaya hai?

$\boxed{O \cdot C}$

1) Comp. wallah → 11th class ✓ Rev | Backlog

2. Lakshya Neet → 12th class ✓ Rev | Backlog

3. Utthaan series

QUESTION (NCERT Exemplar)

Reduction of aromatic nitro compounds using Fe and HCl gives ________.

(A) aromatic oxime

(B) aromatic hydrocarbon

[✓ (C)] aromatic primary amine

(D) aromatic amide

$$PhNO_2 \longrightarrow PhNH_2$$

QUESTION (NCERT Exemplar)

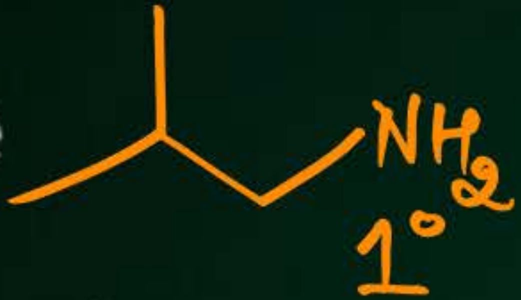
Reduction of nitrobenzene by which of the following reagent gives aniline?

- **A** Sn/HCl
- **B** Fe/HCl
- **C** H_2/Pd
- **D** [✓ All of these]

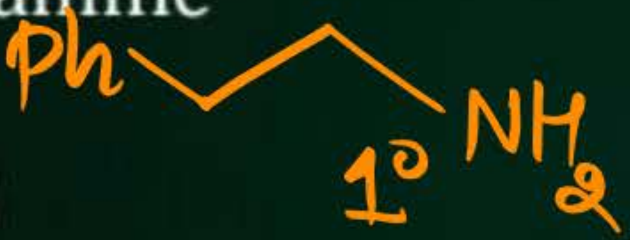
QUESTION (NCERT Exemplar)

Which of the following amines can be prepared by Gabriel synthesis?

A Isobutyl amine



B 2-Phenylethylamine



[✓ **C**] Both (A) & (B)

D Aniline

QUESTION (NCERT Exemplar)

Assertion: Only a small amount of HCl is required in the reduction of nitro compounds with iron scrap and HCl in the presence of steam.

Reason: $FeCl_2$ formed gets hydrolyzed to release HCl during the reaction.

$\xrightarrow{H_2O} Fe(OH)_2 + \boxed{HCl}$

- **A** Both assertion and reason are wrong.
- **B** Both assertion and reason are correct statements but reason is not correct explanation of assertion.
- **C** Assertion is correct statement but reason is wrong statement.
- [✓ **D**] Both assertion and reason are correct statements and reason is correct explanation of assertion.

QUESTION (NCERT Exemplar)

Assertion: Aromatic 1° amines can be prepared by Gabriel Phthalimide Synthesis.
Reason: Aryl halides undergo nucleophilic substitution with anion formed by phthalimide.

Ph–X

[✓ A] Both assertion and reason are wrong.

B Both assertion and reason are correct statements but reason is not correct explanation of assertion.

C Assertion is correct statement but reason is wrong statement.

D Both assertion and reason are correct statements and reason is correct explanation of assertion.

QUESTION

Which on reduction does not give primary amine?

A $CH_3\underline{CN}$ $CH_3CH_2NH_2$ 1°

[✓ B] $C_2H_5\underline{NC}$ $C_2H_5-NH-CH_3$ 2°

C $CH_3\boxed{CO}NH_2$ $CH_3-CH_2-NH_2$ 1°

D All of these

$\frac{600}{720} \rightarrow$ 600+

650+

700+

Rank

Jo ques na bane ← question practice

Utthaan

(JEE main)

6 Yrs

QUESTION

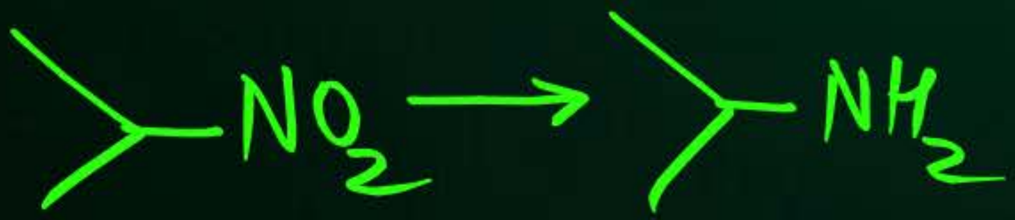
Which of the following compounds gives secondary amine on reduction?

A Alkyl nitrile $R-\boxed{CN}$ RCH_2NH_2

[✓ B] Carbylamine $R-\boxed{NC} \longrightarrow R-NH-CH_3$
(isocyanide)

C Primary amine

D Secondary nitro compound

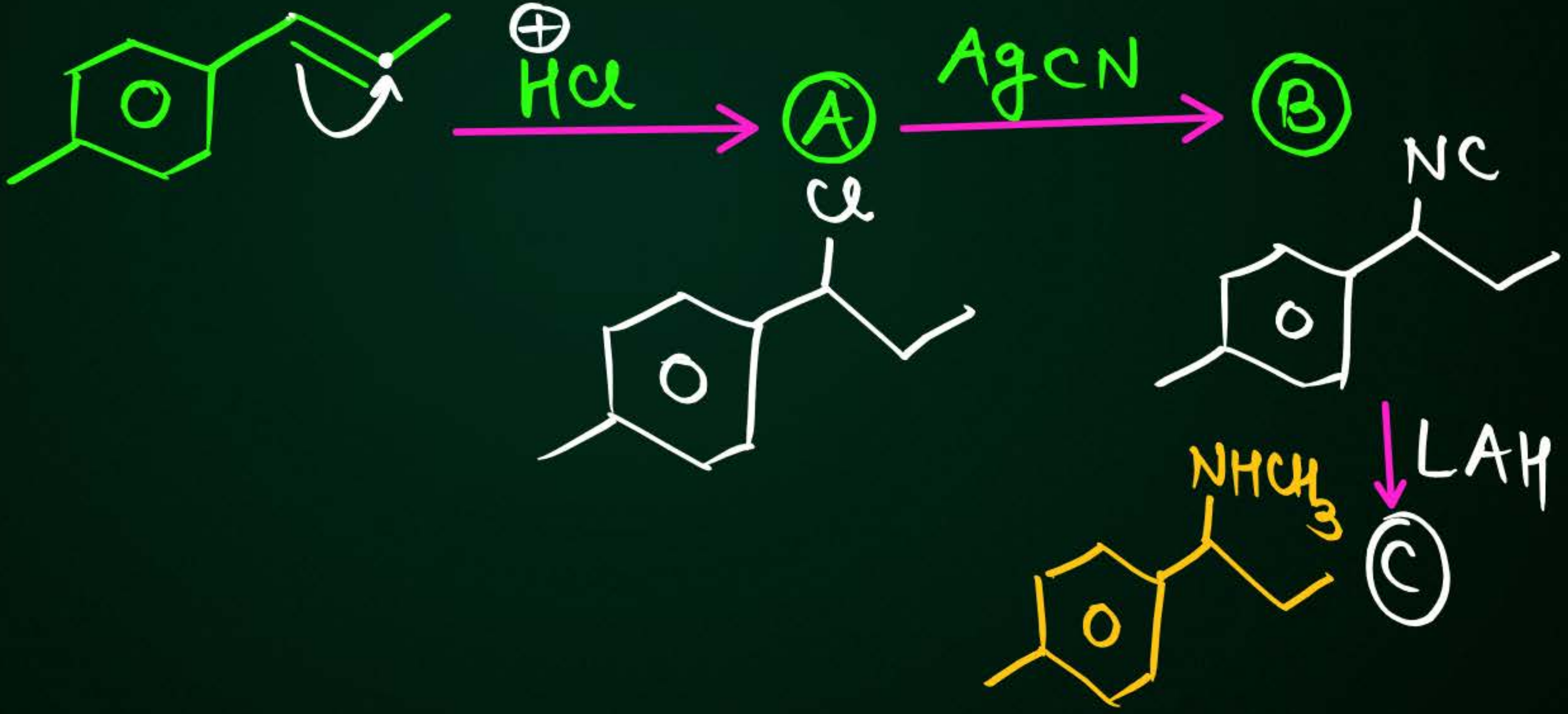


Q/ JEE main
28 Jan
S-2

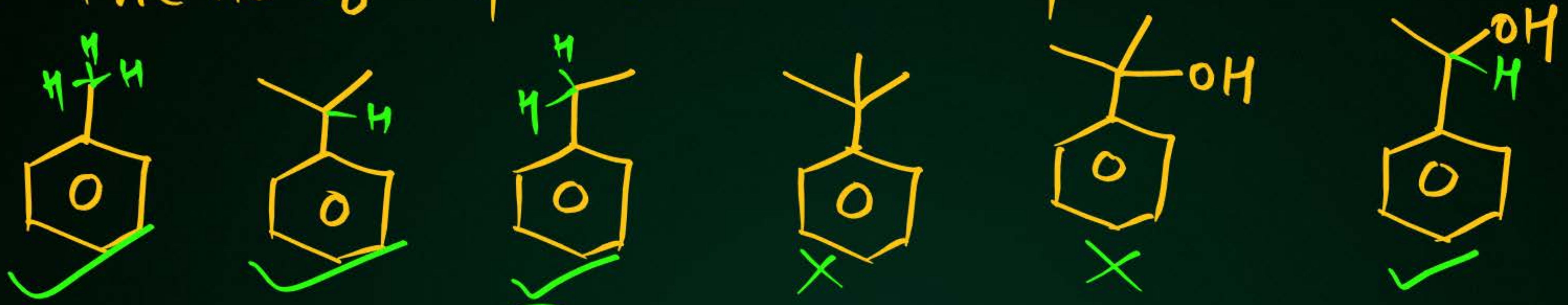
① $CH_3-\overset{H}{C}\overset{1}{\equiv}\overset{H}{C}H \xrightarrow{H_2+Pd/C} Ⓐ \xrightarrow[Zn]{O_3+CCl_4} Ⓑ + Ⓒ$

$CH_3-\overset{O}{C}H \nmid\!= \overset{O}{C}H_2$ $\quad$ CH_3CHO $\quad$ $HCHO$

②

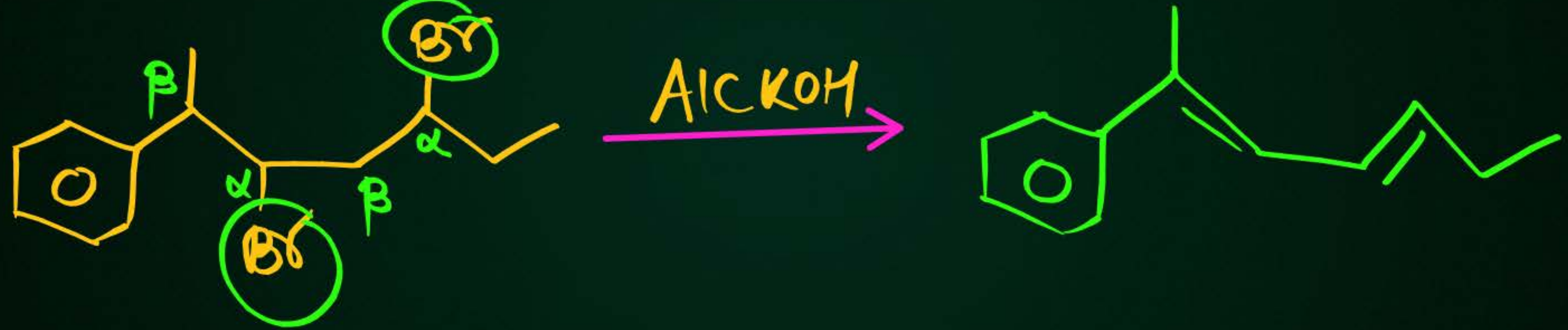

⊕
HCl
Ⓐ
AgCN
Ⓑ
Cl
NC
LAH
NHCH3
Ⓒ

③ The no. of comp react with $KMnO_4$



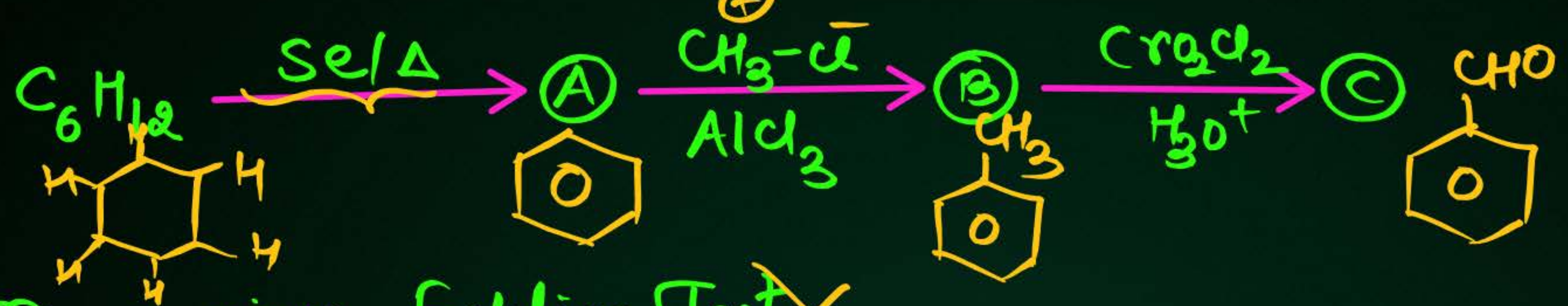
H
H
H
H
H
H
OH
OH
H
✓
✓
✓
×
×
✓

④



β
α
β
α
Br
Br
Alc KOH

Q/



C_6H_{12}
H H H H H H
Se/Δ
A
$\overset{\oplus}{CH_3}-\bar{Cl}$
$AlCl_3$
B
CH_3
CrO_2Cl_2
H_3O^+
C
CHO

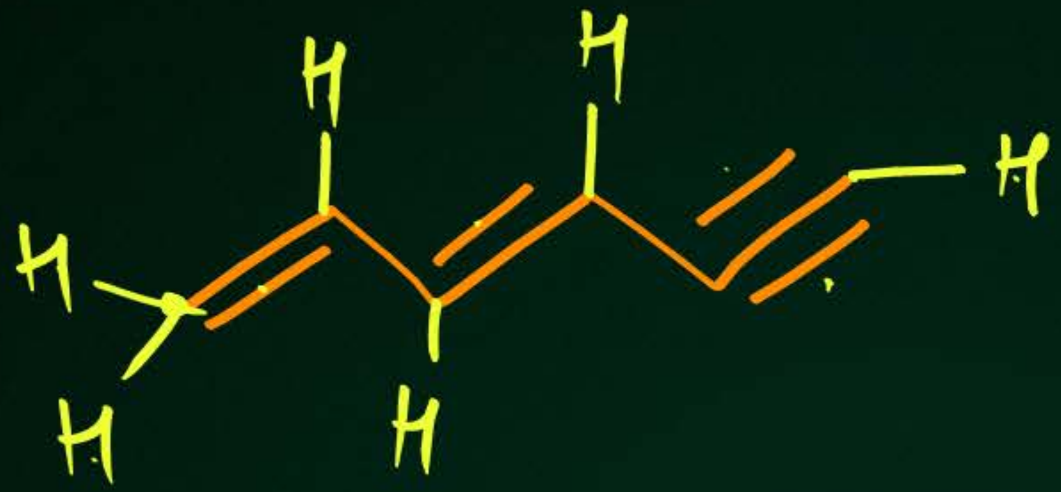
Ⓐ C gives Fehling Test ✗

Ⓑ✗ C can be prep by reacting PhMgBr with CO_2 S- PhCOOH

Ⓒ ✓ C can give Tollen's Test

Ⓓ✗ " " " Brisk eff with $NaHCO_3$

29 Jan
M.S



Sum of σ & π Bond = 15

QUESTION

Na(Hg)+ROH

$$R-\boxed{CN}\xrightarrow{\underline{[H]}C_2H_5ONa}A \quad 1^\circ$$

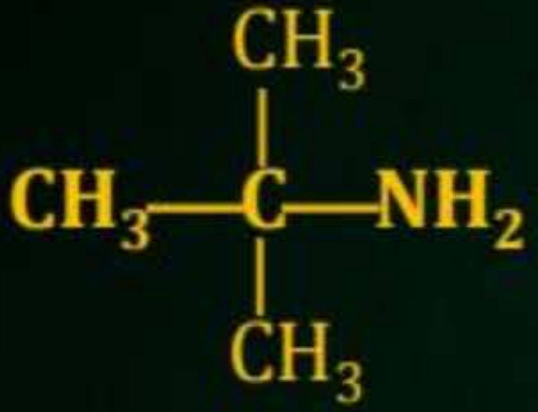
$$R-\boxed{NC}\xrightarrow{\underline{[H]}C_2H_5ONa}B \quad 2^\circ$$

Product A and B will be respectively:

- **A** $R-NH-CH_3$ & RCH_2NH_2
- [✓ **B**] RCH_2NH_2 & $RNHCH_3$
- **C** RCH_2NH_2 & $RN(CH_3)_2$
- **D** $RNH-CH_3$ & RCH_2NH

Home Work

QUESTION 01



$CH_3-\overset{\displaystyle CH_3}{\underset{\displaystyle CH_3}{C}}-NH_2$ is a:

- **A** primary amine
- **B** secondary amine
- **C** tertiary amine
- **D** quanternary salt

QUESTION 02

Which of the following would undergo Hofmann's reaction to give a primary amine?

- A $RCONH_2$
- B $RCONHCH_3$
- C $RCOCl$
- D $RCOOR$

QUESTION 03

Gabriel phthalimide synthesis is used in the preparation of:

- (A) 1° amine
- (B) 2° amine
- (C) 3° amine
- (D) 4° amine

QUESTION 04

$R - CN \xrightarrow{\text{Partial Hydrolysis}} A$, Product A will be:

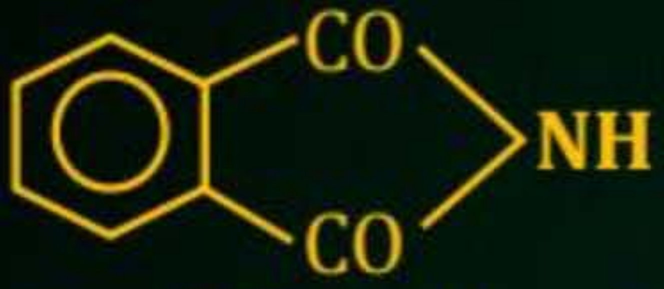
- **A** $RCOOH$
- **B** RCH_2NH_2
- **C** $RCONH_2$
- **D** $RCHO$

QUESTION 05

Which of the following reactions are suitable method for the preparation of primary amines?

- A Action of ammonia on alkyl halides
- B Hoffmann bromide reaction
- C Gabriel's phthalimide synthesis of amines
- D Both (B) & (C)

QUESTION 06



$\xrightarrow{KOH} A \xrightarrow{C_2H_5Br} B \xrightarrow{H2O/H^+} C + D$

C and D in the above sequence are:

(A) Benzoic acid + aniline

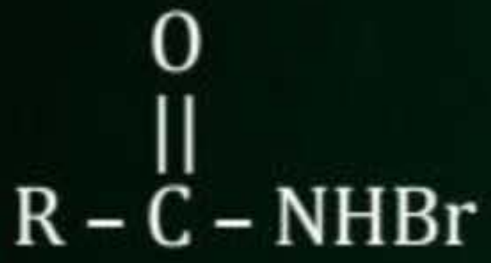
(B) Phthalic acid + ethylamine

(C) Phthalic acid + aniline

(D) Benzoic acid + ethylamine

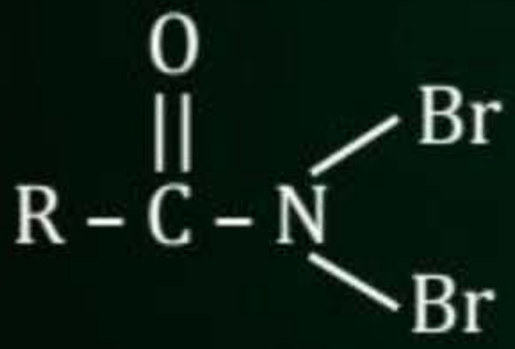
QUESTION 07

Reaction of $RCONH_2$ with a mixture of Br_2 and KOH gives RNH_2 as the main product. The intermediate involved in the reaction is:

A 

$R-\overset{\overset{\large O}{||}}{C}-NHBr$

B $R-NHBr$

C 

$R-\overset{\overset{\large O}{||}}{C}-N(Br)_2$

D $R-C=N=O$

QUESTION 08

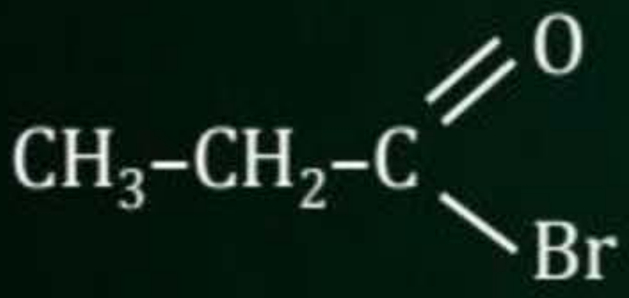
Starting from propanoic acid, the following reactions were carried out

Propanoic acid $\xrightarrow{SOCl_2} X \xrightarrow{NH_3.\Delta} Y \xrightarrow{Br_2+KOH} Z$

What is the compound Z?

A $CH_3{-}CH_2{-}Br$

B $CH_3{-}CH_2{-}NH_2$

C 
$CH_3{-}CH_2{-}C(=O){-}Br$

D $CH_3{-}CH_2{-}CH_2{-}NH_2$

QUESTION 09

When acetamide is converted to methylamine, what is the name of the reaction?

A Friedel-Craft's reaction

B Hoffmann reaction

C Hoffmann bromamide degradation reaction

D Hinsberg reaction

QUESTION 10

Which is not in the favour of Gabriel phthalimide reaction?

Ⓐ It is the method for the preparation of pure primary amine.

Ⓑ Aromatic amines can not be prepared by this method.

Ⓒ All aromatic amines (except aniline) can be prepared by this method.

Ⓓ 2° & 3° amines cannot be prepared by this method.

ANSWER KEY

1. A
2. A
3. A
4. C
5. D
6. B
7. A
8. B
9. C
10. C

Home Work From PW Module (Yakeen NEET)

Prarambh: Q 01, 02, 03, 04, 05, 06, 07, 08, 09, 10, 11, 12, 13, 14

Prabal: Q 01, 03, 05, 09, 11, 15, 18

Parikshit: Q 26

PhysicsWallah
अनुगच्छतु प्रवाहं

PANKAJ SIR

JOIN MY OFFICIAL TELEGRAM CHANNEL

@PSCAA

Thank you!

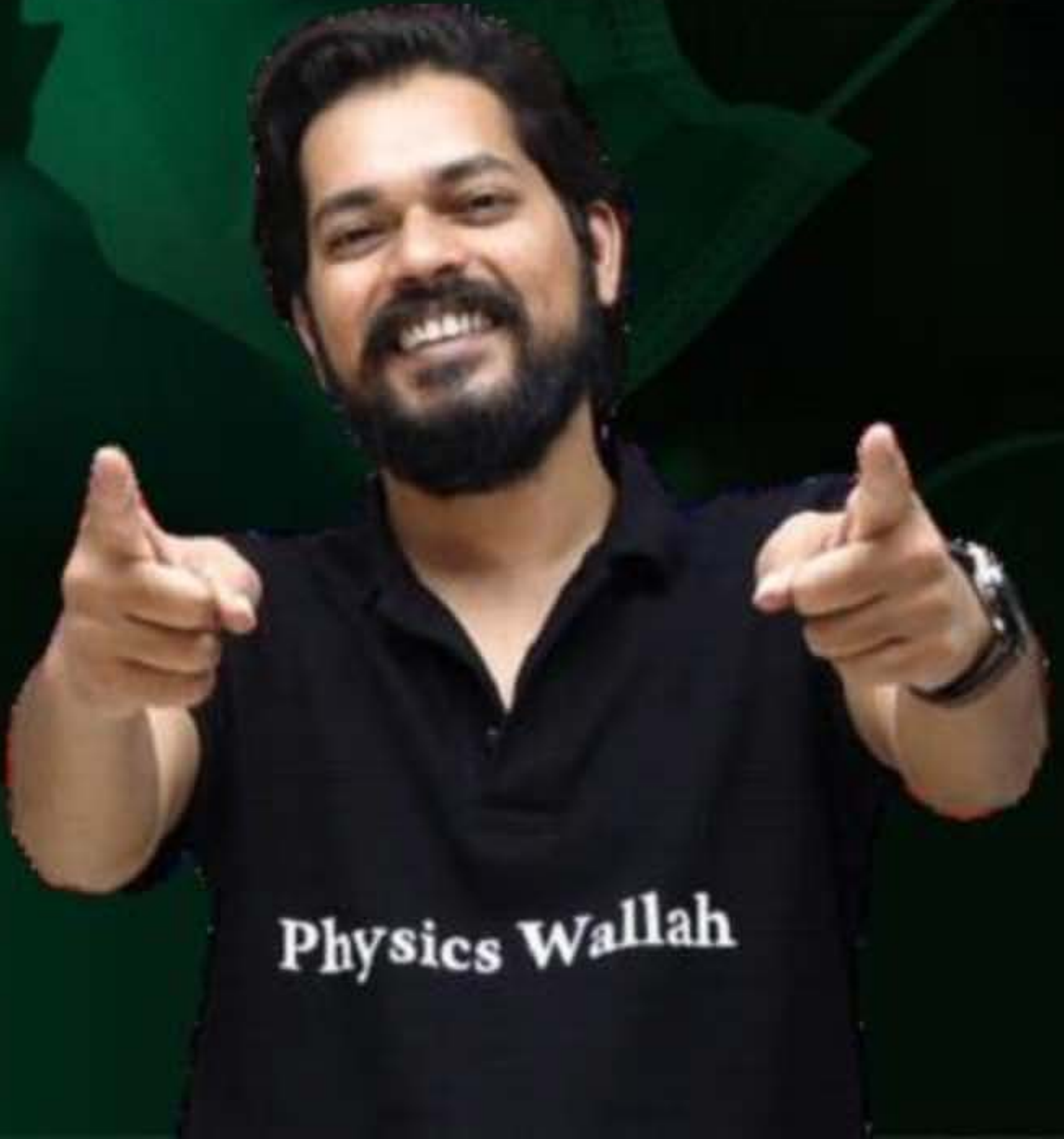
YAKEEN 2.0

FOR NEET 2025

Lecture- 02 | **Organic Chemistry**

Amines

By- Pankaj Sir(POPU MAMA)


Physics Wallah

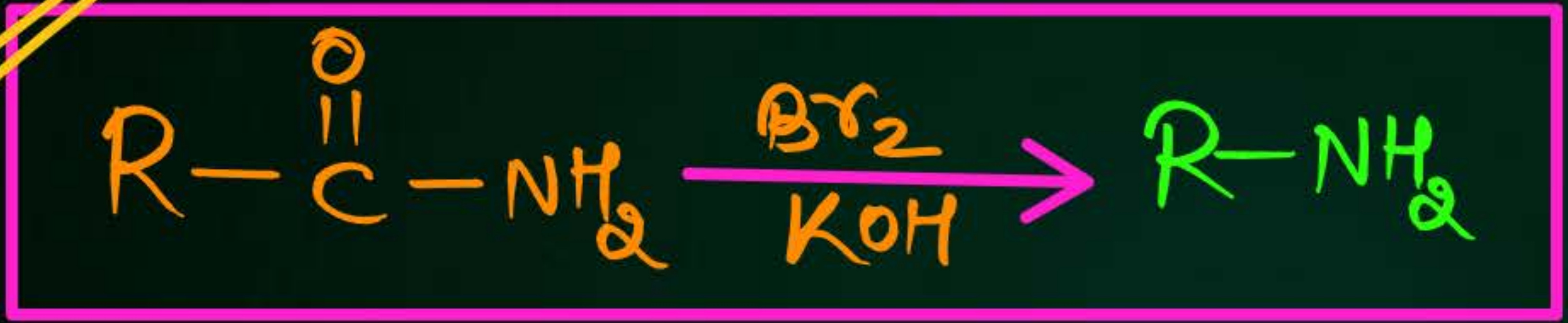
Topics *to be covered*

1. Methods of Preparation of Amines Part 02
2. Hoffmann Bromamide Degradation Reaction
3. PSS & Practice

Methods of Preparation of Amines

1° amide (Ali & Aro)

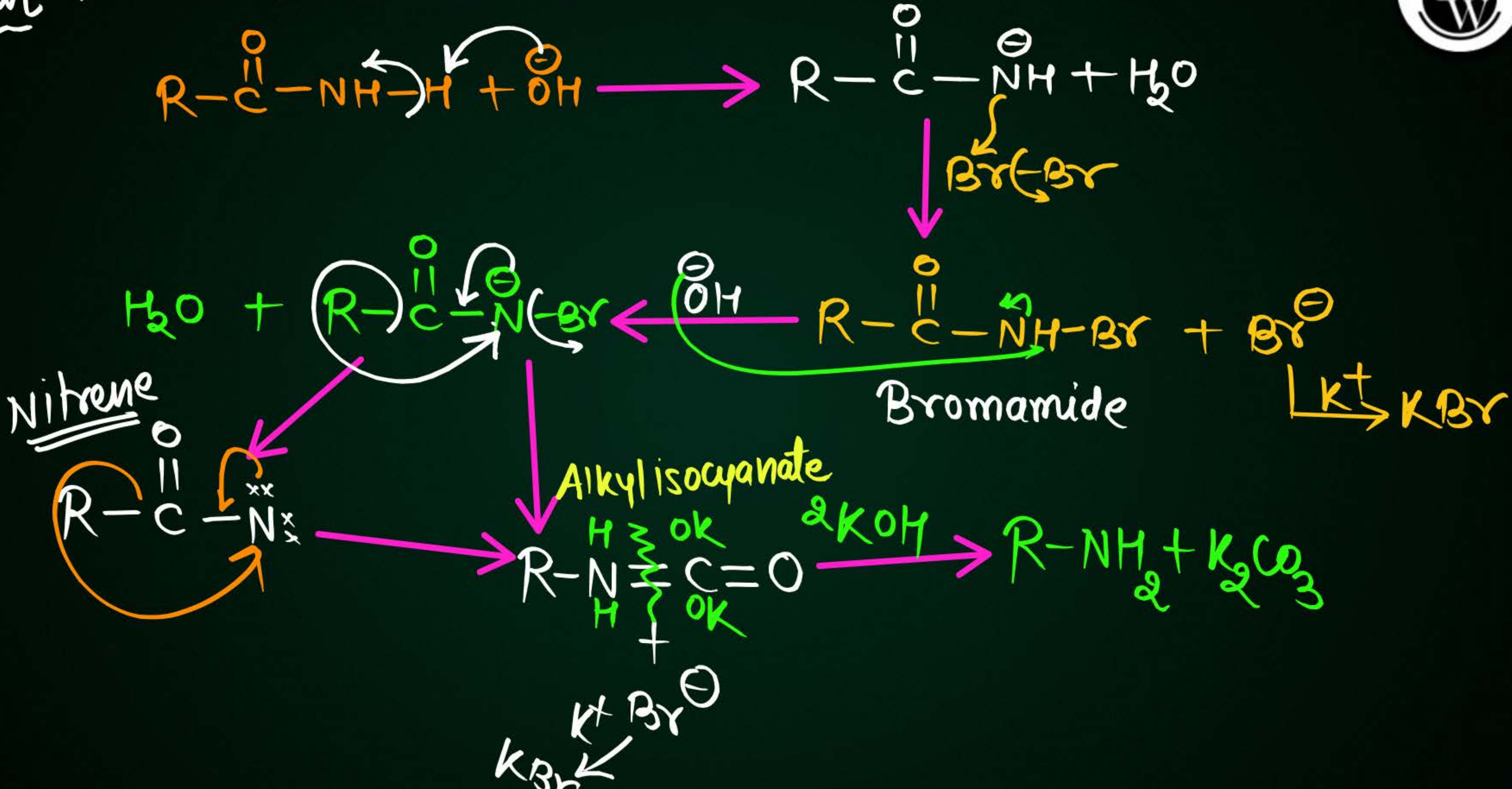
6. Hoffmann bromamide degradation reaction:



$$R-\overset{O}{\overset{\|}{C}}-NH_2 \xrightarrow[KOH]{Br_2} R-NH_2$$

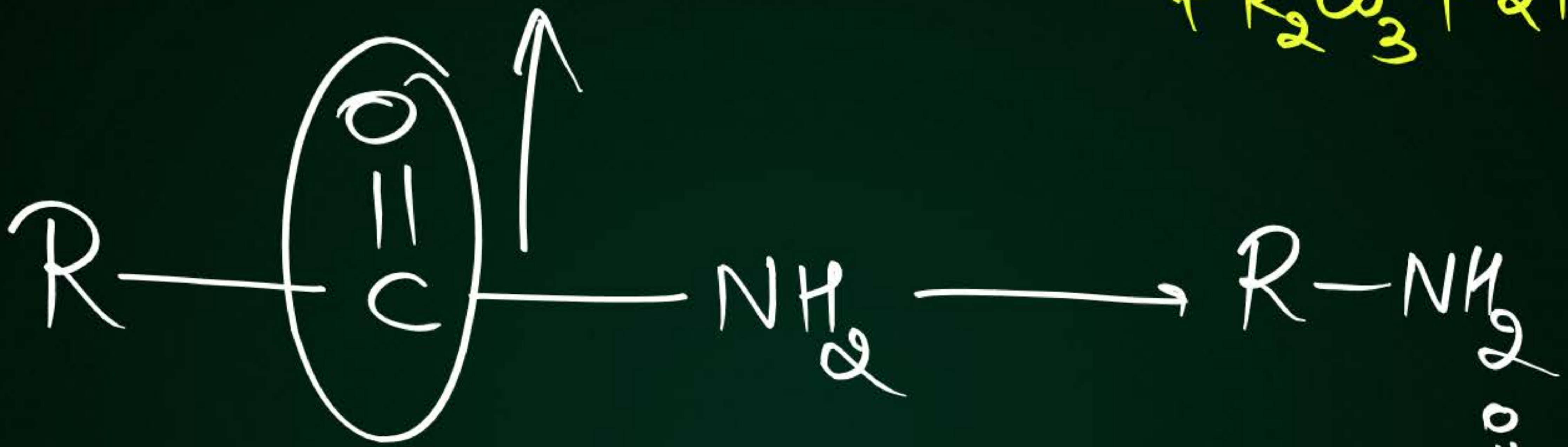
Mech :

$2KOH \rightarrow 2K^+ + 2\overset{-}{O}H$


$R-\overset{O}{\overset{\|}{C}}-NH-H + \overset{\ominus}{O}H \rightarrow R-\overset{O}{\overset{\|}{C}}-\overset{\ominus}{N}H + H_2O$
Br–Br
$R-\overset{O}{\overset{\|}{C}}-NH-Br + Br^{\ominus}$
Bromamide
$K^+ \rightarrow KBr$
$\overset{\ominus}{O}H$
$H_2O + R-\overset{O}{\overset{\|}{C}}-\overset{\ominus}{N}-Br$
Nitrene
$R-\overset{O}{\overset{\|}{C}}-\ddot{N}:$
Alkyl isocyanate
$R-N=C=O$
H OK
H OK
2KOH
$R-NH_2 + K_2CO_3$
+
$K^+ Br^{\ominus}$
KBr

Net Rxn $R-\overset{O}{\overset{||}{C}}-NH_2 + Br_2 + 4KOH \longrightarrow R-NH_2 + 2KBr + K_2CO_3 + 2H_2O$

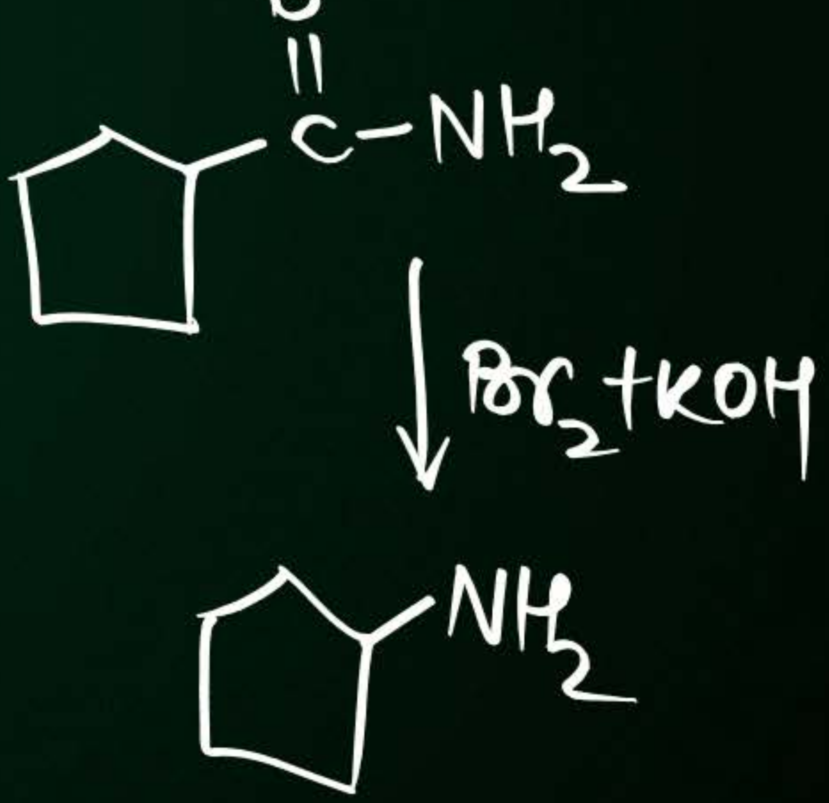
D.M


R
O
C
NH2
R–NH2

Q 1) $CH_3-\overset{O}{\overset{||}{C}}-NH_2 \xrightarrow{Br_2+KOH} CH_3-NH_2$

2) $Ph-\overset{O}{\overset{||}{C}}-NH_2 \xrightarrow{\text{"}} Ph-NH_2$

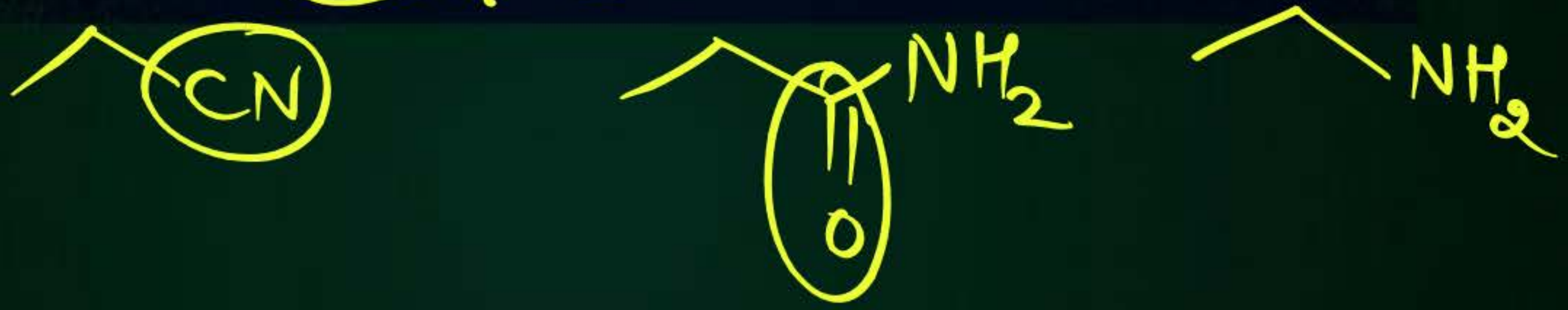
3)


O
C–NH2
Br2+KOH
NH2

QUESTION (NCERT Exercise)

Give the structures of A, B and C in the following reactions:

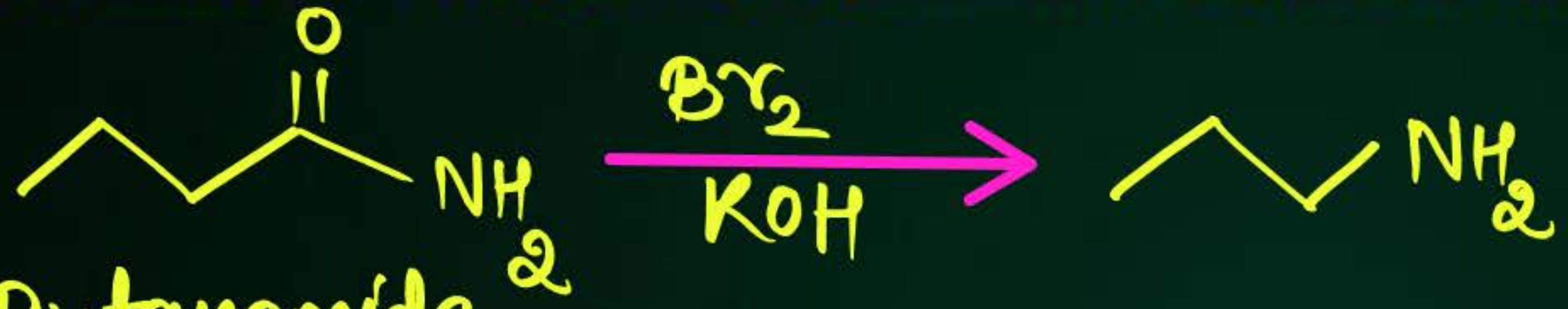
(i) $CH_3CH_2I \xrightarrow{\overset{+\,\ominus}{NaCN}} A \xrightarrow[\text{Partial hydrolysis}]{OH^-} B \xrightarrow{NaOH+Br_2} C$



QUESTION (NCERT Example)

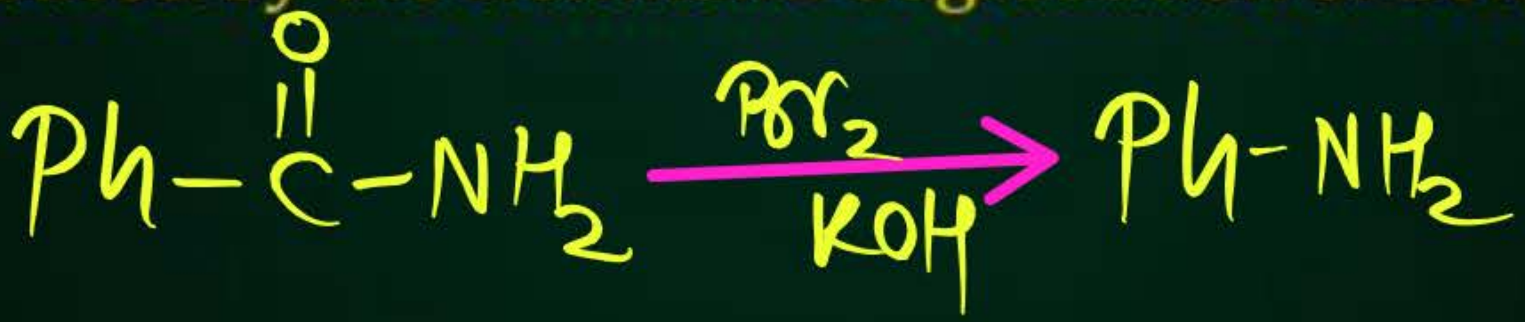
Write structures and IUPAC names of

(i) The amide which gives propanamine by Hoffmann bromamide reaction.



Butanamide

(ii) The amine produced by the Hoffmann degradation of benzamide.



$$Ph-\overset{O}{\overset{\|}{C}}-NH_2 \xrightarrow[KOH]{Br_2} Ph-NH_2$$

QUESTION (NCERT Exemplar)

Hoffmann Bromamide Degradation reaction is shown by ________.

(A) $\underline{ArNH_2}$ ×

[✓ (B)] $\underbrace{ArCONH_2}$ $\boxed{ArNH_2}$

(C) $\underline{ArNO_2}$ ×

(D) $\underline{ArCH_2}NH_2$ ×

QUESTION (NCERT Exemplar)

Best method for preparing primary amines from alkyl halides without changing the number of carbon atoms in the chain is:

$\overset{1^\circ}{R-Cl} \longrightarrow \overset{1^\circ}{R-NH_2}$

- A ✗ Hoffmann Bromamide reaction
- [✓ B] Gabriel phthalimide synthesis
- C ✗ Sandmeyer reaction
- ✗ D Reaction with NH_3

QUESTION (NCERT Exemplar)

Assertion: ✗ Hoffmann's bromamide reaction is given by primary amines.
Reason: ✗ Primary amines are more basic than secondary amines.

[✓ A] Both assertion and reason are wrong.

B Both assertion and reason are correct statements but reason is not correct explanation of assertion.

C Assertion is correct statement but reason is wrong statement.

D Both assertion and reason are correct statements and reason is correct explanation of assertion.

QUESTION (AIIMS 2007)

Reduction of nitrobenzene with Sn/HCl produces:

(A) azobenzene

(B) azoxybenzene

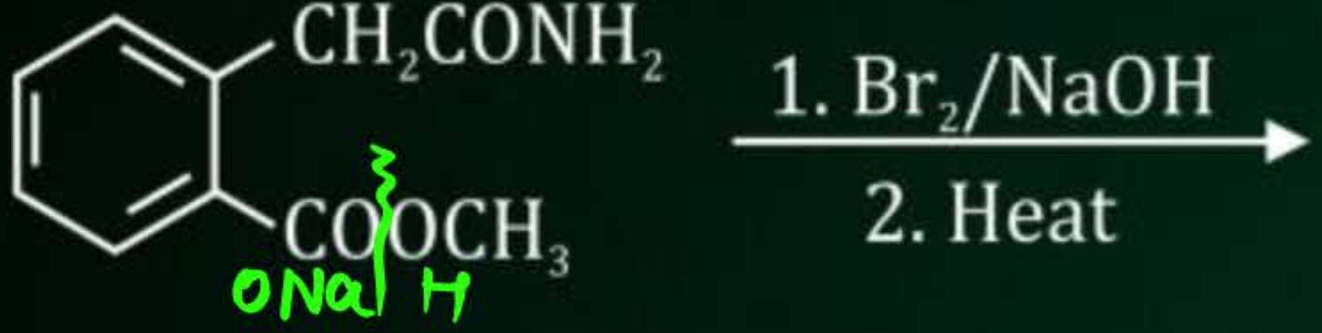
(C) nitrobenzene

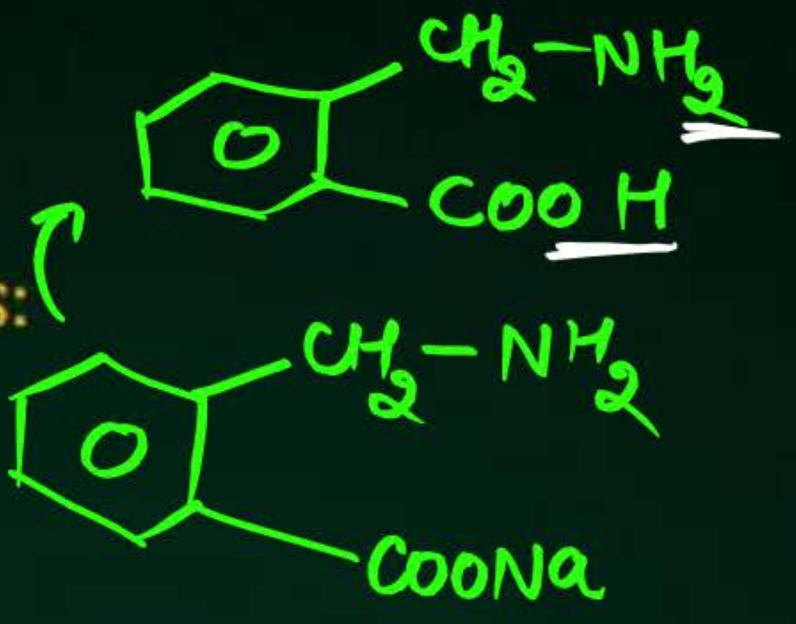
[✓ (D) aniline]

$$Ph-NO_2 \xrightarrow{Sn/HCl} Ph-NH_2$$

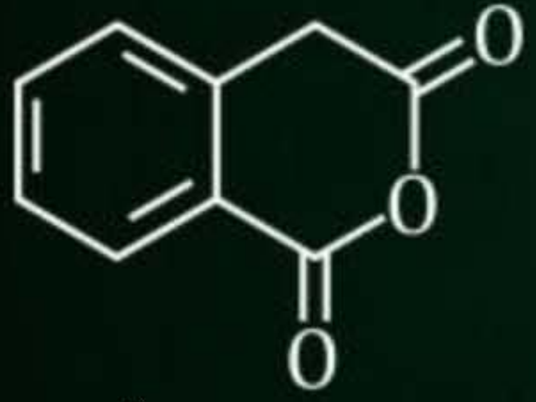
QUESTION (AIIMS 2006)

The following sequence of reaction gives:

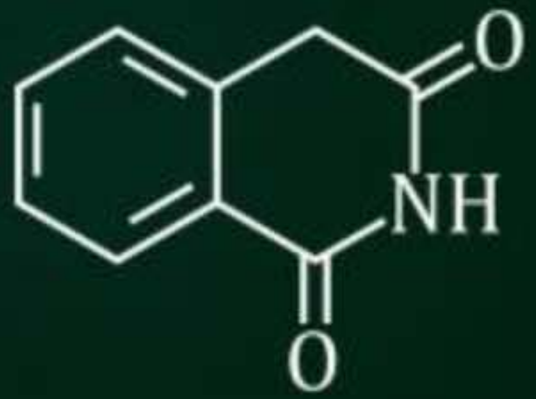

CH$_2$CONH$_2$
COOCH$_3$
ONa
H
1. Br$_2$/NaOH
2. Heat


CH$_2$–NH$_2$
COOH
CH$_2$–NH$_2$
COONa

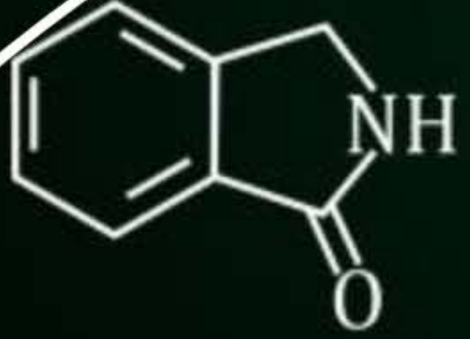
A



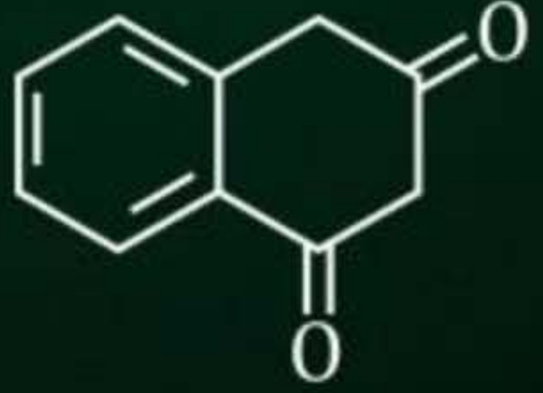
B



C ✓



D

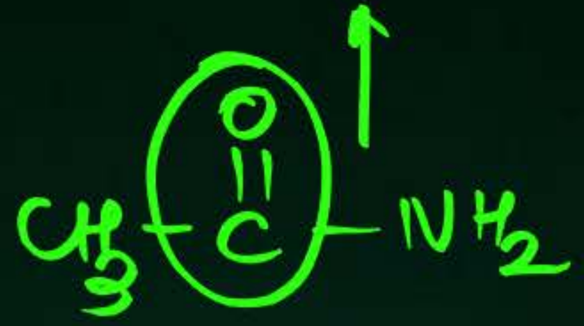


QUESTION (AIIMS 2005)

Among the following which one does not act as and intermediate in Hoffmann rearrangement?

- A $RNCO$
- B $RCON$
- C $RCO\ddot{N}HBr$
- [✓ D RNC]

QUESTION (AIIMS 2001)



$CH_3-\overset{O}{\overset{\|}{C}}-NH_2$

The product formed by the reaction of acetamide with bromine in presence of NaOH is:

A CH_3CN

B CH_3CHO

C CH_3CH_2OH

[✓ D] CH_3NH_2

QUESTION

In Hoffmann Bromamide process the sequence of intermediate formed in formation of 1° amine:

A $\mathrm{RCO\ddot{N}}:$, R–NCO, RCONHBr

B RCONHR, R–NCO, RCON

[✓ C] RCONHBr, RCON, RNCO

D RCON, CONHBr, RNCO

QUESTION

This on reduction with $LiAlH_4$ produces secondary amine

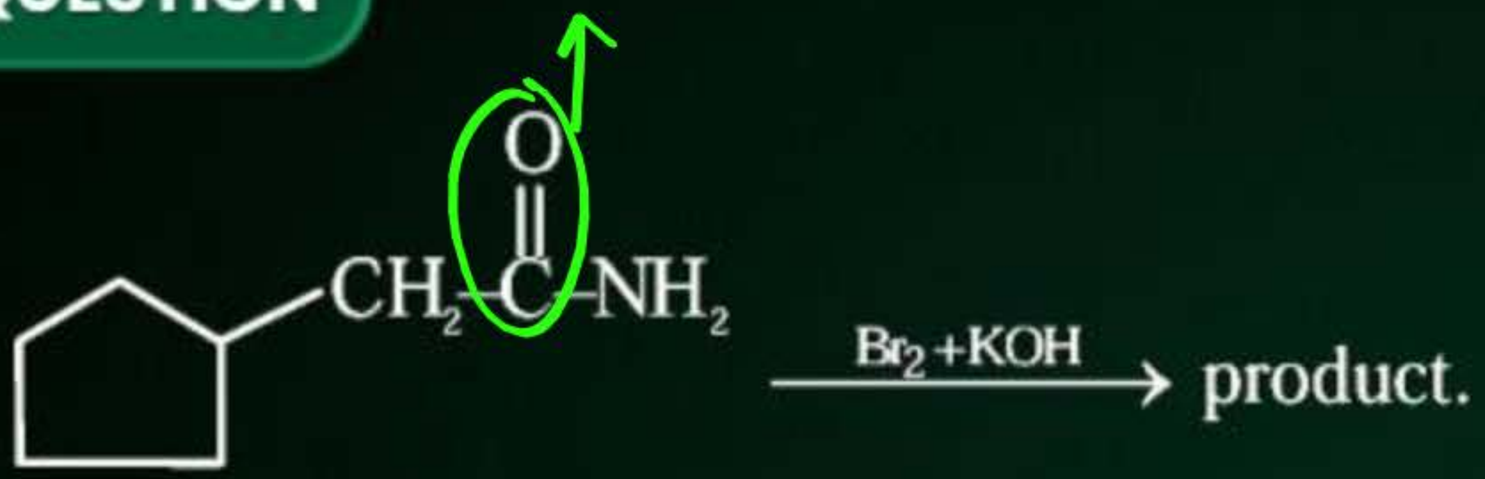
A Methyl cyanide

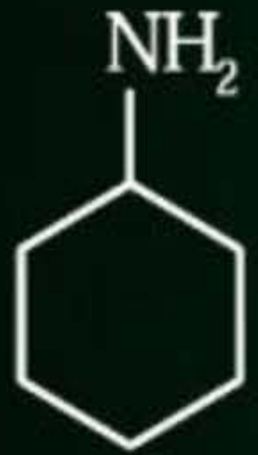
B Nitroethane

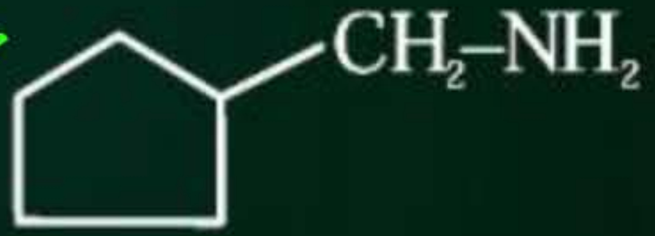
[✓ C] Methyl Isocyanide $CH_3-NC \longrightarrow CH_3NHCH_3$

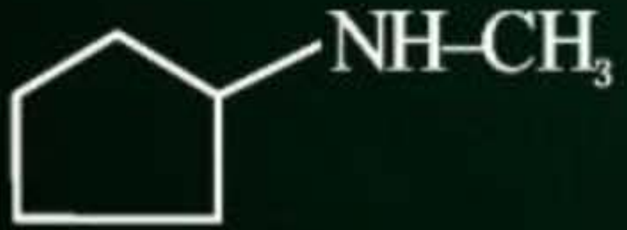
D Acetamide

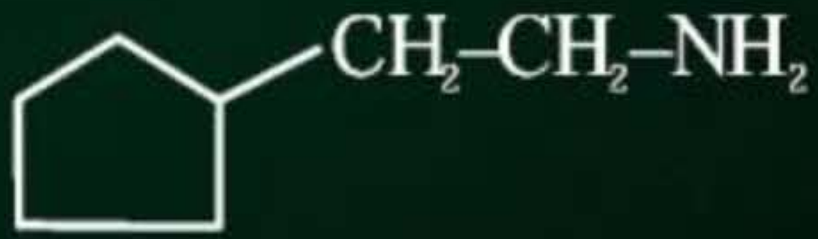
QUESTION


CH2–C(=O)–NH2
Br2 + KOH
product.

(A)


[✓ (B)]


(C)


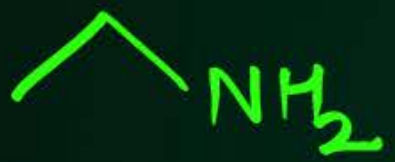
(D)


QUESTION

Which of the following reactions will not give a primary amine?

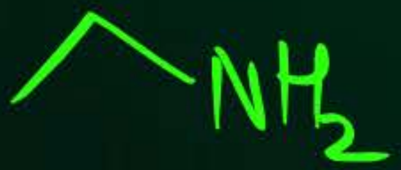
(A) $CH_3CONH_2 \xrightarrow{Br_2/KOH} CH_3-NH_2$

(B) $CH_3CN \xrightarrow{LiAlH_4}$



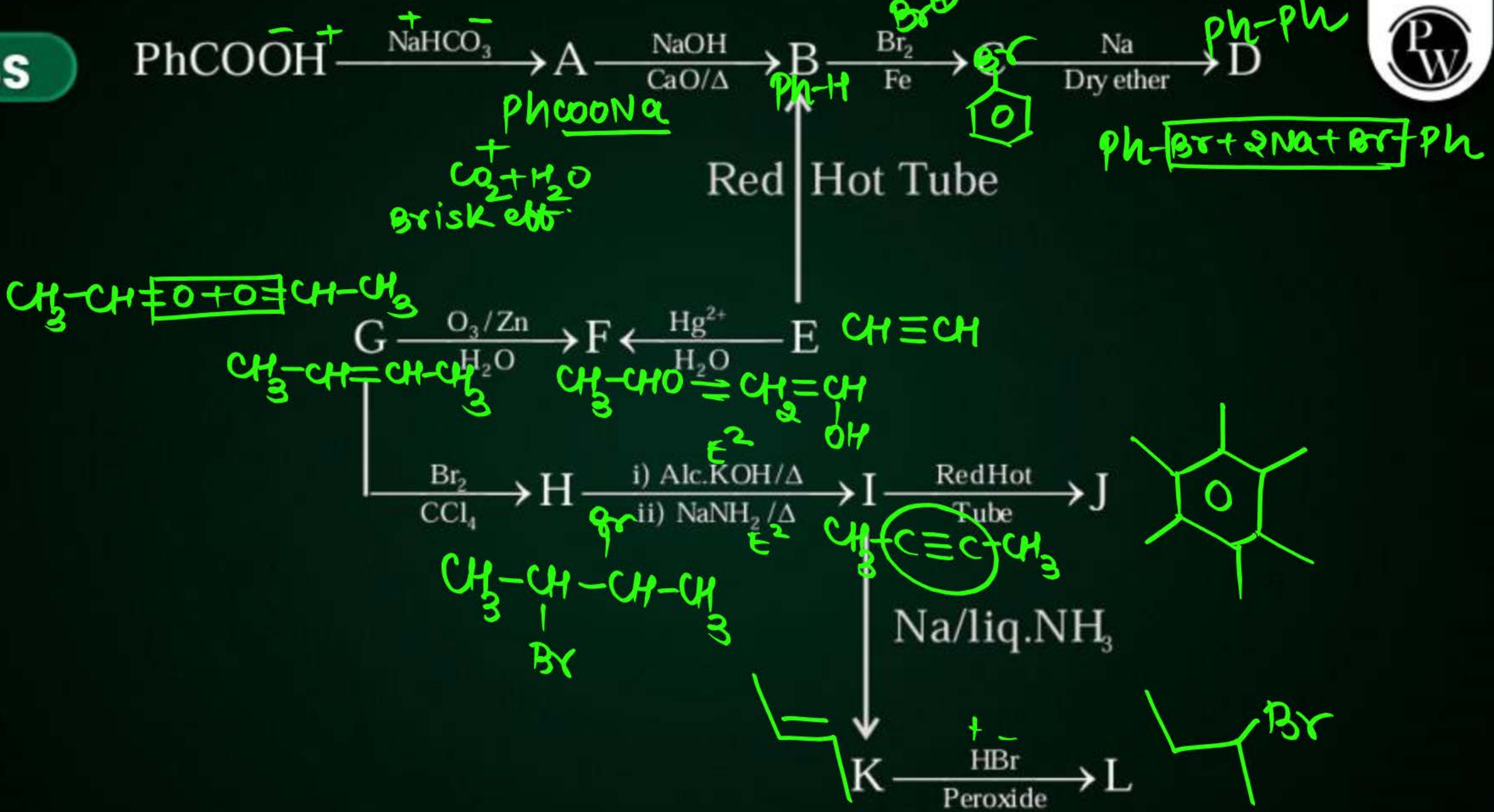
[✓ (C)] $CH_3NC \xrightarrow{LiAlH_4} CH_3-NH-CH_3$

(D) $CH_3CONH_2 \xrightarrow{LiAlH_4}$



PSS

PSS



$PhCOOH \xrightarrow{NaHCO_3} A \xrightarrow[CaO/\Delta]{NaOH} B \xrightarrow[Fe]{Br_2} C \xrightarrow[\text{Dry ether}]{Na} D$

$E \xrightarrow{\text{Red Hot Tube}} B$

$G \xrightarrow[H_2O]{O_3/Zn} F \xleftarrow[H_2O]{Hg^{2+}} E$

$G \xrightarrow[CCl_4]{Br_2} H \xrightarrow[\text{ii) } NaNH_2/\Delta]{\text{i) Alc.KOH}/\Delta} I \xrightarrow{\text{Red Hot Tube}} J$

$I \xrightarrow{Na/liq.NH_3} K \xrightarrow[\text{Peroxide}]{HBr} L$

$PhCOONa$

$CO_2 + H_2O$

Brisk eff.

$Ph-H$

$Br^{\oplus}$

$Ph-Ph$

$Ph-\boxed{Br + 2Na + Br}-Ph$

$CH \equiv CH$

$CH_3-CH\boxed{=O + O=}CH-CH_3$

$CH_3-CH=CH-CH_3$

$CH_3-CHO \rightleftharpoons CH_2=CH-OH$

E^2

or

E^2

$CH_3-CH(Br)-CH-CH_3$

$CH_3-C\equiv C-CH_3$

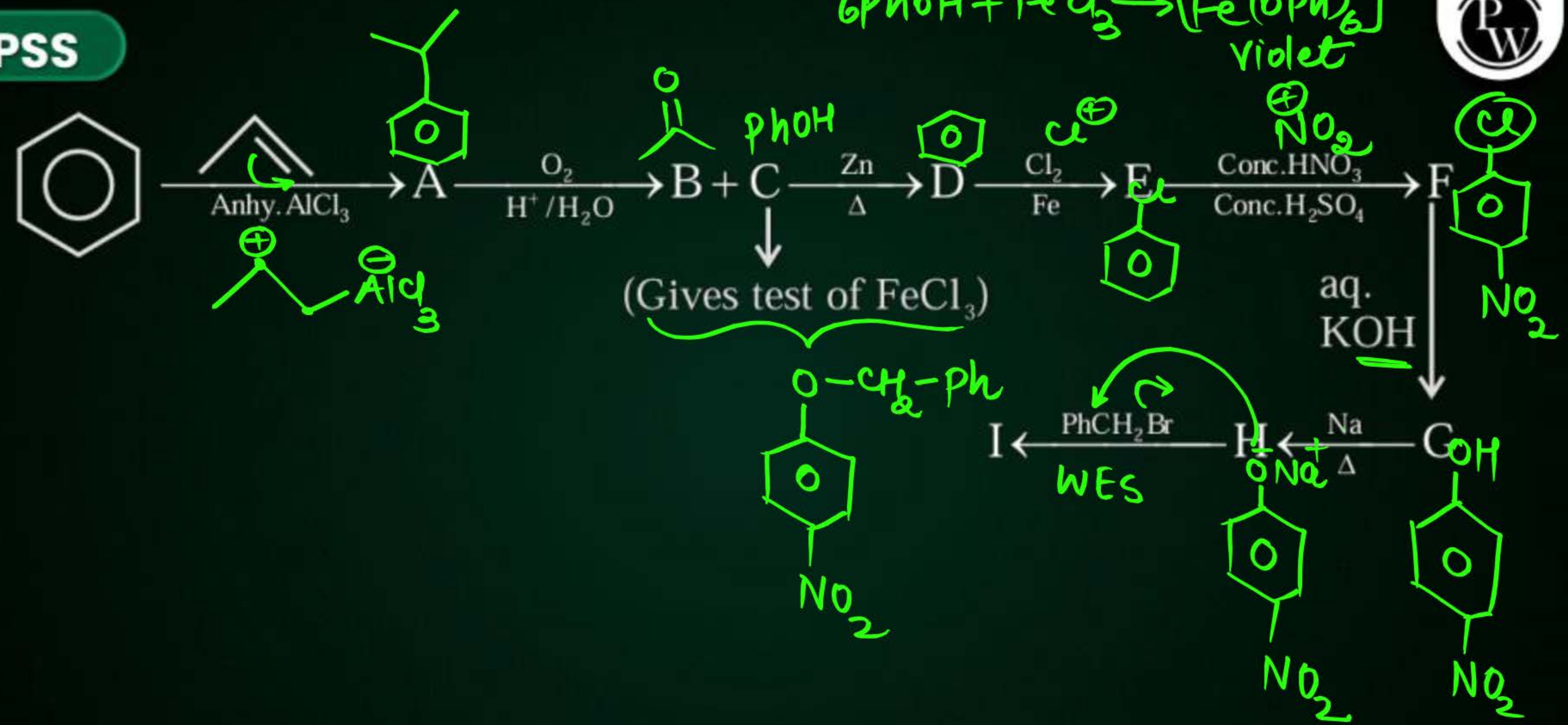
PSS

$$\begin{tikzcd}
\text{PhCOOH} \arrow[r, "NaHCO_3"] & A \arrow[r, "NaOH", "CaO/\Delta"'] & B \arrow[r, "Br_2", "Fe"'] & C \arrow[r, "Na", "\text{Dry ether}"'] & D \\
G \arrow[r, "O_3/Zn", "H_2O"'] \arrow[dr, "Br_2", "CCl_4"'] & F & E \arrow[l, "Hg^{2+}"', "H_2O"] \arrow[u, "\text{Red Hot Tube}"] & & \\
 & H \arrow[r, "\text{i) Alc.KOH}/\Delta", "\text{ii) }NaNH_2/\Delta"'] & I \arrow[r, "\text{Red Hot}", "\text{Tube}"'] \arrow[d, "Na/liq.NH_3"] & J & \\
 & & K \arrow[r, "HBr", "\text{Peroxide}"'] & L &
\end{tikzcd}$$

PSS

$6PhOH + FeCl_3 \rightarrow [Fe(OPh)_6]^{3-}$

Violet

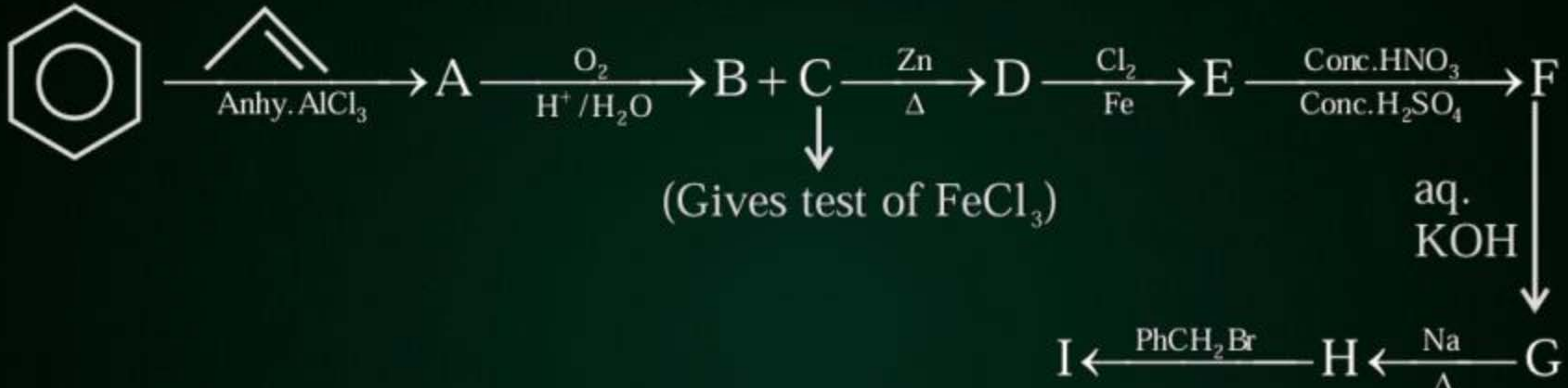


$$\text{C}_6\text{H}_6 \xrightarrow[\text{Anhy. AlCl}_3]{} \text{A} \xrightarrow[\text{H}^+/\text{H}_2\text{O}]{\text{O}_2} \text{B} + \text{C} \xrightarrow[\Delta]{\text{Zn}} \text{D} \xrightarrow[\text{Fe}]{\text{Cl}_2} \text{E} \xrightarrow[\text{Conc.H}_2\text{SO}_4]{\text{Conc.HNO}_3} \text{F}$$

C ↓ (Gives test of $FeCl_3$)

$$\text{F} \xrightarrow{\text{aq. KOH}} \text{G} \xrightarrow[\Delta]{\text{Na}} \text{H} \xrightarrow{\text{PhCH}_2\text{Br}} \text{I}$$

PSS



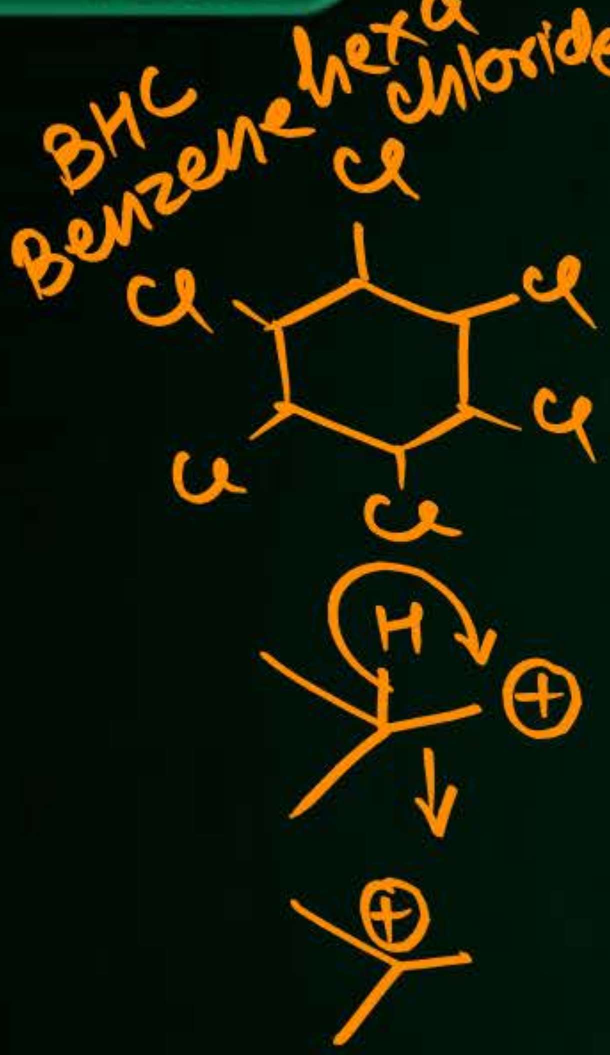
$$\xrightarrow[\text{Anhy. AlCl}_3]{} \mathrm{A} \xrightarrow[H^+/H_2O]{O_2} \mathrm{B} + \mathrm{C} \xrightarrow[\Delta]{Zn} \mathrm{D} \xrightarrow[Fe]{Cl_2} \mathrm{E} \xrightarrow[\text{Conc.}H_2SO_4]{\text{Conc.}HNO_3} \mathrm{F}$$

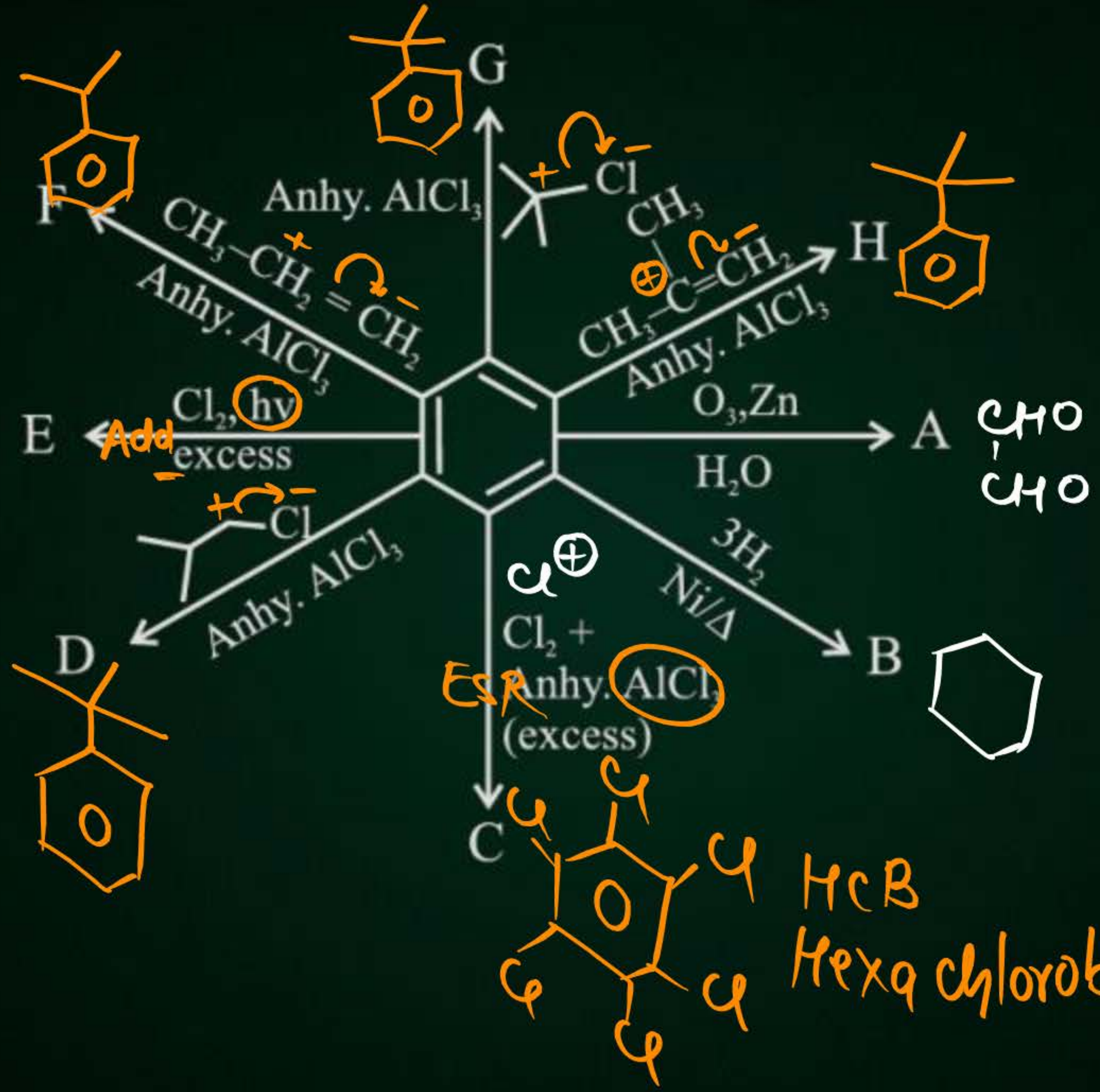
$$\mathrm{C} \downarrow \text{(Gives test of FeCl}_3\text{)}$$

$$\mathrm{F} \xrightarrow{\text{aq. KOH}} \mathrm{G}$$

$$\mathrm{I} \xleftarrow{PhCH_2Br} \mathrm{H} \xleftarrow[\Delta]{Na} \mathrm{G}$$

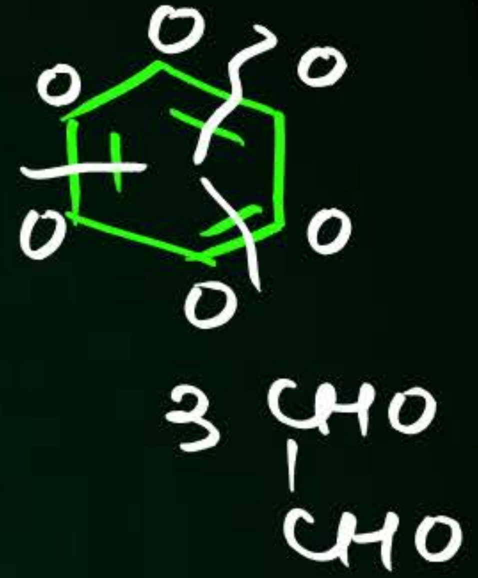
PSS


BHC
Benzene hexa chloride
Cl
Cl
Cl
Cl
Cl
Cl
H
⊕
⊕

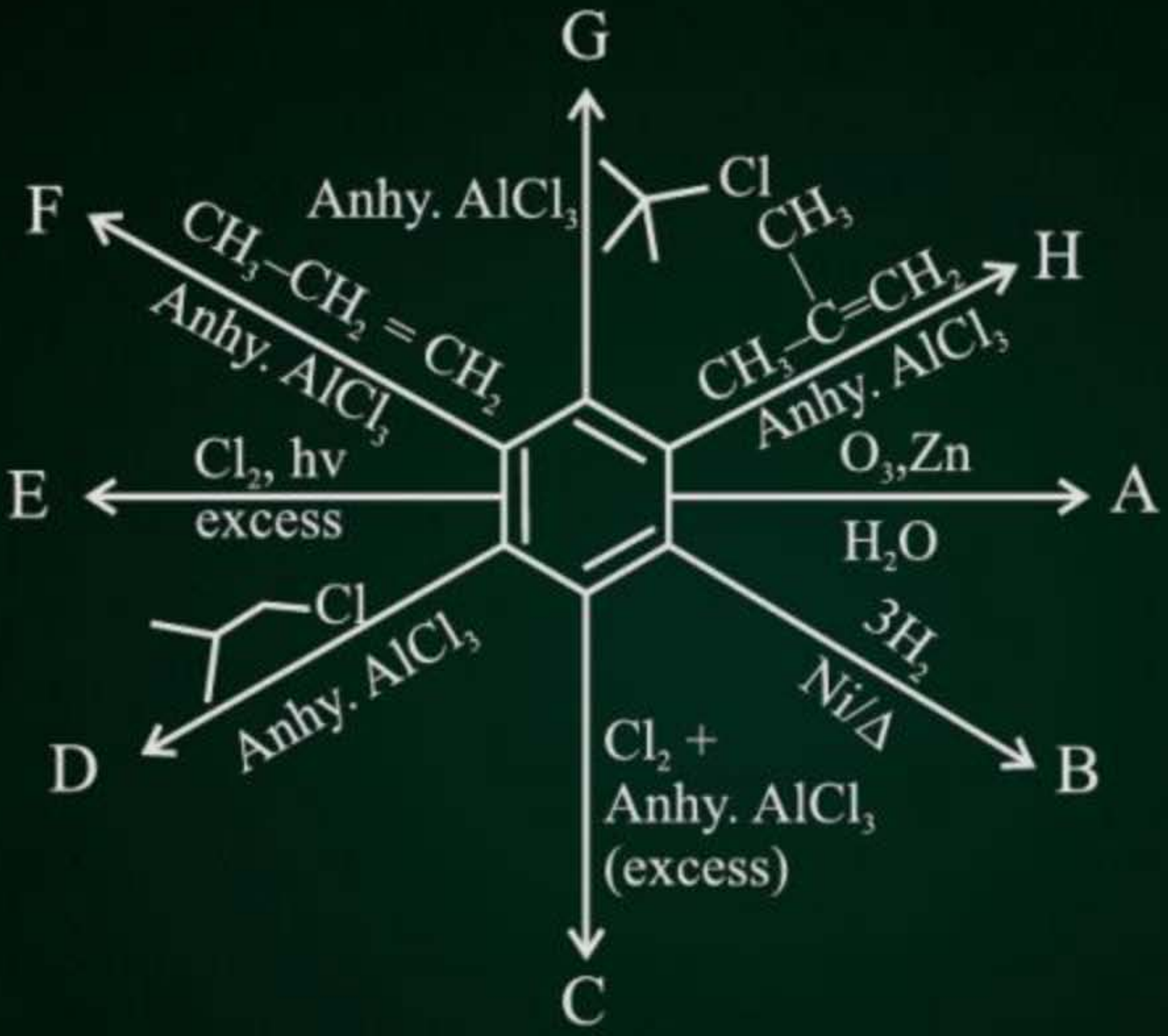

G
Anhy. AlCl$_3$
+
Cl$^-$
F
CH$_3$–$\overset{+}{C}$H$_2$=CH$_2$
Anhy. AlCl$_3$
H
CH$_3$
⊕
CH$_3$–C=CH$_2$
Anhy. AlCl$_3$
E
Add
Cl$_2$, hν
excess
A
O$_3$,Zn
H$_2$O
CHO
CHO
+
Cl
D
Anhy. AlCl$_3$
Cl⊕
3H$_2$
Ni/Δ
B
Cl$_2$ +
ESR
Anhy. AlCl$_3$
(excess)
C
Cl
Cl
Cl
Cl
Cl
Cl

HCB

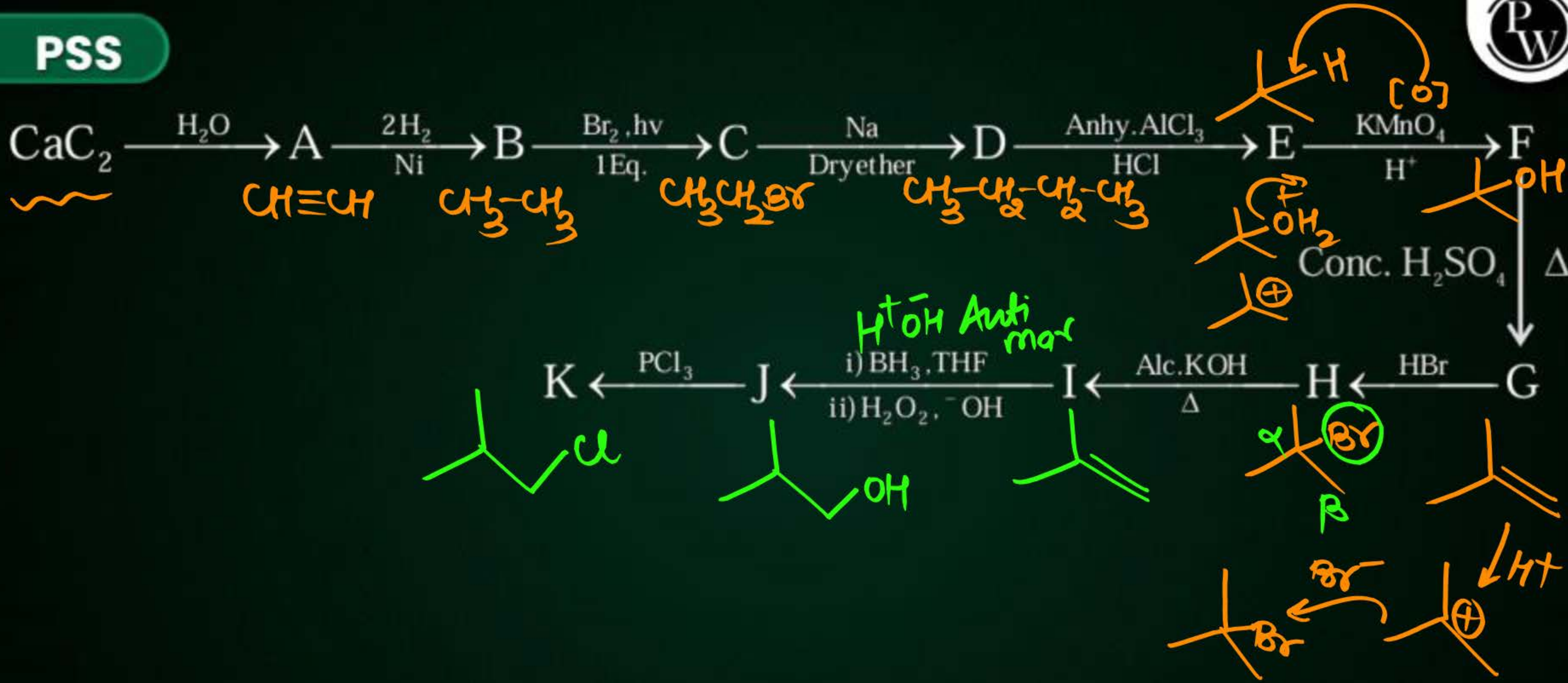
Hexa chlorobenzene


O
O
O
O
O
O
3 CHO
CHO

PSS


G
Anhy. AlCl$_3$
Cl
F
CH$_3$–CH$_2$ = CH$_2$
Anhy. AlCl$_3$
CH$_3$
CH$_3$–C=CH$_2$
Anhy. AlCl$_3$
H
E
Cl$_2$, hν
excess
O$_3$,Zn
H$_2$O
A
Cl
Anhy. AlCl$_3$
D
3H$_2$
Ni/Δ
B
Cl$_2$ +
Anhy. AlCl$_3$
(excess)
C

PSS



$$CaC_2 \xrightarrow{H_2O} A \xrightarrow[Ni]{2H_2} B \xrightarrow[1Eq.]{Br_2,hv} C \xrightarrow[Dry\ ether]{Na} D \xrightarrow[HCl]{Anhy.AlCl_3} E \xrightarrow[H^+]{KMnO_4} F$$

$$F \xrightarrow{Conc.\ H_2SO_4,\ \Delta} G$$

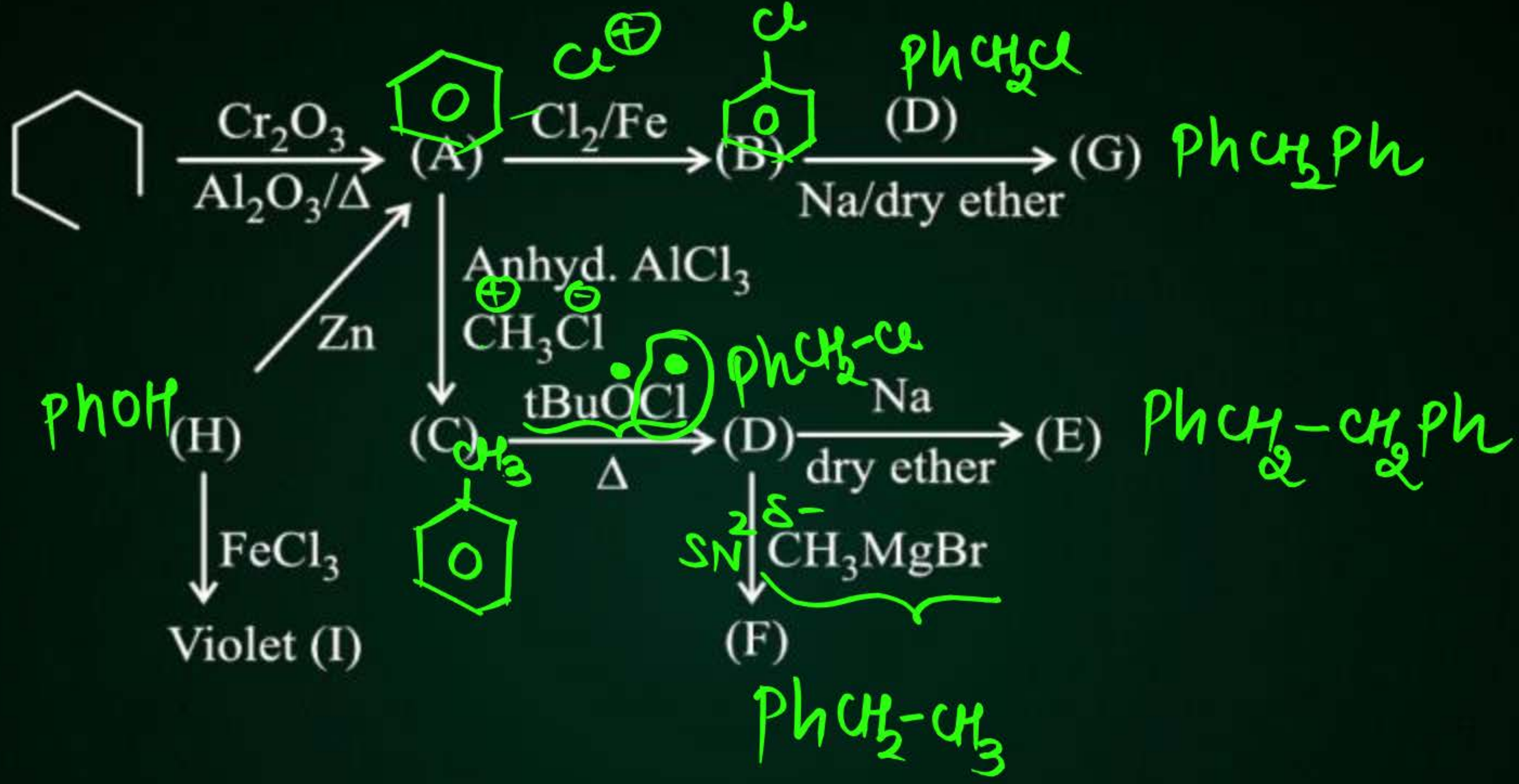
$$G \xrightarrow{HBr} H \xrightarrow[\Delta]{Alc.KOH} I \xrightarrow[ii)\ H_2O_2,\ ^-OH]{i)\ BH_3, THF} J \xrightarrow{PCl_3} K$$

CH≡CH
CH3-CH3
CH3CH2Br
CH3-CH2-CH2-CH3
H
[O]
OH
OH2+
⊕
H+OH− Anti mar
Cl
OH
α
Br
β
Br−
H+
⊕
Br

PSS

$$\begin{tikzcd}
CaC_2 \arrow[r, "H_2O"] & A \arrow[r, "2H_2", "Ni"'] & B \arrow[r, "{Br_2, h\nu}", "1\,Eq."'] & C \arrow[r, "Na", "Dry\,ether"'] & D \arrow[r, "Anhy.\,AlCl_3", "HCl"'] & E \arrow[r, "KMnO_4", "H^+"'] & F \arrow[d, "\Delta", "Conc.\,H_2SO_4"'] \\
 & & K & J \arrow[l, "PCl_3"'] & I \arrow[l, "{i)\,BH_3,\,THF}"', "{ii)\,H_2O_2,\,^-OH}"] & H \arrow[l, "Alc.\,KOH"', "\Delta"] & G \arrow[l, "HBr"']
\end{tikzcd}$$

PSS



Cr_2O_3
Al_2O_3/Δ
(A)
Cl_2/Fe
(B)
(D)
Na/dry ether
(G)
Anhyd. $AlCl_3$
CH_3Cl
Zn
(H)
(C)
tBuOCl
Δ
(D)
Na
dry ether
(E)
$FeCl_3$
Violet (I)
CH_3MgBr
(F)

$Cl^{\oplus}$

PhCH₂Cl

PhCH₂Ph

PhCH₂-Cl

PhCH₂-CH₂Ph

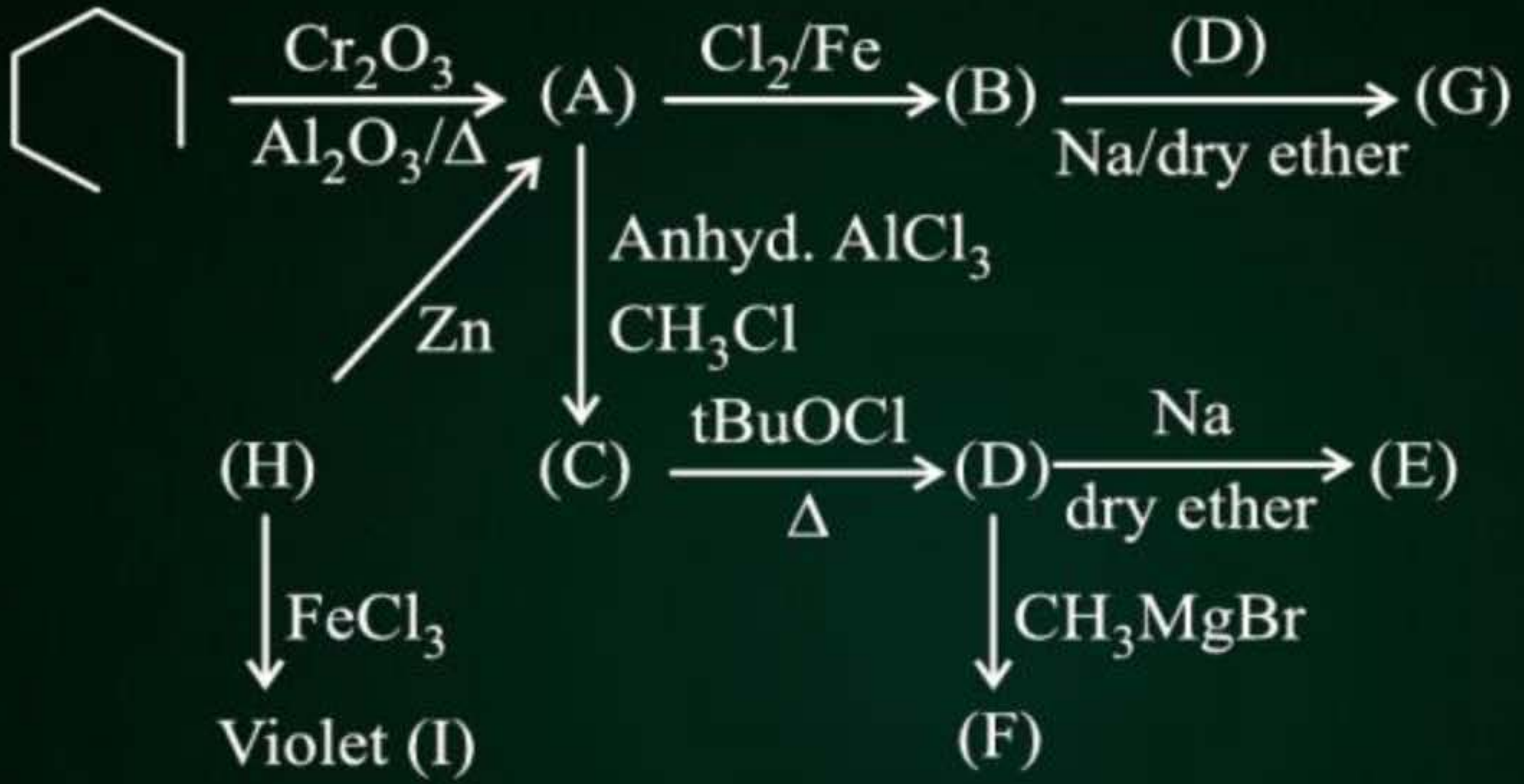
PhOH

SN2

δ-

PhCH₂-CH₃

PSS



$\xrightarrow[Al_2O_3/\Delta]{Cr_2O_3}$ (A) $\xrightarrow{Cl_2/Fe}$ (B) $\xrightarrow[\text{Na/dry ether}]{(D)}$ (G)

(A) $\xrightarrow[CH_3Cl]{\text{Anhyd. } AlCl_3}$ (C)

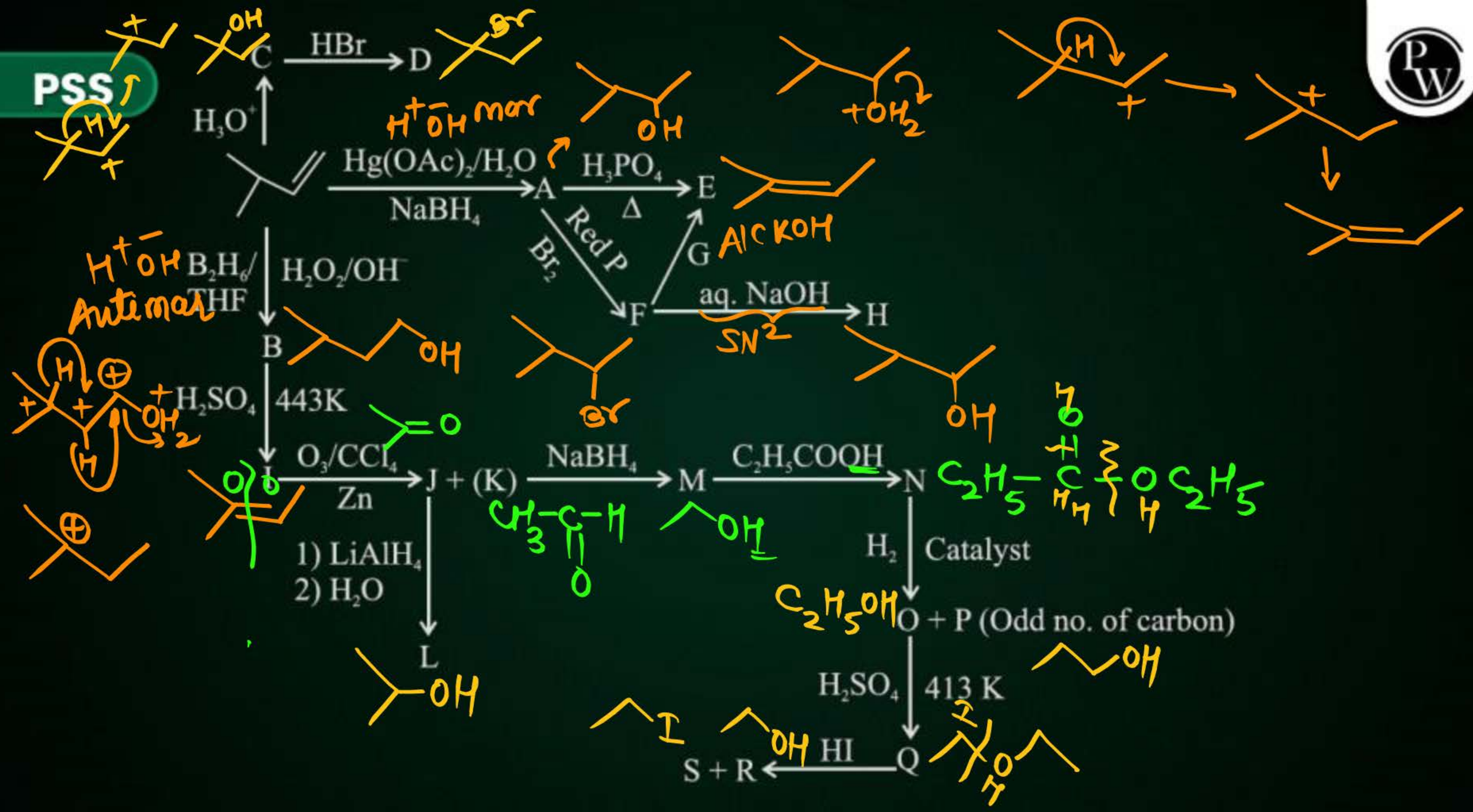
(H) $\xrightarrow{Zn}$ (A)

(C) $\xrightarrow[\Delta]{tBuOCl}$ (D) $\xrightarrow[\text{dry ether}]{Na}$ (E)

(D) $\xrightarrow{CH_3MgBr}$ (F)

(H) $\xrightarrow{FeCl_3}$ Violet (I)

PSS



C $\xrightarrow{HBr}$ D

H_3O^+ ↑ C

$\xrightarrow[NaBH_4]{Hg(OAc)_2/H_2O}$ A $\xrightarrow[\Delta]{H_3PO_4}$ E

A $\xrightarrow{Red\ P / Br_2}$ F

F → G → E

F $\xrightarrow{aq.\ NaOH}$ H

B_2H_6/THF | H_2O_2/OH^- ↓ B

B | H_2SO_4 | 443K ↓ I

I $\xrightarrow[Zn]{O_3/CCl_4}$ J + (K) $\xrightarrow{NaBH_4}$ M $\xrightarrow{C_2H_5COOH}$ N

J ↓ 1) $LiAlH_4$ 2) H_2O ↓ L

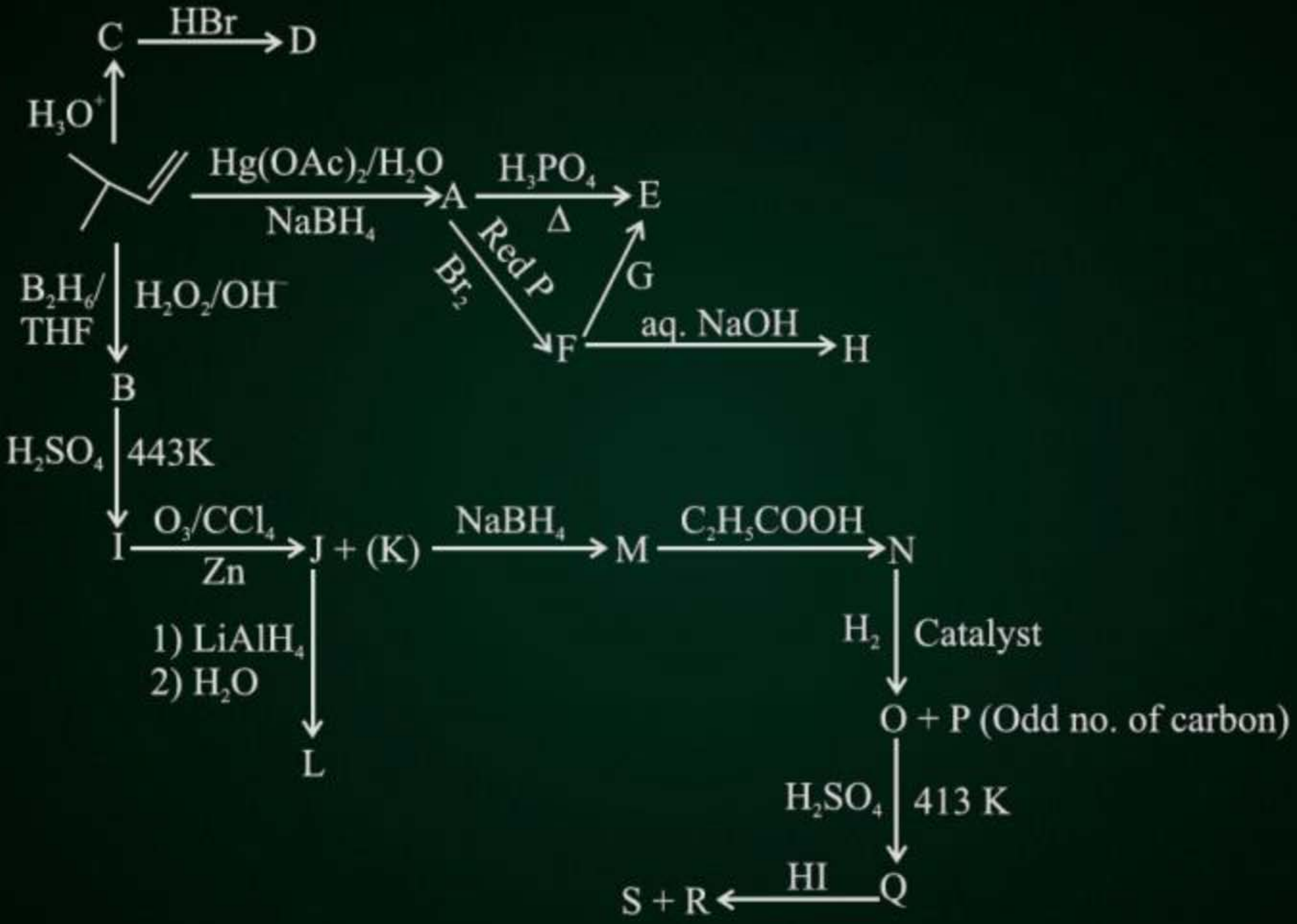
N ↓ H_2 | Catalyst ↓ O + P (Odd no. of carbon)

O ↓ H_2SO_4 | 413 K ↓ Q

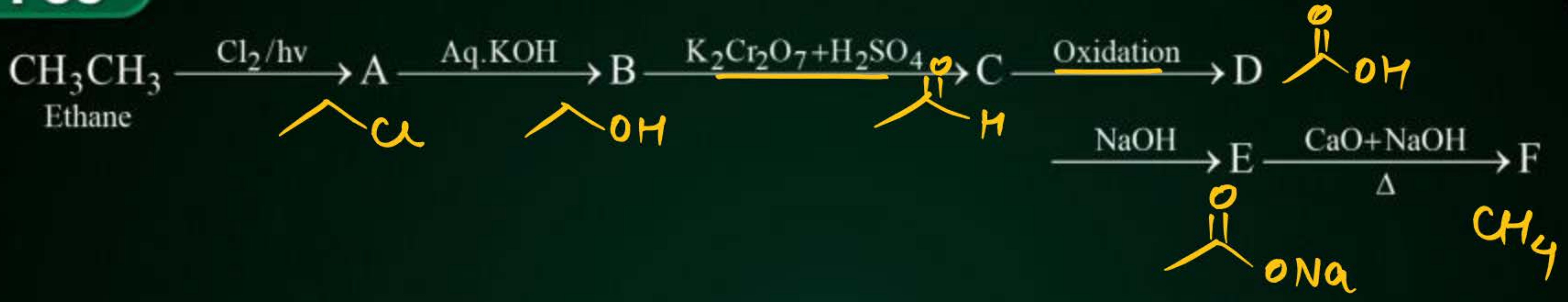
Q $\xrightarrow{HI}$ S + R

H⁺ŌH mar
H⁺ŌH
Antimar
Alc KOH
SN2
OH
Br
+OH₂
CH₃–C–H
C₂H₅–C–O C₂H₅
C₂H₅OH
OH
I
=O

PSS


C
HBr
D
H_3O^+
$Hg(OAc)_2/H_2O$
$NaBH_4$
A
H_3PO_4
Δ
E
Red P
Br_2
G
F
aq. NaOH
H
$B_2H_6/$
THF
H_2O_2/OH^-
B
H_2SO_4
443K
I
O_3/CCl_4
Zn
J + (K)
$NaBH_4$
M
C_2H_5COOH
N
1) $LiAlH_4$
2) H_2O
L
H_2
Catalyst
O + P (Odd no. of carbon)
H_2SO_4
413 K
Q
HI
S + R

PSS



$$\underset{\text{Ethane}}{CH_3CH_3} \xrightarrow{Cl_2/h\nu} A \xrightarrow{Aq.KOH} B \xrightarrow{K_2Cr_2O_7+H_2SO_4} C \xrightarrow{\text{Oxidation}} D$$

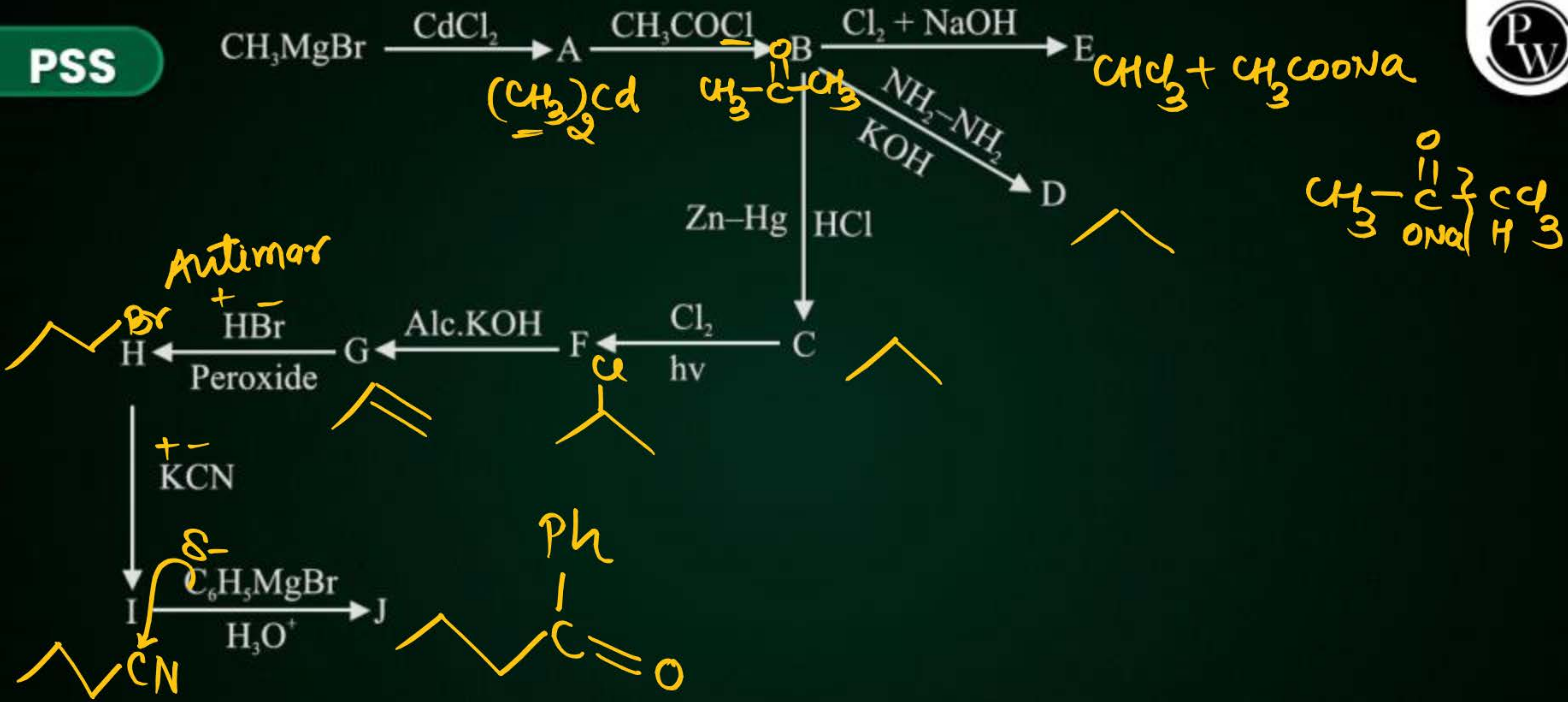
$$\xrightarrow{NaOH} E \xrightarrow[\Delta]{CaO+NaOH} F$$

PSS

$$\underset{\text{Ethane}}{CH_3CH_3} \xrightarrow{Cl_2/hv} A \xrightarrow{\text{Aq.KOH}} B \xrightarrow{K_2Cr_2O_7+H_2SO_4} C \xrightarrow{\text{Oxidation}} D$$

$$\xrightarrow{NaOH} E \xrightarrow[\Delta]{CaO+NaOH} F$$

PSS



$CH_3MgBr \xrightarrow{CdCl_2} A \xrightarrow{CH_3COCl} B \xrightarrow{Cl_2 + NaOH} E$

$B \xrightarrow[KOH]{NH_2-NH_2} D$

$B \xrightarrow[HCl]{Zn-Hg} C$

$C \xrightarrow[hv]{Cl_2} F \xrightarrow{Alc.KOH} G \xrightarrow[Peroxide]{HBr} H$

$H \xrightarrow{KCN} I \xrightarrow[H_3O^+]{C_6H_5MgBr} J$

$(CH_3)_2Cd$
$CH_3-\overset{O}{\overset{\|}{C}}-CH_3$
$CHCl_3 + CH_3COONa$
$CH_3-\overset{O}{\overset{\|}{C}}-ONa \; CHCl_3$
Antimar
+ −
Br
Cl
+ −
δ−
CN
Ph
C=O

PSS

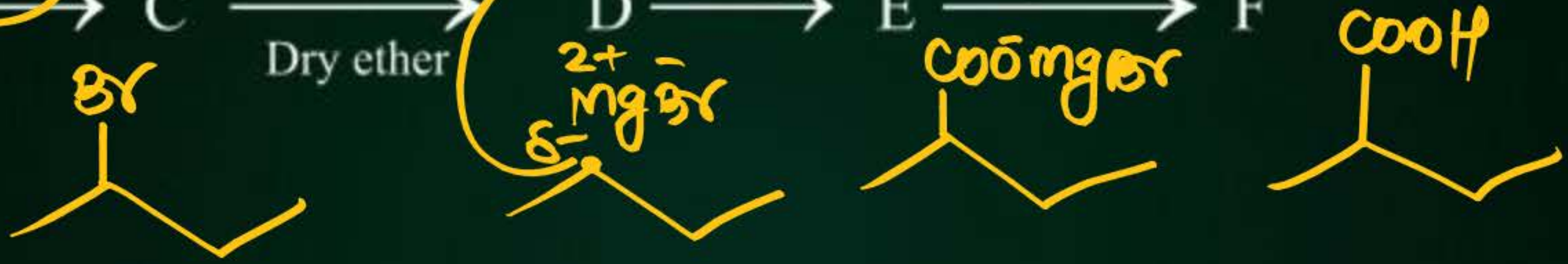
$$\begin{tikzcd}
 & CH_3MgBr \arrow[r, "CdCl_2"] & A \arrow[r, "CH_3COCl"] & B \arrow[r, "Cl_2 + NaOH"] \arrow[dr, "NH_2-NH_2", "KOH"'] \arrow[dd, "Zn-Hg"', "HCl"] & E \\
 & & & & D \\
H \arrow[d, "KCN"] & G \arrow[l, "HBr"', "Peroxide"] & F \arrow[l, "Alc.KOH"'] & C \arrow[l, "Cl_2"', "h\nu"] & \\
I \arrow[r, "C_6H_5MgBr", "H_3O^+"'] & J & & &
\end{tikzcd}$$

PSS

$$C_2H_5OH \xrightarrow{Cu, 573K} \overset{CH_3CHO}{A} + H_2$$

$$CH_3-\overset{\overset{O}{\|}}{C}-H \quad A + \overset{\delta-}{C_2H_5}MgBr \xrightarrow{H_3O^+} B \quad CH_3-\overset{\overset{OH}{|}}{CH}-CH_2CH_3$$

$$B \xrightarrow{PBr_3} C \xrightarrow[\text{Dry ether}]{Mg} D \xrightarrow{CO_2} E \xrightarrow{H_2O/H^+} F$$


Br
$\overset{2+}{Mg}\overset{-}{Br}$
δ-
$CO\overset{-}{O}MgBr$
COOH

PSS

$$C_2H_5OH \xrightarrow{\text{Cu}, 573\text{K}} A + H_2$$

$$A + C_2H_5MgBr \xrightarrow{H_3O^+} B$$

$$B \xrightarrow{PBr_3} C \xrightarrow[\text{Dry ether}]{Mg} D \xrightarrow{CO_2} E \xrightarrow{H_2O/H^+} F$$

Home Work From PW Module (Yakeen NEET)

Prarambh: Q 07, 10, 14

Prabal: Q 11, 18

Parikshit: Q 08

PANKAJ SIR
JOIN MY OFFICIAL TELEGRAM CHANNEL
@PSCAA
PhysicsWallah
अनुगच्छतु प्रवाहं
CH
CH₂
SO₃

Thankyou!!

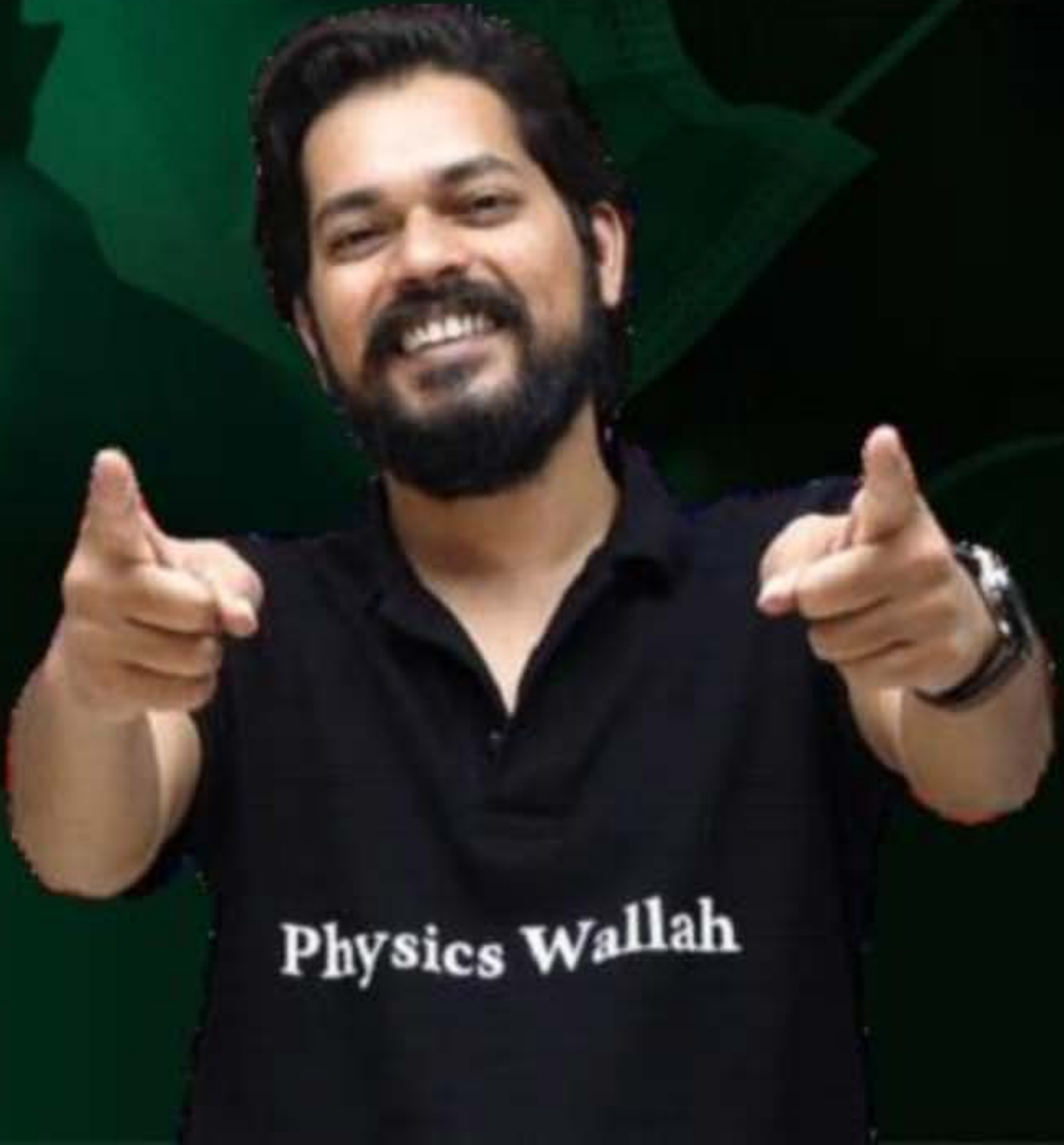
YAKEEN 2.0

FOR NEET 2025

Lecture- 03 Organic Chemistry

Amines

By- Pankaj Sir(POPU MAMA)


Physics Wallah

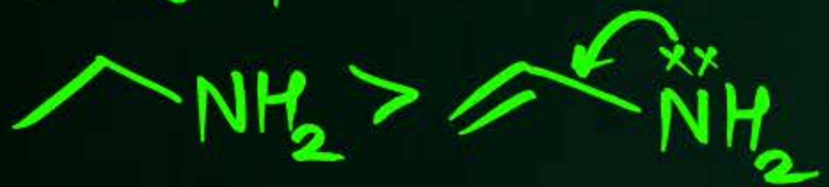
Topics *to be covered*

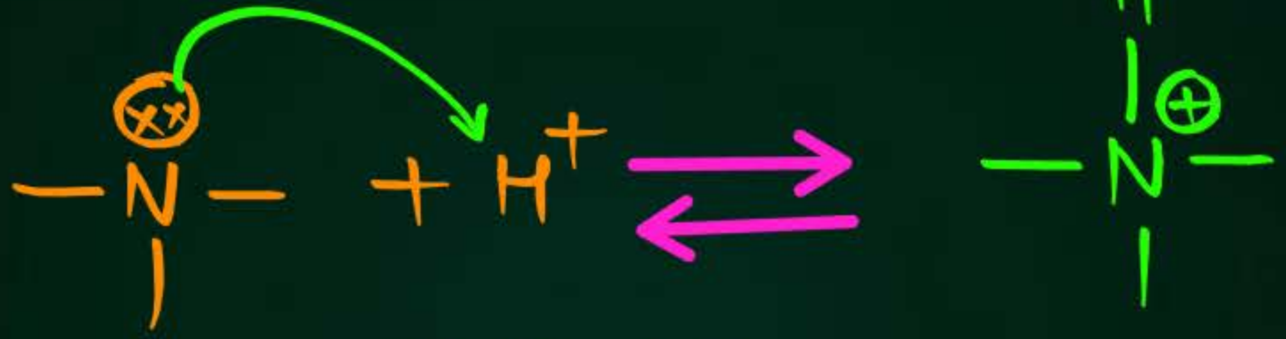
1. Chemical Properties of Amines ✓
2. Practice

Chemical Properties of Amines

1. Basic character of amines:

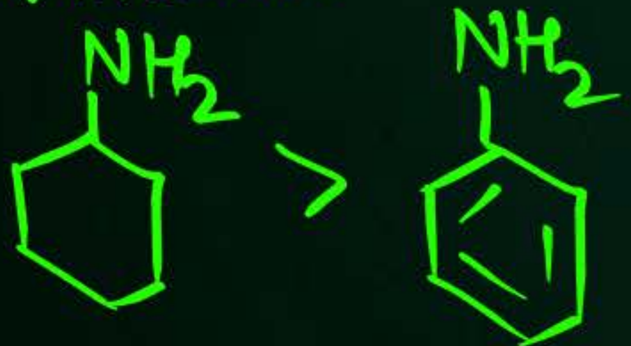
① Local L.P > delocal LP





② Ali Amine > Aroamine More available L.P

more Basic



③ B.S $\propto$ +M, +H, +I $\propto \frac{1}{-M, -H, -I}$

④ In gas phase

$3° > 2° > 1°$ (+I)

⑤ In aq media +I Hydro bond

R = Me 2 > 1 > 3

R = Et 2 > 3 > 1

R = Pr 3 > 2 > 1

⋮

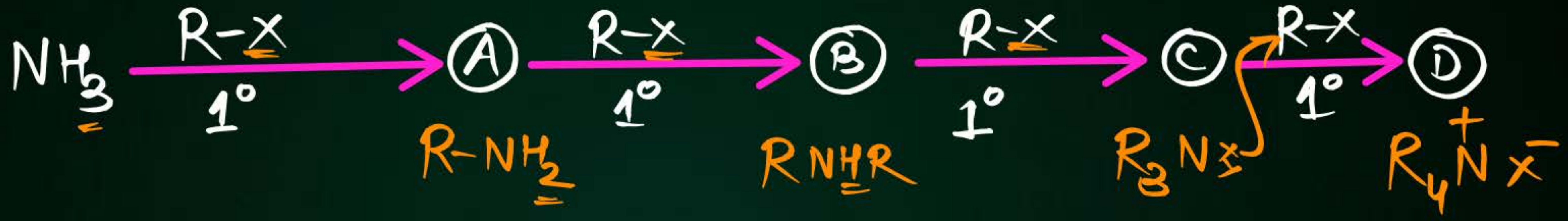
⑥ SIR effect BS↑

SIP effect BS↓

⑦ Amines > Amides > cyanide

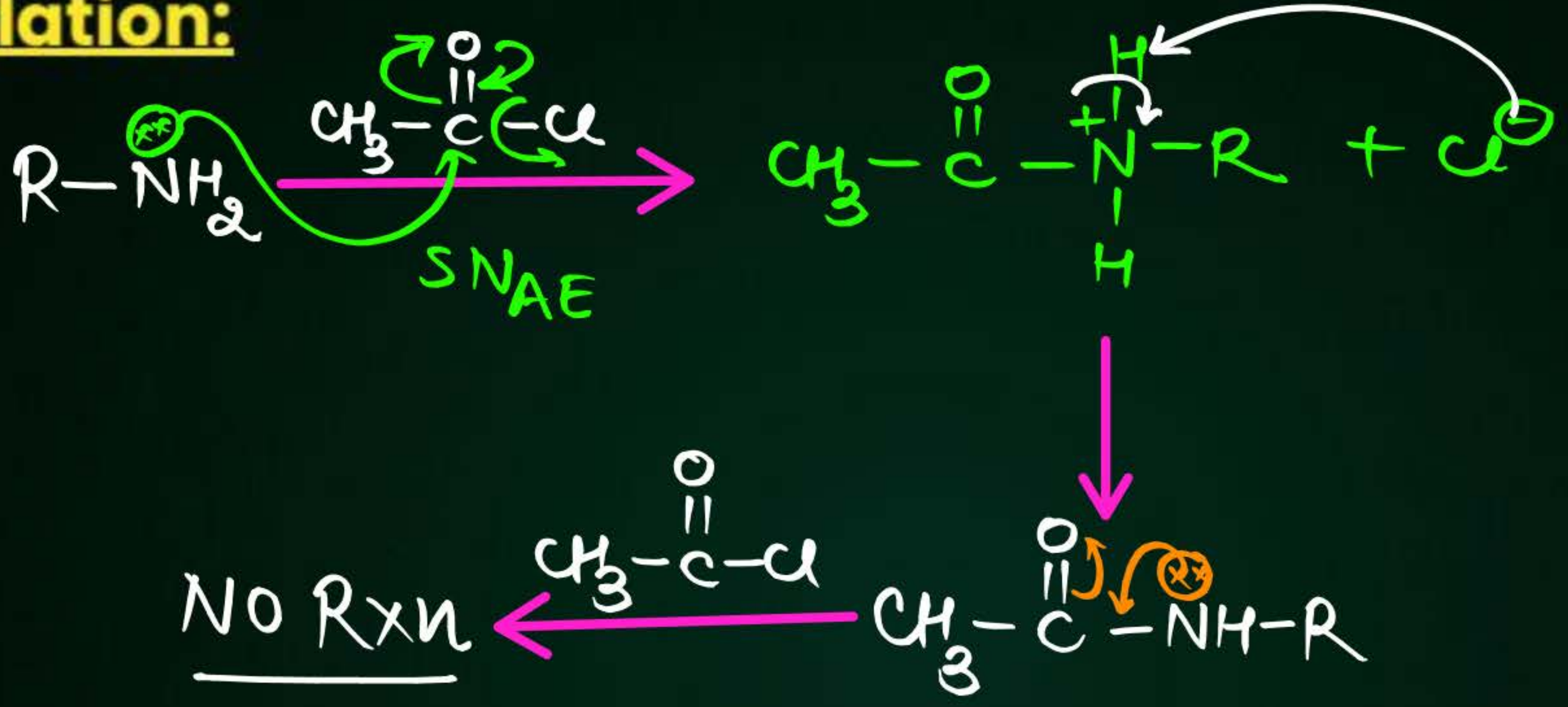
2. Alkylation: (Ammonolysis)

Pad chuke hain



$$NH_3 \xrightarrow[1^\circ]{R-X} \underset{R-NH_2}{Ⓐ} \xrightarrow[1^\circ]{R-X} \underset{RNHR}{Ⓑ} \xrightarrow[1^\circ]{R-X} \underset{R_3N}{Ⓒ} \xrightarrow[1^\circ]{R-X} \underset{R_4\overset{+}{N}\,\overset{-}{X}}{Ⓓ}$$

3. Acylation:



$$R-NH_2 \xrightarrow[S_NAE]{CH_3-\overset{O}{\overset{\|}{C}}-Cl} CH_3-\overset{O}{\overset{\|}{C}}-\underset{H}{\overset{H}{\overset{+}{N}}}-R + Cl^{\ominus}$$

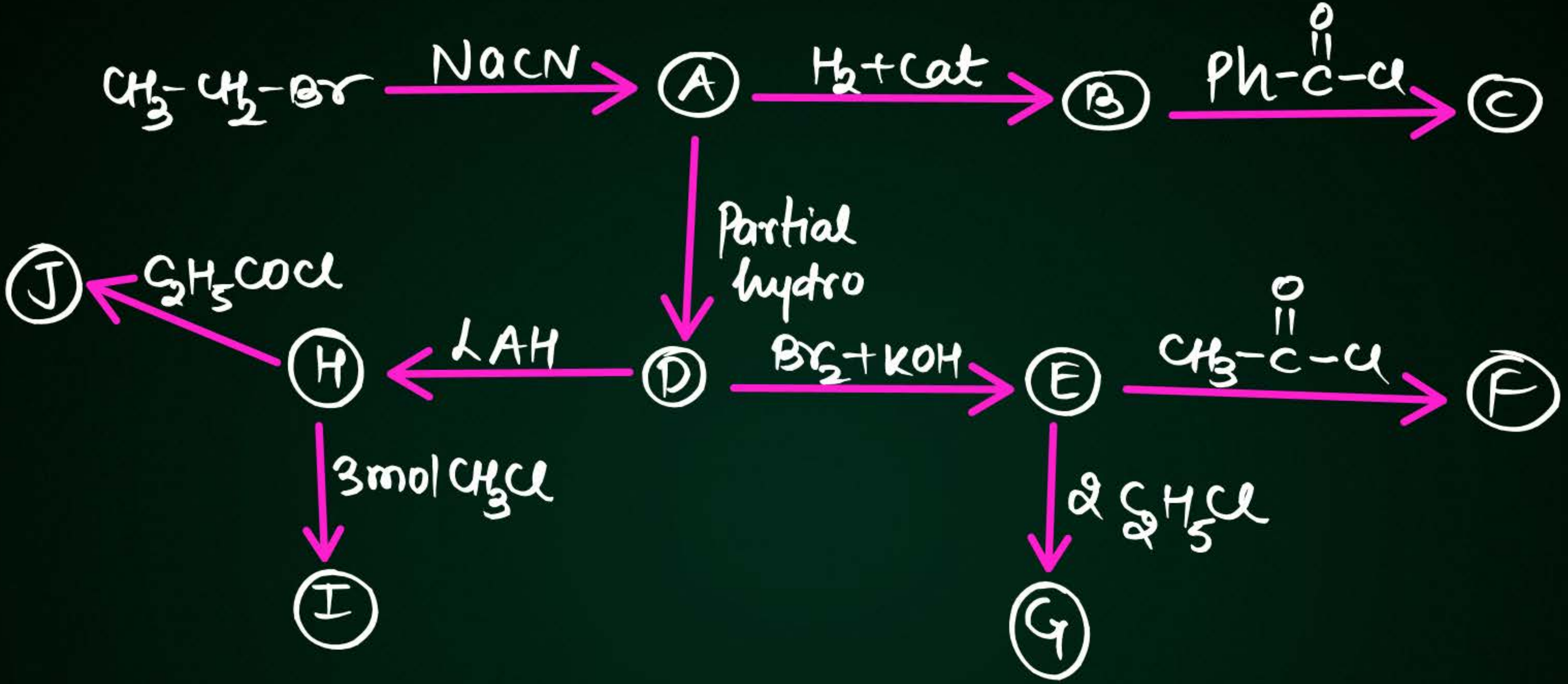
$$\downarrow$$

$$\underline{\text{NO Rxn}} \xleftarrow{CH_3-\overset{O}{\overset{\|}{C}}-Cl} CH_3-\overset{O}{\overset{\|}{C}}-NH-R$$

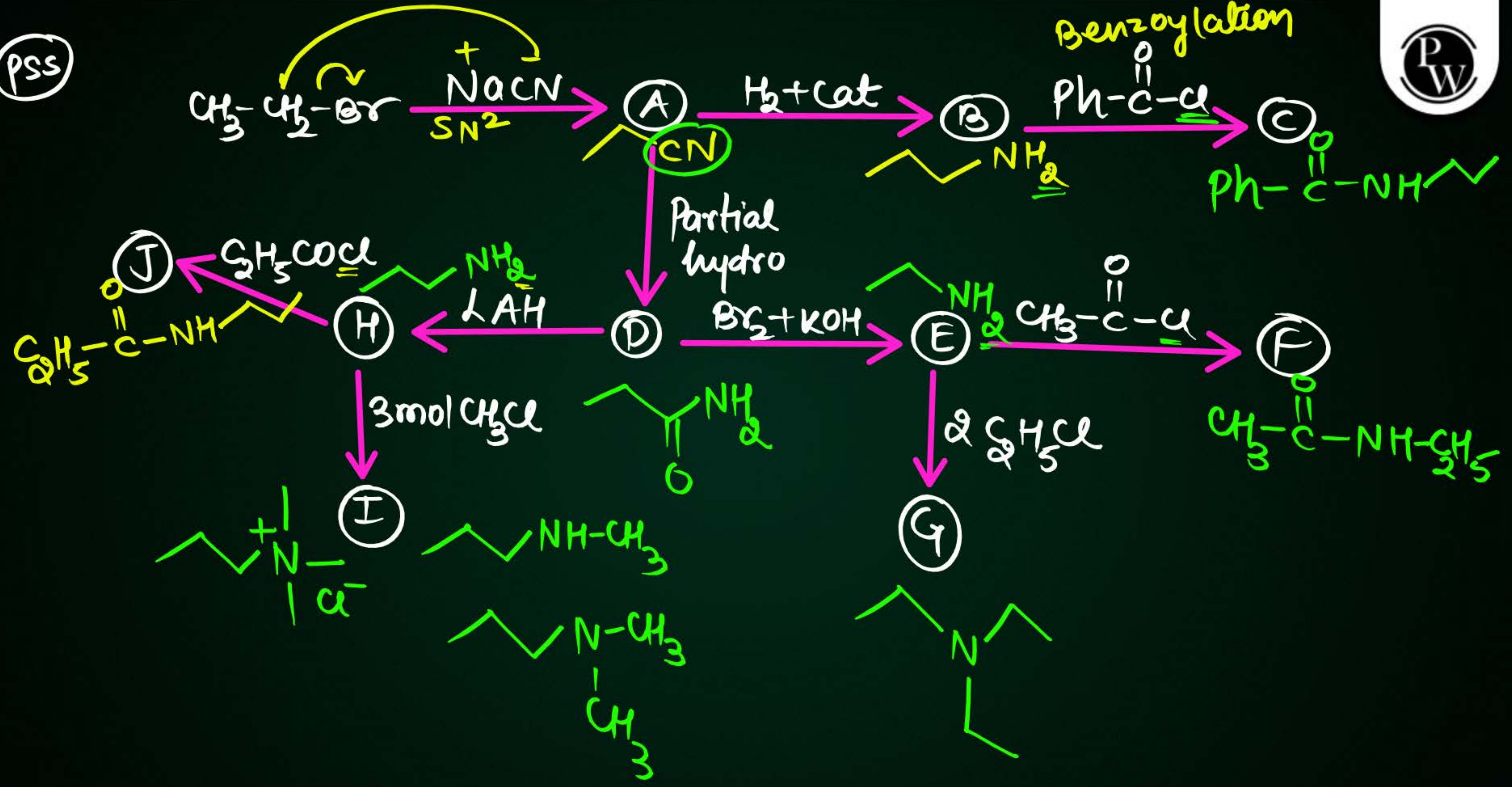
Acylation
- 1 baar

Alkylation
baar baar

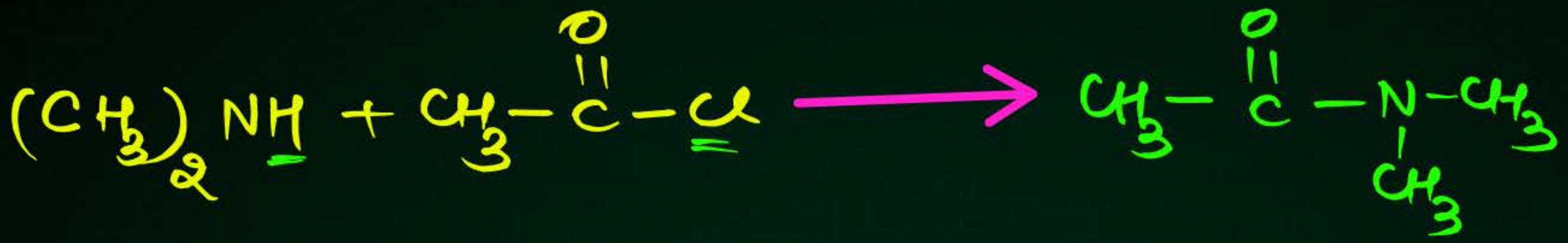
(PSS)


CH_3-CH_2-Br
NaCN
A
H_2+cat
B
Ph-C(=O)-Cl
C
Partial hydro
D
Br_2+KOH
E
CH_3-C(=O)-Cl
F
2 C_2H_5Cl
G
LAH
H
3mol CH_3Cl
I
C_2H_5COCl
J

(PSS)

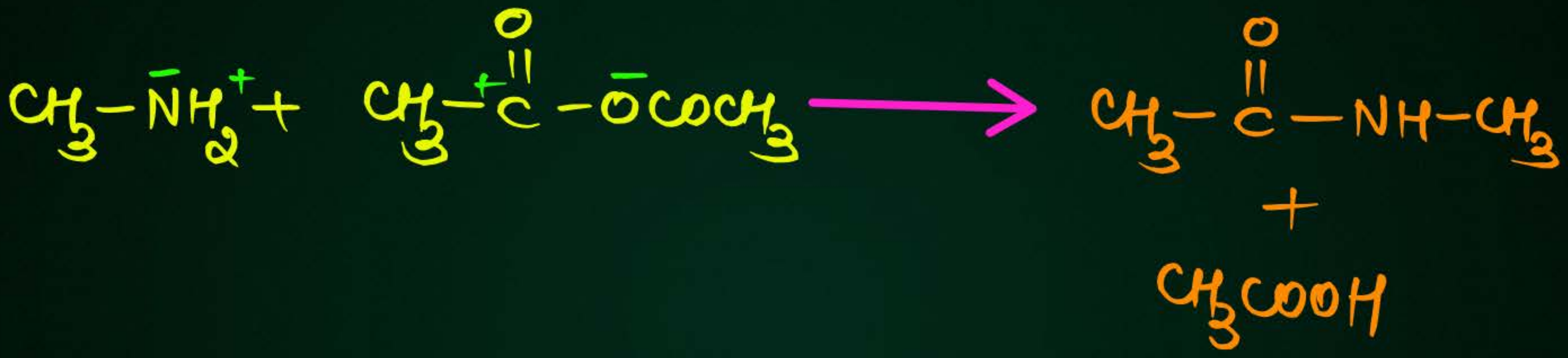

Benzoylation
CH3-CH2-Br
NaCN
SN2
A
CN
H2+Cat
B
NH2
Ph-C(=O)-Cl
C
Ph-C(=O)-NH
Partial hydro
D
NH2
O
LAH
H
NH2
C2H5COCl
J
C2H5-C(=O)-NH
3mol CH3Cl
I
N+
Cl−
NH-CH3
N-CH3
CH3
Br2+KOH
E
NH2
CH3-C(=O)-Cl
F
CH3-C(=O)-NH-C2H5
2 C2H5Cl
G
N

Q/



$$(CH_3)_2N\underline{H} + CH_3-\overset{O}{\overset{\|}{C}}-\underline{Cl} \longrightarrow CH_3-\overset{O}{\overset{\|}{C}}-\underset{CH_3}{\underset{|}{N}}-CH_3$$

Q



$$CH_3-\bar{N}H_2^{+} + CH_3-\overset{O}{\overset{\|}{\overset{+}{C}}}-\bar{O}COCH_3 \longrightarrow CH_3-\overset{O}{\overset{\|}{C}}-NH-CH_3 + CH_3COOH$$

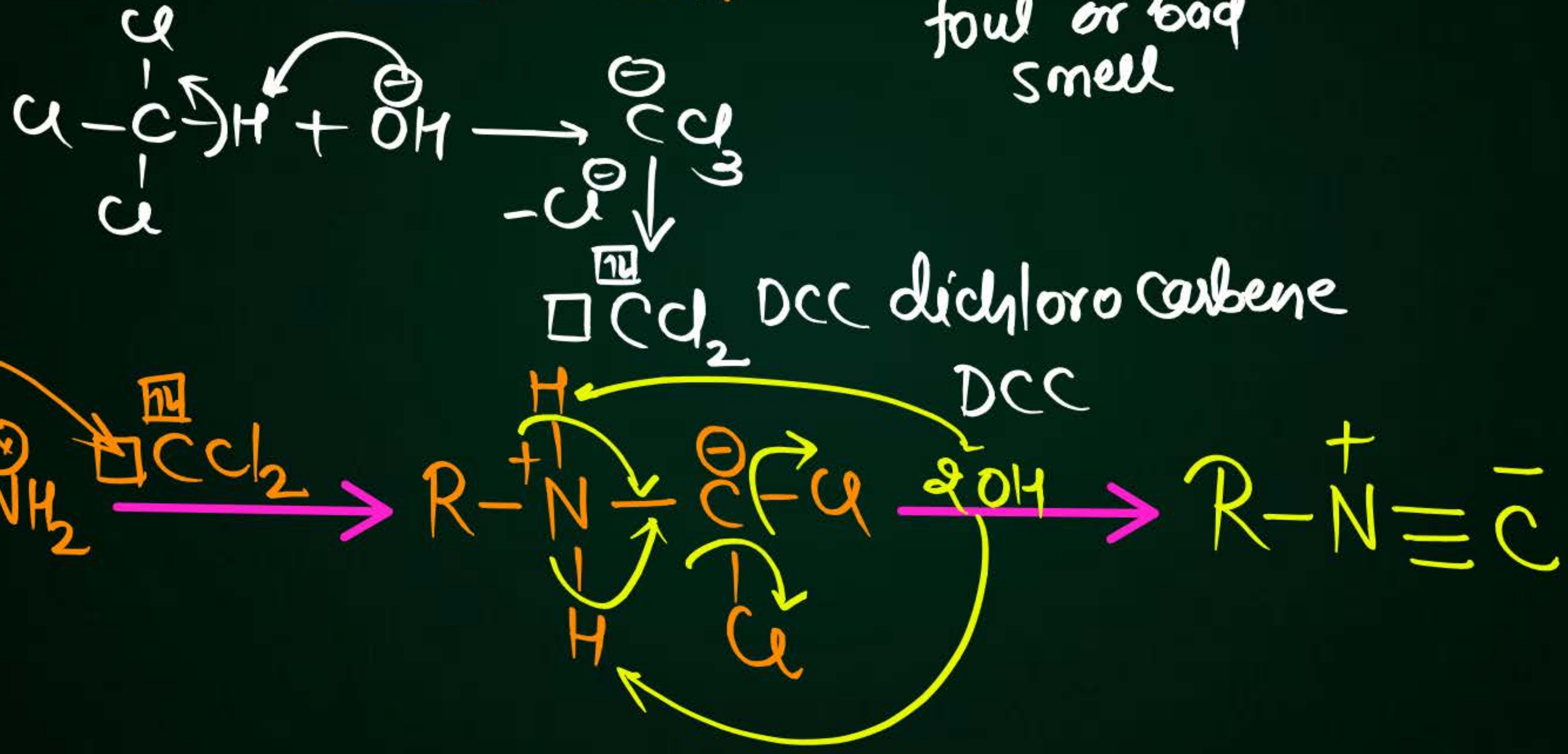
4. Carbylamine Test: 1° Ali & Aro Amine

Isocyanide Test

$$R-\boxed{NH_2} \xrightarrow[KOH]{CHCl_3} R-\boxed{NC}$$

foul or bad smell

Mech



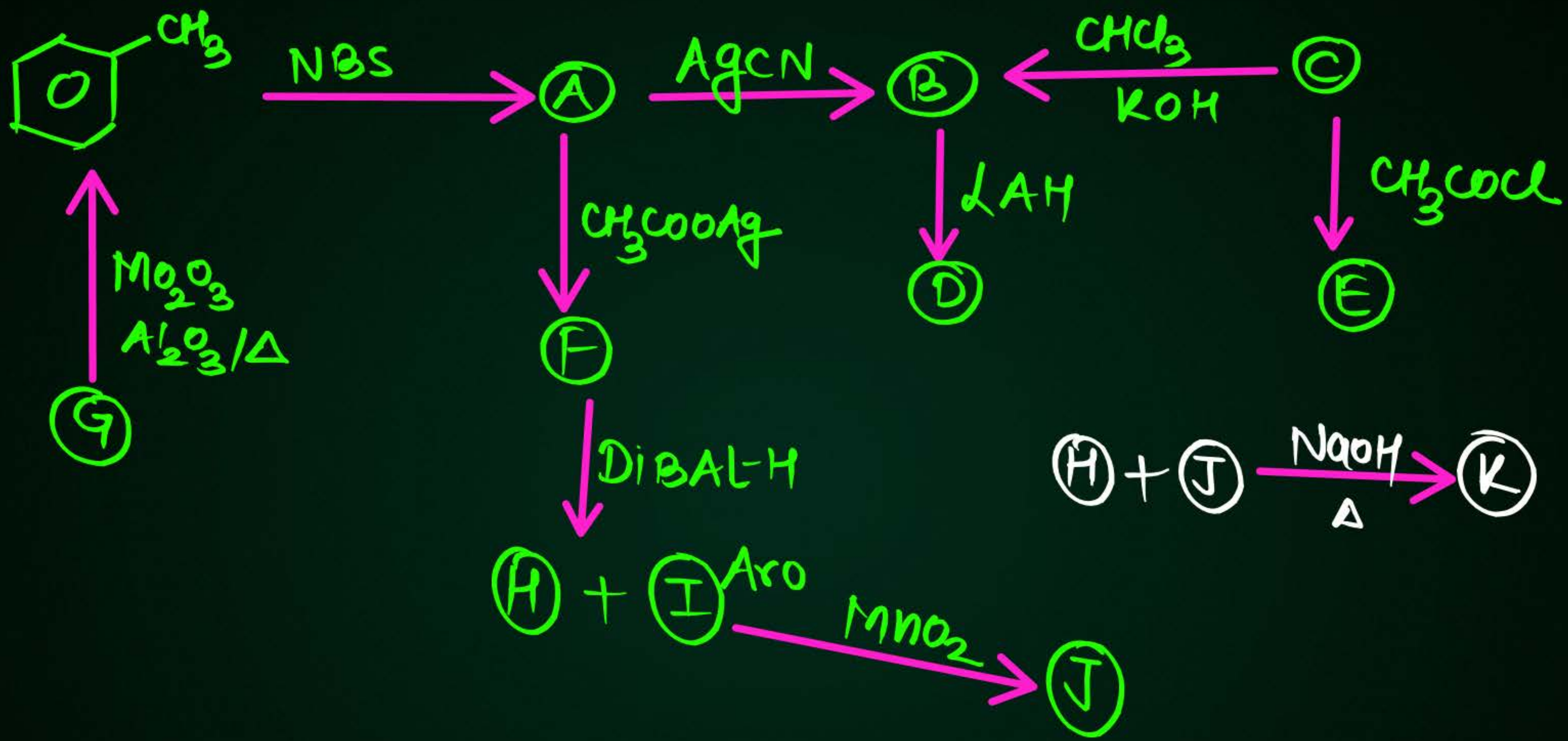
$$Cl-\overset{Cl}{\underset{Cl}{C}}-H + \overset{\ominus}{O}H \longrightarrow \overset{\ominus}{C}Cl_3 \xrightarrow{-Cl^{\ominus}} \square CCl_2$$

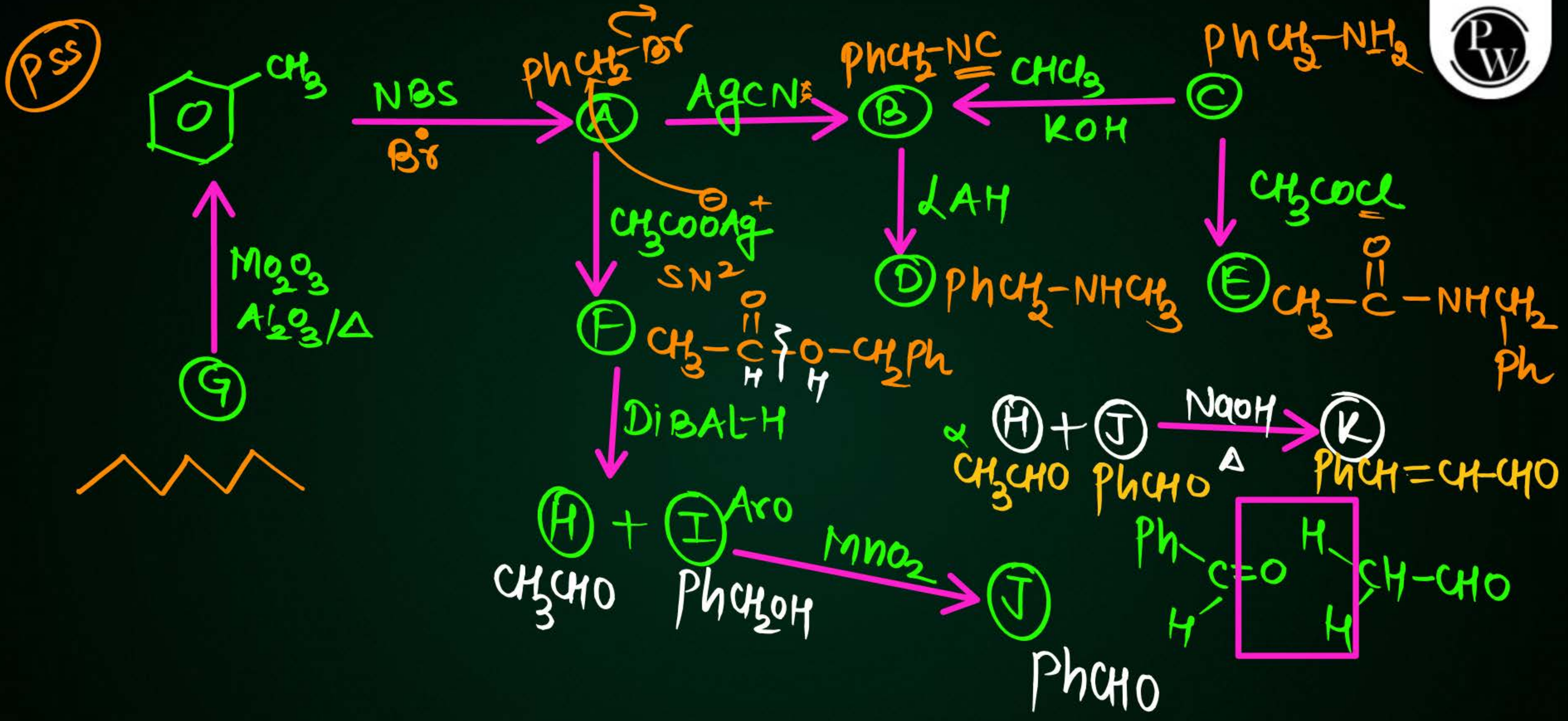
DCC dichloro carbene

DCC

$$R-\ddot{N}H_2 + \square CCl_2 \longrightarrow R-\overset{+}{N}H_2-\overset{\ominus}{C}Cl_2 \xrightarrow{2\,OH} R-\overset{+}{N}\equiv\overset{-}{C}$$

PSS


CH3
NBS
A
AgCN
B
CHCl3
KOH
C
CH3COOAg
LAH
CH3COCl
D
E
Mo2O3
Al2O3/Δ
G
F
DIBAL-H
H + I
Aro
MnO2
J
H + J
NaOH
Δ
K


PSS
CH3
NBS
Br•
PhCH2-Br
A
AgCN
PhCH2-NC
B
CHCl3
KOH
PhCH2-NH2
C
LAH
D PhCH2-NHCH3
CH3COCl
E CH3-C(=O)-NH-CH2-Ph
CH3COO⁻Ag⁺
SN2
F CH3-C(=O)-O-CH2Ph
H
H
DIBAL-H
H + I
Aro
CH3CHO
PhCH2OH
MnO2
J
PhCHO
Mo2O3
Al2O3/Δ
G
α H + J
NaOH
Δ
K
CH3CHO
PhCHO
PhCH=CH-CHO
Ph
C=O
H
H
CH-CHO
H

5. Reaction with nitrous acid:

HNO_2

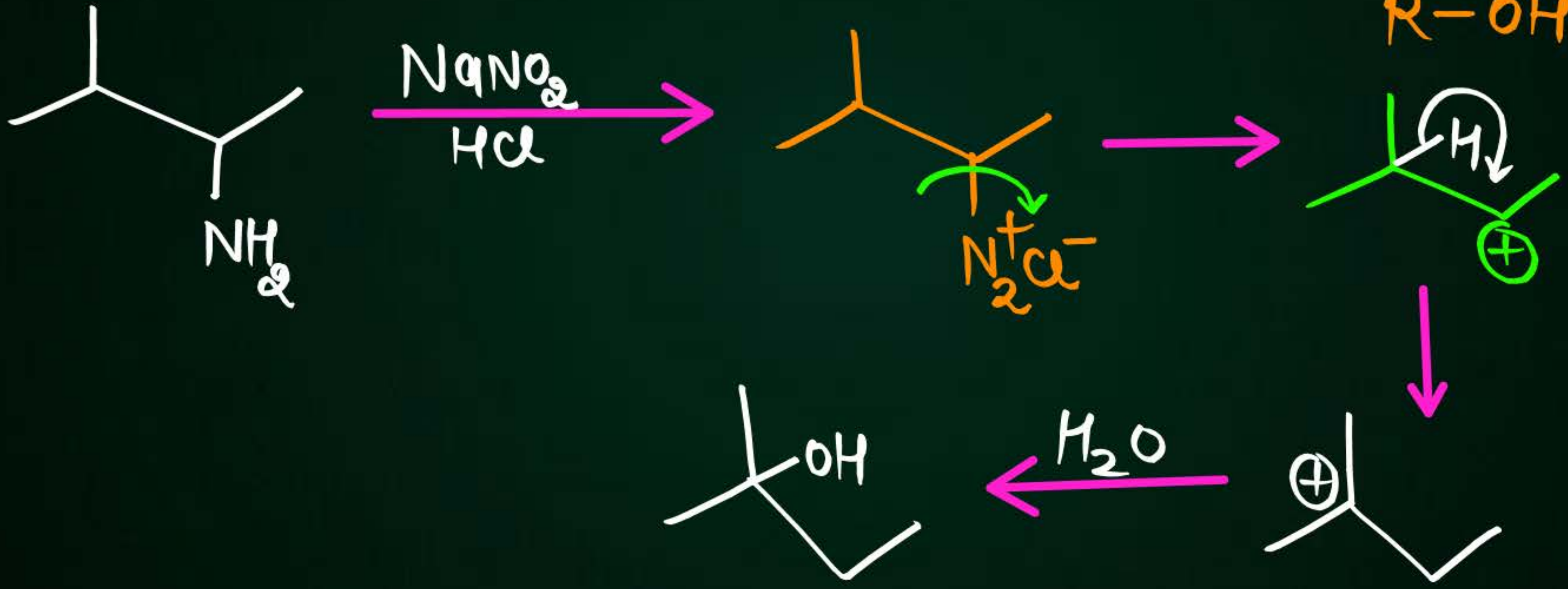
$\overset{+}{Na}\overset{-}{NO_2} + \overset{+}{H}\overset{-}{Cl} \longrightarrow NaCl + HNO_2$

a) 1° ali amine

$$\begin{tikzcd} R-NH_2 \arrow[r, "NaNO_2+HCl"] & R-N_2^+Cl^- \arrow[r] & R^{\oplus} \arrow[d, "H_2O"] \\ & & R-OH \end{tikzcd}$$

Rearrange if pos

Q



NH2
NaNO2
HCl
N2+Cl−
H
⊕
⊕
H2O
OH

b) 1° aroamine

$$Ph{-}NH_2 \xrightarrow[0-5^\circ C]{NaNO_2+HCl} Ph{-}N_2^+Cl^-$$

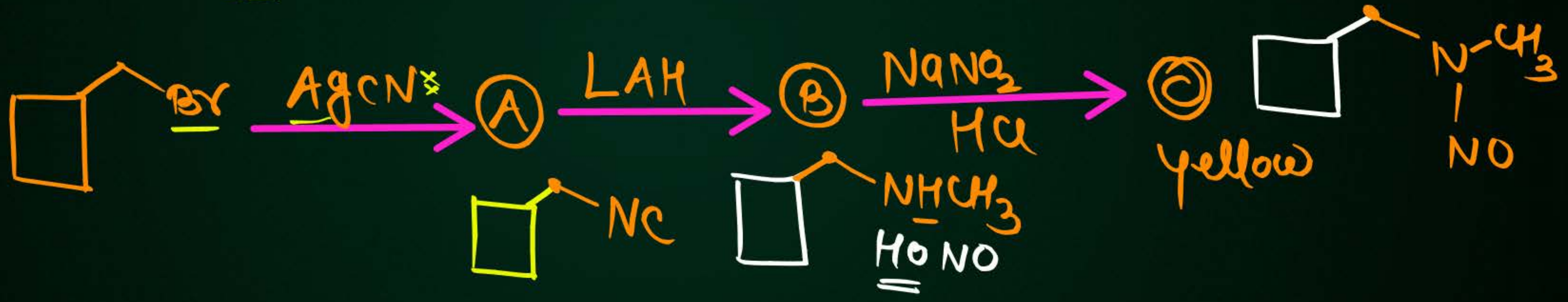
c) 2° ali & aro amine

$$R_2N{-}H \xrightarrow{NaNO_2+HCl} R_2N{-}NO$$

HONO

yellow oily
nitroso amine

Q


Br
AgCN
Ⓐ
LAH
Ⓑ
NaNO₂
HCl
Ⓒ
NC
NHCH₃
HONO
yellow
N–CH₃
NO

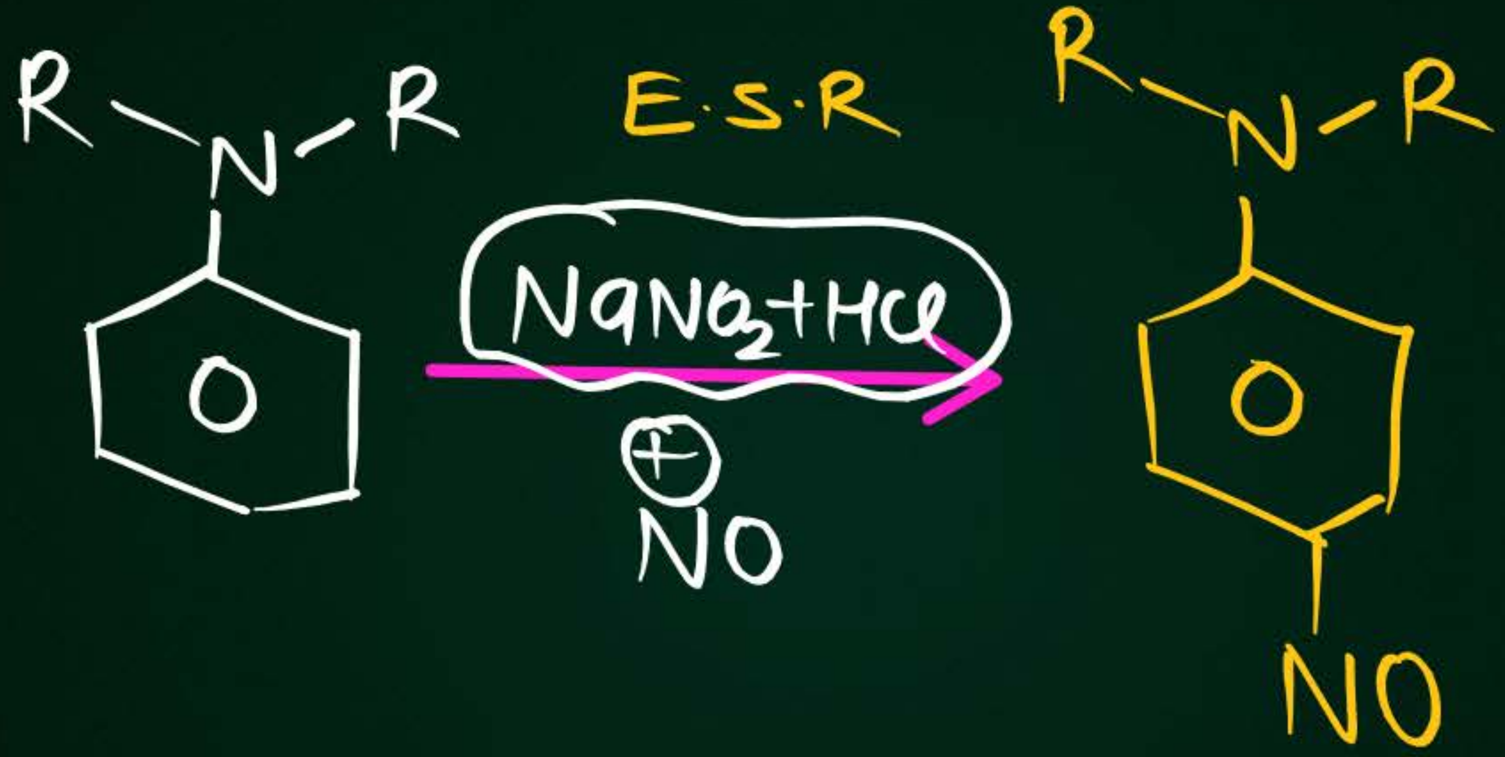
a) Ali 3° amine

$HO-NO \xrightarrow{H^+} \overset{+}{N}O$

$R_3\ddot{N} \xrightarrow[HCl]{NaNO_2} R_3\ddot{N} \longrightarrow NO$

$\overset{+}{N}O$

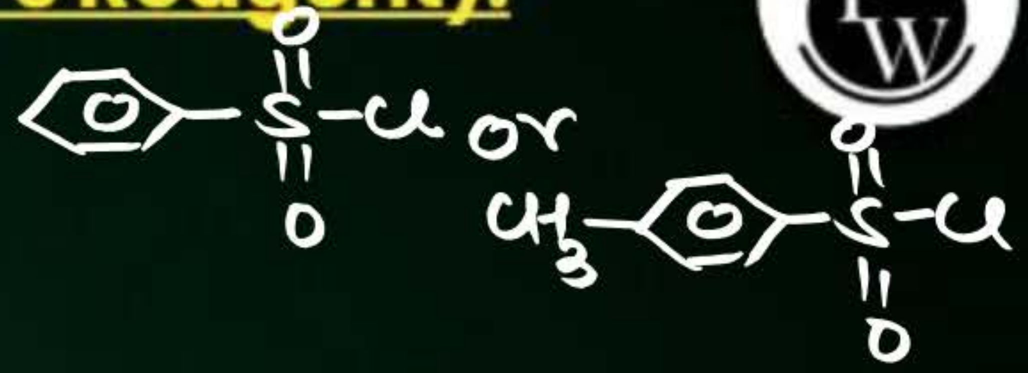
e) Aro 3° amine


R
N
R
NaNO2+HCl
+
NO
R
N
R
NO

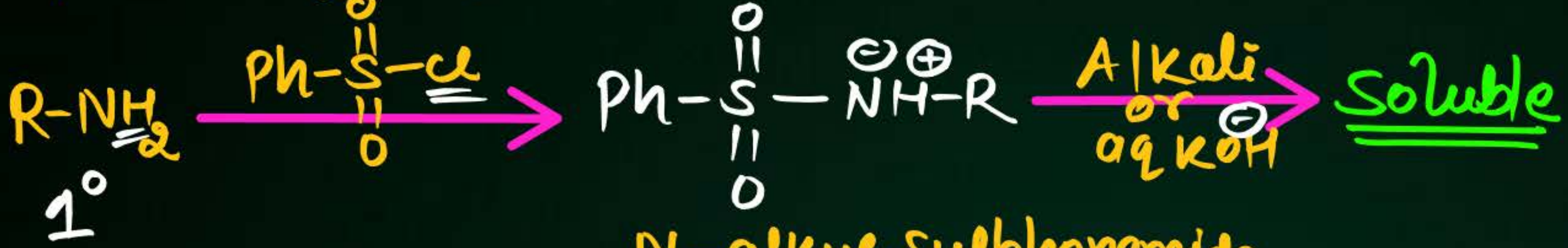
E.S.R

6. Reaction with Aryl sulphonyl chlorides (Hinsberg's Reagent):

For diff of 1°, 2° & 3° amine

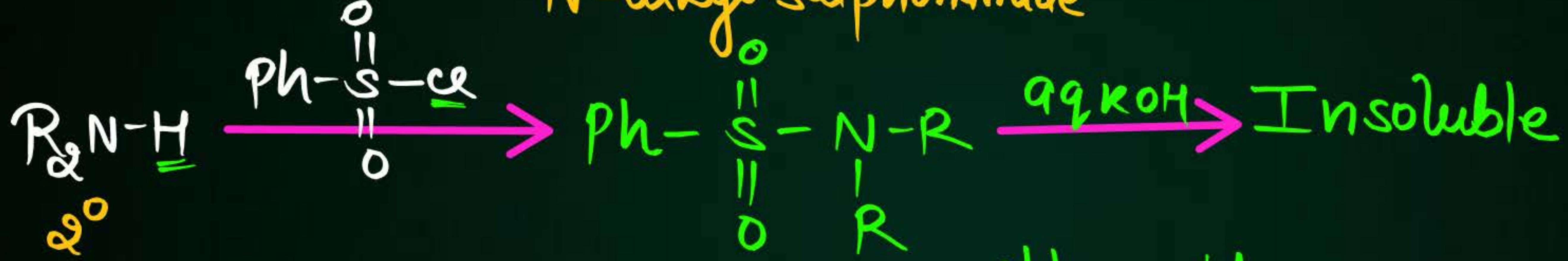


$$C_6H_5-\overset{O}{\overset{\|}{\underset{\underset{O}{\|}}{S}}}-Cl \quad or \quad CH_3-C_6H_4-\overset{O}{\overset{\|}{\underset{\underset{O}{\|}}{S}}}-Cl$$



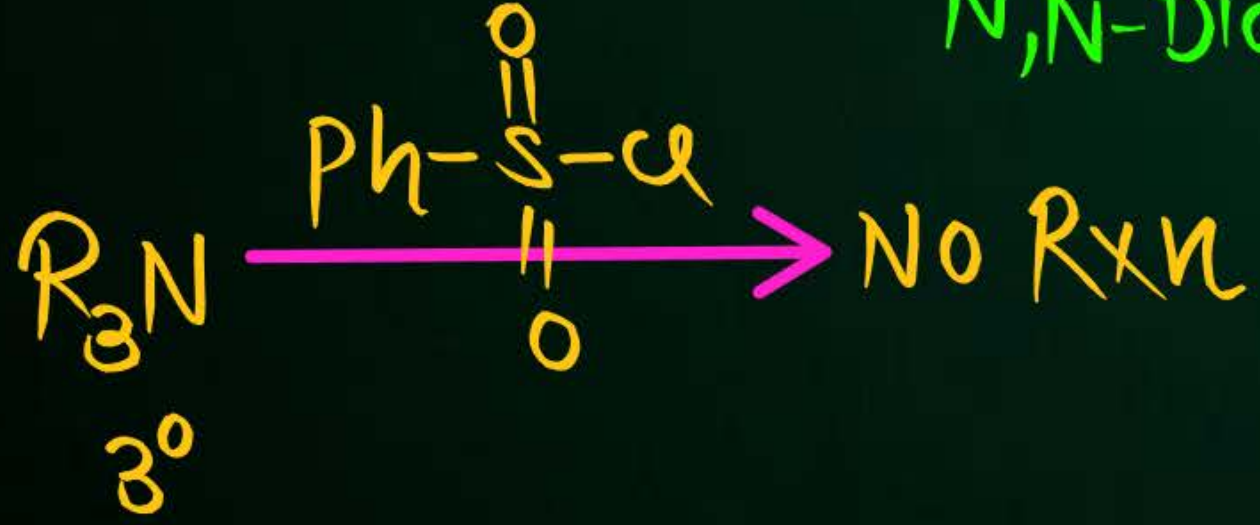
$$\underset{1^\circ}{R-NH_2} \xrightarrow{Ph-\overset{O}{\overset{\|}{\underset{\underset{O}{\|}}{S}}}-Cl} Ph-\overset{O}{\overset{\|}{\underset{\underset{O}{\|}}{S}}}-\overset{\ominus\ \oplus}{NH}-R \xrightarrow[aq\ KOH^{\ominus}]{Alkali\ or} \underline{\underline{Soluble}}$$

N-alkyl sulphonamide



$$\underset{2^\circ}{R_2N-\underline{\underline{H}}} \xrightarrow{Ph-\overset{O}{\overset{\|}{\underset{\underset{O}{\|}}{S}}}-Cl} Ph-\overset{O}{\overset{\|}{\underset{\underset{O}{\|}}{S}}}-\underset{\underset{R}{|}}{N}-R \xrightarrow{aq\ KOH} Insoluble$$

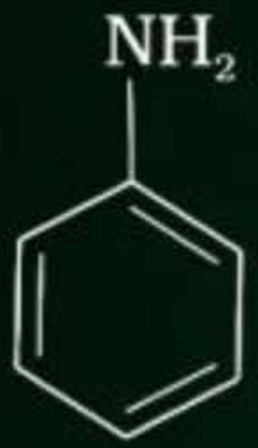
N,N-Dialkyl sulphonamide

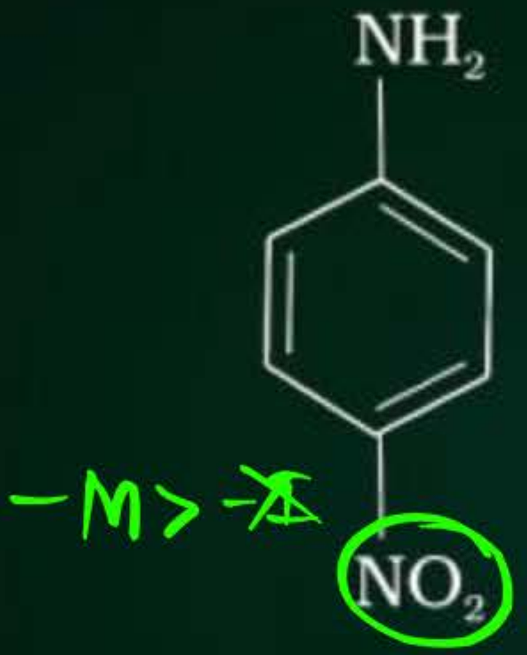


$$\underset{3^\circ}{R_3N} \xrightarrow{Ph-\overset{O}{\overset{\|}{\underset{\underset{O}{\|}}{S}}}-Cl} No\ Rxn$$

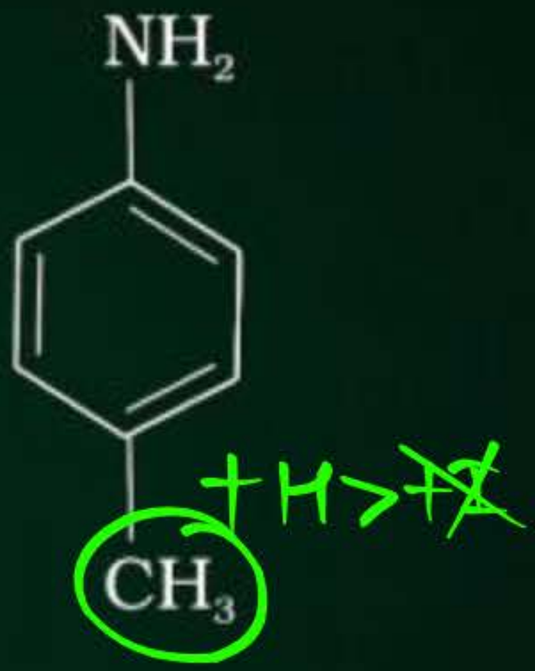
QUESTION (NCERT Exemplar)

The correct increasing order of basic strength for the following compounds is ______.


(I)



(II)



(III)

A II < III < I

B III < I < II

C III < II < I

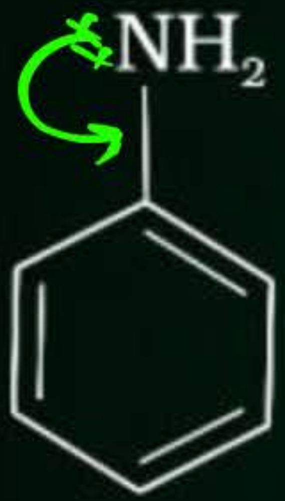
[✓ **D**] II < I < III

QUESTION (NCERT Exemplar)

Among the following amines, the strongest Brönsted base is ________.

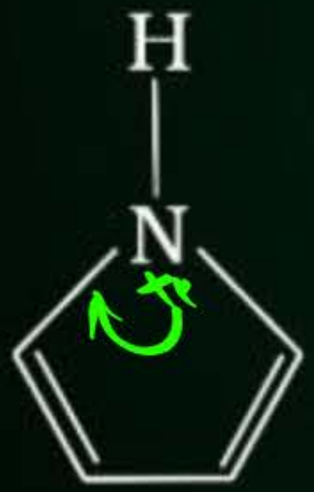
Lewis Base

A

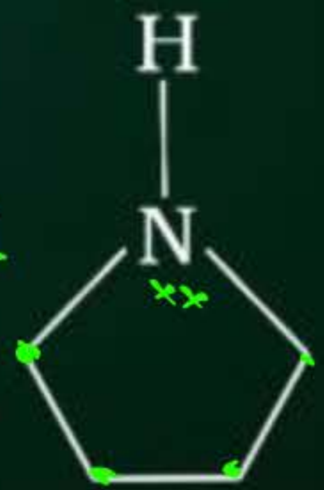


B $\overset{\times\times}{NH_3}$

C



[✓ D] +I



QUESTION (NCERT Exemplar)

Which of the following species are involved in the carbylamine test?

- A RNC
- B $CHCl_3$
- [✓ C] Both (A) & (B)
- D $NaNO_2$ + HCl

QUESTION (NCERT Exemplar)

Match the reactions given in Column I with the statements given in Column II.

Column I	Column II
(i) Ammonolysis ⓓ	(a) Amine with lesser number of carbon atoms.
(ii) Gabriel phthalimide synthesis ⓒ	(b) Detection test for primary amines.
(iii) Hoffmann Bromamide reaction ⓐ	(c) Reaction of phthalimide with KOH and R—X
(iv) Carbylamine reaction ⓑ	(d) Reaction of alkyl halides with NH_3

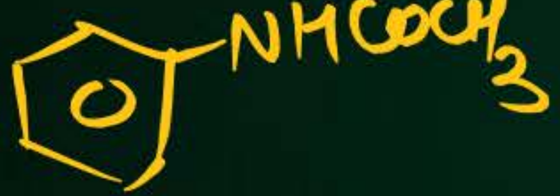
QUESTION (AIIMS 2012)

Consider the following reaction

$$C_6H_5\underline{NO_2} \xrightarrow{Sn/HCl} X \xrightarrow{C_6H_5COCl} Y + HCl$$

What is Y? $C_6H_5-\underline{NH_2}$ $C_6H_5-NH-\overset{O}{\overset{\|}{C}}-C_6H_5$

(A) Acetanilide



(B) Benzanilide ✓

(C) Azobenzene

Ph–N=N–Ph

(D) Aniline

PhNH$_2$

QUESTION (AIIMS 2008)

The compound which gives an oily nitroso amine on reaction with nitrous acid at low temperature is:

A CH_3NH_2 1°

B $(CH_3)_2CHNH_2$ 1°

[✓ C] $CH_3-NH-CH_3$ 2°

D $(CH_3)_3N$ 3°

QUESTION (AIIMS 2001)

Hinsberg's reagent is:

A benzaldehyde

[✓ B] $C_6H_5SO_2Cl$

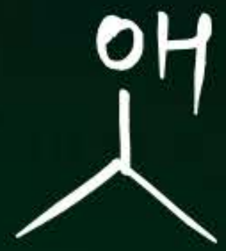
C $C_6H_5SO_2NH_2$

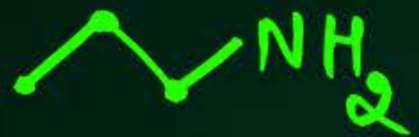
D $CH_3COCH_2COOC_2H_5$

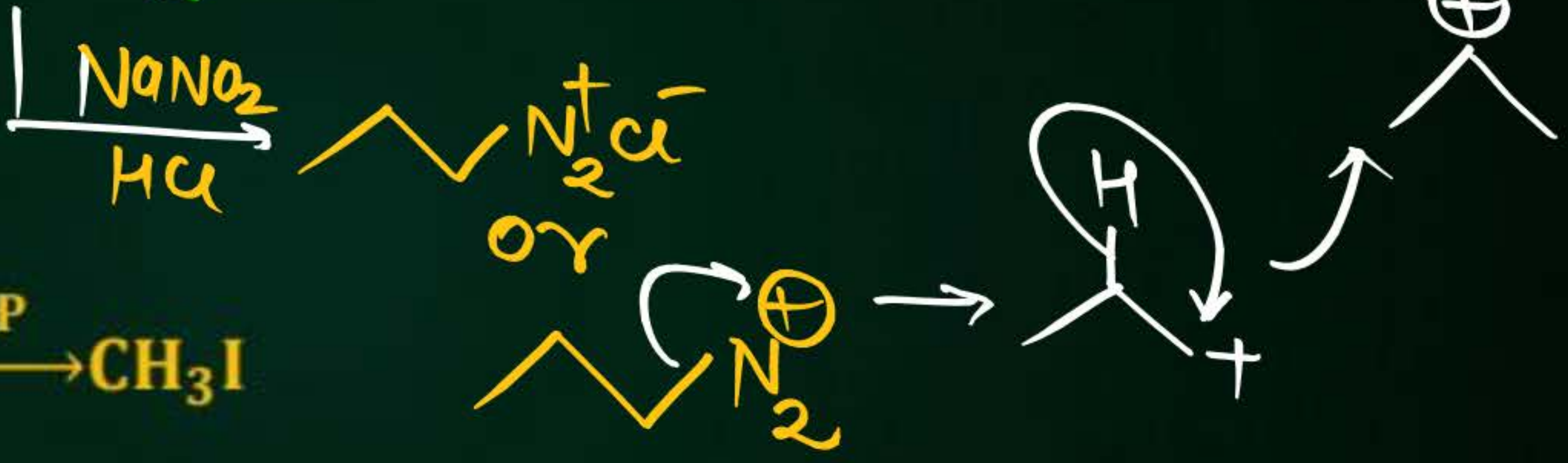
QUESTION

$$CH_3CH_2Cl \xrightarrow{\overset{+\ -}{KCN}} (A) \xrightarrow{\boxed{H_2/Ni}} (B) \xrightarrow{\boxed{HNO_2}} (C)$$

CH_3CH_2CN






NaNO2
HCl
N2+ Cl−
or
⊕
N2
H
+
⊕

$$(A) \xrightarrow[NaOH]{Br_2} (B) \xrightarrow{HNO_2} (C) \xrightarrow[I_2]{Red\ P} CH_3I$$

$CH_3-\overset{O}{\overset{\|}{C}}-NH_2$ CH_3-NH_2 CH_3-OH

QUESTION

The reaction between primary amine, chloroform and few drops of alcoholic KOH is known as: $RNH_2 \longrightarrow RNC$

A Hoffmann's reaction

B Kolbe's reaction

[✓ C] Carbylamine reaction

D Reimer-Tiemann's reaction

QUESTION

Aniline on treatment with nitrous acid ($NaNO_2$ + HCl) at 0°C, forms:

A phenol

B nitrobenzene

C nitrosobenzene

[✓ D] benzene diazonium chloride

QUESTION

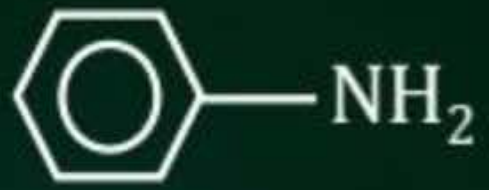
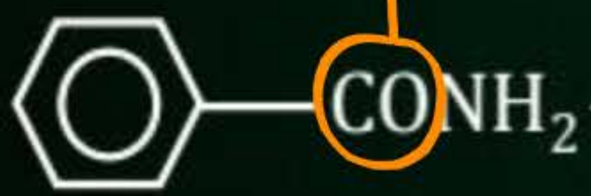
$$\underset{\text{(Amine)}}{\overset{1^\circ}{A}} + \text{Hinsberg Reagent} \longrightarrow B \xrightarrow{\text{aq.KOH}} \underset{\text{(water soluble)}}{C}$$

A and B will be respectively:

- **A** 1° amine and N, N-dialkyl benzene sulphonamide
- [✓ **B**] 1° amine and N-alkyl benzene sulphonamide
- **C** ✗ 2° amine and N, N-dialkyl benzene sulphonamide
- **D** ✗ Both (A) and (C)

QUESTION

Match the List-I with List-II and pick the correct matching from the codes give below:

List I (Reactants)	List II (Products)
A. $RX + KCN \xrightarrow{ethanol}$ ②	1. 
B. $RX + CH_3CO\overset{-}{O}\overset{+}{Ag} \longrightarrow$ ③	2. RCN
C. $CH_3\overset{H\,H}{C}\equiv\overset{H\,H}{N} \xrightarrow{LiAlH_4}$ ④	3. CH_3COOR
D.  $\xrightarrow[\text{degradation}]{\text{Hofmann's}}$ ①	4. $CH_3CH_2NH_2$
E. $R-NH_2 \xrightarrow[\text{reaction } CH_3/KOH]{\text{Carbylamine}}$ RNC ⑤	5. RNC

Code:

Ⓐ A – 3, B–1, C–2, D–5, E–4

[✓ Ⓑ A – 2, B–3, C–4, D–1, E–5]

Ⓒ A – 3, B–2, C–1, D–5, E–4

Ⓓ A – 5, B–3, C–2, D–4, E–1

QUESTION

Which of the following is obtained in carbylamine reaction?

A $C_2H_5NH_2$

B $COCl_2$

C C_6H_5CN

[✓ D] C_6H_5NC isocyanide Test

QUESTION

Hinsberg's reagent is used to distinguish between

A 1° and 2° amine

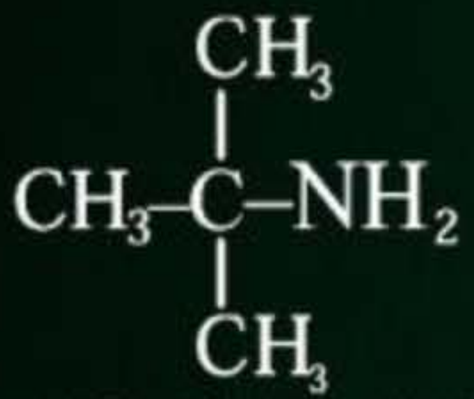
B 2° and 3° amine

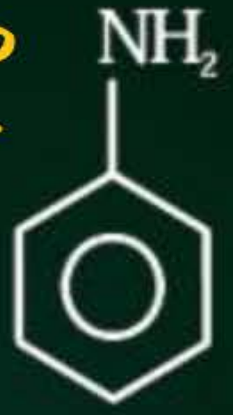
C 1° and 3° amine

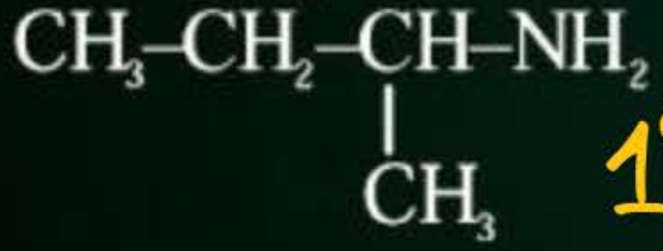
[✓ D All of these]

QUESTION

Which of the following will not give carbylamines reaction?

(A)

$CH_3-\underset{CH_3}{\overset{CH_3}{C}}-NH_2$ 1°

(B) 1°


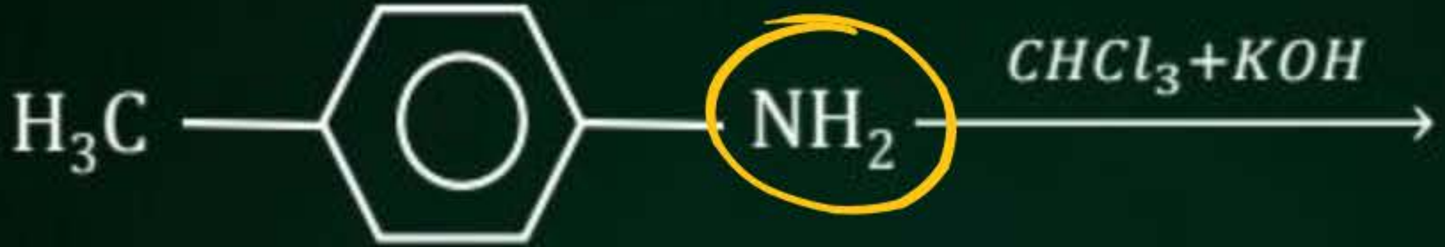
(C)

$CH_3-CH_2-\underset{CH_3}{CH}-NH_2$ 1°

[✓ D] CH_3-CONH_2

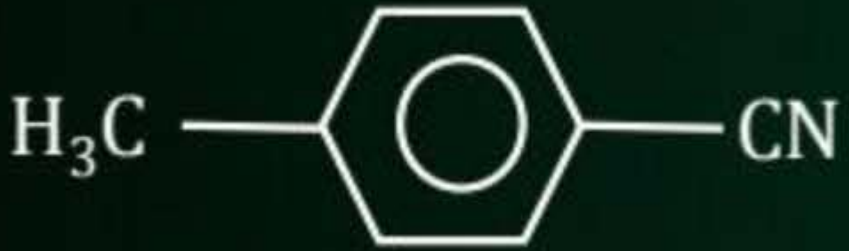
amide

QUESTION

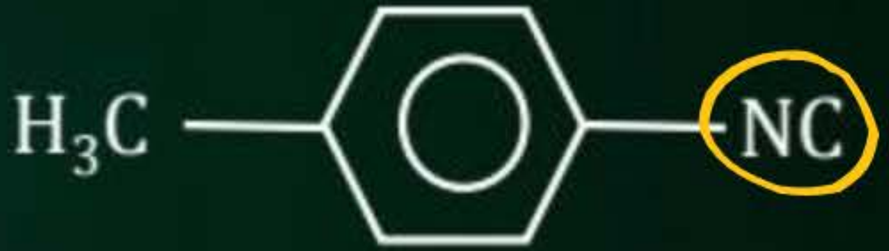
Which of the following products will form by following reaction?


H_3C
NH_2
$CHCl_3 + KOH$

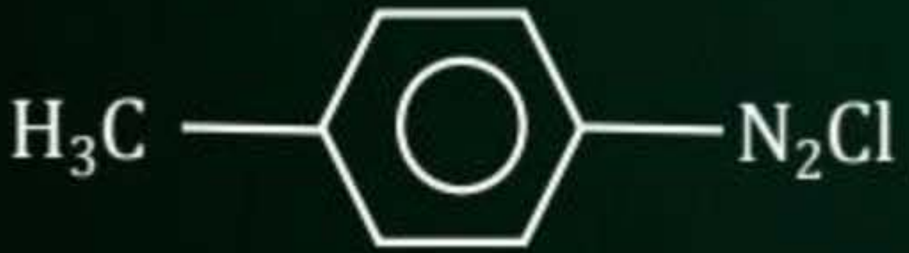
A



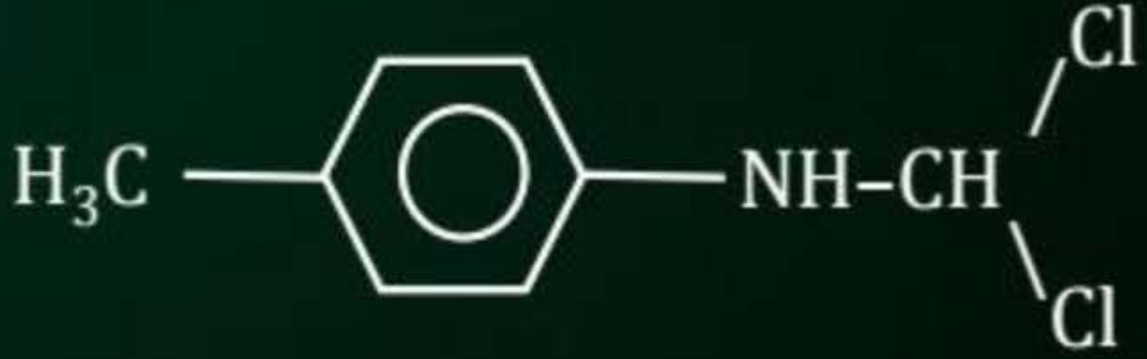
[✓ B]



C



D


H_3C
NH–CH
Cl
Cl

QUESTION

Match the column:

Column – I		Column - II	
(A)	Lucas Test Ⓣ	(P)	NaOI
(B)	Haloform Test Ⓟ	(Q)	$\overset{+2}{Cu}SO_4$ and Potassium, Sodium Tartrate
(C)	Isocyanide Ⓢ Test	(R)	$\left[Ag(NH_3)_2\right]^{\text{Å}}\ \bar{O}$
(D)	Tollen's Test Ⓡ	(S)	$CHBr_3/KOH$
(E)	Fehling Test Ⓠ	(T)	$\underbrace{HCl/ZnCl_2}_{}$

Home Work

QUESTION 01

Assertion: Amines are basic in nature.

Reason: Amines have lone pair of electrons on nitrogen atom.

- A If both Assertion and Reason are correct and the Reason is a correct explanation of the Assertion.
- B If both Assertion and reason are correct but Reason is not a correct explanation of the Assertion.
- C If the Assertion is correct but Reason is incorrect.
- D If both the Assertion and Reason are incorrect.

QUESTION 02

The end product of the reaction,

Ethylamine $\xrightarrow{HNO_2}$ (A) $\xrightarrow{PCl_5}$ (B) $\xrightarrow{KCN}$ (C), is:

- (A) propane nitrile
- (B) triethylamine
- (C) diethylamine
- (D) propylamine

QUESTION 03

Which of the following reagents can be used to prepare ethyl carbylamine from ethyl iodide?

- (A) KCN
- (B) AgCN
- (C) CuCN
- (D) HCN

QUESTION 04

Ethylamine reacts with nitrous acid to form:

- (A) methyl alcohol
- (B) ethyl alcohol
- (C) ethane
- (D) ethyl nitrite

QUESTION 05

Hinsberg's reagent is:

Ⓐ benzene sulphonamide

Ⓑ benzene sulphonic acid

Ⓒ benzene sulphuryl chloride

Ⓓ benzene sulphonyl chloride

QUESTION 06

The positive carbylamine test is not given by

Ⓐ aniline

Ⓑ 2, 4-dimethyl aniline

Ⓒ N–methyl-0-methylaniline

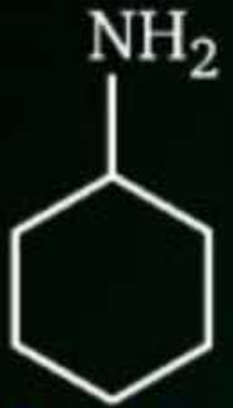
Ⓓ p-methyl benzylamine

QUESTION 07

Which of the following is incorrect for primary amines?

- A On reaction with nitrous acid alkylamines produce alcohol.
- B On reaction with nitrous acid arylamines produce phenol.
- C Alkylamines are more basic than ammonia.
- D Alkylamines are more basic than arylamines.

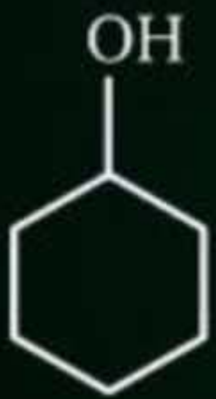
QUESTION 08



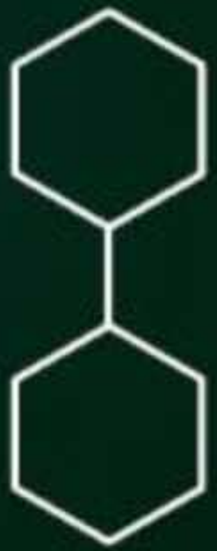
$\xrightarrow{HNO_2}$ A (Major) :

Product (A) is:

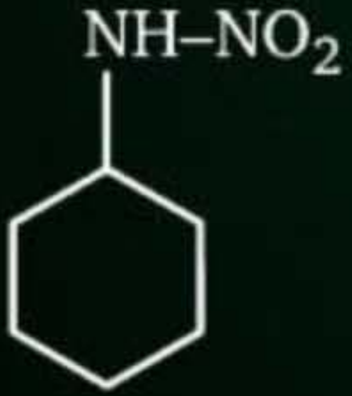
A



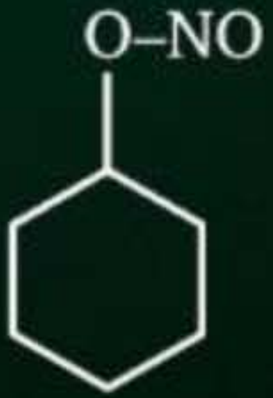
B



C

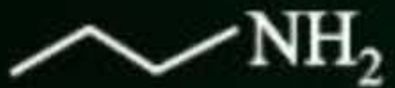


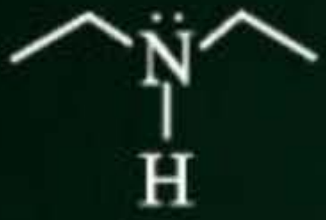
D

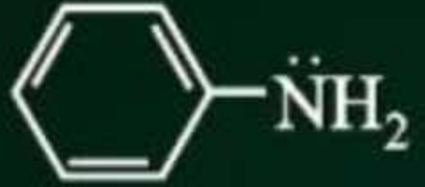


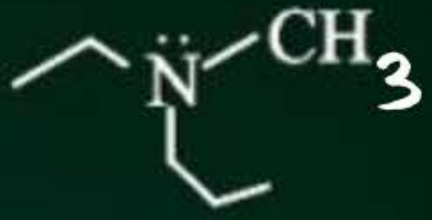
QUESTION 09

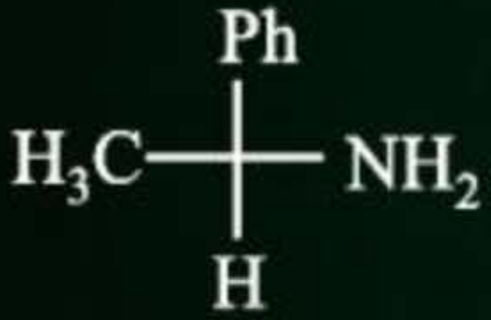
Out of the following amines how many amines can give carbylamine reaction?

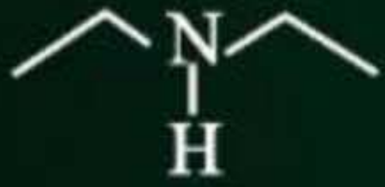












QUESTION 10

$C_2H_5NH_2 \xrightarrow{HNO_2} A \xrightarrow{PCl_3} B \xrightarrow{NH_3} C$ Recognize the compound C from the following:

- A propanenitrile
- B methylamine
- C ethylamine
- D acetamide

ANSWER KEY

1. A
2. A
3. B
4. B
5. D
6. C
7. B
8. A
9. 3
10. C

Home Work From PW Module (Yakeen NEET)

Prarambh: Q 15, 16, 17, 18, 21, 23, 24, 25, 26, 27, 30, 31, 37

Prabal: Q 13, 15, 21

Parikshit: Q 01, 08, 26, 27, 28

PANKAJ SIR
JOIN MY OFFICIAL TELEGRAM CHANNEL
@PSCAA
PhysicsWallah
अनुगच्छतु प्रवाहं

Thank you!!

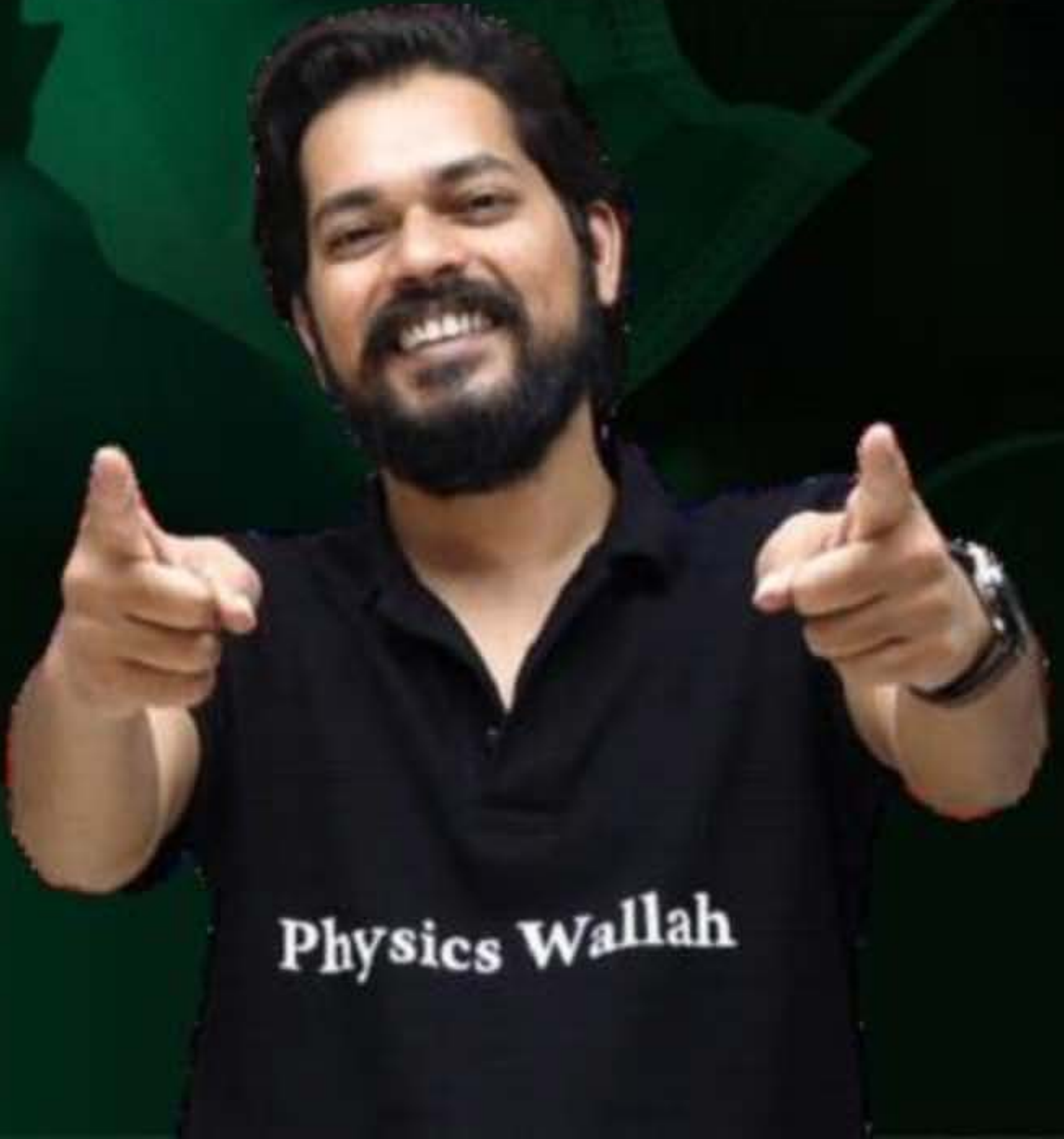
YAKEEN 2.0

FOR NEET 2025

Lecture- 04 | **Organic Chemistry**

Amines

By- Pankaj Sir(POPU MAMA)


Physics Wallah

Topics *to be covered*

1. Electrophilic Substitution Reactions of Aniline ✓
2. Diazonium Salts ✓
3. Practice ✓
4. NEET/AIPMT & JEE Mains PYQs ✓

Electrophilic Substitution Reactions of Aniline

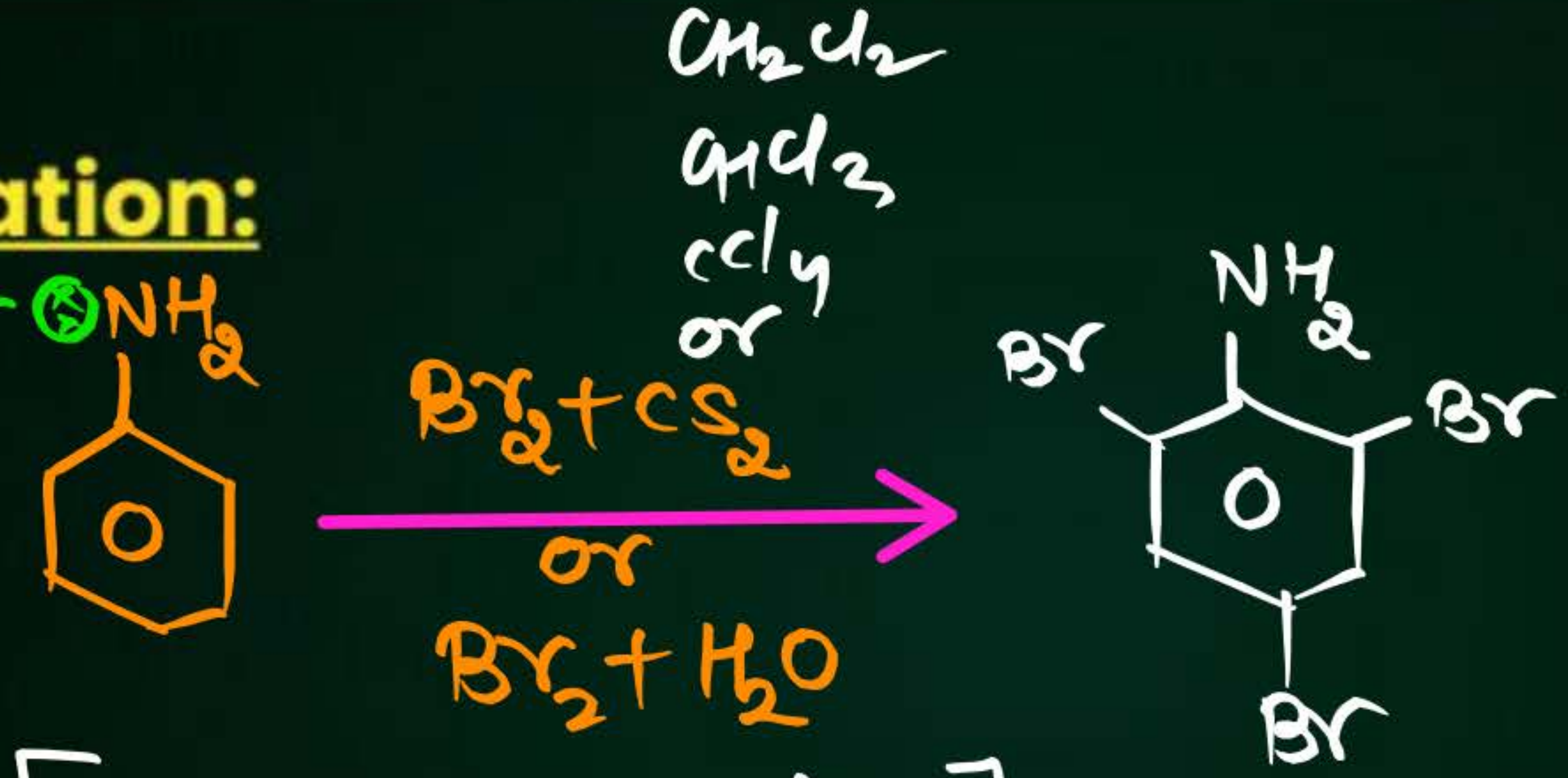
+M power

$-NH_2 > -OH$

A. Bromination:

+M ←

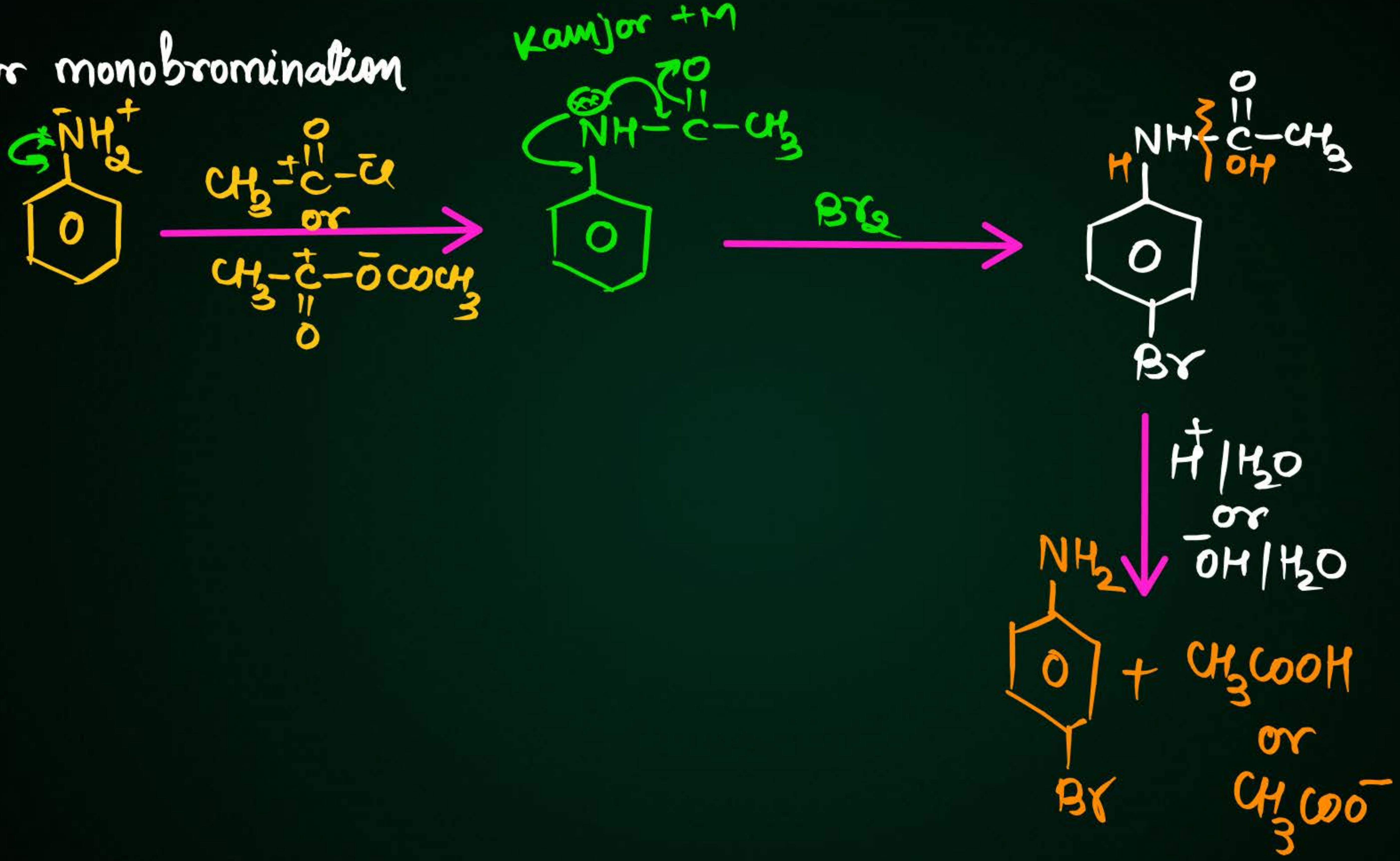
Bhayankar ke Papa



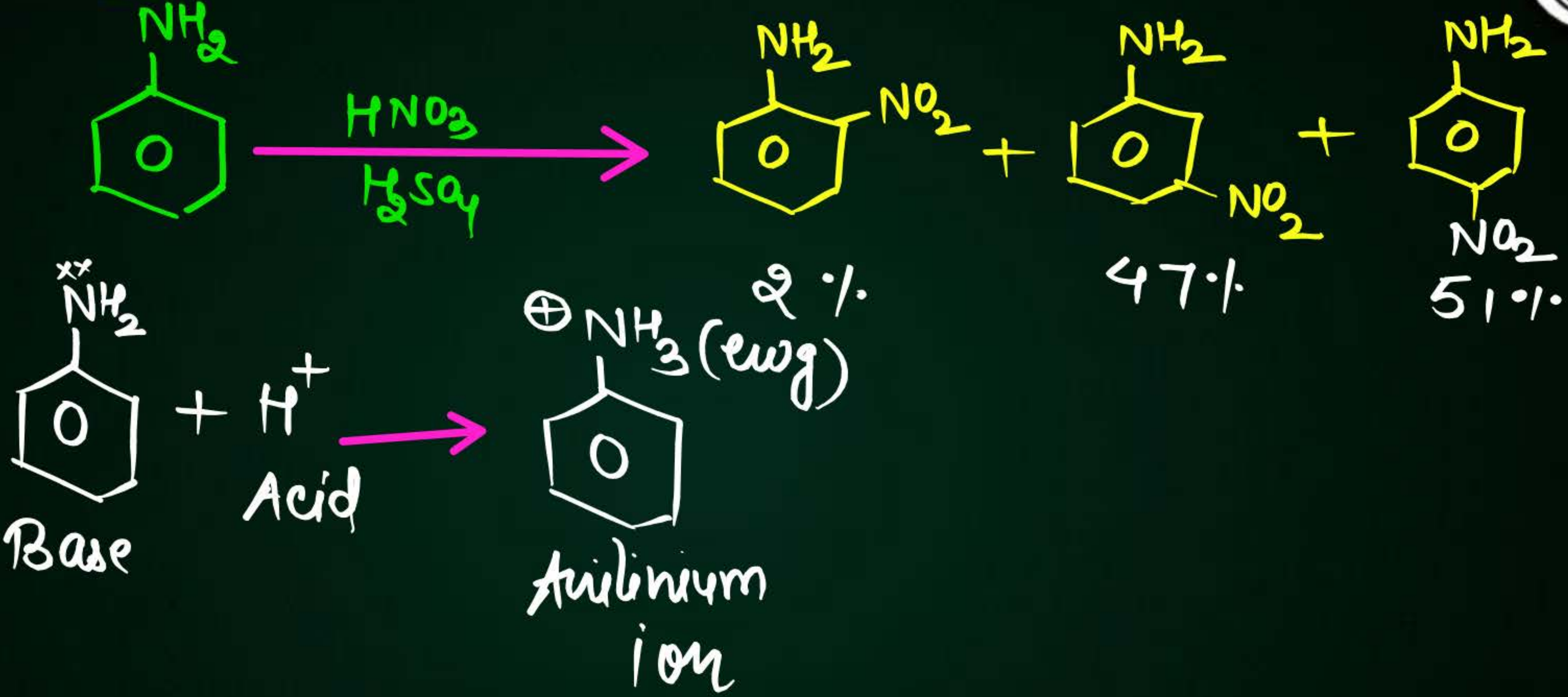
CH_2Cl_2
$CHCl_3$
CCl_4
or
$Br_2 + CS_2$
or
$Br_2 + H_2O$
NH_2
NH_2
Br
Br
Br

[Always tribromination]

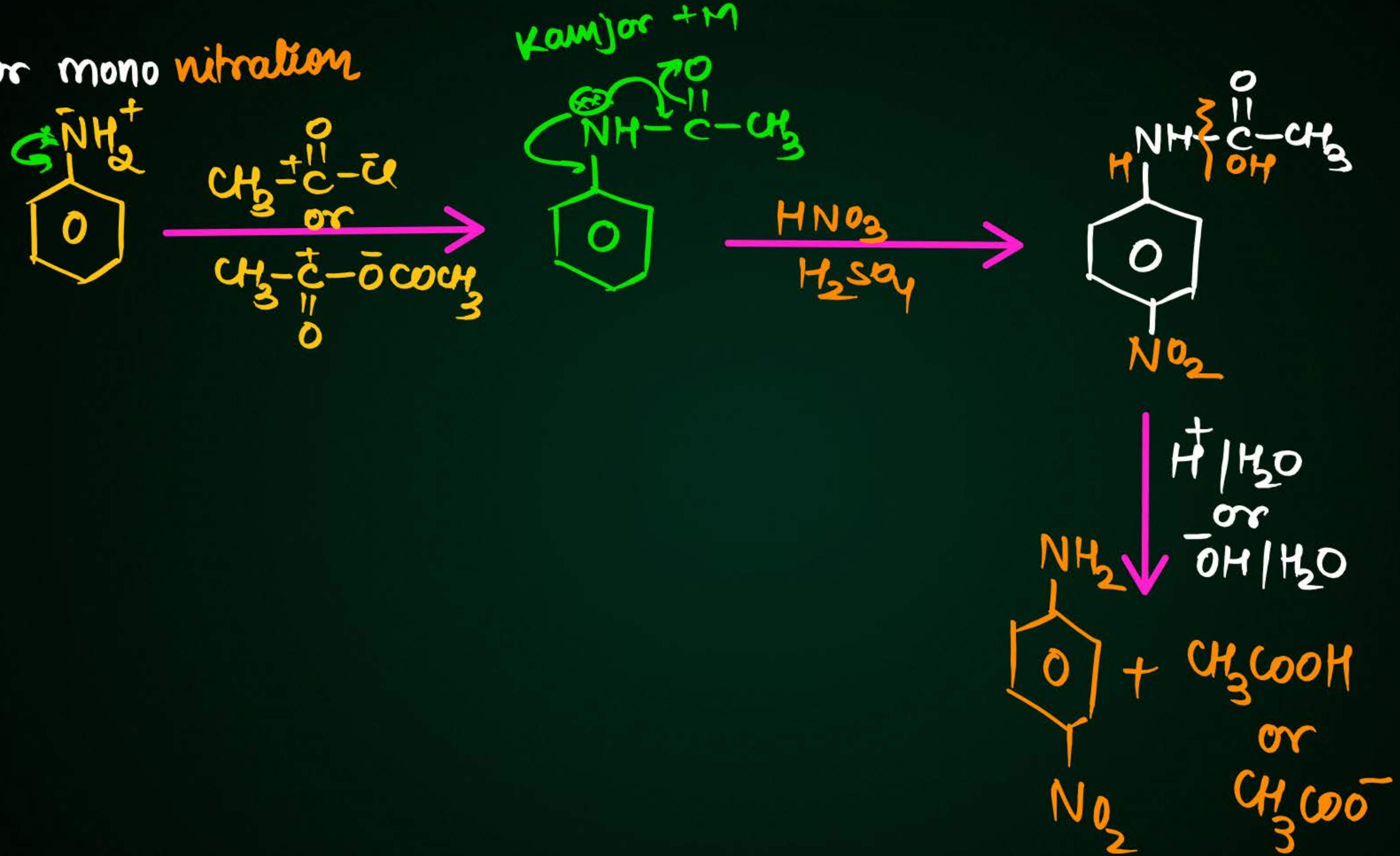
For monobromination


Kamjor +M
$\bar{N}H_2^+$
$CH_3-\overset{+}{C}(=O)-\bar{Cl}$
or
$CH_3-\overset{+}{C}(=O)-\bar{O}COCH_3$
NH–C(=O)–CH_3
Br_2
H NH–C(=O)–CH_3 OH
Br
$\overset{+}{H}/H_2O$
or
$\bar{O}H/H_2O$
NH_2
Br
+ CH_3COOH
or
CH_3COO^-

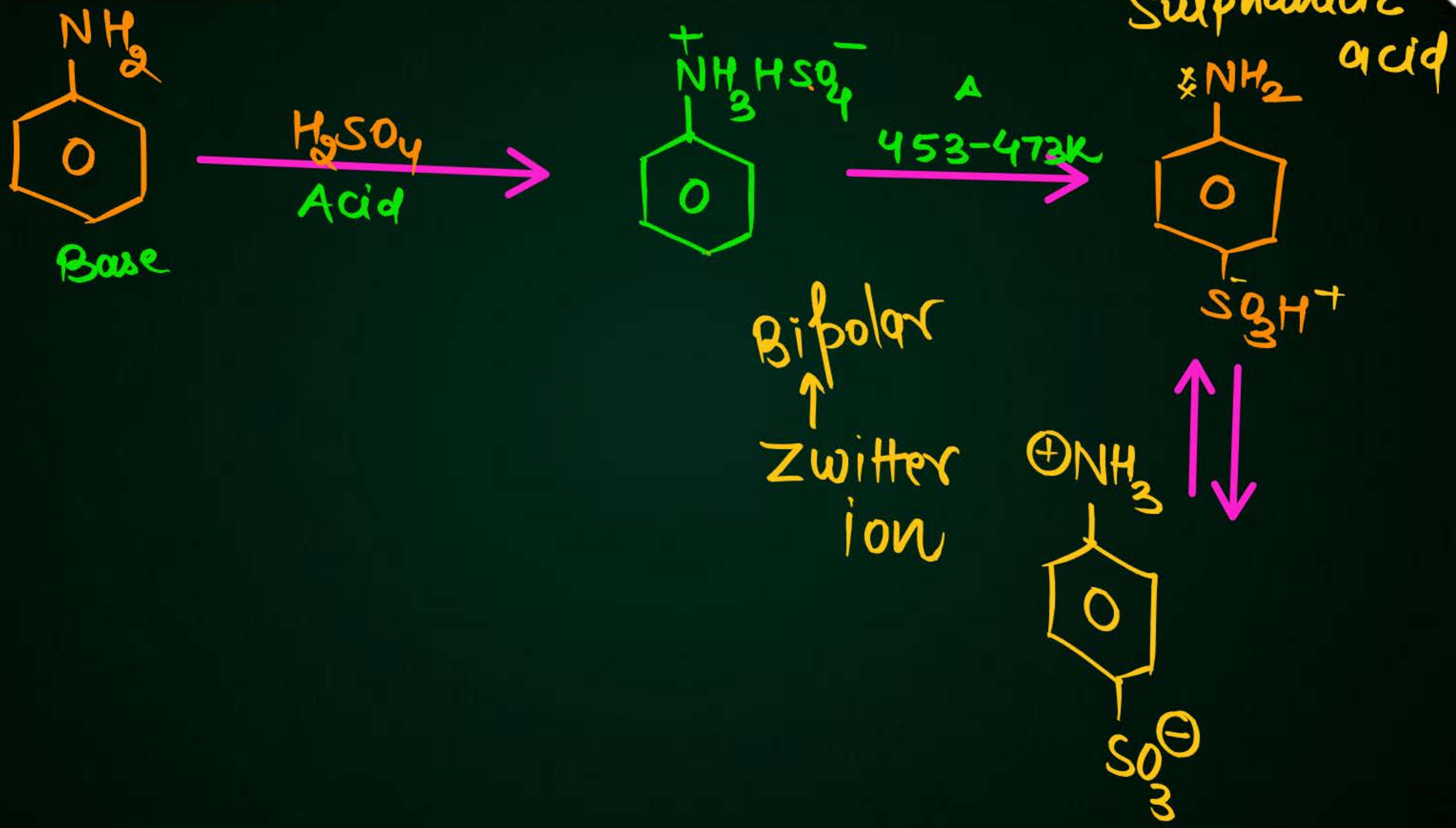
B. Nitration:


NH_2
HNO_3
H_2SO_4
NH_2
NO_2
2%
NH_2
NO_2
47%
NH_2
NO_2
51%
$\ddot{N}H_2$
Base
H^+
Acid
$\oplus NH_3$ (ewg)
Anilinium ion

For mono nitration


Kamjor +M
NH2
CH3-C(=O)-Cl
or
CH3-C(=O)-O-COCH3
NH-C(=O)-CH3
HNO3
H2SO4
NH-C(=O)-CH3
OH
NO2
H+ / H2O
or
-OH / H2O
NH2
NO2
+ CH3COOH
or
CH3COO-

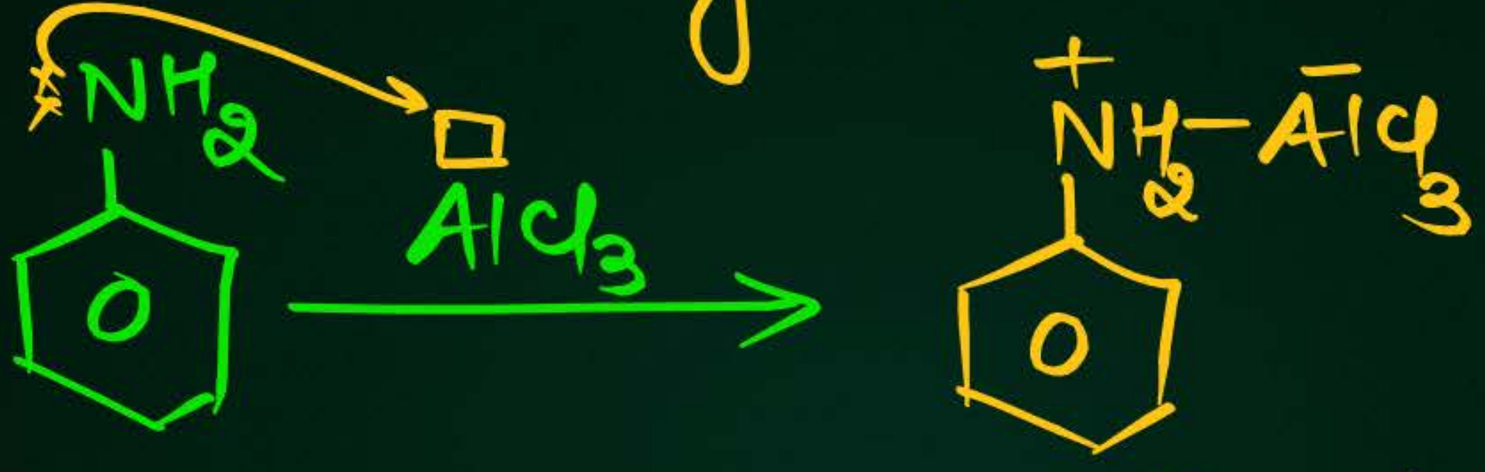
C. Sulphonation:



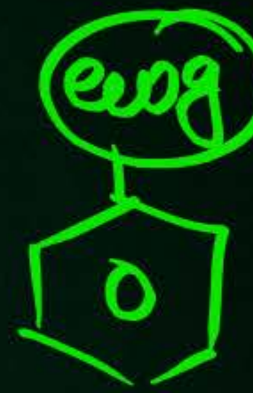
NH_2
Base
H_2SO_4
Acid
$\overset{+}{N}H_3HSO_4^-$
Δ
453-473K
Sulphanilic acid
NH_2
$SO_3^-H^+$
Bipolar
↑
Zwitter ion
$\oplus NH_3$
$SO_3^{\ominus}$

op point

Aniline does not undergo Freidel craft rxns


NH2
AlCl3
+NH2–AlCl3 −

Deactivator



NO FCR

for exp

$\underbrace{\text{nitrobenzene}}$

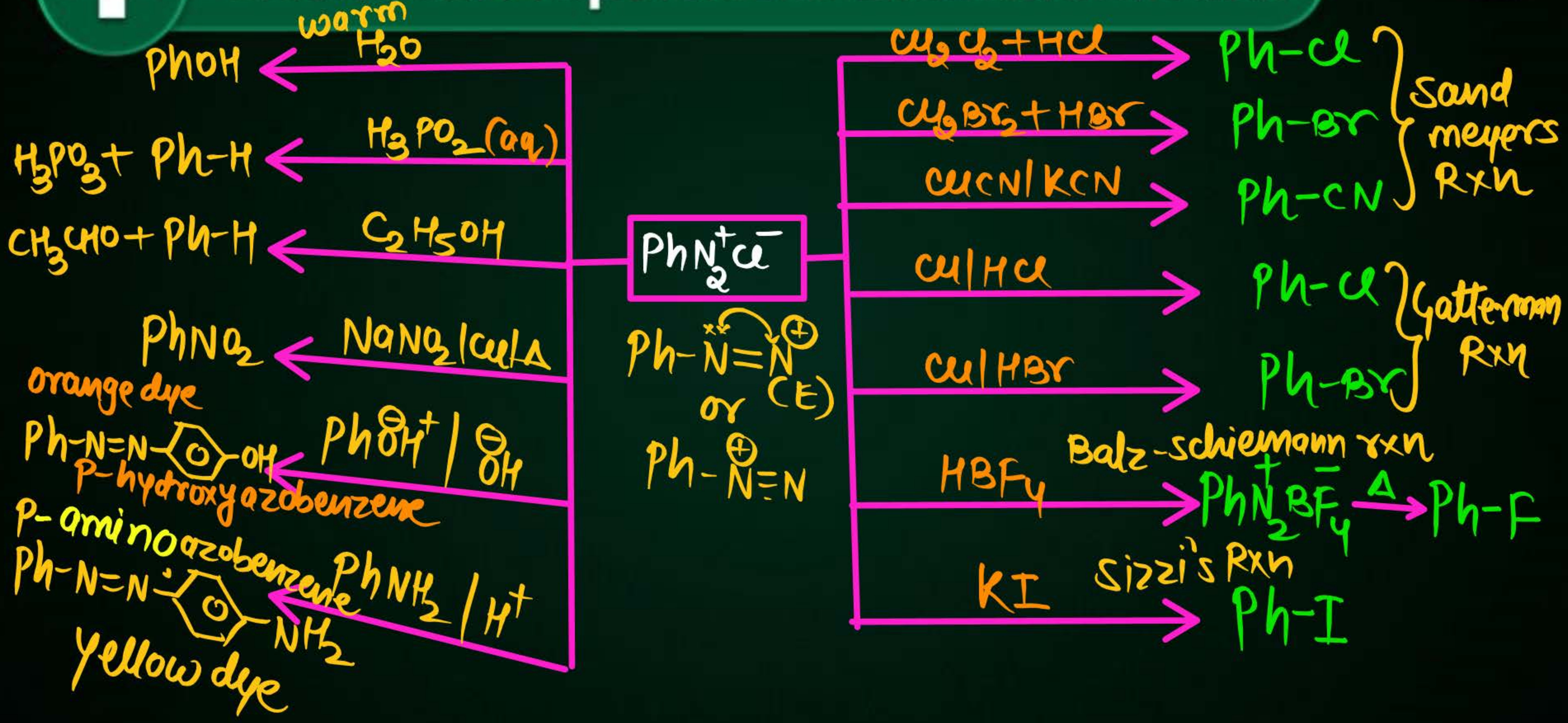
NO_2 group deact.

Methods of Preparation of Diazonium salts

$$Ph-NH_2 \xrightarrow[0-5^\circ C]{NaNO_2 + HCl} Ph-N_2^+Cl^-$$

[Sabse jyada imp. chart]

Chemical Properties of Diazonium salts



$PhN_2^+Cl^-$

$Ph-\overset{\cdot\cdot}{N}=\overset{\oplus}{N}$ (E)

or

$Ph-\overset{\oplus}{N}\equiv N$

$$PhOH \xleftarrow{\text{warm } H_2O} PhN_2^+Cl^-$$

$$H_3PO_3 + Ph-H \xleftarrow{H_3PO_2(aq)} PhN_2^+Cl^-$$

$$CH_3CHO + Ph-H \xleftarrow{C_2H_5OH} PhN_2^+Cl^-$$

$$PhNO_2 \xleftarrow{NaNO_2/Cu/\Delta} PhN_2^+Cl^-$$

orange dye

$$Ph-N=N-C_6H_4-OH \xleftarrow{Ph\overset{\ominus}{O}H^+ \mid \overset{\ominus}{O}H} PhN_2^+Cl^-$$

p-hydroxyazobenzene

p-aminoazobenzene

$$Ph-N=N-C_6H_4-NH_2 \xleftarrow{PhNH_2 \mid H^+} PhN_2^+Cl^-$$

yellow dye

$$PhN_2^+Cl^- \xrightarrow{Cu_2Cl_2 + HCl} Ph-Cl$$

$$PhN_2^+Cl^- \xrightarrow{Cu_2Br_2 + HBr} Ph-Br$$

$$PhN_2^+Cl^- \xrightarrow{CuCN/KCN} Ph-CN$$

Sandmeyers Rxn

$$PhN_2^+Cl^- \xrightarrow{Cu/HCl} Ph-Cl$$

$$PhN_2^+Cl^- \xrightarrow{Cu/HBr} Ph-Br$$

Gattermann Rxn

Balz-schiemann rxn

$$PhN_2^+Cl^- \xrightarrow{HBF_4} Ph\overset{+}{N_2}\overset{-}{B}F_4 \xrightarrow{\Delta} Ph-F$$

Sizzi's Rxn

$$PhN_2^+Cl^- \xrightarrow{KI} Ph-I$$

QUESTION (NCERT Exemplar)

Under which of the following reaction conditions, aniline gives p-nitro derivative as the major product?

$CH_3\overset{+}{-}\overset{O}{\overset{\|}{C}}-\overset{-}{Cl}$ $Ph-NH_2 \longrightarrow Ph-NH-\overset{O}{\overset{\|}{C}}-CH_3$

(A) Acetyl chloride/pyridine followed by reaction with conc. H_2SO_4 + conc. HNO_3.

(B) Acetic anhydride/pyridine followed by conc. H_2SO_4 + conc. HNO_3.

$CH_3\overset{+}{-}\overset{O}{\overset{\|}{C}}-\overset{-}{O}COCH_3$

(C) Dil. HCl followed by reaction with conc. H_2SO_4 + conc. HNO_3.

(D) Both (A) & (B) ✓

QUESTION (NCERT Exemplar)

The reaction $Ar\overset{+}{N}_2Cl^- \xrightarrow{\overset{\circ}{\mathrm{Cu}}/\mathrm{HCl}} ArCl + N_2 + CuCl$ is named as ______.

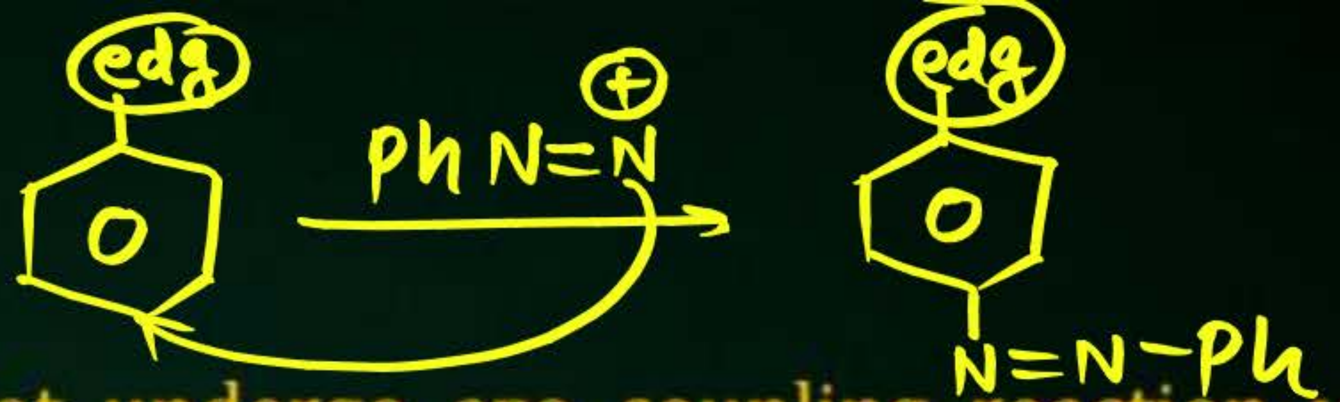
A Sandmeyer reaction

[✓ B] Gatterman reaction

C Claisen reaction

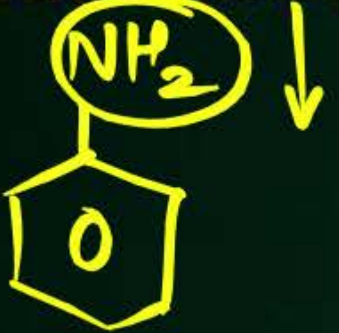
D Carbylamine reaction

QUESTION (NCERT Exemplar)


edg
Ph N=N⁺
edg
N=N-Ph

Which of the following compound will not undergo azo coupling reaction with benzene diazonium chloride?

A Aniline



B Phenol

C Anisole

[✓ **D**] Nitrobenzene

QUESTION (NCERT Exemplar)

Which of the following cannot be prepared by Sandmeyer's reaction?

- A Chlorobenzene
- B Fluorobenzene
- C Iodobenzene
- [✓ D Both (B) & (C)]

QUESTION (NCERT Exemplar)

The reagents that can be used to convert benzenediazonium chloride to benzene are ________.

$PhN_2^+Cl^- \longrightarrow Ph-\textcircled{H}$

A $SnCl_2/HCl$

B $\underline{CH_3CH_2OH}$

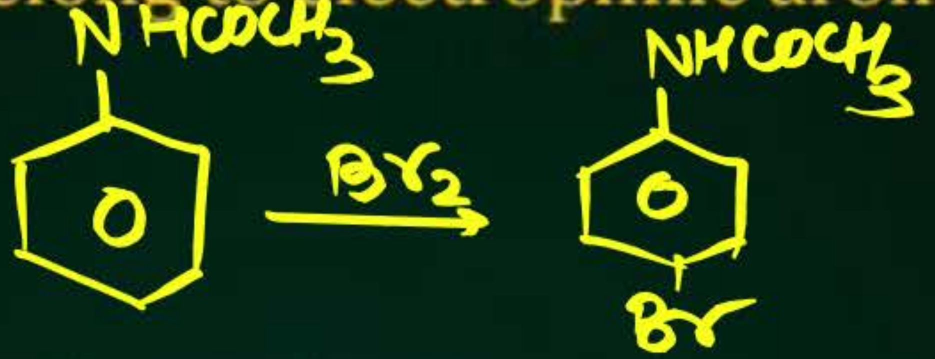
C $\underline{H_3PO_2}$

[✓ D Both (B) & (C)]

QUESTION (NCERT Exemplar)

Which of the following reactions belong to electrophilic aromatic substitution?

A Bromination of acetanilide


NHCOCH3
Br2
NHCOCH3
Br

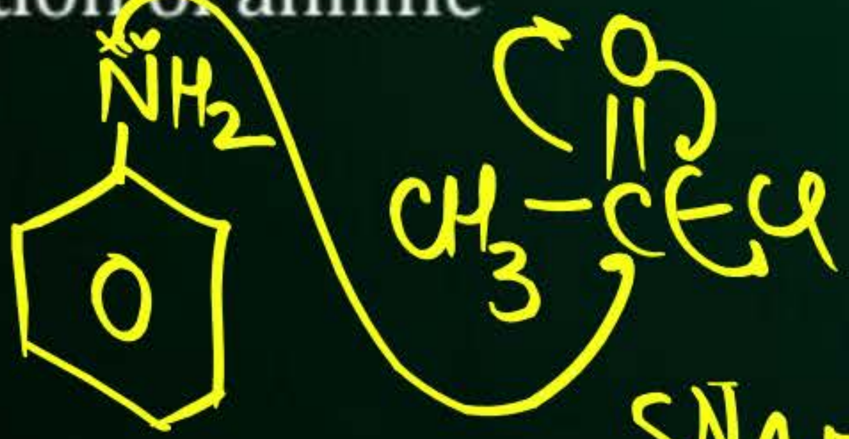
E.A.S
E.S.R

B Coupling reaction of aryldiazonium salts

$Ph-N\equiv N^{\oplus}$
Ⓔ

[✓ **C**] Both (A) & (B)

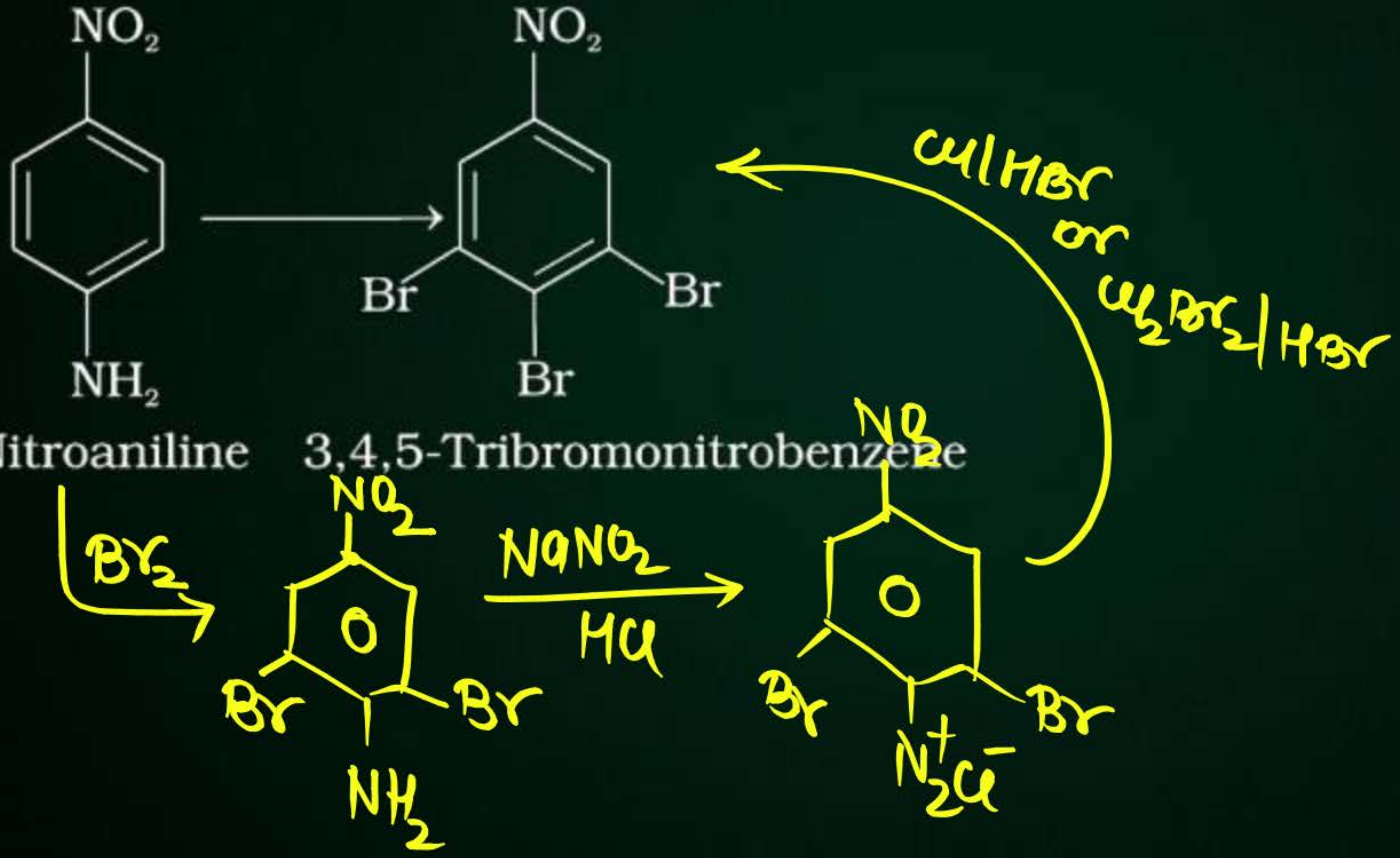
D Acylation of aniline


NH2
O
CH3-C-Cl

SNAE

QUESTION (NCERT Exemplar)

How will you bring out the following conversion?



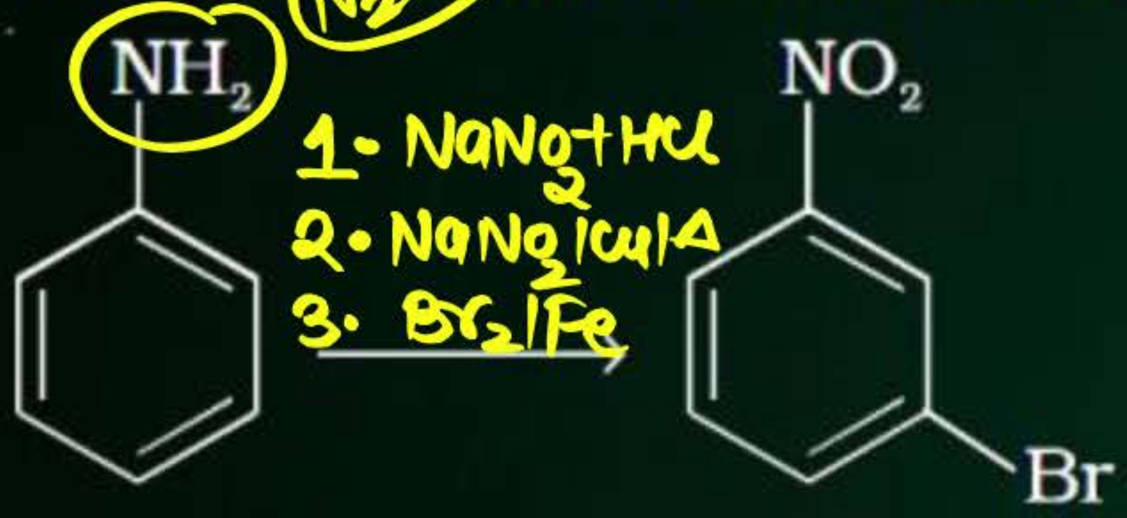
NO_2
NH_2
NO_2
Br
Br
Br
Cu/HBr or Cu_2Br_2/HBr
Br_2
NO_2
Br
Br
NH_2
$NaNO_2$
HCl
NO_2
Br
Br
$N_2^+Cl^-$

p-Nitroaniline 3,4,5-Tribromonitrobenzene

QUESTION (NCERT Exemplar)

How will you carry out the following conversion?

$N_2^+Cl^-$ NO_2



NH_2
1. $NaNO_2 + HCl$
2. $NaNO_2 / Cu / \Delta$
3. Br_2 / Fe
NO_2
Br

QUESTION (NCERT Exercise)

Give the structures of A, B and C in the following reactions:

(i) $CH_3CH_2I \xrightarrow{NaCN} A \xrightarrow[\text{Partial hydrolysis}]{OH^-} B \xrightarrow{NaOH+Br_2} C$

(ii) $C_6H_5N_2Cl \xrightarrow{CuCN} A \xrightarrow{H_2O/H^+} B \xrightarrow[\Delta]{NH_3} C$

(iii) $CH_3CH_2Br \xrightarrow{KCN} A \xrightarrow{LiAlH_4} B \xrightarrow[0^\circ C]{HNO_2} C$

(iv) $C_6H_5NO_2 \xrightarrow{Fe/HCl} A \xrightarrow[273\,K]{NaNO_2+HCl} B \xrightarrow[\Delta]{H_2O/H^+} C$

(v) $CH_3COOH \xrightarrow[\Delta]{NH_3} A \xrightarrow{NaOBr} B \xrightarrow{NaNO_2/HCl} C$

(vi) $C_6H_5NO_2 \xrightarrow{Fe/HCl} A \xrightarrow[273\,K]{HNO_2} B \xrightarrow{C_6H_5OH} C$

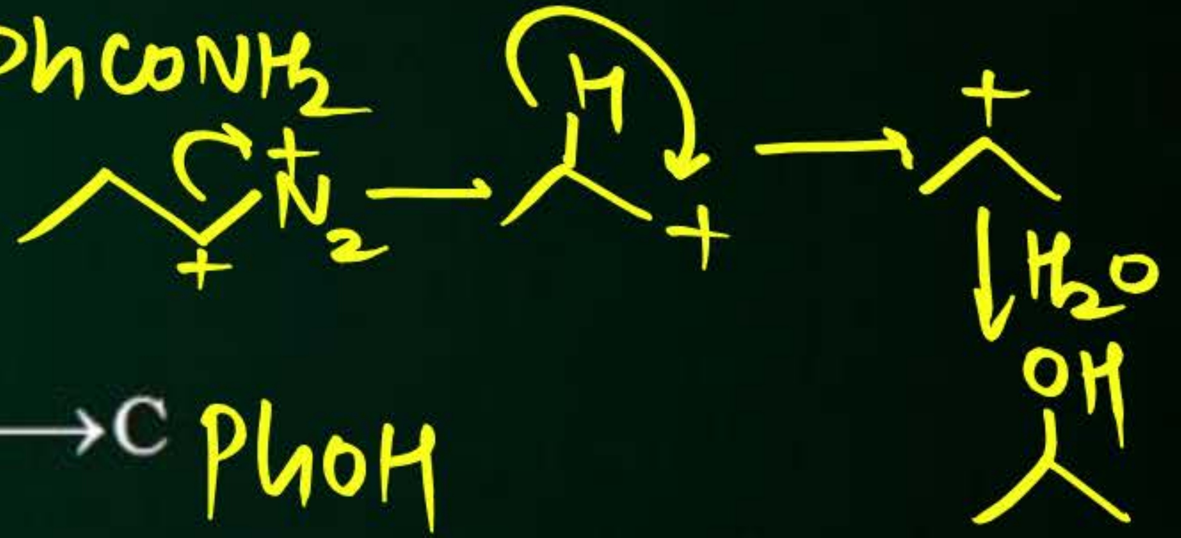
QUESTION (NCERT Exercise)

Give the structures of A, B and C in the following reactions:

(i) $CH_3CH_2I \xrightarrow[SN^2]{\overset{+}{Na}\overset{-}{CN}} \underset{EtCN}{A} \xrightarrow[\text{Partial hydrolysis}]{OH^-} \underset{Et-\overset{\overset{O}{\|}}{C}-NH_2}{B} \xrightarrow{NaOH+Br_2} C$ $Et-NH_2$

(ii) $C_6H_5N_2Cl \xrightarrow{\boxed{CuCN}} \underset{PhCN}{A} \xrightarrow{H_2O/H^+} \underset{PhCOOH}{B} \xrightarrow[\Delta]{NH_3} C$ $PhCONH_2$

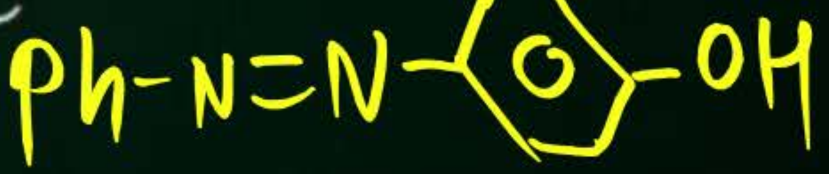
(iii) $CH_3CH_2Br \xrightarrow{KCN} \underset{Et-CN}{A} \xrightarrow{LiAlH_4} \underset{Et-CH_2-NH_2}{B} \xrightarrow[0°C]{HNO_2} C$



(iv) $C_6H_5NO_2 \xrightarrow{Fe/HCl} \underset{PhNH_2}{A} \xrightarrow[273\,K]{NaNO_2+HCl} \underset{PhN_2^+Cl^-}{B} \xrightarrow[\Delta]{H_2O/H^+} C$ $PhOH$

(v) $CH_3COOH \xrightarrow[\Delta]{NH_3} \underset{CH_3CONH_2}{A} \xrightarrow{NaOBr} \underset{CH_3NH_2}{B} \xrightarrow{NaNO_2\,/\,HCl} C$ CH_3-OH

(vi) $C_6H_5NO_2 \xrightarrow{Fe/HCl} \underset{PhNH_2}{A} \xrightarrow[273\,K]{HNO_2} \underset{PhN_2^+}{B} \xrightarrow{C_6H_5OH} C$



QUESTION (AIIMS 2019)

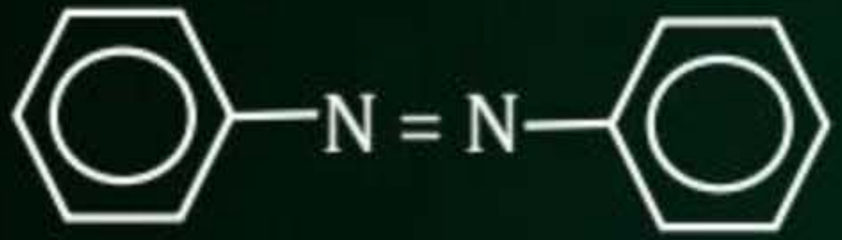
✓ ✗ Ⓔ

Phenol + Aniline $\xrightarrow[\boxed{KOH}]{C_6H_5N_2^+Cl^-}$ Major product

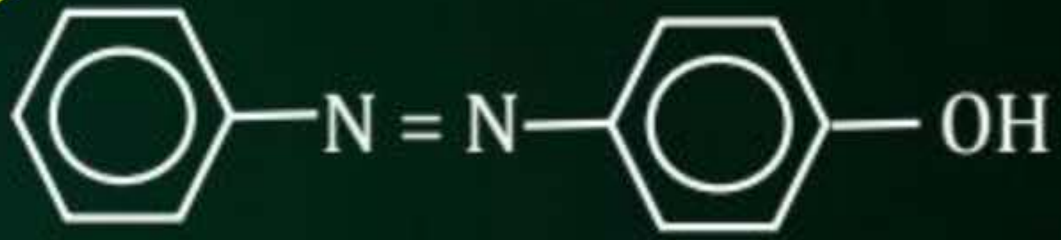
$\text{Ph}-N=\overset{\oplus}{N}$

Product will be:

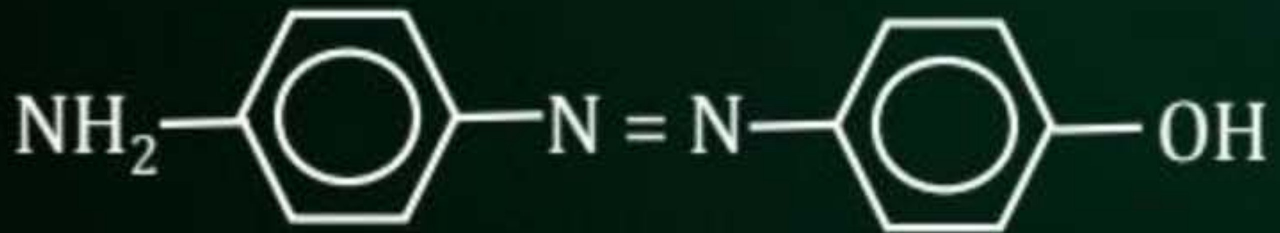
A



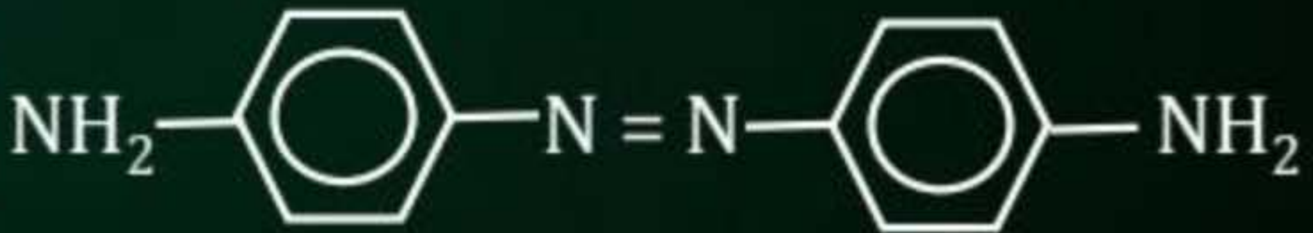
B ✓



C



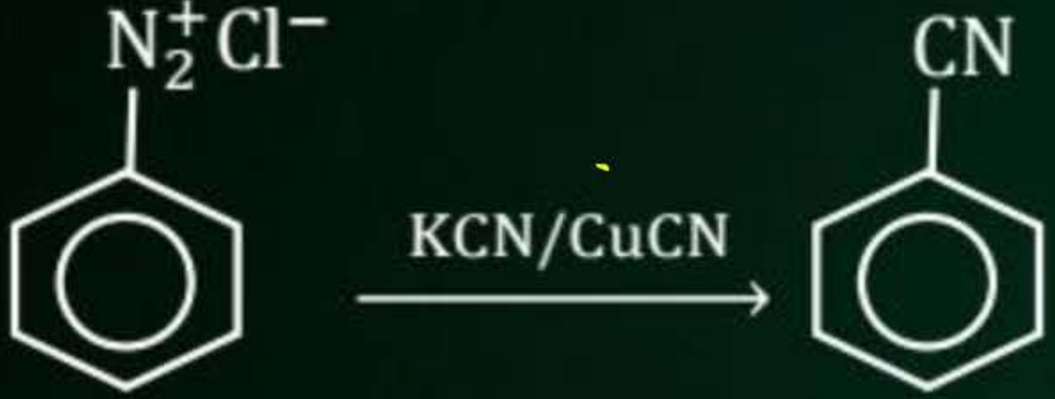
D



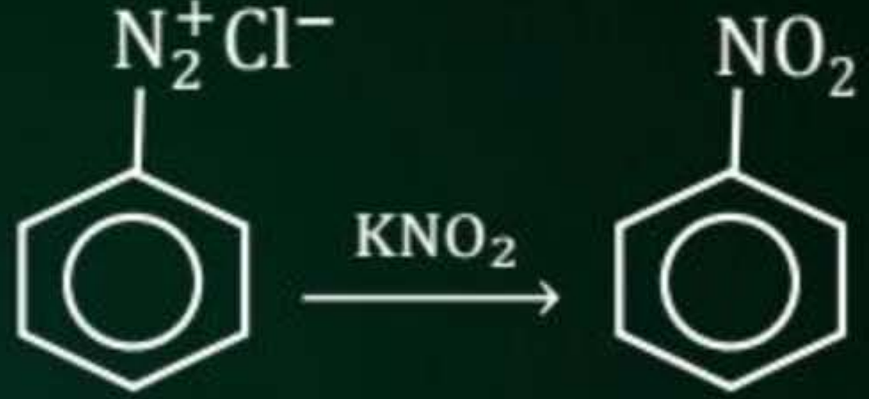
QUESTION (AIIMS 27 May, 2018 (M))

Which reaction gives wrong product?

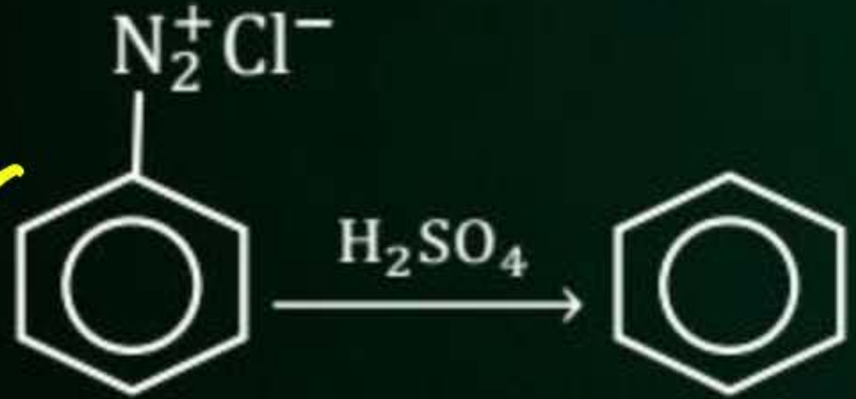
A


$N_2^+Cl^-$
$KCN/CuCN$
CN

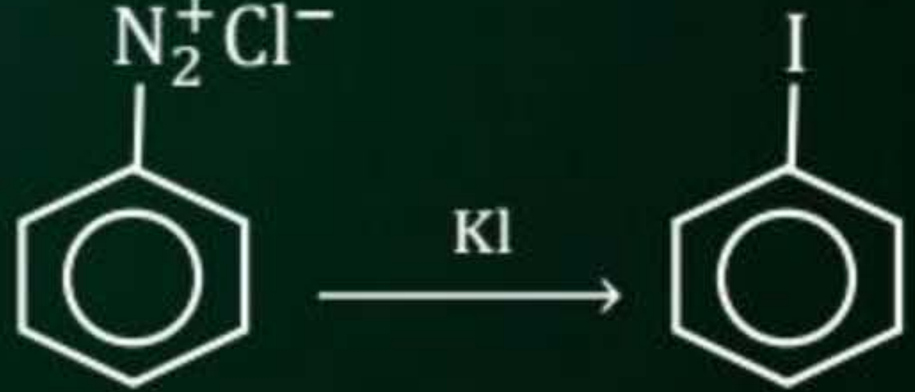
B


$N_2^+Cl^-$
KNO_2
NO_2

[✓ C]



D



QUESTION (AIIMS 2017)

Assertion: Aniline does not undergo Friedel-Craft's reaction. ✓

Reason: $-NH_2$ group of aniline reacts with $AlCl_3$ (Lewis acid) to ✓ gave acid-base reaction.

[✓ A] If both Assertion and Reason are correct and the Reason is the correct explanation of Assertion.

B If both Assertion and Reason are correct but Reason is not the correct explanation of Assertion.

C If Assertion is correct but Reason is incorrect.

D If both the Assertion and Reason are incorrect.

QUESTION (AIIMS 2010)

Assertion: Nitration of aniline can be conveniently done by protecting the amino group by acetylation. ✓

Reason: Acetylation increases the electron-density on the benzene ring. ✗

- A If both Assertion and Reason are correct and the Reason is the correct explanation of Assertion.
- B If both Assertion and Reason are correct but Reason is not the correct explanation of Assertion.
- [✓ C] If Assertion is correct but Reason is incorrect.
- D If both the Assertion and Reason are incorrect.

NEET/AIPMT

PYQs

QUESTION [NEET 2024]

Given below are two statements:

Statement I: Aniline does not undergo Friedel-Crafts alkylation reaction.

Statement II: Aniline cannot be prepared through Gabriel synthesis.

In the light of the above statement, choose the correct answer from the option given below.

A Statement I is correct but Statement II is false.

B Statement I is incorrect but Statement II is true.

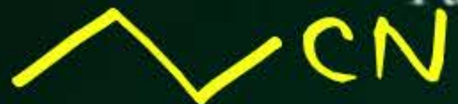
[✓ C Both Statement I and Statement II are true.]

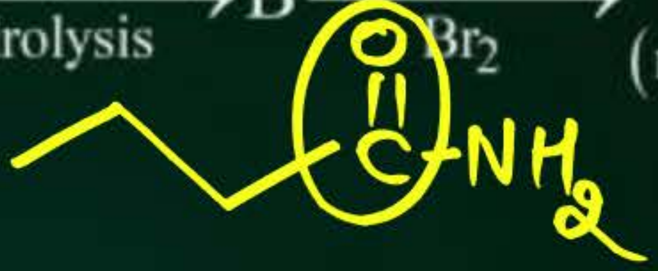
D Both Statement I and Statement II are false.

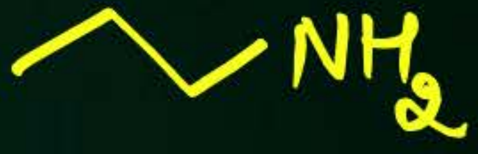
QUESTION [NEET 2024]

Identify the major product *C* formed in the following reaction sequence:

$$CH_3{-}CH_2{-}CH_2{-}I \xrightarrow{NaCN} A \xrightarrow[\text{Partial hydrolysis}]{OH^-} B \xrightarrow[Br_2]{NaOH} \underset{\text{(major)}}{C}$$



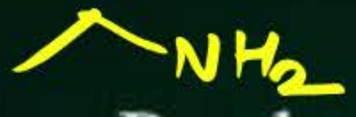




- **A** butanamide
- **B** α-bromobutanoic acid
- **C** [✓ propylamine]
- **D** butylamine

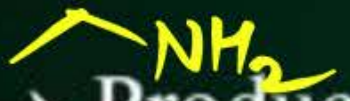
QUESTION [NEET 2023]

Which of the following reactions will NOT give primary amines as the product ?



(A) $CH_3\overset{CH_2}{CO}NH_2 \xrightarrow[\text{(ii) } H_3O^{\oplus}]{\text{(i) LiAlH}_4}$ Product

(B) $CH_3CONH_2 \xrightarrow{Br_2/KOH} \overset{CH_3NH_2}{\text{Product}}$



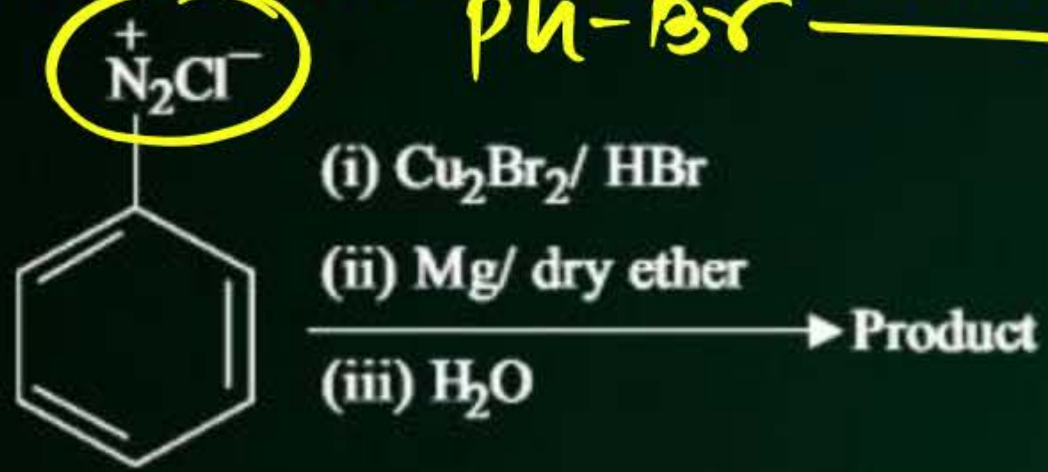
(C) $CH_3CN \xrightarrow[\text{(ii) } H_3O^{\oplus}]{\text{(i) LiAlH}_4}$ Product

[✓ D] $CH_3NC \xrightarrow[\text{(ii) } H_3O^{\oplus}]{\text{(i) LiAlH}_4}$ Product

$CH_3-NH-CH_3$

QUESTION [NEET 2023]

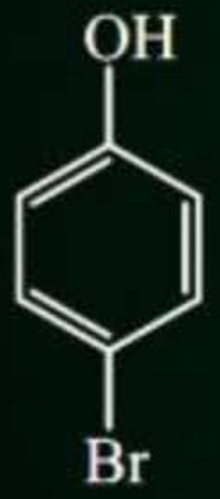
Identify the product in the following reactions:

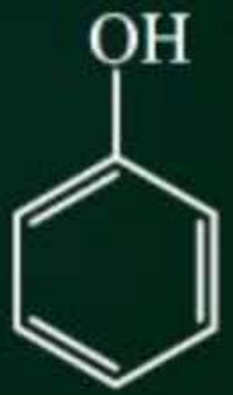

$\overset{+}{N}_2Cl^-$
(i) Cu_2Br_2/ HBr
(ii) Mg/ dry ether
(iii) H_2O
Product

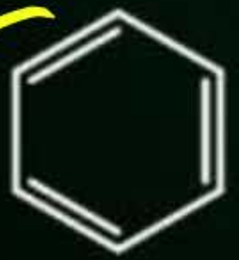
$Ph-Br \longrightarrow \overset{\ominus}{Ph}MgBr$

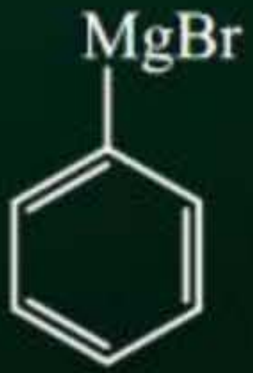
$\downarrow \overset{+}{H_2O}$

$Ph-H$

A 

B 

[✓ C] 

D 

QUESTION [NEET 2022]

$R-N_2^+ \rightarrow R^+$

Given below are two statements:

Statements I: Primary aliphatic amines react with HNO_2 to give unstable diazonium salts. ✓

Statements II: Primary aromatic amines react with HNO_2 to form diazonium salts which are stable even above 300 K.

$Ph-N_2^+Cl^-$

$0-5^\circ C$

In the light of the above Statements, choose the most appropriate answer from the options given below:

A Statements I is incorrect but Statements II is correct.

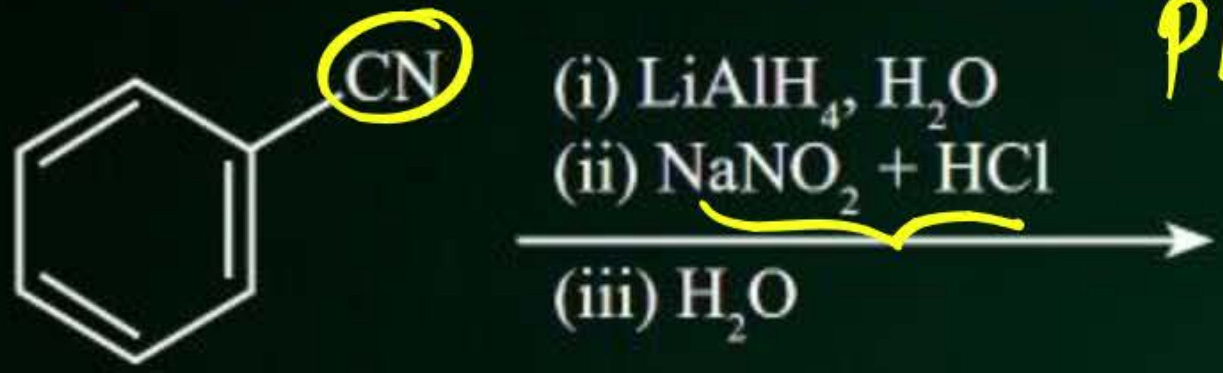
B Both Statements I and Statements II are correct.

C Both Statements I and Statements II are incorrect.

[✓ D] Statements I is correct but Statement II is incorrect.

QUESTION [NEET 2022]

The product formed from the following reaction sequence is:



(i) $LiAlH_4$, H_2O

(ii) $NaNO_2 + HCl$

(iii) H_2O

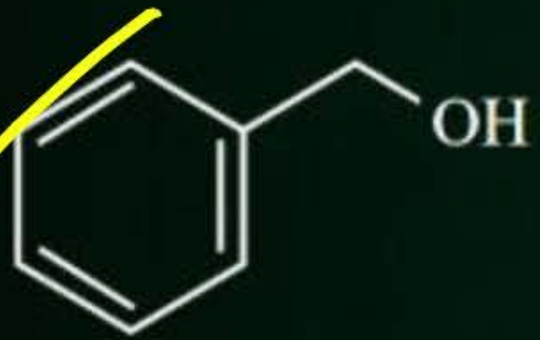
$Ph-CH_2-NH_2$

$Ph-\overset{\oplus}{C}H_2-N_2^+Cl^-$

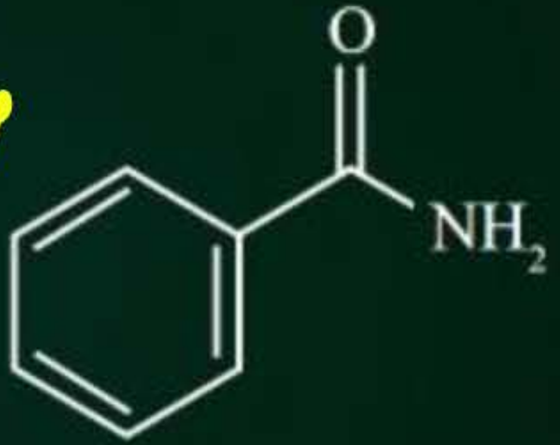
$\downarrow H_2O$

$PhCH_2OH$

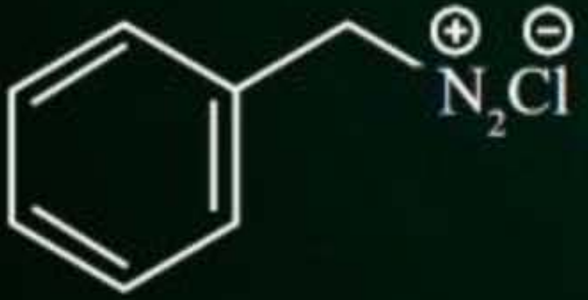
A ✓



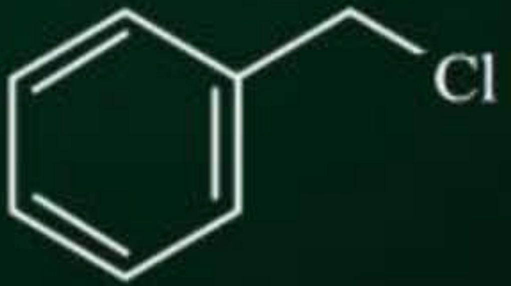
B



C



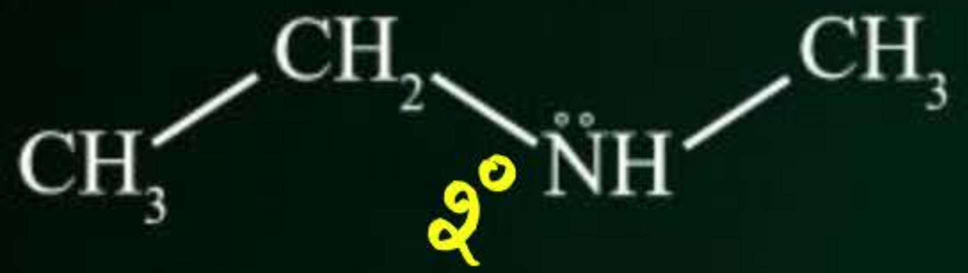
D



QUESTION [NEET 2021]

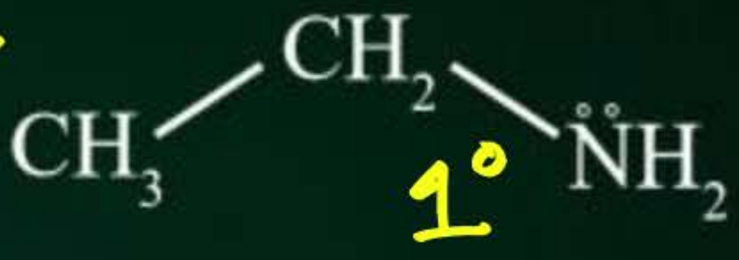
Identify the compound that will react with Hinsberg's reagent to give a solid which dissolves in alkali

Ⓐ



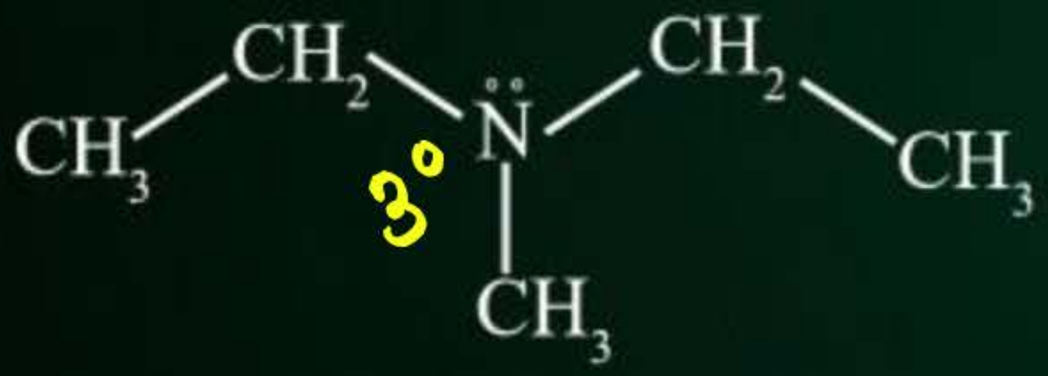
CH₂
CH₃
CH₃
N̈H
2°

✓ Ⓑ



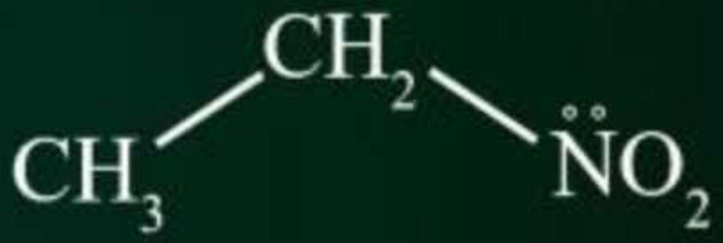
CH₂
CH₃
N̈H₂
1°

Ⓒ



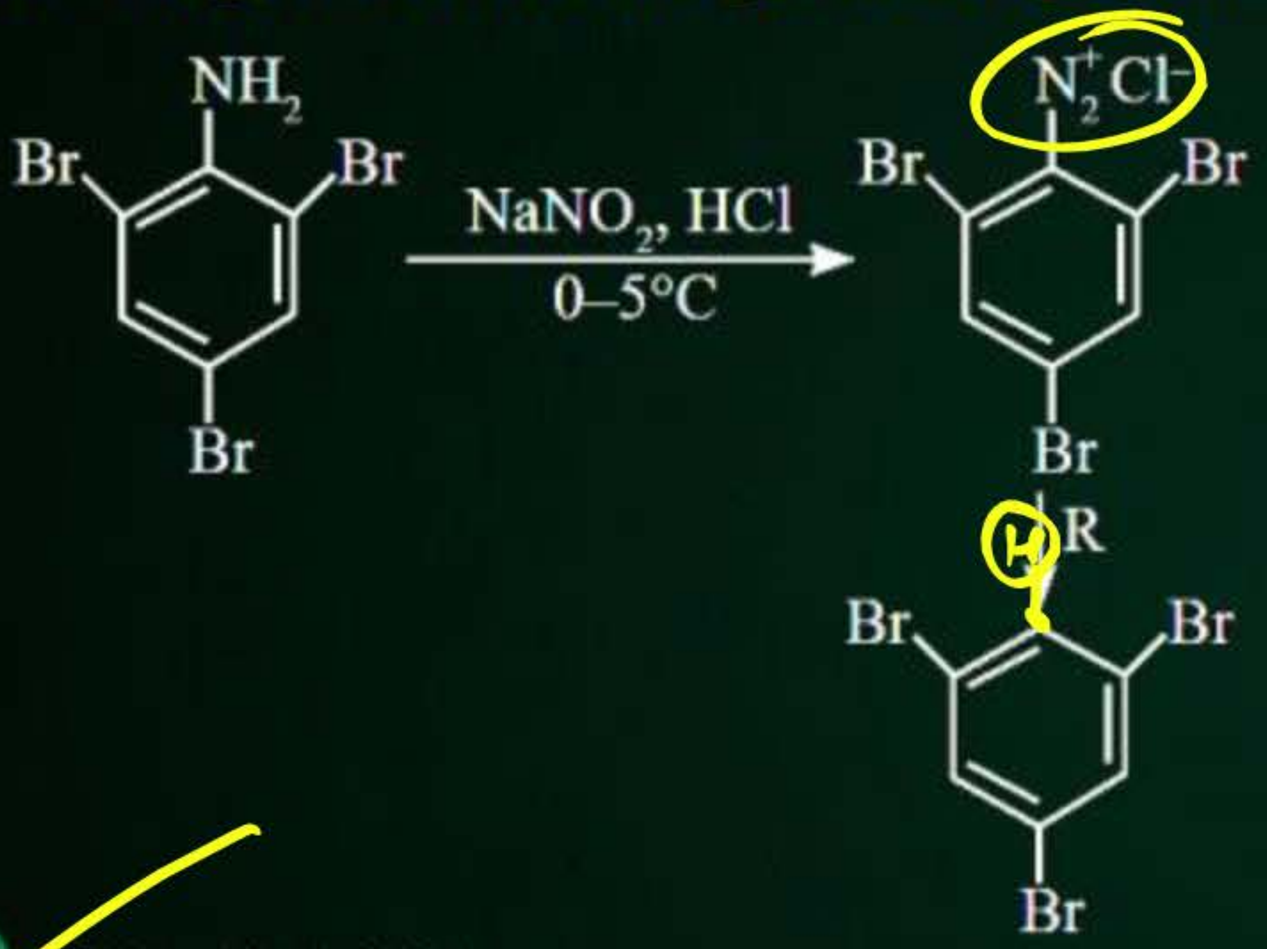
CH₂
CH₂
CH₃
N̈
CH₃
CH₃
3°

Ⓓ



QUESTION [NEET 2021]

The reagent 'R' in the given sequence of chemical reaction is:


NH₂
Br
Br
Br
NaNO₂, HCl
0–5°C
N₂⁺Cl⁻
Br
Br
Br
H
R
Br
Br
Br

[✓ (A) CH_3CH_2OH]

(B) HI

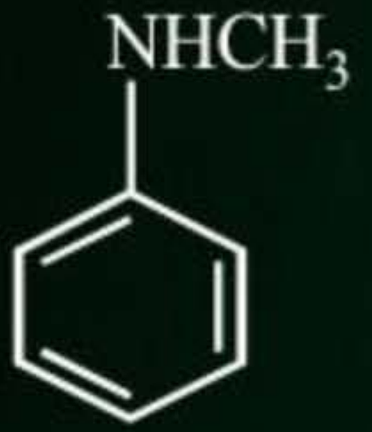
(C) CuCN/KCN

(D) H_2O

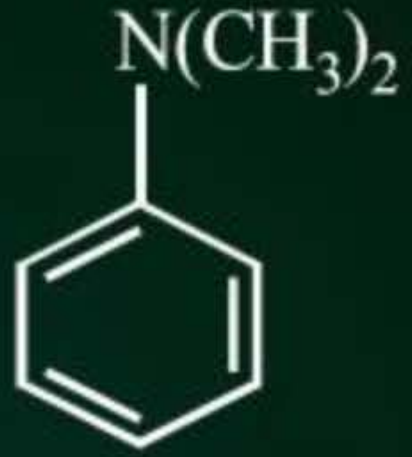
QUESTION [NEET 2020]

Which of the following amine will give the carbylamine test?

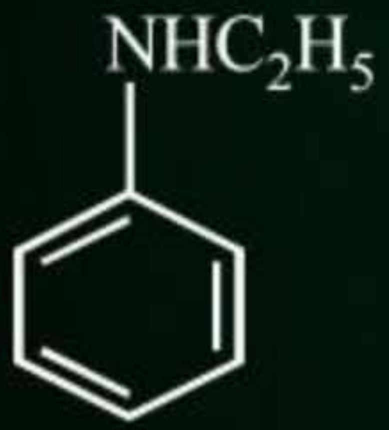
A



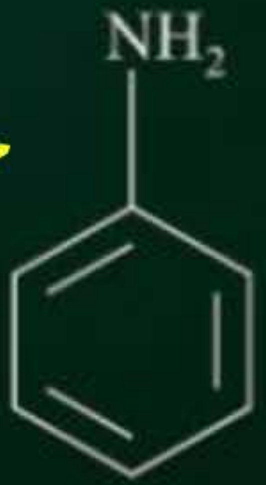
B



C



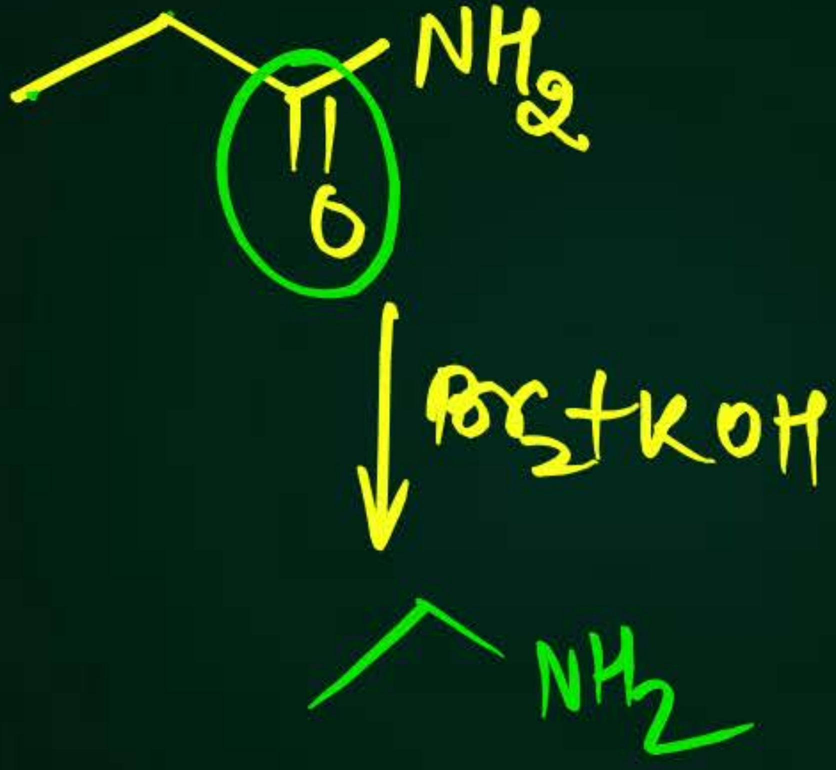
[✓ **D**]



QUESTION [NEET 2020-Covid]

Reaction of propanamide with ethanolic sodium hydroxide and bromine will give

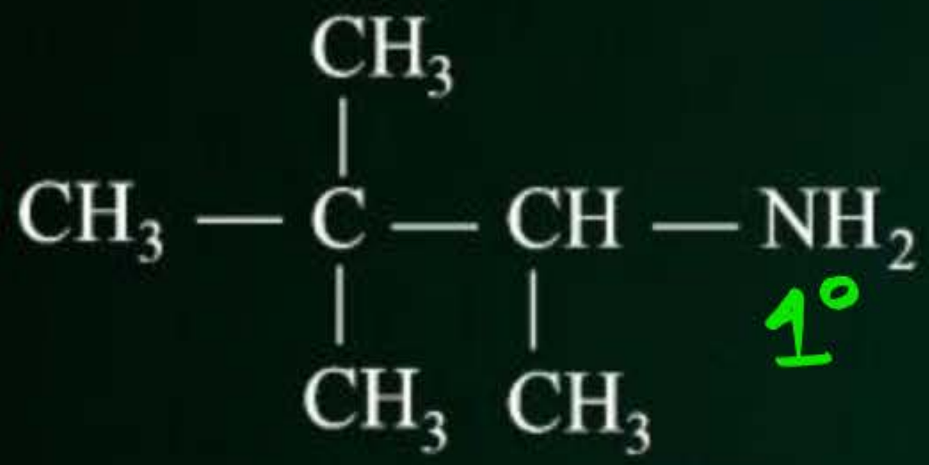
- A Methylamine
- B Propylamine
- C Aniline
- [✓ D] Ethylamine



QUESTION [NEET Odisha 2019]

The amine that reacts with Hinsberg's reagent to give an alkali insoluble product is:

(A)

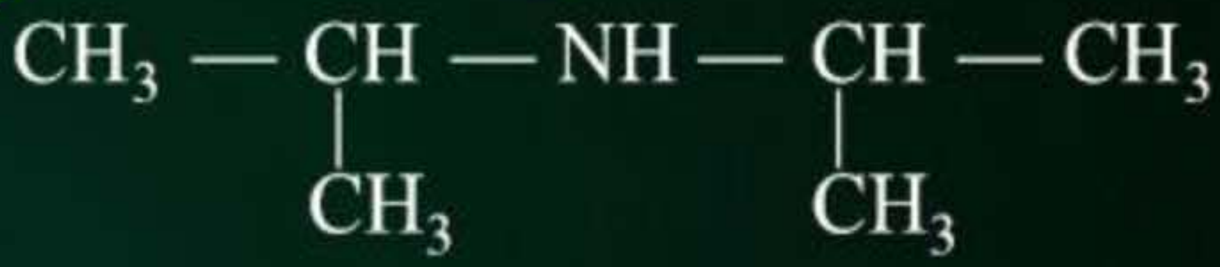


$CH_3-\overset{CH_3}{\underset{CH_3}{C}}-\underset{CH_3}{CH}-NH_2$

1°

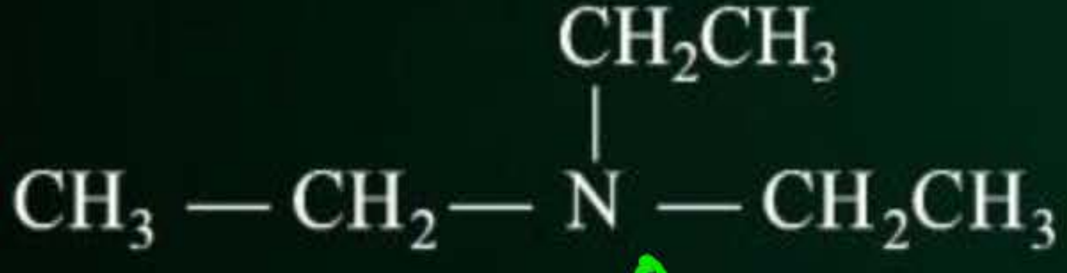
[✓ (B)]

2°



$CH_3-\underset{CH_3}{CH}-NH-\underset{CH_3}{CH}-CH_3$

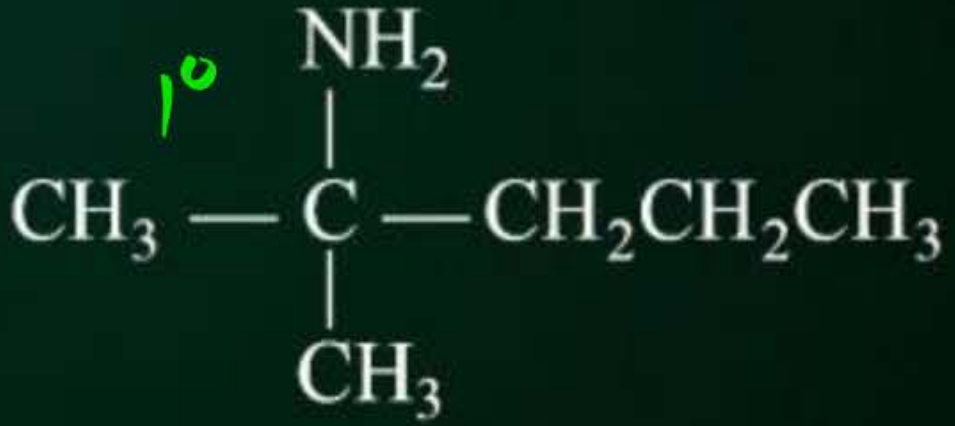
(C)



$CH_3-CH_2-\overset{CH_2CH_3}{N}-CH_2CH_3$

3°

(D)



$CH_3-\overset{NH_2}{\underset{CH_3}{C}}-CH_2CH_2CH_3$

1°

QUESTION [NEET 2019]

The correct order of the basic strength of methyl substituted amines in aqueous solution is:

R=Me

[✓ A] $\overset{2^\circ}{(CH_3)_2NH} > \overset{1^\circ}{CH_3NH_2} > \overset{3^\circ}{(CH_3)_3N}$

B $(CH_3)_3N > CH_3NH_2 > (CH_3)_2NH$

C $(CH_3)_3N > (CH_3)_2NH > CH_3NH_2$

D $CH_3NH_2 > (CH_3)_2NH > (CH_3)_3N$

QUESTION [NEET 2018]

Nitration of aniline in strong acidic medium also gives m-nitroaniline because

- **A** Inspite of substituents nitro group always goes to only m-position.
- **B** In electrophilic substitution reactions, amino group is meta directive.

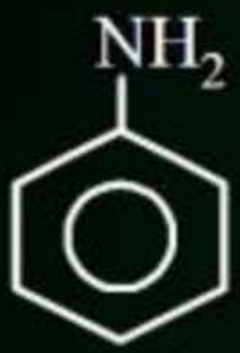
$PhNH_2 + H^+ \rightarrow Ph\overset{\oplus}{N}H_3$

- [✓ **C**] In acidic (strong) medium aniline is present as anilinium ion.
- **D** In absence of substituents, nitro group always goes to m-position.

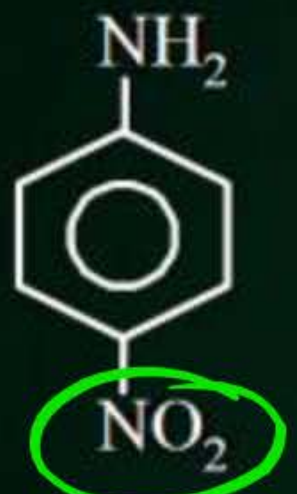
QUESTION [NEET 2017]

The correct increasing order of basic strength for the following compounds is:

I)

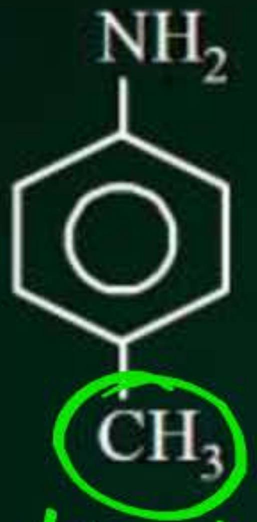


(II)



−M > −I

(III)



+H > +I

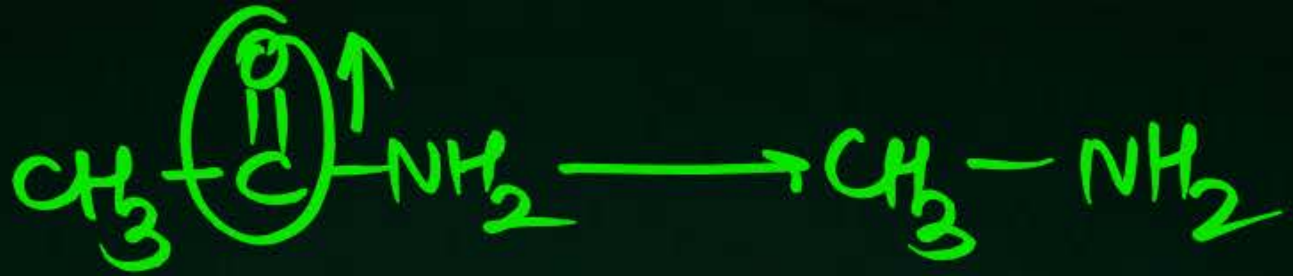
A III < I < II

B III < II < I

[✓ **C**] II < I < III

D II < III < I

QUESTION [NEET 2017]



$$CH_3-\overset{O}{\overset{\|}{C}}-NH_2 \longrightarrow CH_3-NH_2$$

Which of the following reactions is appropriate for converting acetamide to methanamine?

- [✓ A] Hoffmann bromamide reaction
- B Stephens reaction
- C Gabriels phthalimide synthesis
- D Carbylamine reaction

QUESTION [NEET 2016]

The correct statement regarding the basicity of arylamines is:

[✓ A] Arylamines are generally less basic than alkylamines because the nitrogen lone-pair electrons are delocalized by interaction with the aromatic ring electron system.

B Arylamines are generally more basic than alkylamines because the nitrogen lone-pair electrons are not delocalized by interaction with the aromatic ring electron system.

C Arylamines are generally more basic than alkylamines because of aryl group.

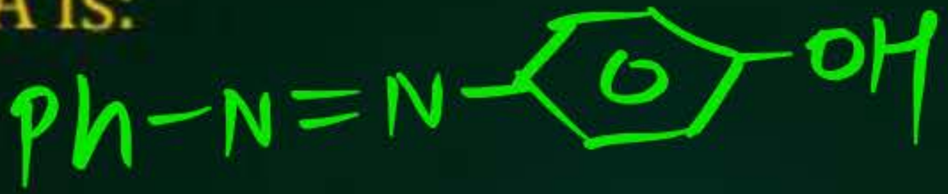
D Arylamines are generally more basic than alkylamines, because the nitrogen atom in arylamines is sp-hybridized.

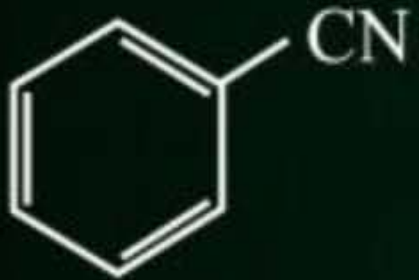
QUESTION (NEET 2016 - II)

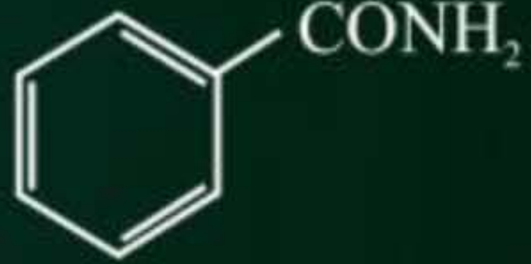
$PhNO_2$ $PhNH_2$

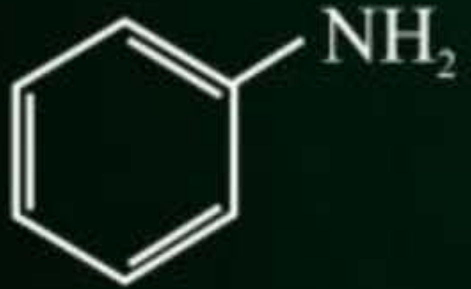
A given nitrogen-containing aromatic compound A reacts with Sn/HCl, followed by HNO_2 to give an unstable compound B. B on treatment with phenol, forms a beautiful colored compound C with the molecular formula $C_{12}H_{10}N_2O$. The structure of compound A is:

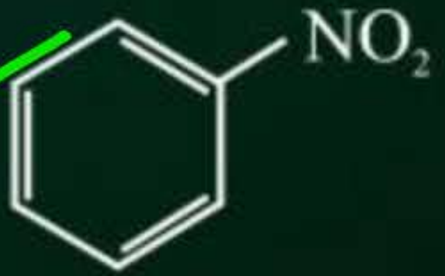
PhN_2^+



(A)


(B)


(C)


[✓ (D)]


QUESTION [NEET 2015 RS]

Method by which aniline cannot be prepared is:

(A) hydrolysis of phenyl isocyanide with acidic solution.

(B) degradation of benzamide with bromine in alkaline solution.

(C) reduction of nitrobenzene with H_2/Pd in ethanol.

[✓ (D)] potassium salt of phthalimide treated with chlorobenzene followed by hydrolysis with aqueous NaOH solution.

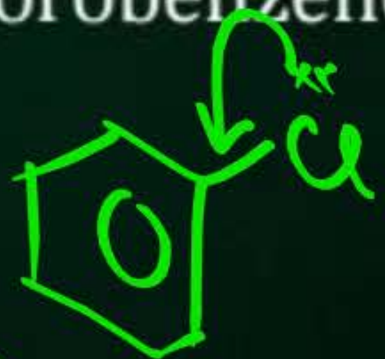
$PhNH_2$

$\uparrow \bar{O}H$

$Ph-NC \xrightarrow{H_3O^+} \underbrace{Ph-\overset{+}{N}H_3}$

$Ph-\overset{O}{\overset{\|}{C}}-NH_2 \xrightarrow[KOH]{Br_2} PhNH_2$

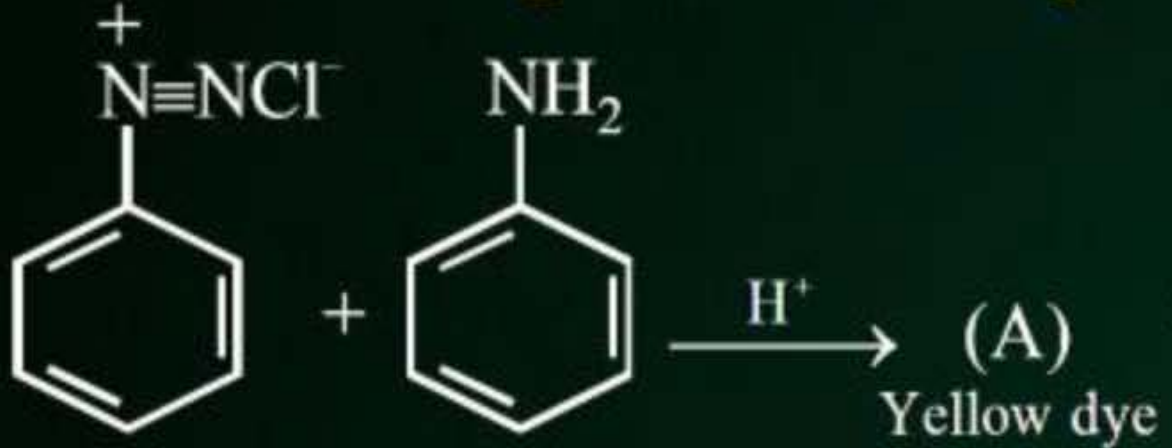
$PhNO_2 \longrightarrow PhNH_2$



No Rxn

QUESTION [NEET 2014]

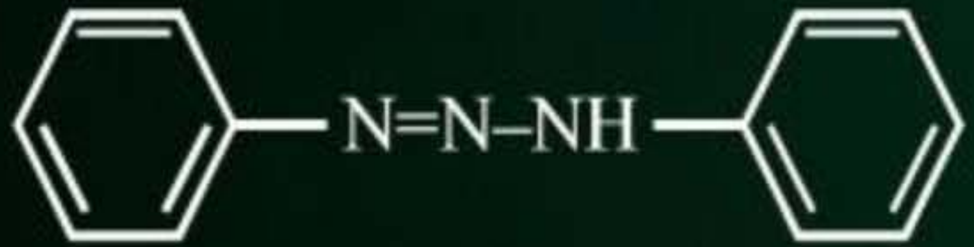
In the following reaction, the product (A)



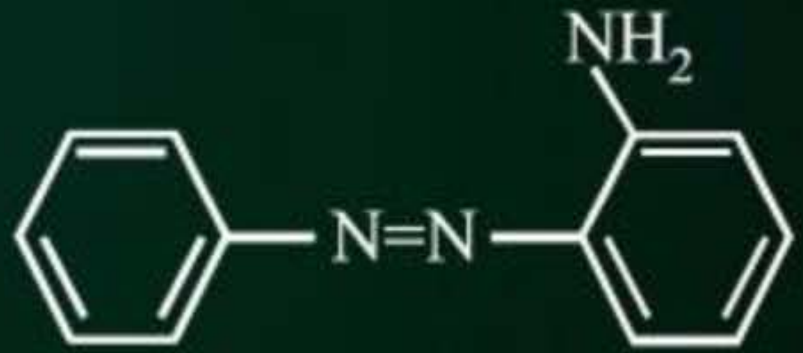
$\overset{+}{N}\equiv NCl^-$
NH_2
+
H^+
(A)
Yellow dye

is :

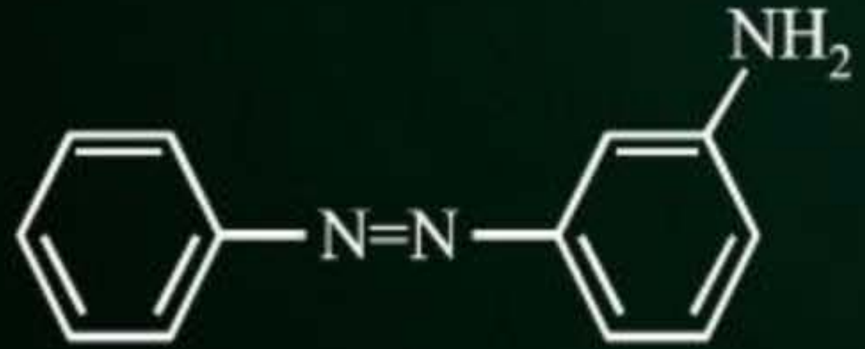
(A)



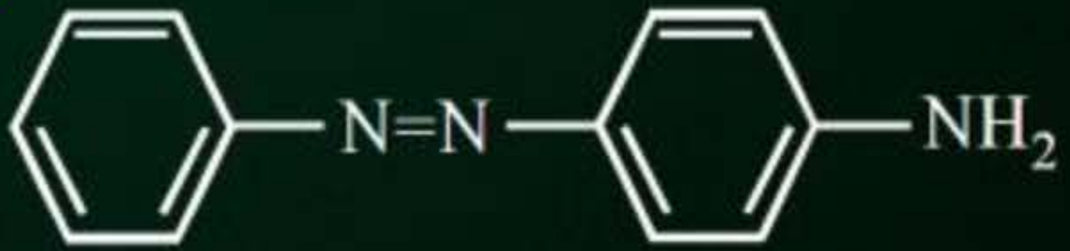
(B)



(C)



[✓ (D)]

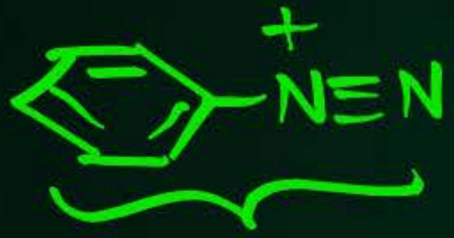


QUESTION [NEET 2014]

Which of the following will be most stable diazonium salt $RN_2^+X^-$?

(A) $\underline{CH_3}\overset{\curvearrowright}{N_2}^+X^-$

(B) $\underbrace{C_6H_5N_2}^+X^-$



(C) $CH_3CH_2\overset{\curvearrowright}{N_2}^+X^-$

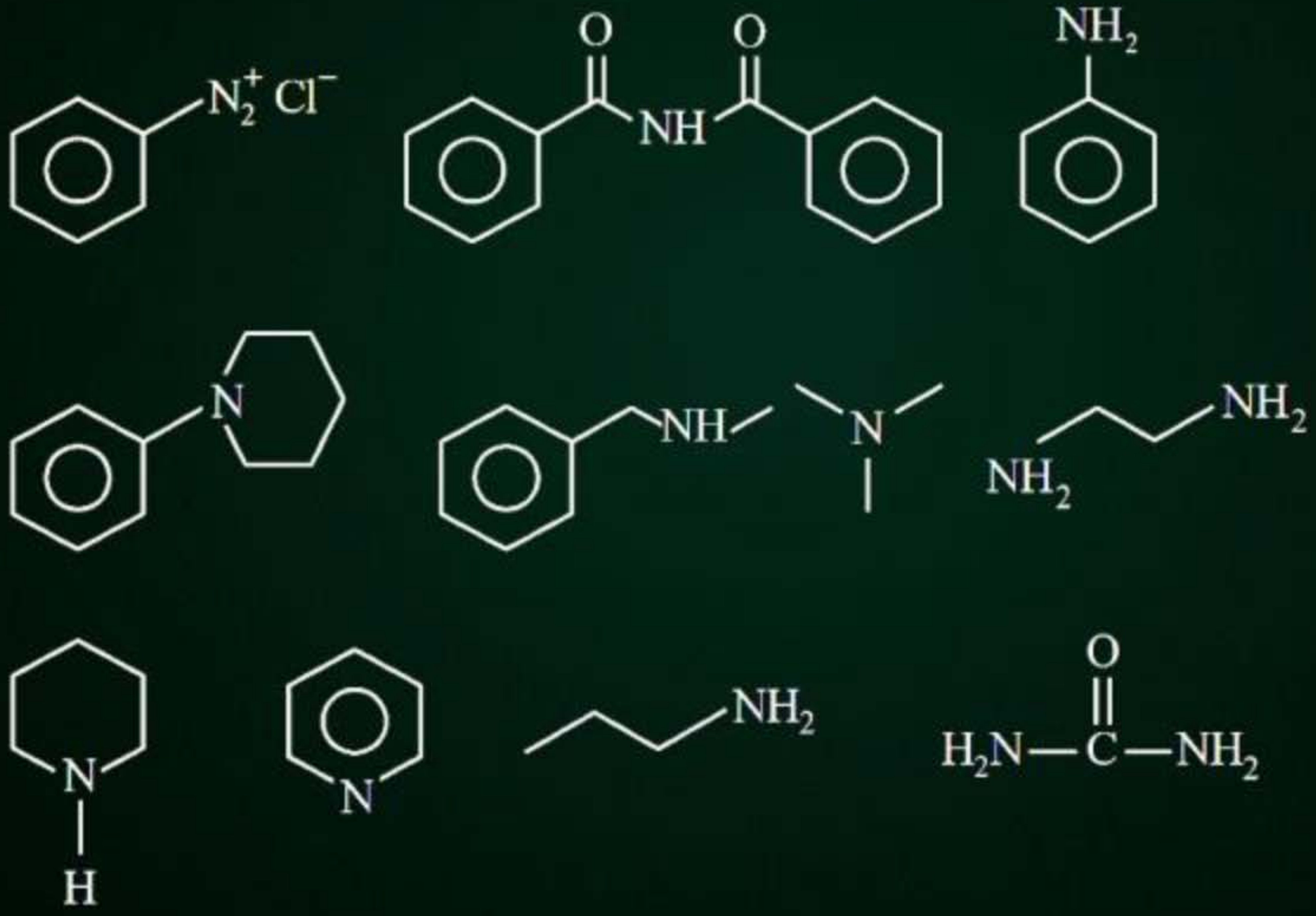
(D) $C_6H_5CH_2\overset{\curvearrowright}{N_2}^+X^-$

JEE Mains PYQs

Home work

QUESTION (JEE Mains 1st Feb 2024, Evening Shift)

Number of compound which give reaction with Hinsberg's reagent is ____.


$N_2^+ Cl^-$
O
O
NH
NH_2
N
NH
N
NH_2
NH_2
N
H
N
NH_2
O
$H_2N—C—NH_2$

$$H_2N-\overset{\overset{\Large O}{\|}}{C}-NH_2$$

QUESTION (JEE Mains 1st Feb 2024, Morning Shift)

Given below are two statements:

Statements (I): Aminobenzene and aniline are same organic compounds.

Statement (II): Aminobenzene and aniline are different organic compounds.

In the light of the above statements, choose the most appropriate answer from the options given below:

(A) Both Statement I and Statement II are correct.

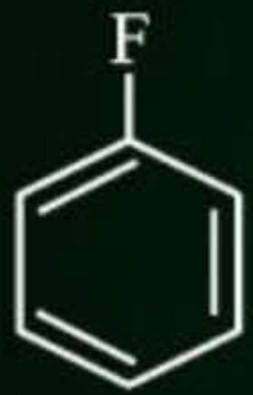
(B) Statement I is correct but Statement II is incorrect.

(C) Statement I is incorrect but Statement II is correct.

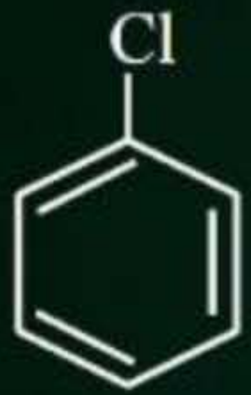
(D) Both Statement I and Statement II are incorrect.

QUESTION (JEE Mains 5th April 2024, Morning Shift)

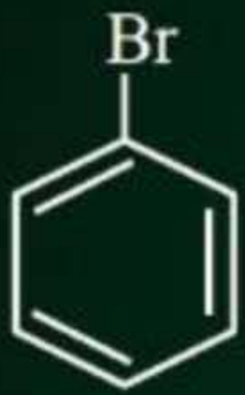
The number of halobenzenes from the following that can be prepared by Sandmeyer's reaction is ....



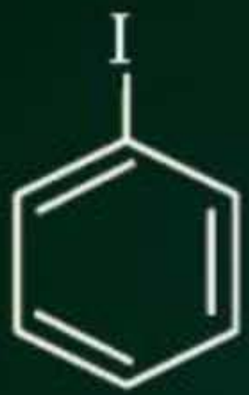
I



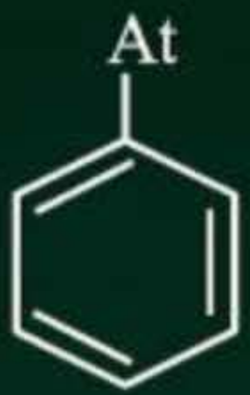
II



III



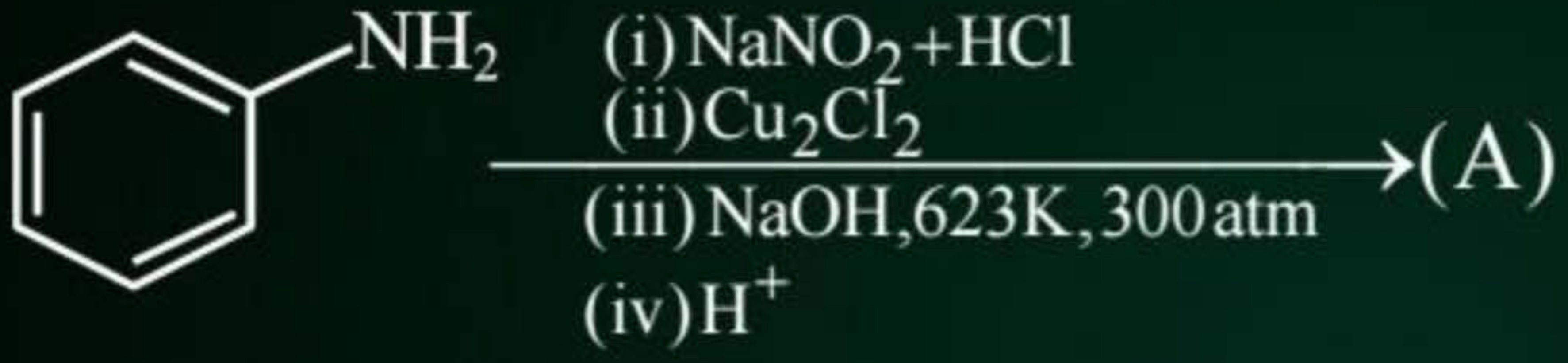
IV



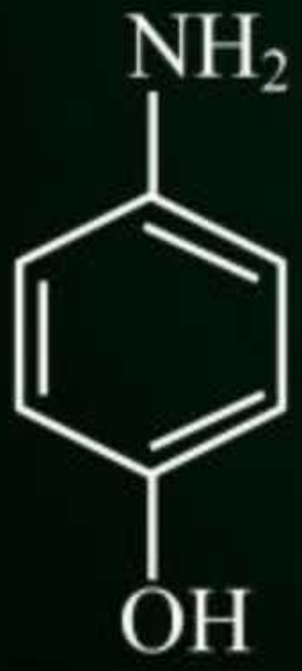
V

QUESTION (JEE Mains 6th April 2024, Evening Shift)

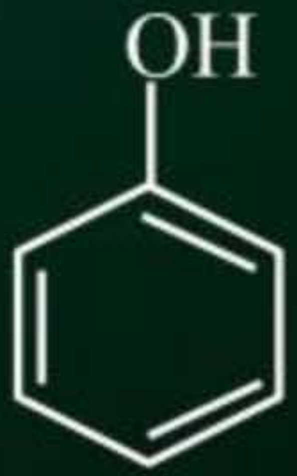
Identify the product (A) in the following reaction.


NH2
(i) NaNO2 + HCl
(ii) Cu2Cl2
(iii) NaOH, 623K, 300 atm
(iv) H+
(A)

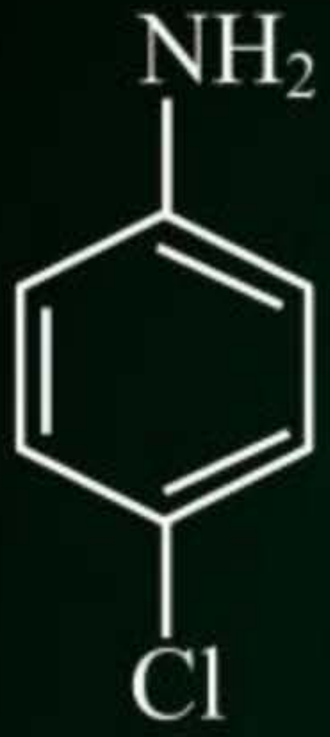
A



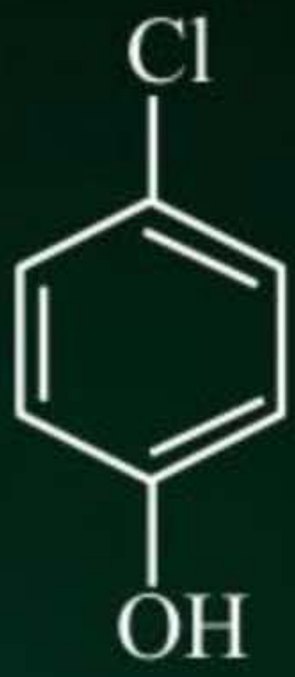
B



C



D

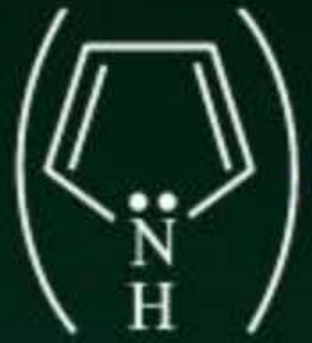
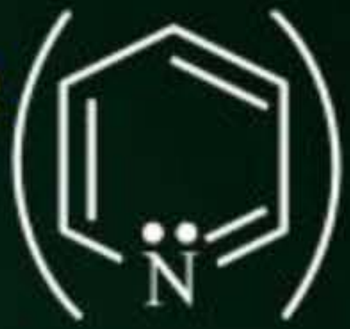
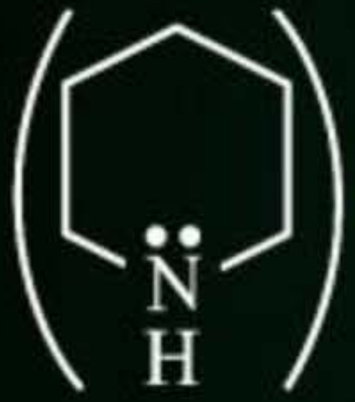


QUESTION (JEE Mains 9th April 2024, Evening Shift)

Number of compounds from the following which cannot undergo Friedel-Crafts reactions is:___

toluene, nitrobenzene, xylene, cumene, aniline, chlorobenzene, m-nitroaniline, m-dinitrobenzene

QUESTION (JEE Mains 9th April 2024, Morning Shift)

Correct order of basic strength of Pyrrole , Pyridine  and Piperidine  is:

A Piperidine > Pyridine > Pyrrole

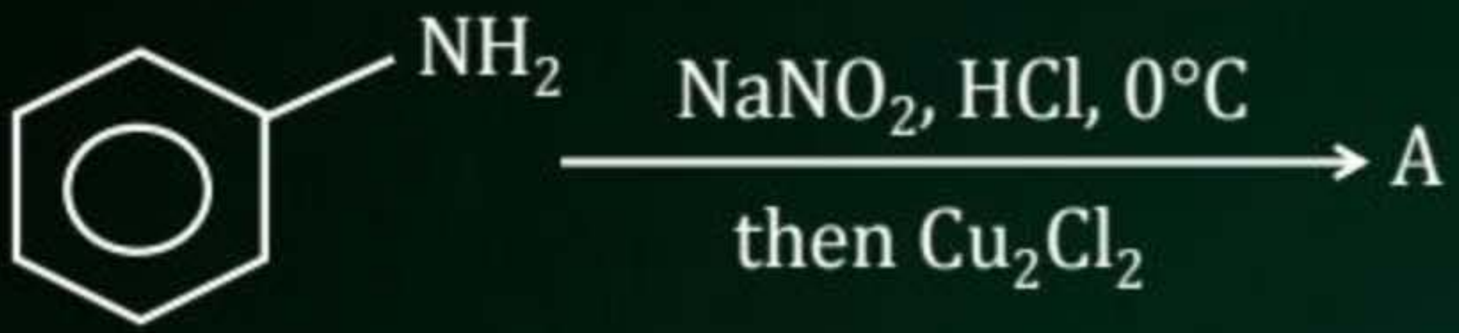
B Pyrrole > Pyridine > Piperidine

C Pyridine > Piperidine > Pyrrole

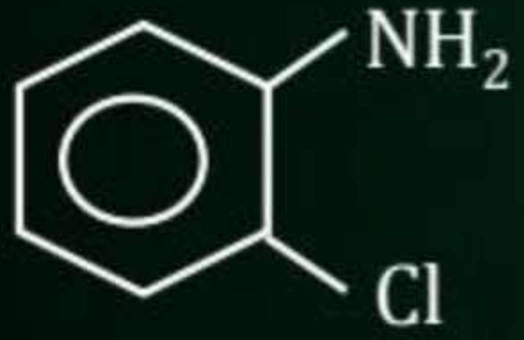
D Pyrrole > Piperidine >Pyridine

QUESTION (JEE Mains 29 January 2024, Evening Shift)

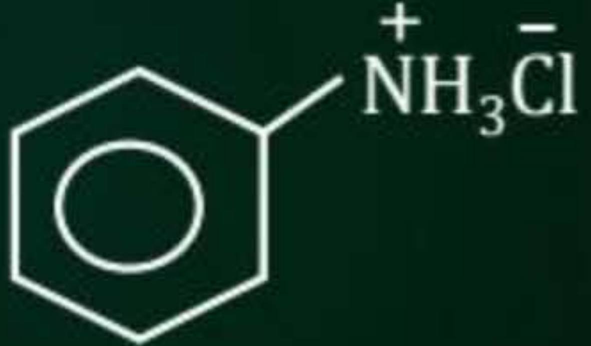
The product A formed in the following reaction is:


NH2
NaNO2, HCl, 0°C
then Cu2Cl2
A

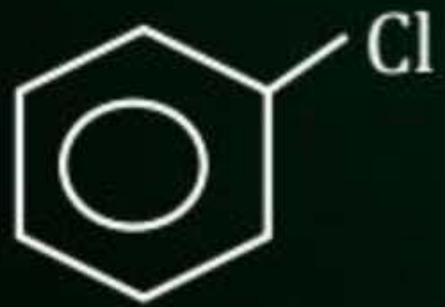
A



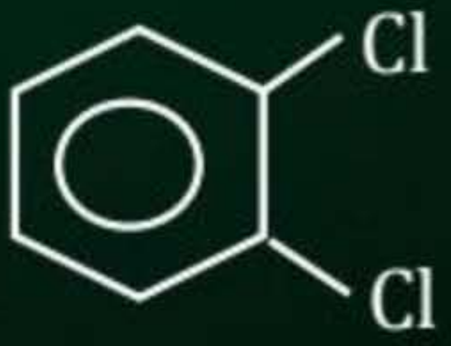
B



C



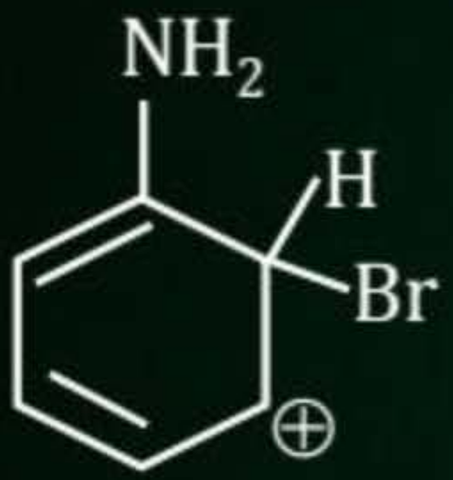
D



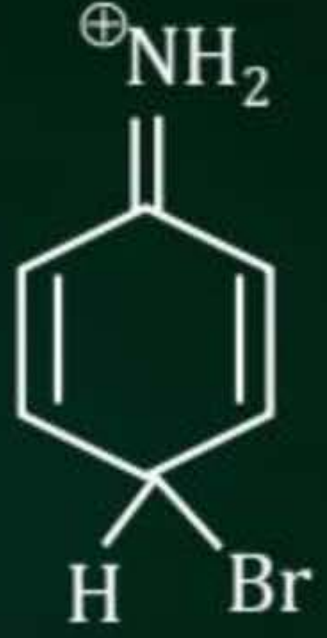
QUESTION (JEE Mains 29 January 2024, Morning Shift)

The arenium ion which is not involved in the bromination of Aniline is:

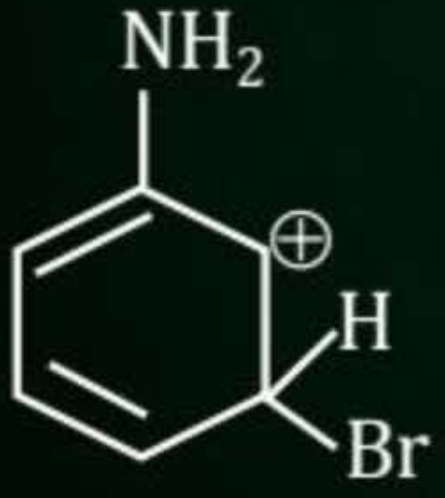
(A)



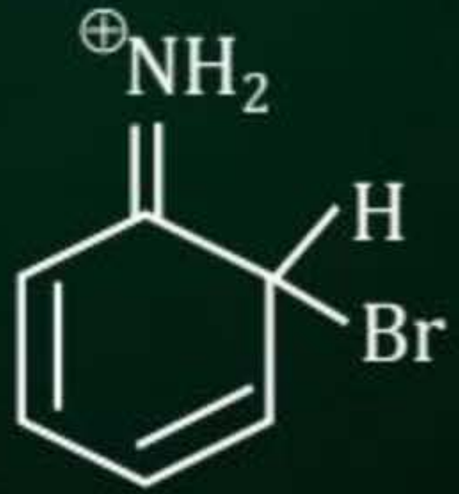
(B)



(C)

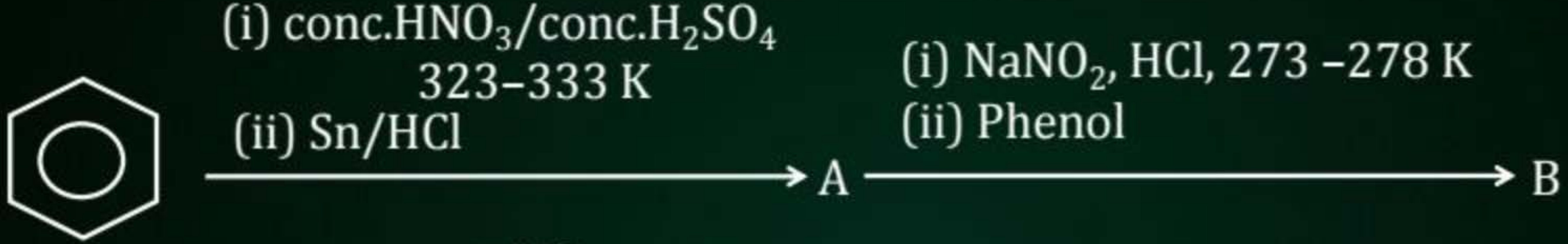


(D)



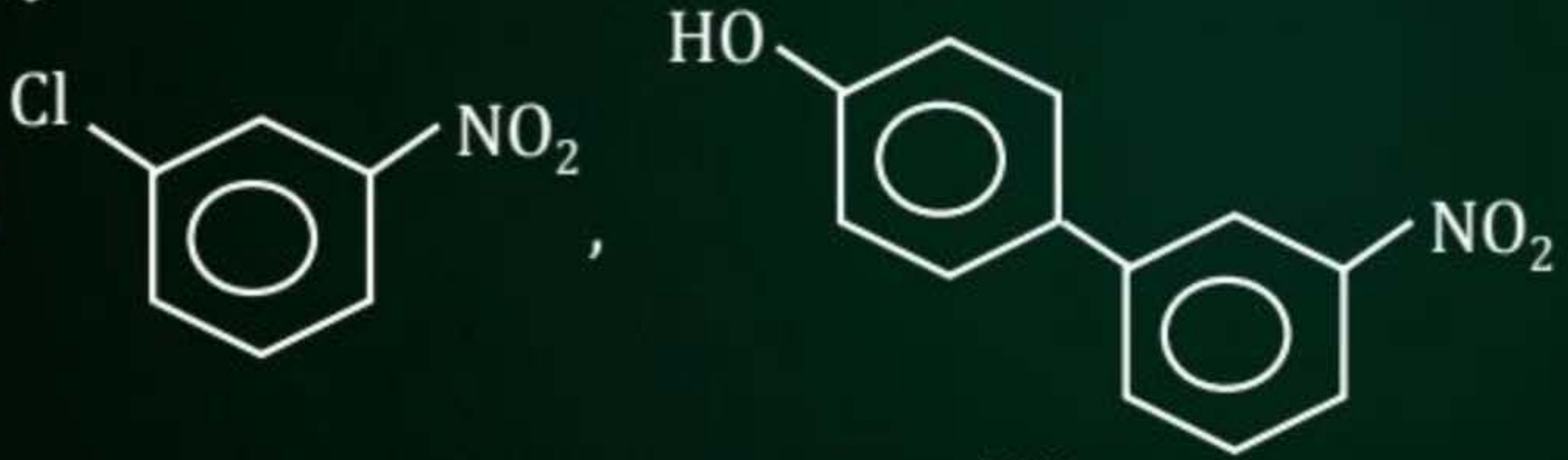
QUESTION (JEE Mains 30th January 2024, Evening Shift)

The products A and B formed in the following reaction scheme are respectively

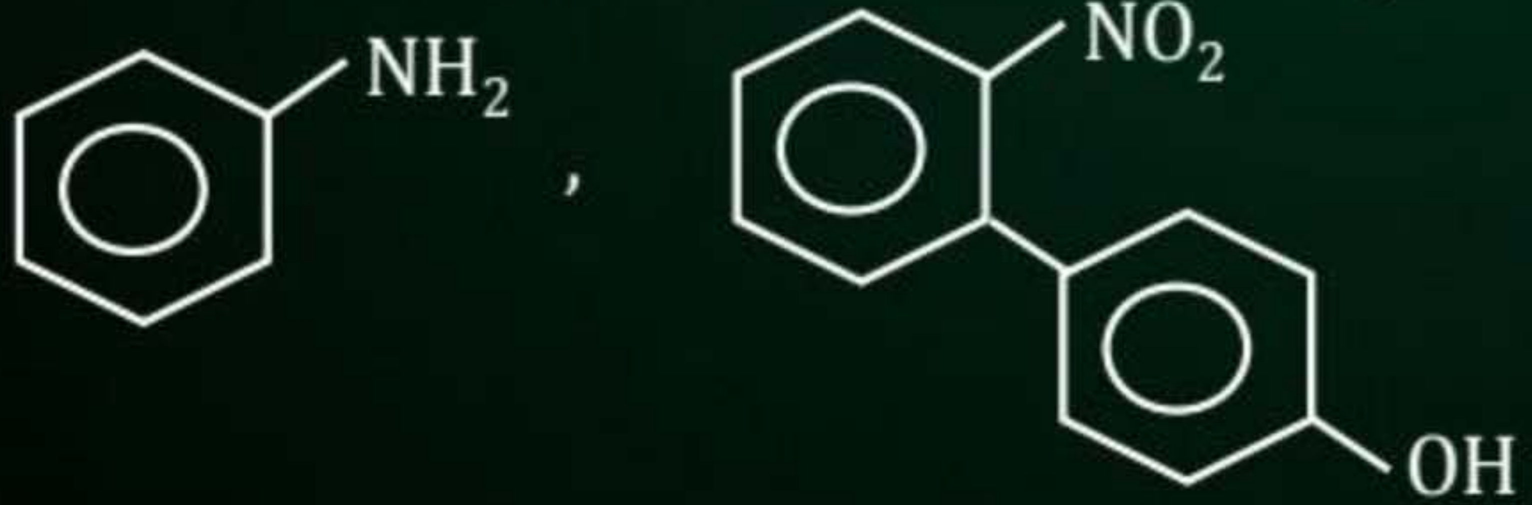


$$\xrightarrow[\text{(ii) Sn/HCl}]{\text{(i) conc.}HNO_3/\text{conc.}H_2SO_4\ 323\text{–}333\ K} A \xrightarrow[\text{(ii) Phenol}]{\text{(i) }NaNO_2,\ HCl,\ 273-278\ K} B$$

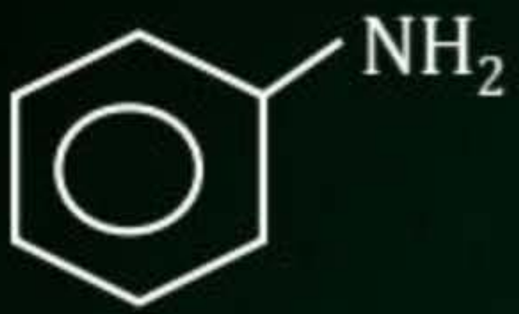
A



B



C



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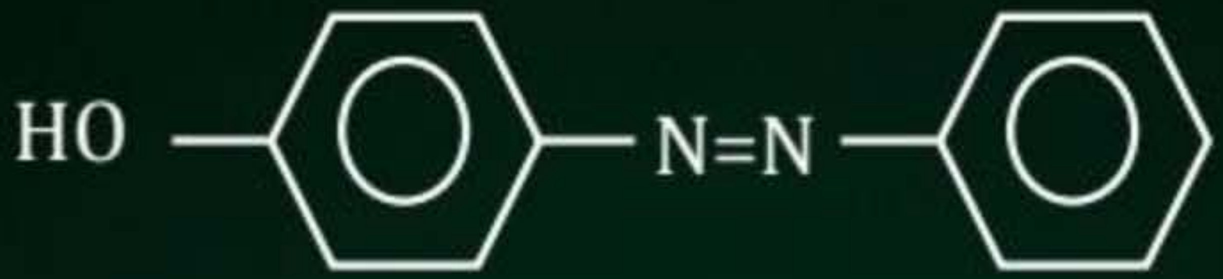
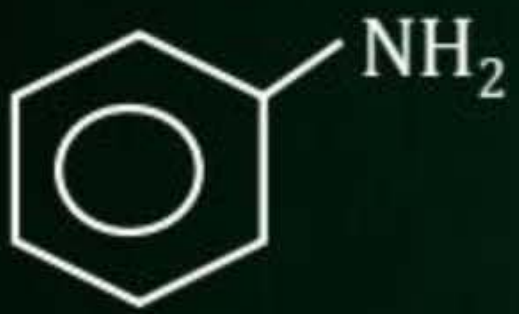


D



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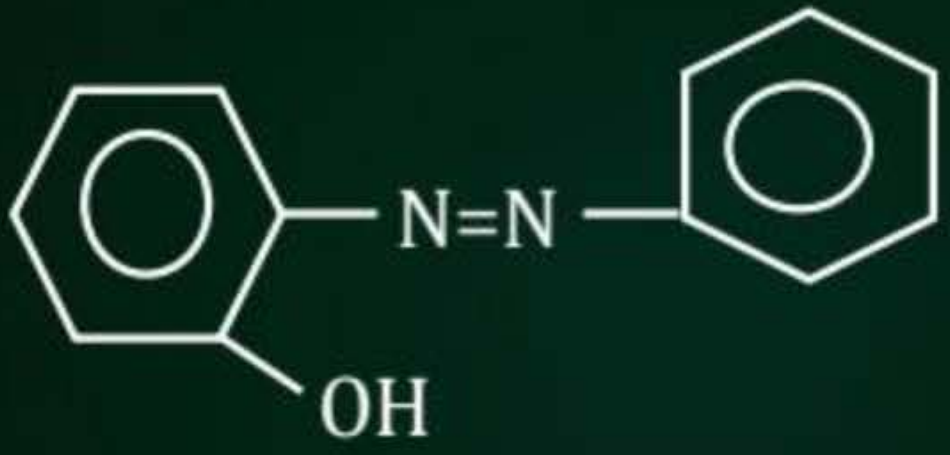


Home Work From PW Module (Yakeen NEET)

Prarambh: Q 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71

Parikshit: Q 33, 35, 38

PANKAJ SIR
JOIN MY OFFICIAL TELEGRAM CHANNEL
@PSCAA
PhysicsWallah
अनुगच्छतु प्रवाहं

Thank you!!

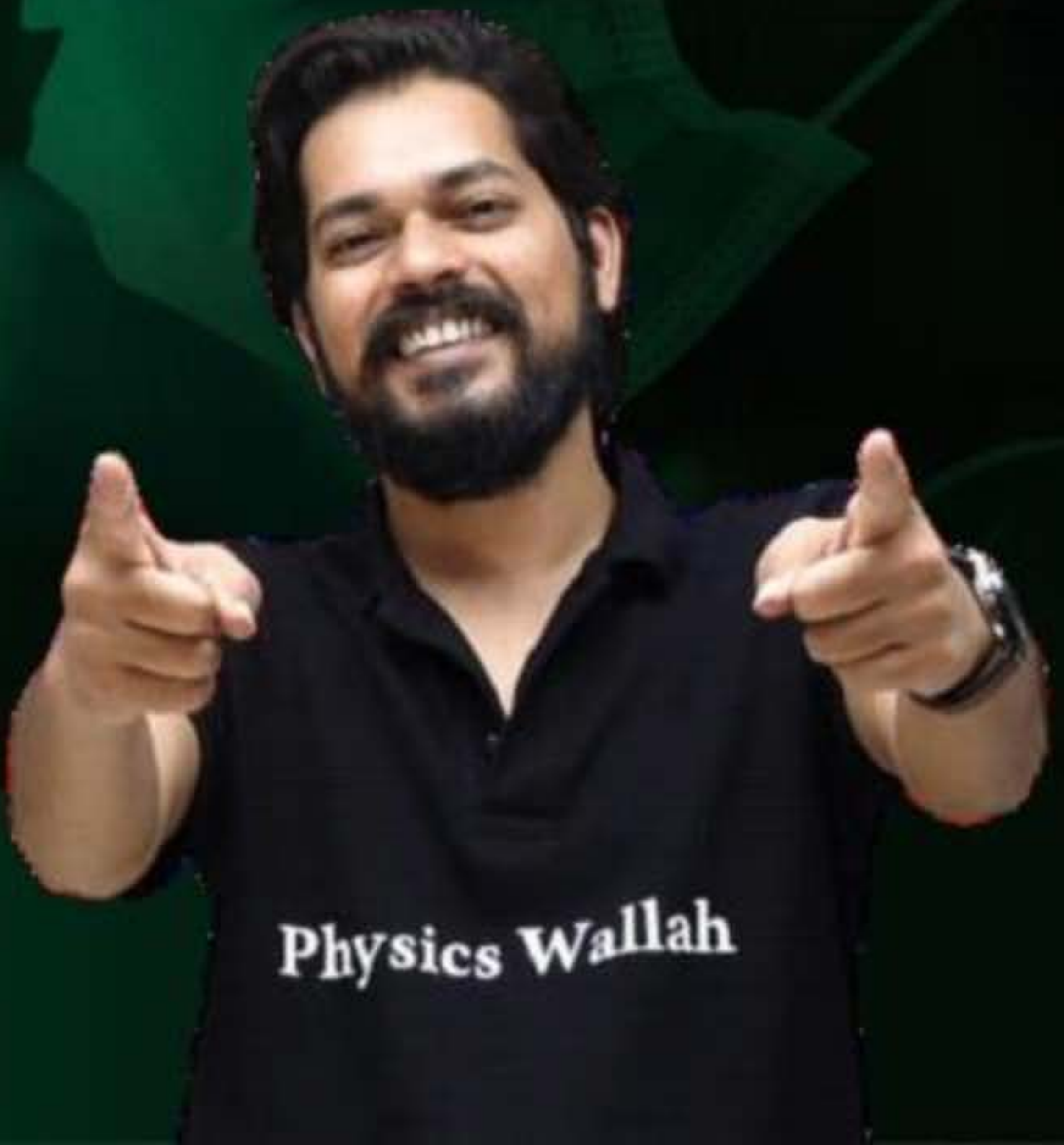
YAKEEN 2.0

FOR NEET 2025

Lecture- 01 | **Organic Chemistry**

Biomolecules

By- Pankaj Sir(POPU MAMA)


Physics Wallah

Topics *to be covered*

1. Introduction
   - carbohydrates
   - Amino acid
   - Nucleic acid
   - Vitamin
   - Enzymes
   - Hormones
2. Carbohydrates
3. Practice

Carbohydrates

Hydrates of carbon are called carbohydrates

- General formula # $C_x(H_2O)_y$ ✓

  Exp ÷ $C_6(H_2O)_6 \Longrightarrow C_6H_{12}O_6$ ✓

- Exception : $C_2(H_2O)_2$

  $C_2H_4O_2 \Longrightarrow \underbrace{CH_3COOH}$ (acetic acid) not a carbohydrate

- Rhamnose, $\underbrace{C_6H_{12}O_5}$ is a carbohydrate but does not fit in this definition

Carbohydrates

- The carbohydrates may be defined as optically active polyhydroxy aldehydes or ketones or the compounds which produce such units on hydrolysis.
- carbohydrates, which are sweet in taste→sugars.
- sugar, used in our homes → sucrose
- sugar present in milk →lactose

Classification 1. Based on hydrolysis

(i) monosaccharides does not hydrolyse further.

Exp: Glucose
Fructose
Galactose etc.

(ii) Oligosaccharides
Produces 2 to 10 monosac units on hydrolysis

- Disac → 2 unit

Exp: sucrose, maltose, Lactose etc.

- Trisac → 3 unit

Exp: Raffinose

(iii) Polysaccharides

- Carbohydrates which yield a large number of monosaccharide units on hydrolysis are called polysaccharides.
- examples are starch, cellulose, glycogen, gums, etc.
- Polysaccharides are not sweet in taste, hence they are also called non-sugars

Mono ⟶ simplest unit further hydrolysis is not possible

Glucose, fructose, Galactose

* oligo sacc* ÷ Produces 2 to 10 unit on hydrolysis.

2 unit → Disacc ⟶ Sucrose, Maltose, Lactose

3 unit → Trisacc → Raffinose

4 unit → Tetrasac

⋮

10 unit → Decasacc.

Classification 2. Reducing and non reducing sugar

1. Reducing → Reduces

Tollen's reagent ✓

Fehling's reagent ✓

Benedict's regent ✓

Exp. 1. monosac like Glucose ✓

fructose ✓, Galactose ✓ etc

2. Disac like maltose ✓, Lactose ✓ etc.

2. Non-reducing Do not reduce

T.R. ✗

F.R. ✗

B.R. ✗

★ ★ ★

Exp. : Sucrose etc

★ ★ ★

Classification 3. Based on number of carbon atoms

No. of carbons	Ald	Ket
3	Aldotriose	Ketotriose
4	Aldotetrose	Ketotetrose
5	Aldopentose	Ketopentose
6	Aldohexose ↓ Glucose	Ketohexose → fructose

MOP of Glucose

1. From Sucrose

Inversion of Cane sugar

$$\underset{\substack{\text{Sucrose}\\(+)}}{C_{12}H_{22}O_{11}} + H_3O^+ \xrightarrow[\text{Invertase}]{} \underbrace{\underset{(+)}{\overset{\text{Glucose}}{C_6H_{12}O_6}} + \underset{(-)}{\overset{\text{fructose}}{C_6H_{12}O_6}}}_{(-)}$$

2. From Starch

$$(C_6H_{10}O_5)_n \xrightarrow{H_3O^+} \underset{\text{Glucose}}{nC_6H_{12}O_6}$$

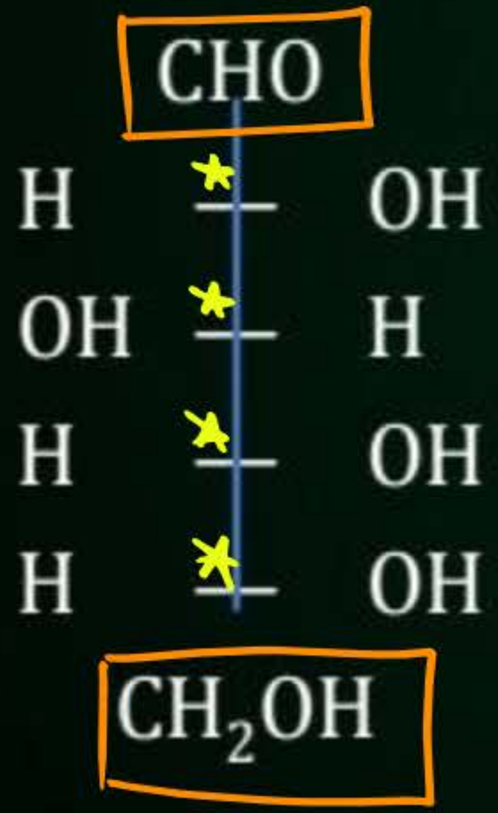
Properties

$\oplus$

1. Glucose is also known as dextrose (+) or Aldohexose
2. Structure

$C_6H_{12}O_6$ ✓

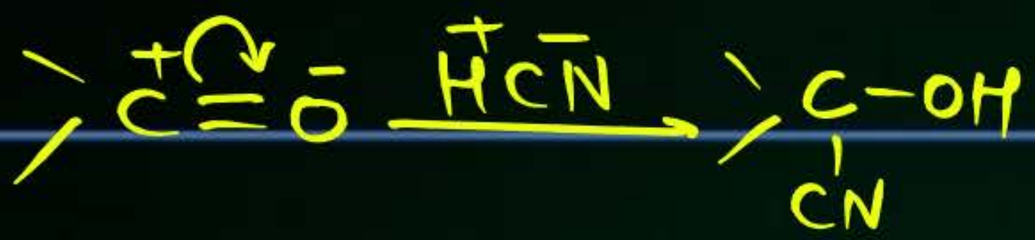
Fischer projection formula



$$\begin{array}{ccc} & \boxed{CHO} & \\ H & -\overset{*}{C}- & OH \\ OH & -\overset{*}{C}- & H \\ H & -\overset{*}{C}- & OH \\ H & -\overset{*}{C}- & OH \\ & \boxed{CH_2OH} & \end{array}$$

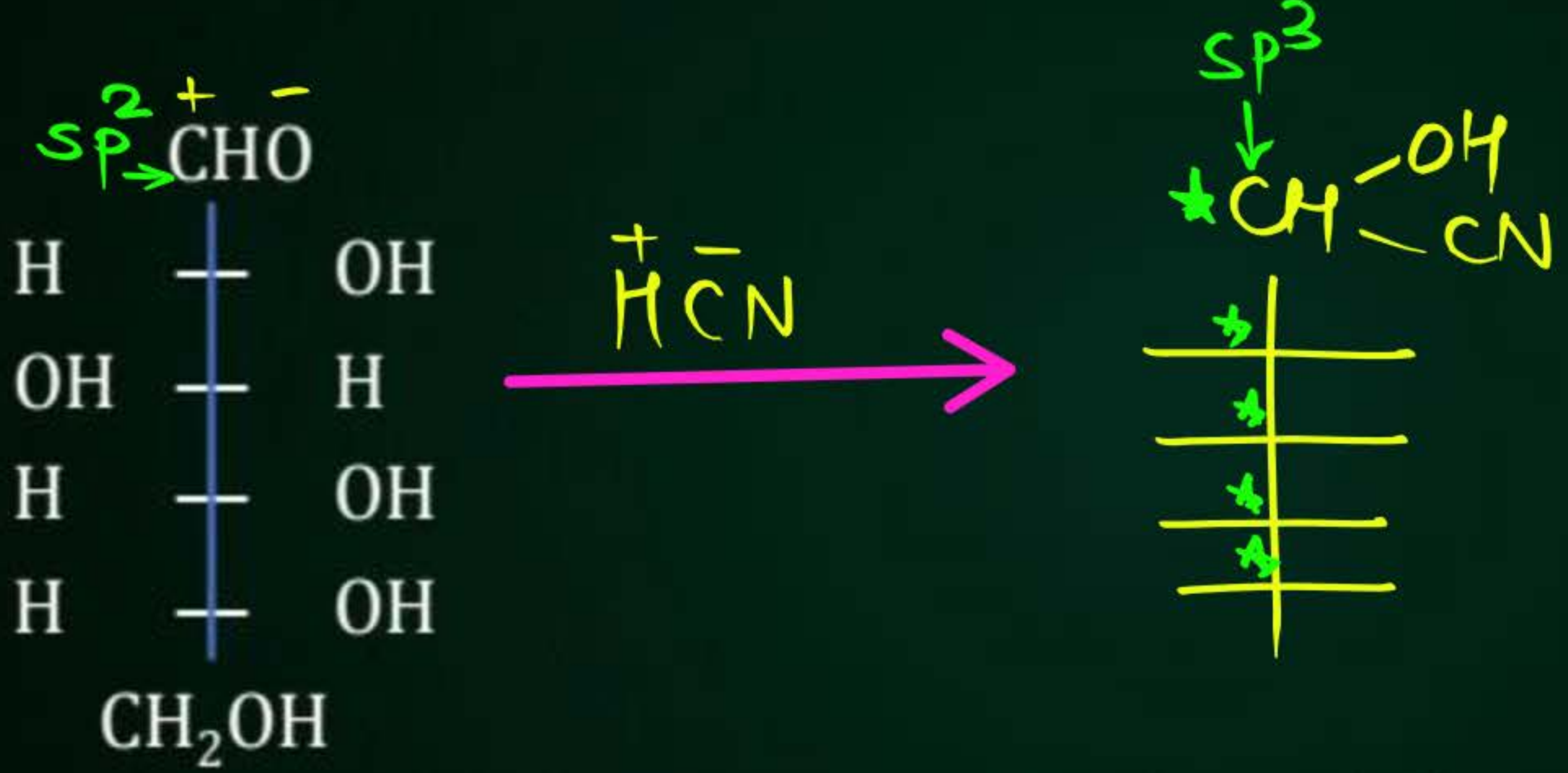
Total no. of Chiral carbons = 4

Chemical Reactions



$$>\overset{+}{C}=\overset{-}{O} \xrightarrow{\overset{+}{H}\overset{-}{CN}} >C(OH)CN$$

1. Rxn with HCN


sp²
CHO
H
OH
OH
H
H
OH
H
OH
CH₂OH
H⁺ CN⁻
sp³
*CH
OH
CN

Glucose cyanohydrin

Total no. of Chiral carbons = 5

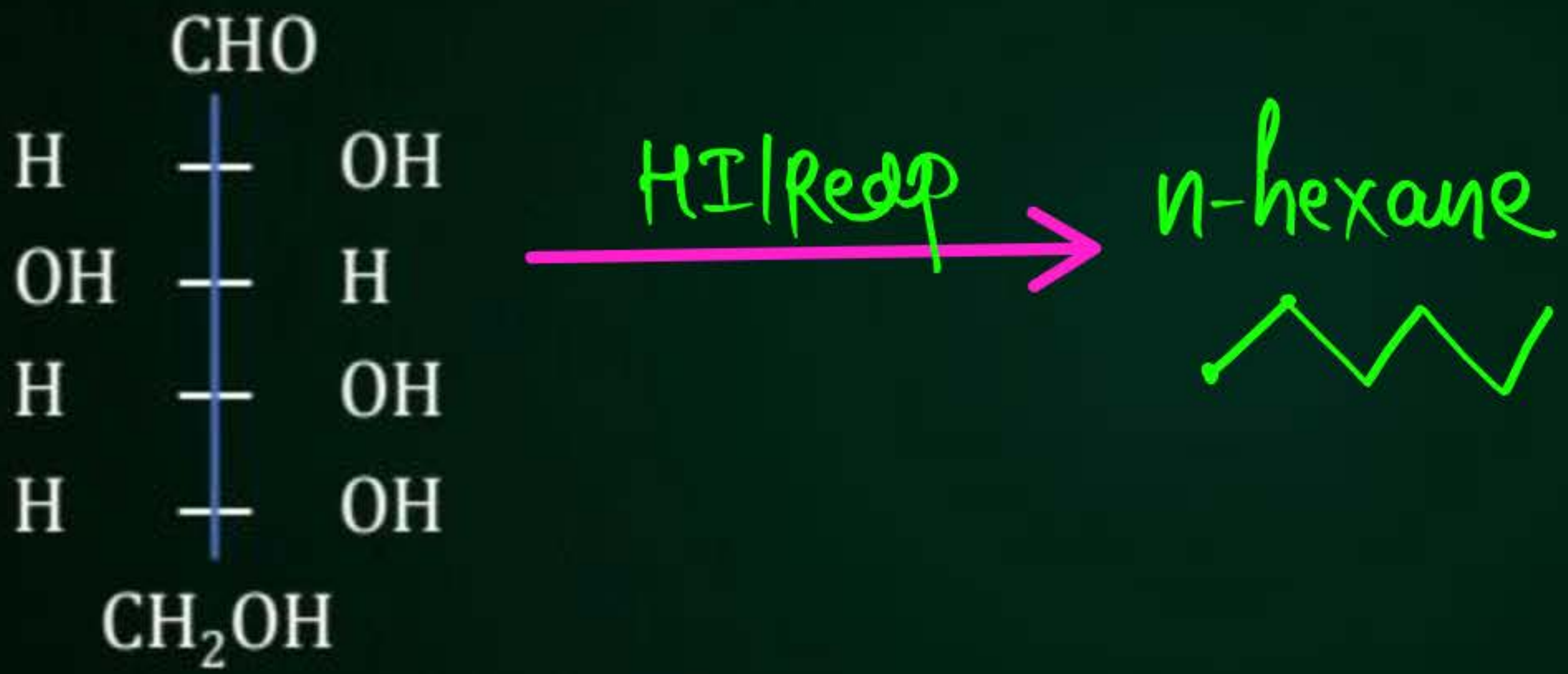
Chemical Reactions

$-COOH \longrightarrow -CH_3$

$-\underset{\underset{O}{\|}}{C}- \longrightarrow -CH_2-$

$-OH \longrightarrow -H$

2. Rxn with HI/Red P

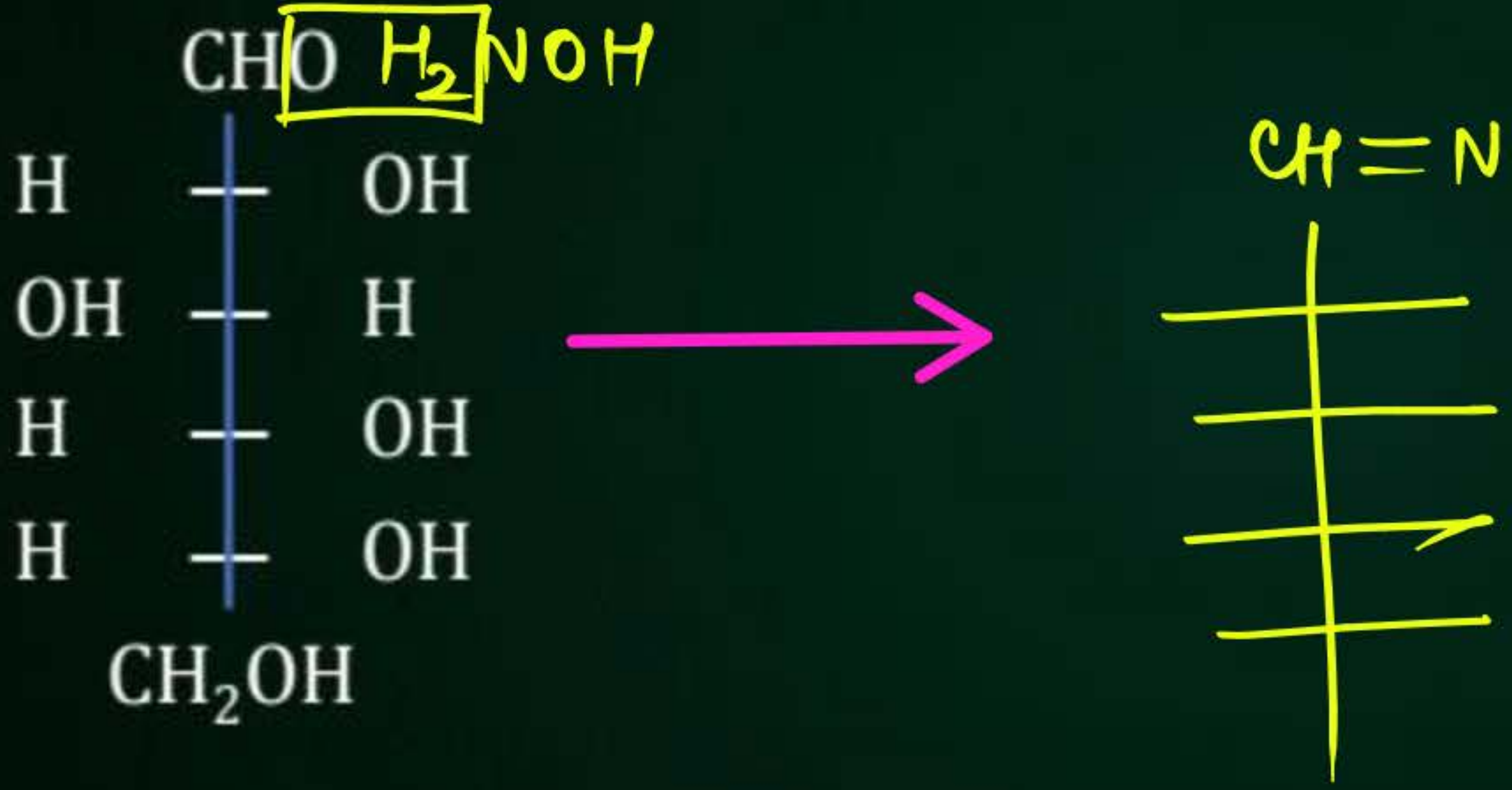

CHO
H
OH
OH
H
H
OH
H
OH
CH₂OH
HI/Red P
n-hexane

Chemical Reactions

$>C=\boxed{O+H_2}N-OH$

3. Rxn with NH_2OH

Glucose oxime



CHO H2NOH
H OH
OH H
H OH
H OH
CH2OH
CH=N-OH

Chemical Reactions

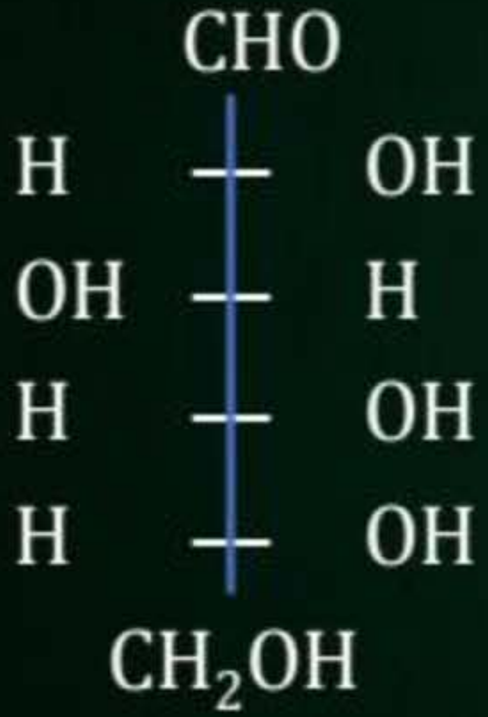
$R-\bar{O}-\overset{+}{H} + CH_3-\overset{+}{\overset{\overset{O}{\|}}{C}}-\bar{O}COCH_3$

$(\underbrace{CH_3-\overset{\overset{O}{\|}}{C}}_{\text{Acyl (Ac)}}-OR)$

(Excess)

4. Rxn with acetic anhydride

Glucose pentaacetate



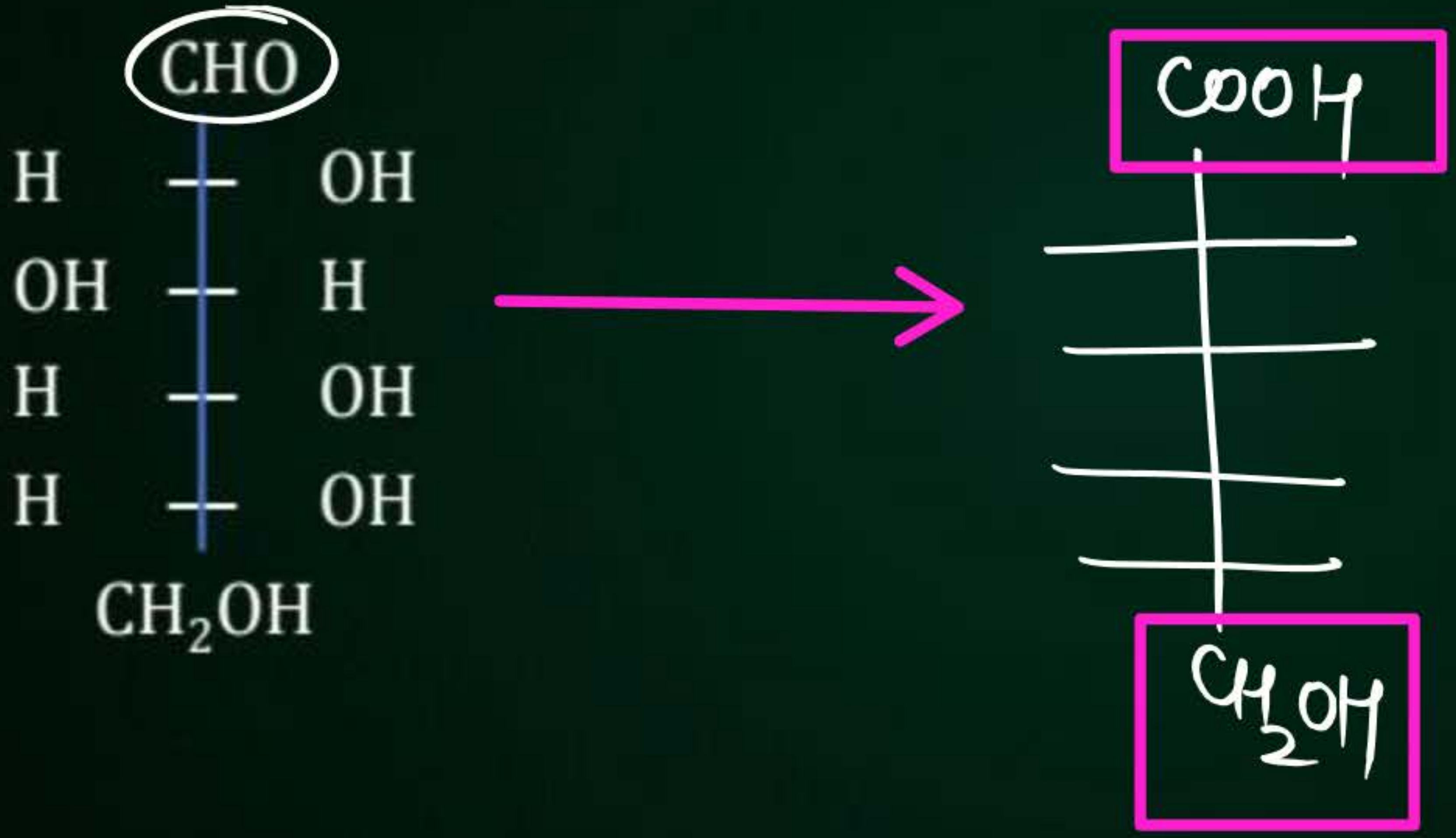
$$\begin{array}{c}CHO\\|\\(\overset{-\;\;+}{CHOH})_4\\|\\CH_2\overset{-\;+}{OH}\end{array} + \overset{\text{Excess}}{CH_3-\overset{+}{\underset{\underset{O}{\|}}{C}}-\bar{O}-\underset{\underset{O}{\|}}{C}-CH_3} \longrightarrow \begin{array}{c}CHO\\|\\(CHOAc)_4\\|\\CH_2-OAc\end{array}$$

$-CHO \longrightarrow -COOH$

Chemical Reactions

5. Rxn with Br_2+H_2O

Gluconic acid (Aldonic acid)


CHO
H OH
OH H
H OH
H OH
CH₂OH
COOH
CH₂OH

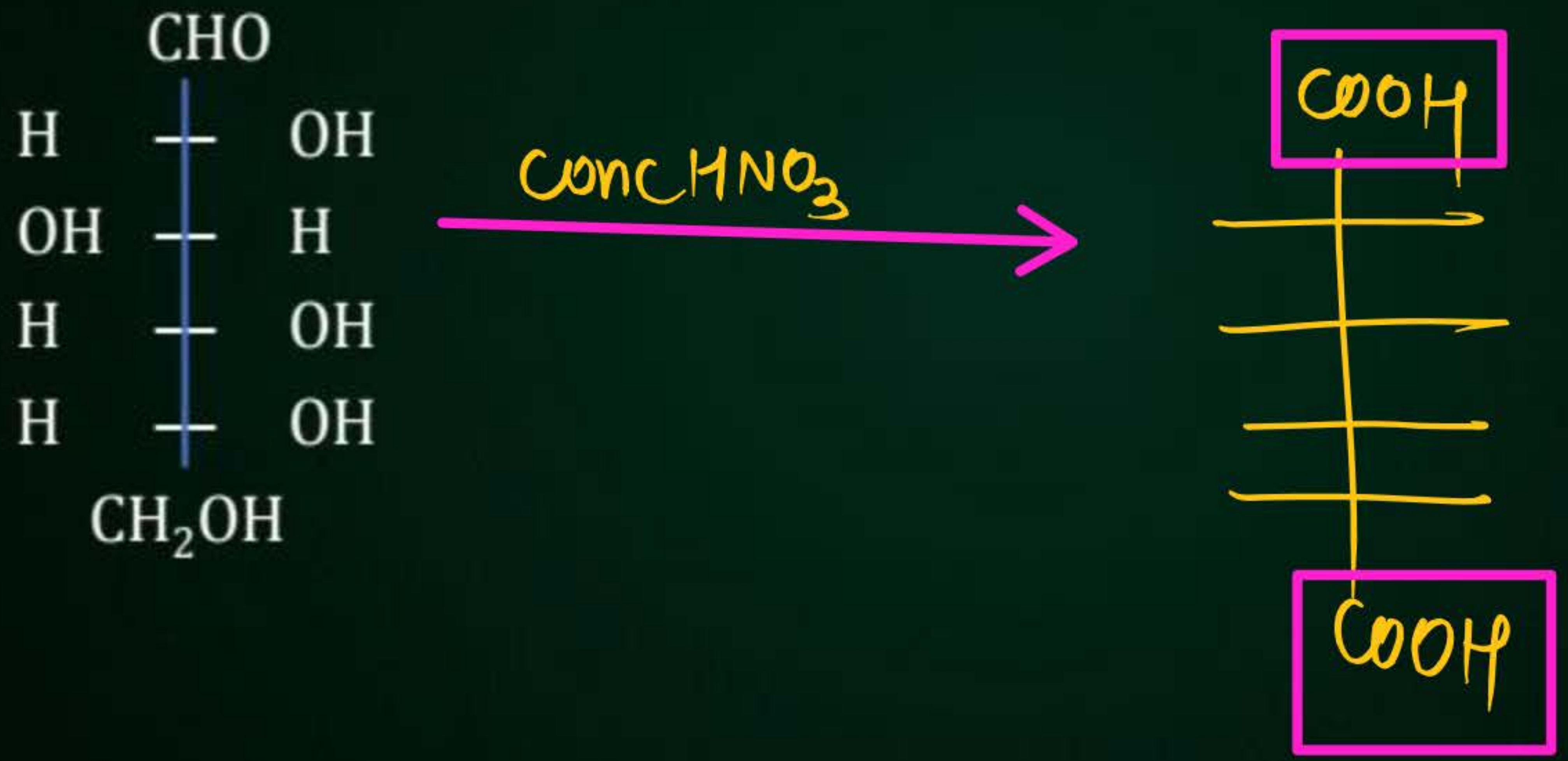
$-CHO \longrightarrow -COOH$

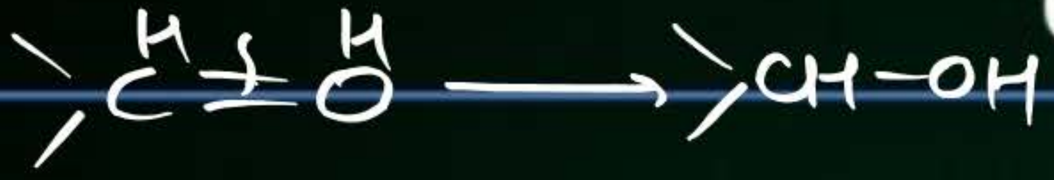
$-CH_2OH \longrightarrow -COOH$

Chemical Reactions

6. Rxn with conc. HNO_3

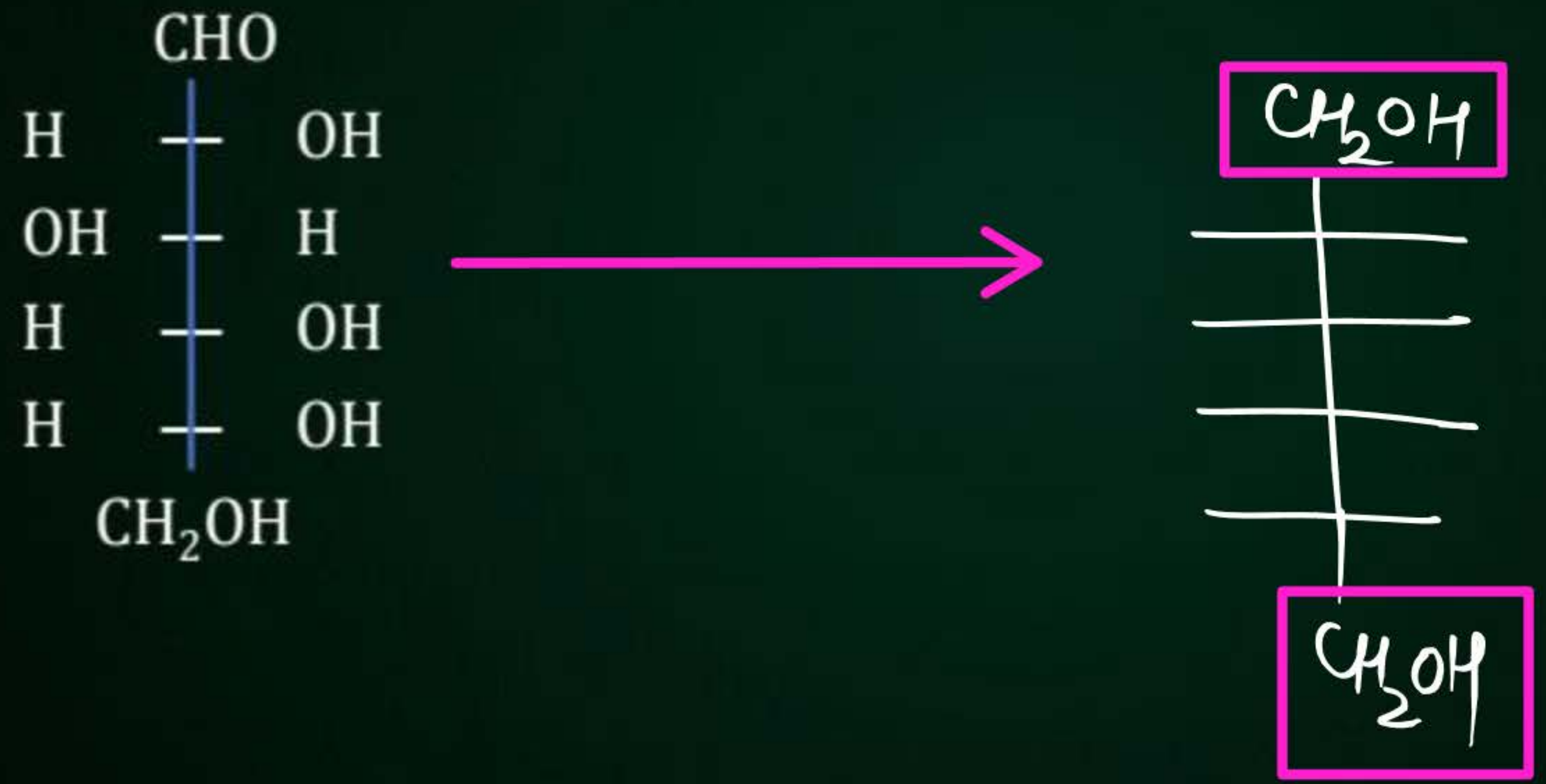
Saccharic acid (Glucharic acid)


CHO
H OH
OH H
H OH
H OH
CH₂OH
conc HNO₃
COOH
COOH



Chemical Reactions

7. Rxn with $\underbrace{Na(Hg)+ROH}$ or $\underbrace{NaBH_4/MeOH}$ or $\underbrace{H_2+}$ Catalyst


CHO
H
OH
OH
H
H
OH
H
OH
CH2OH
CH2OH
CH2OH

Sorbitol

Rxns which support cyclic structure

1. NO rxn with $NaHSO_3$ ✓
2. NO rxn with Schiff's Test ✓ (P-Rosaniline + $HCl + SO_2$)
3. NO rxn with 2,4DNP test ✓
4. NO rxn of Glucose penta acetate with NH_2OH

Magenta colour → Decolourlise
↓
magenta colour restore

schiff's base

$$>C\boxed{=O + H_2}N-R$$

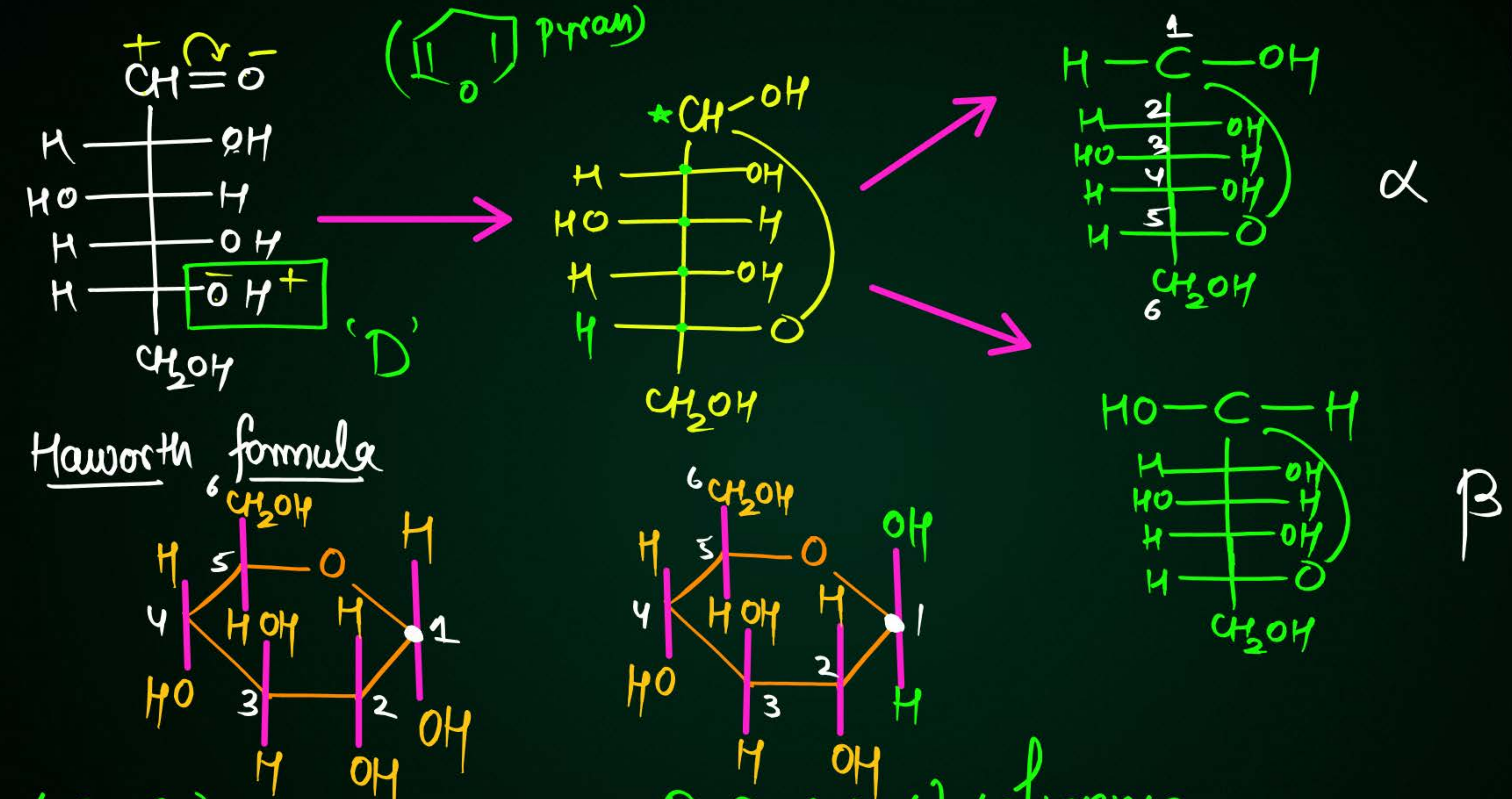
$$\downarrow$$

$$>C=N-R$$

schiff's base

Glucose exist in 3 forms in liquid solution

$$\begin{tikzcd}
\begin{array}{c}\text{cyclic-1}\\ \alpha\text{-form}\end{array} \arrow[r, shift left] & \begin{array}{c}\text{open}\\ \text{chain}\end{array} \arrow[l, shift left] \arrow[r, shift left] & \begin{array}{c}\text{cyclic-2}\\ \beta\text{-form}\end{array} \arrow[l, shift left]
\end{tikzcd}$$


pyran
'D'
α
β
1
2
3
4
5
6
CH₂OH
H
OH
HO
O

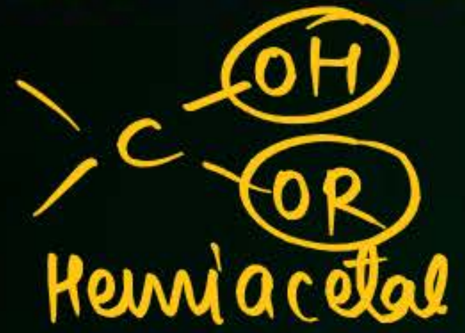
Haworth formula

α-D-(+)-Glucopyranose

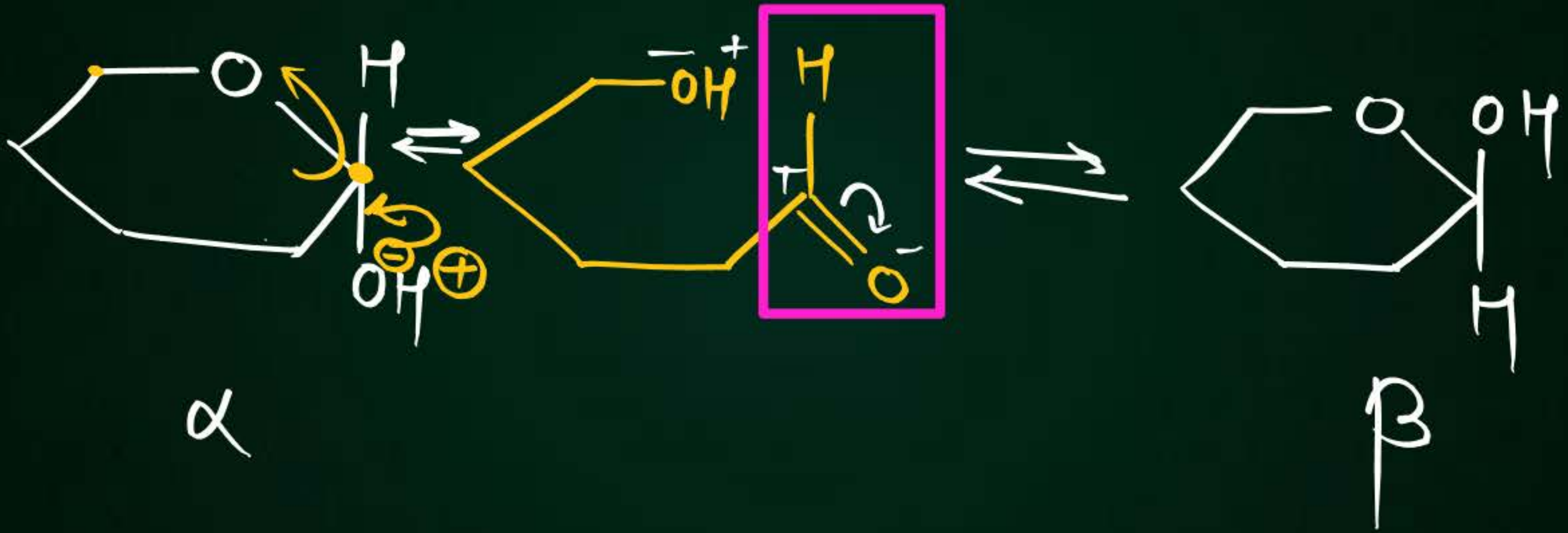
β-D-(+)-Glucopyranose

Mutarotation

Interconversion of α & β in acidic or basic medium is called mutarotation (due to hemiacetal)



C
OH
OR
Hemiacetal



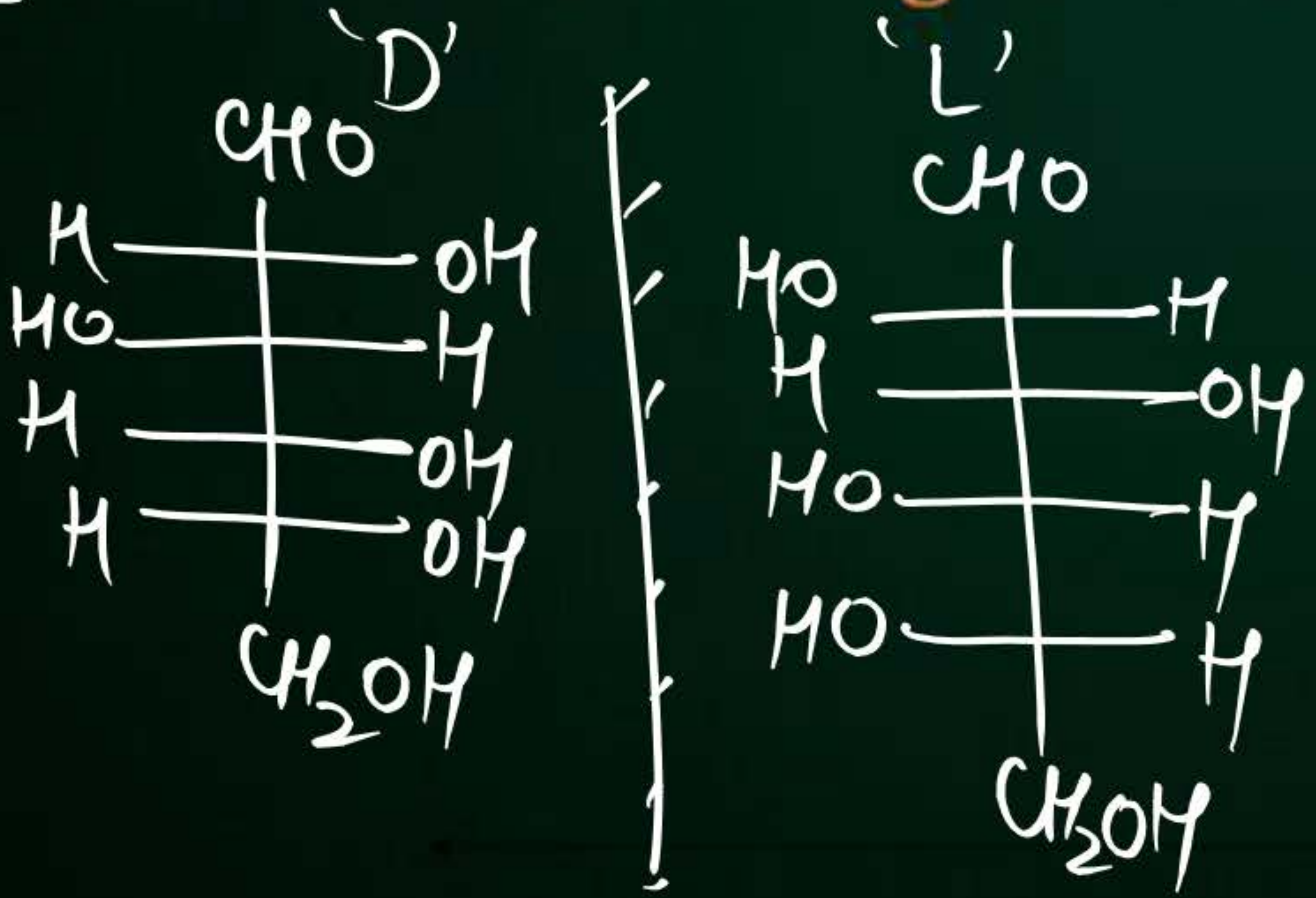
O
H
OH
α
OH
H
O
O
OH
H
β

OP points

1. Net optical Rotation of Glucose = $+52.4^0$
2. % α = 36 % (Sp . Rotation = 112^0) ,

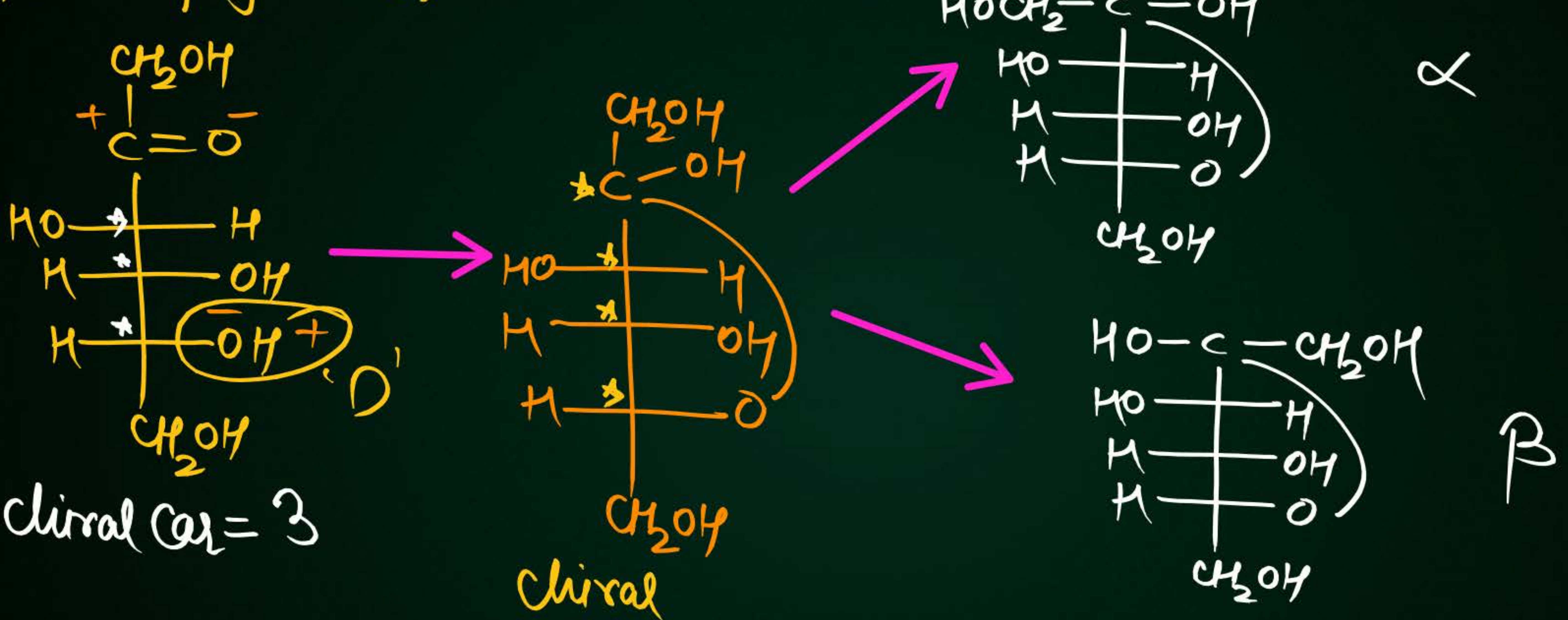
   % β = 63.8% (Sp . Rotation = 19^0)
3. α & β are Diastereomer or [Anomer] → ek he formulae ke do cyclic struc.
4. L-Glucose is the mirror image of D-Glucose

** Glucose ÷ α & $\beta \rightarrow \underbrace{C_1 \text{ anomer}}$


'D'
CHO
H
OH
HO
H
H
OH
H
OH
CH2OH
'L'
CHO
HO
H
H
OH
HO
H
HO
H
CH2OH

cyclic struc of fructose

Fischer projection formula

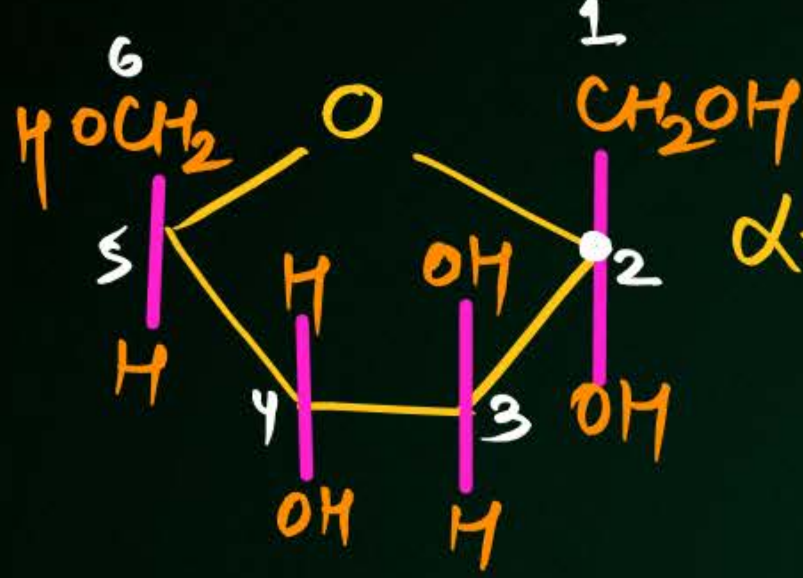

CH2OH
C=O
HO — H
H — OH
H — OH
'D'
CH2OH
CH2OH
C — OH
HO — H
H — OH
H — O
CH2OH
HOCH2 — C — OH
HO — H
H — OH
H — O
CH2OH
α
HO — C — CH2OH
HO — H
H — OH
H — O
CH2OH
β

chiral car = 3

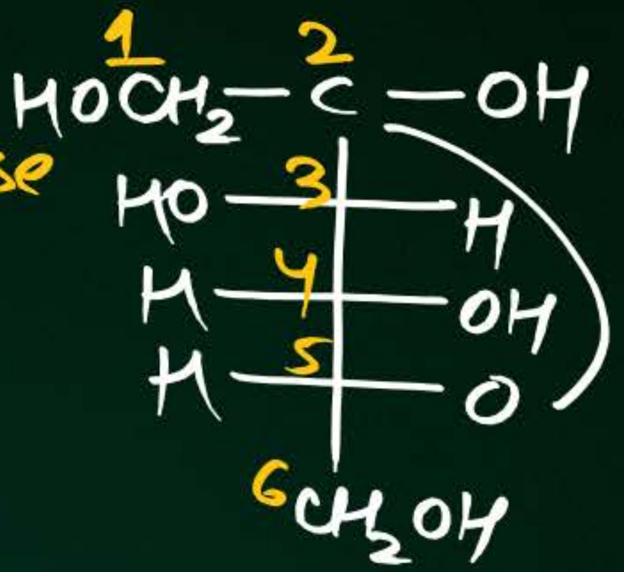
chiral car = 4

cyclic struc of fructose

furan

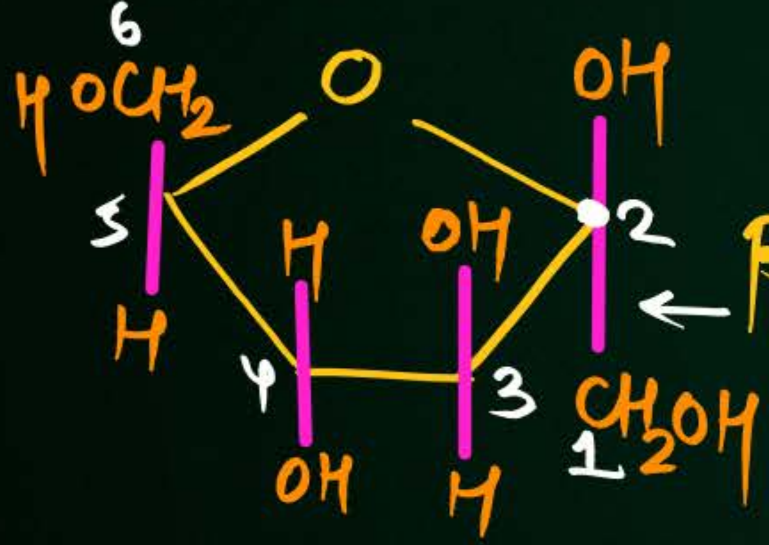

6
$HOCH_2$
O
1
CH_2OH
5
H
H
OH
2
4
3
OH
OH
H

α-D-(−) fructofuranose

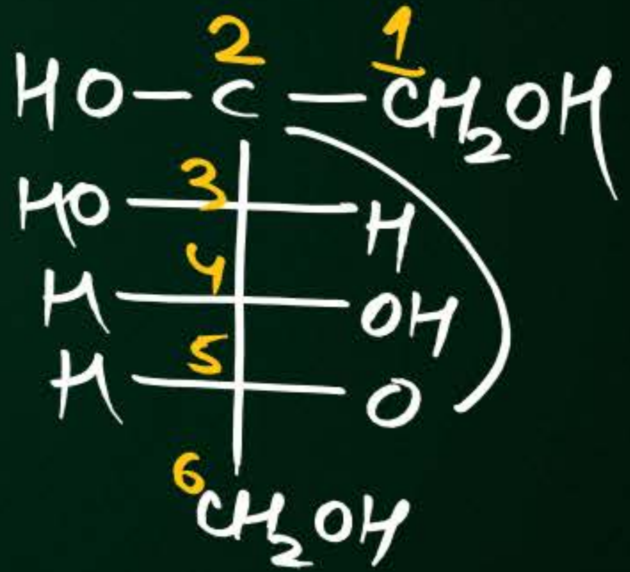

1
2
$HOCH_2-C-OH$
HO
3
H
H
4
OH
H
5
O
6
CH_2OH

α

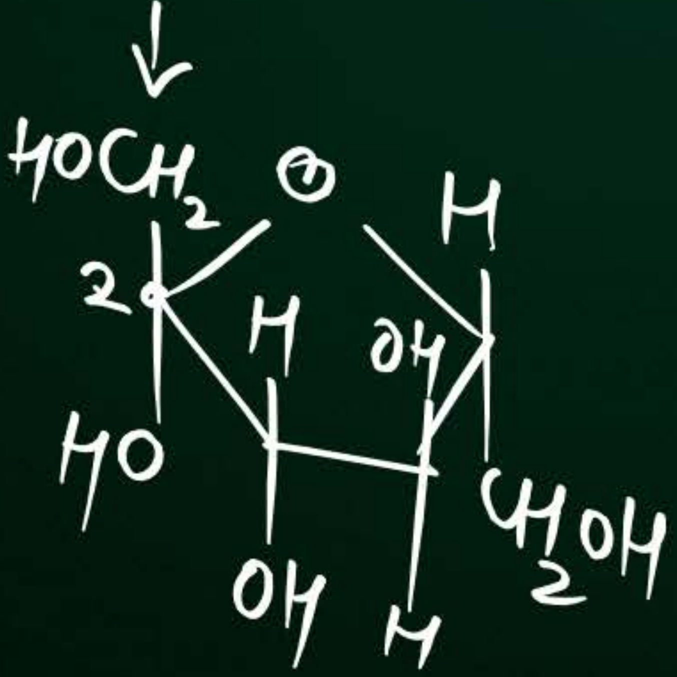
α & β are C-2 anomer


6
$HOCH_2$
O
OH
5
H
H
OH
2
4
3
OH
H
CH_2OH
1

← β-D-(−) fructofuranose


2
1
$HO-C-CH_2OH$
HO
3
H
H
4
OH
H
5
O
6
CH_2OH

β


↓
$HOCH_2$
O
H
2
H
OH
HO
CH_2OH
OH
H

Disaccharides: produces 2 mono sac unit on hydrolysis

Sucrose

α-D-Glucose + β-D-fructose

C_1 & C_2 Glycosidic Linkage

$\boxed{\text{Mono}} - O - \boxed{\text{mono}}$

Maltose

α-D-Glucose + α-D-Glucose

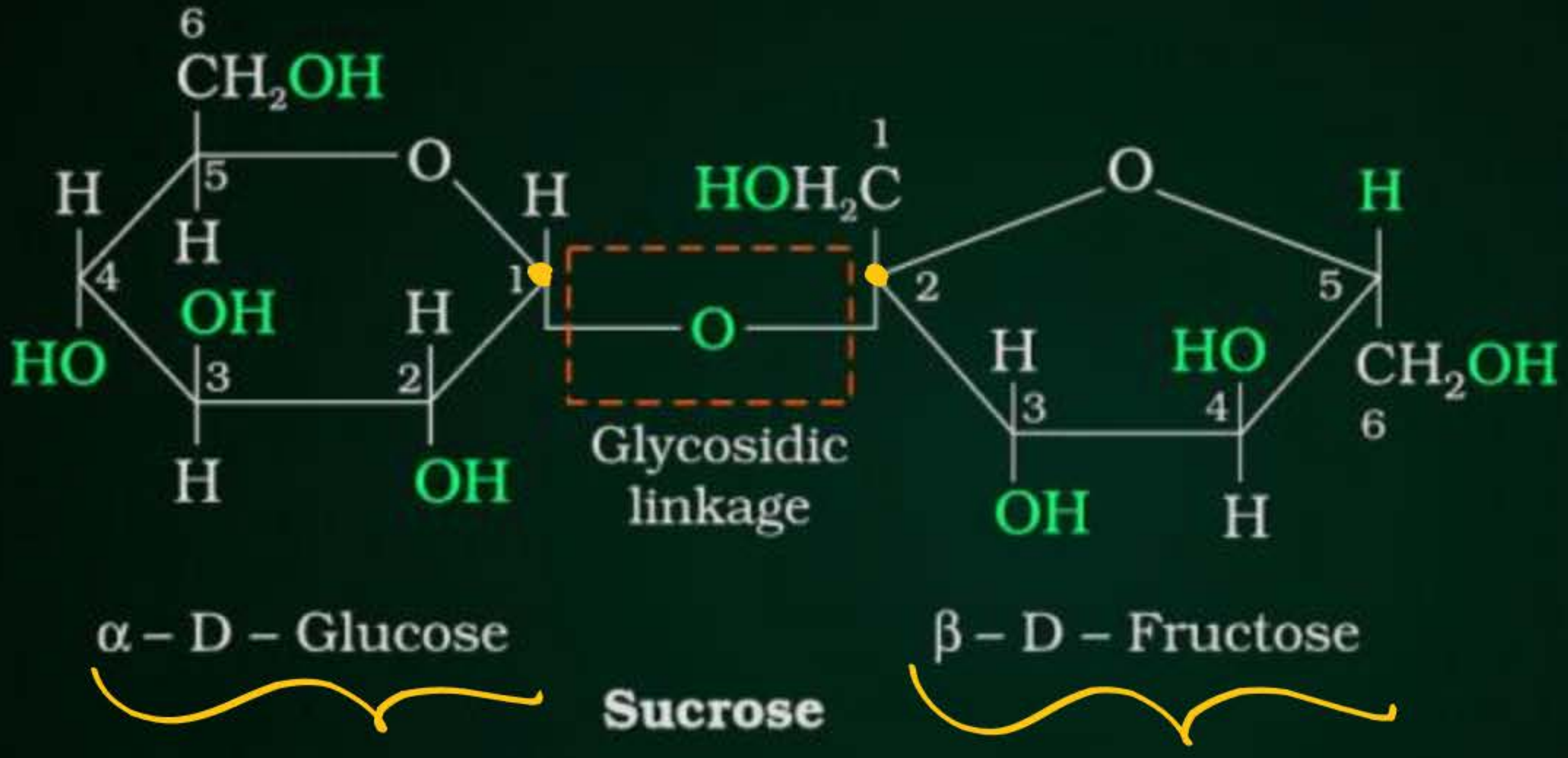
C_1 & C_4 Glycosidic Link

Lactose

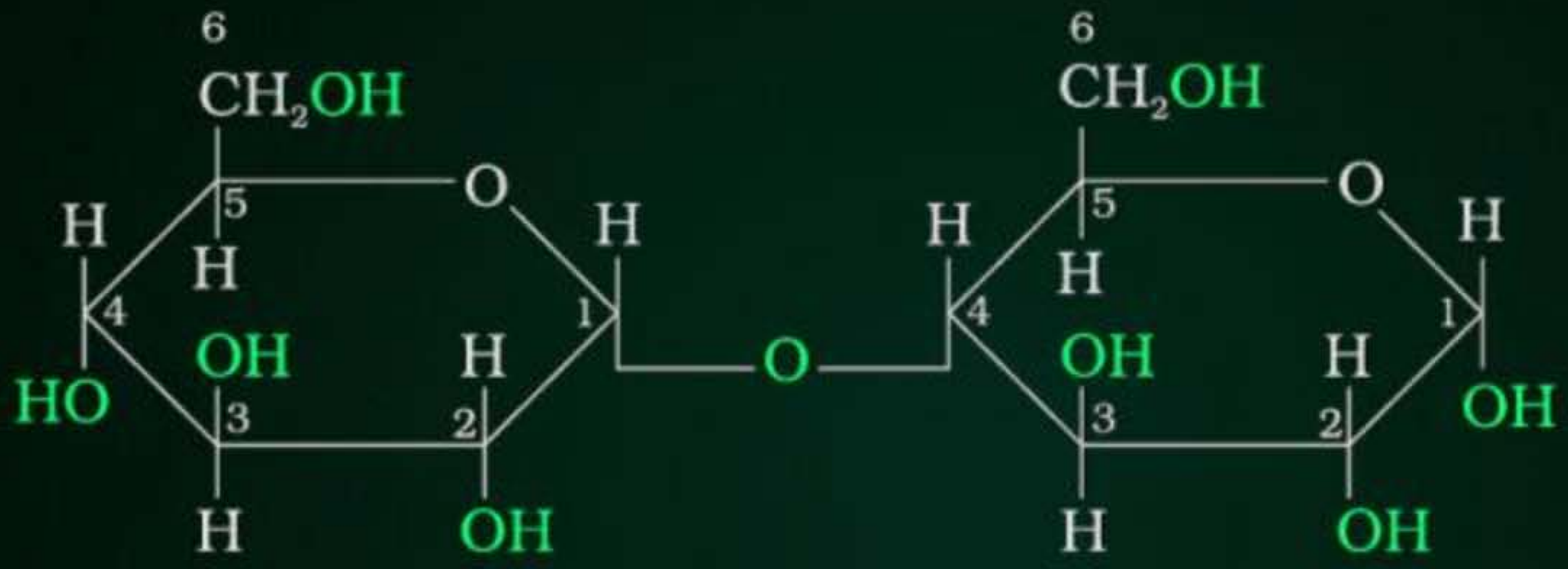
β-D-Galactose
+
β-D-Glucose

C_1 & C_4 Glycosidic Link

A. Structure of Sucrose:


6
CH2OH
O
H
5
H
4
OH
HO
3
H
2
OH
1
H
O
Glycosidic
linkage
1
HOH2C
2
O
H
5
H
3
HO
4
CH2OH
6
OH
H
α – D – Glucose
β – D – Fructose
Sucrose

B. Structure of Maltose:

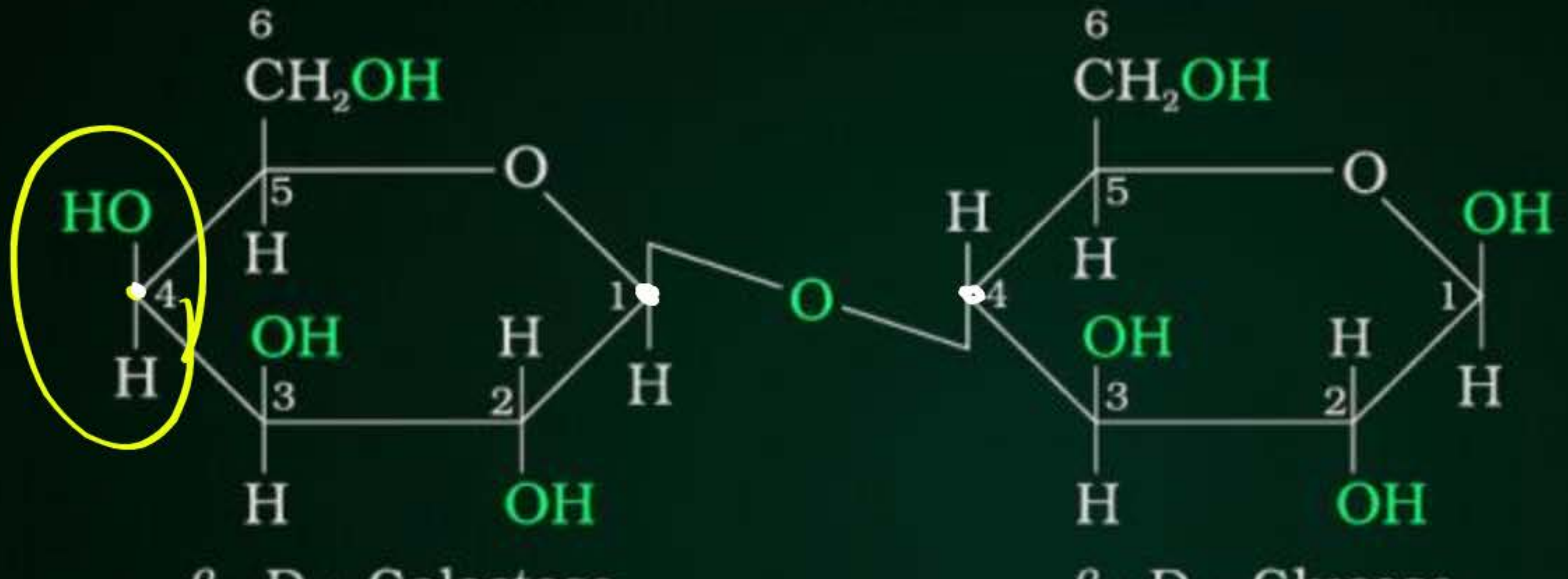

6
CH₂OH
O
5
H
H
4
HO
OH
3
H
H
2
OH
1
H
O
6
CH₂OH
O
5
H
H
4
OH
3
H
H
2
OH
1
H
OH

(I)
α – D – Glucose

Maltose

(II)
α – D – Glucose

C. Structure of Lactose:



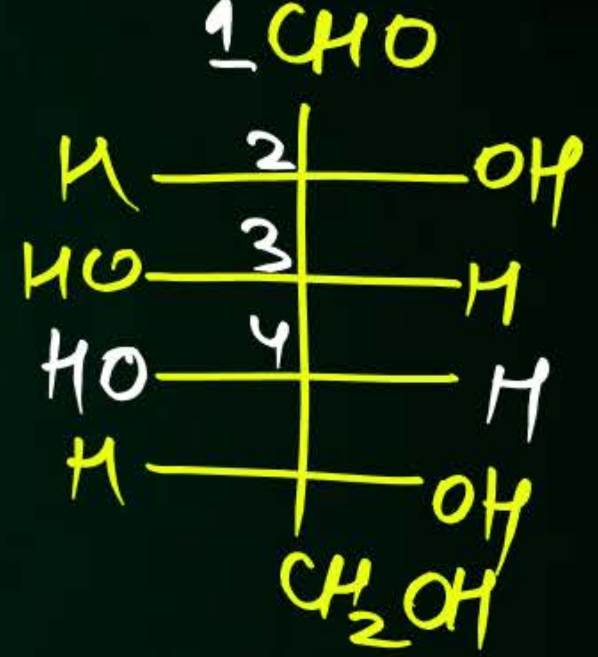
6
CH2OH
O
HO
5
H
4
H
OH
3
H
2
OH
1
H
O
6
CH2OH
O
H
5
H
4
OH
3
H
2
OH
OH
1
H

β – D – Galactose

β – D – Glucose

Lactose

Galactose



1 CHO
H
2
OH
HO
3
H
HO
4
H
H
OH
CH2OH

Polysaccharides:

Starch

Polymer of α-D-Glucose

1) Amylose → Linear

C_1 & C_4 Glycosidic Link (α-Link)

2) Amylopectin → Branch

C_1 & C_4 Glycosidic Link (α-Link)

&

(Branch at C_6) C_1 & C_6 Glycosidic Link (α-Link)

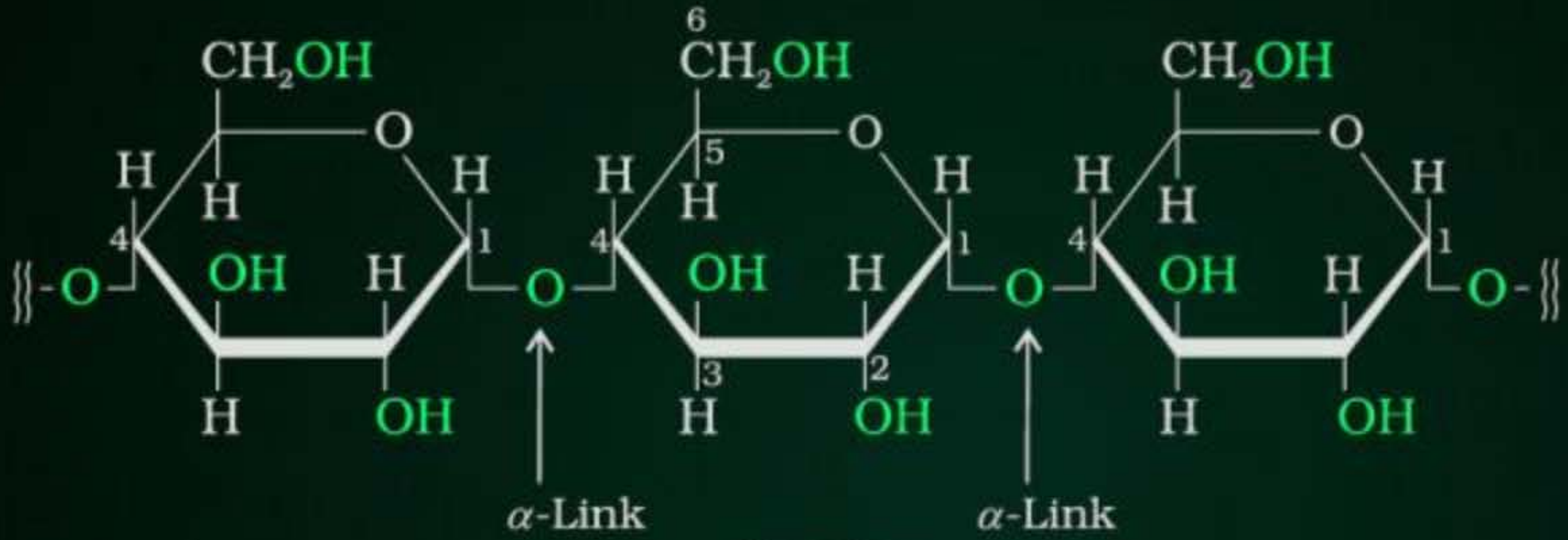
Cellulose

Polymer of β-D-Glucose

C_1 & C_4 Glycosidic Link

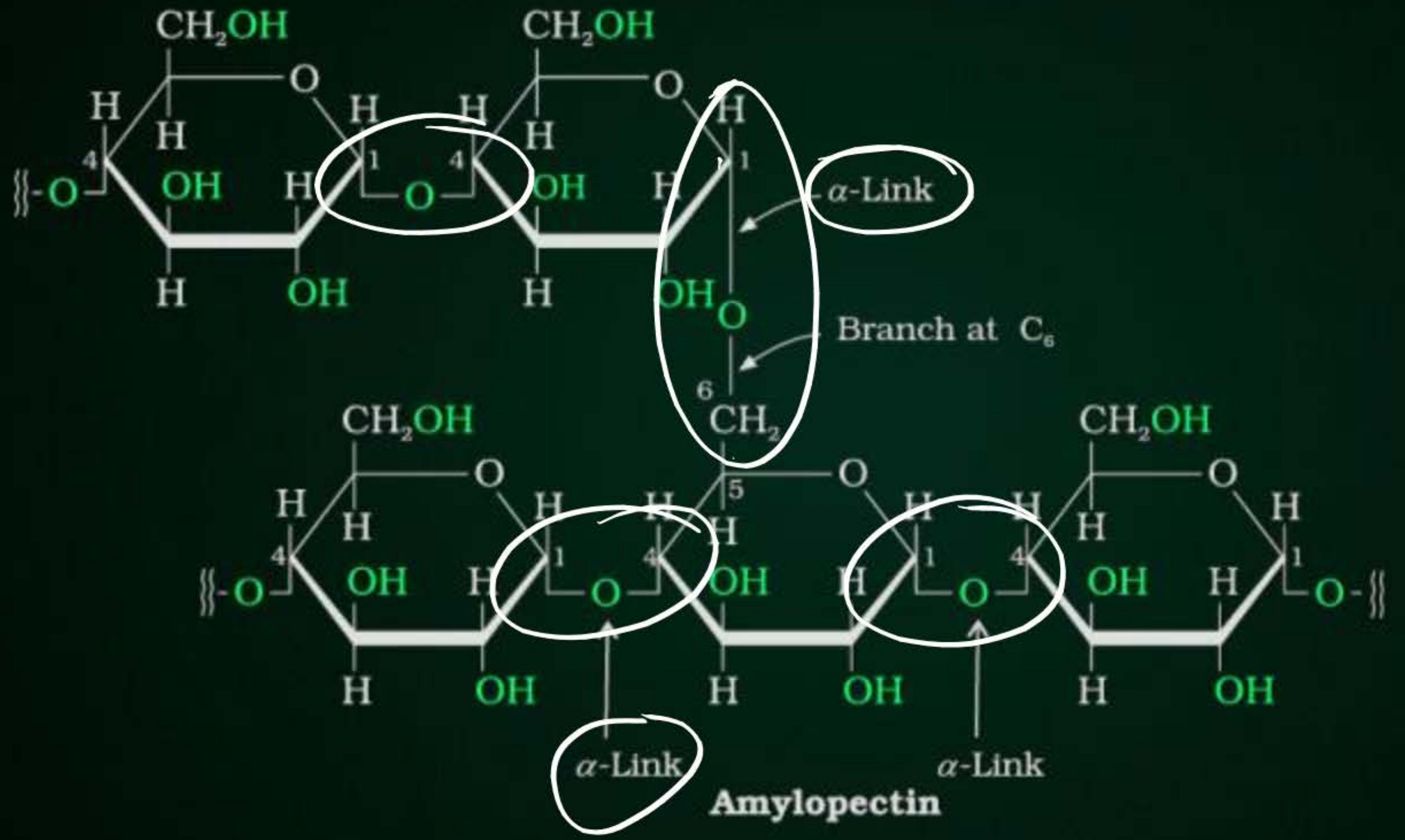
(β-Link)

A. Structure of Starch:


CH2OH
O
H
H
4
1
OH
H
O
H
OH
6
5
3
2
α-Link
α-Link

Amylose

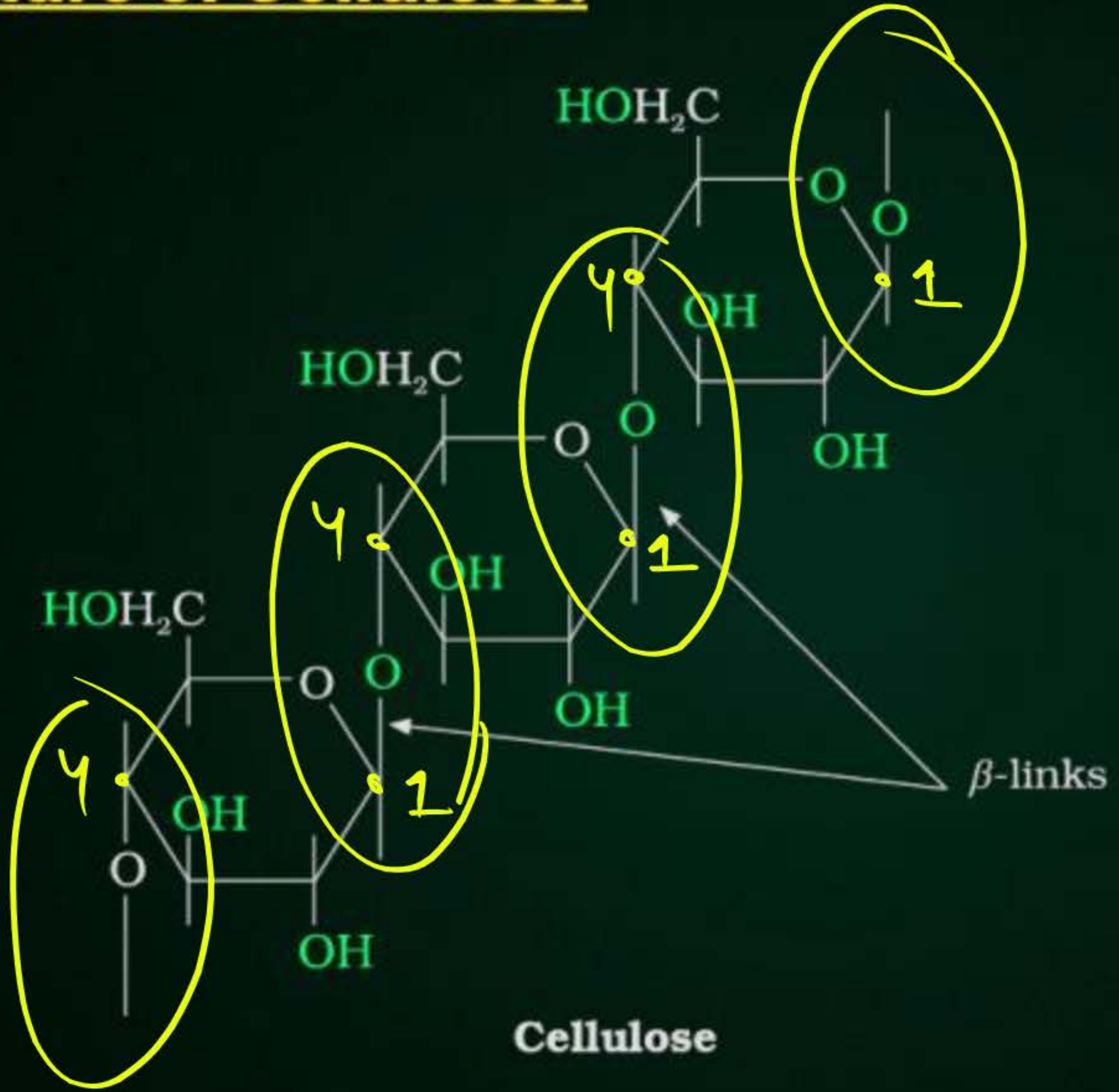
A. Structure of Starch:


CH₂OH
O
H
4
1
OH
α-Link
Branch at C₆
6
CH₂
5
α-Link
α-Link
Amylopectin

Diff b/w amylose and amylopectin

Amylose	Amylopectin
1. Linear polymer ✓	1. Branched Polymer ✓
2. 15-20% starch ✓	2. 80-85% starch ✓
3. Water soluble ✓	3. Water insoluble ✓
4. Glycosidic linkage at C_1 and C_4 ✓	4. Glycosidic linkage at C_1 and C_4 and Branch at C_6 ✓

B. Structure of Cellulose:


HOH₂C
O
O
4
1
OH
OH
HOH₂C
O
O
4
1
OH
OH
HOH₂C
O
O
4
1
OH
OH
O
β-links

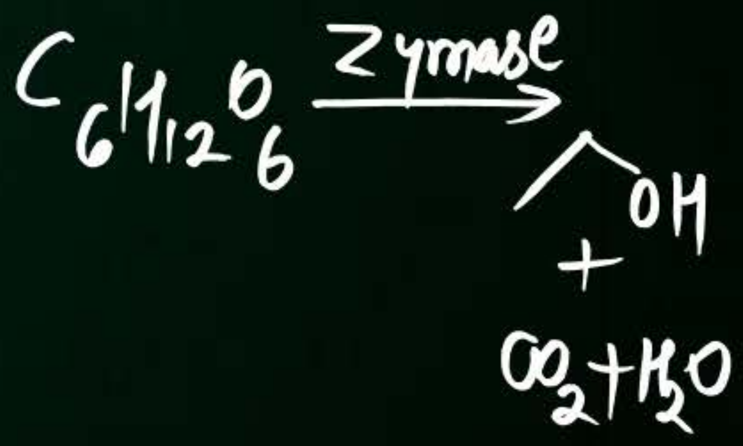
Cellulose

C. Structure of Glycogen:

1. stored in the liver of animals
2. Structure like amylopectin but more heavily branched

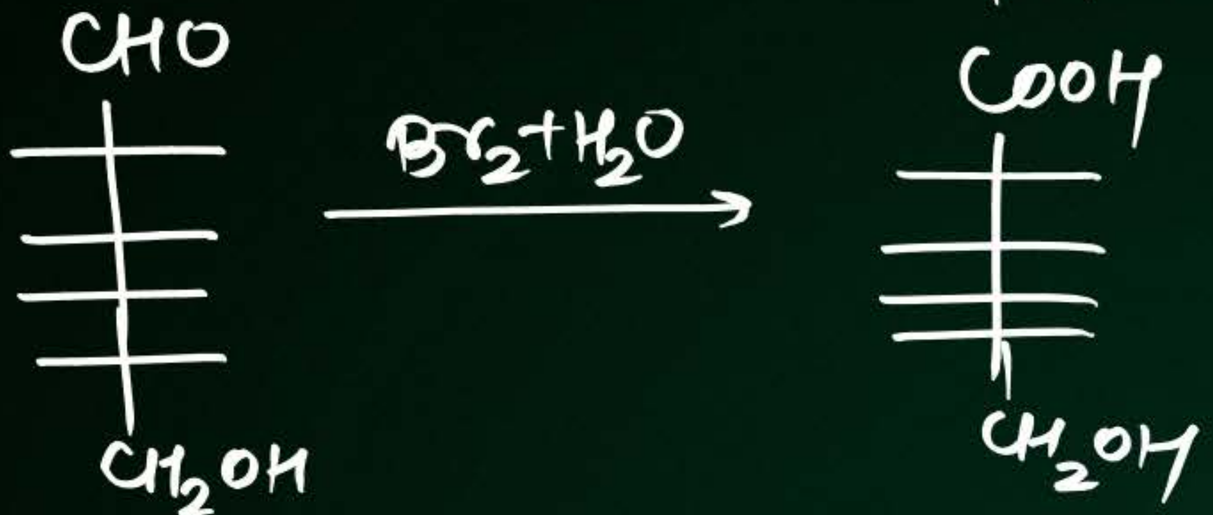
OP points

1. Glucose and fructose can be distinguished by bromine water not by T.R , F.R, B.R
2. Glucose , fructose and mannose give same osazone because in osazone formation take place at first two carbon atoms
3. Osazone is stable by intramolecular H bonding
4. Glucose/ fructose is converted to ethyl alcohol by fermentation in presence of zymase enzyme



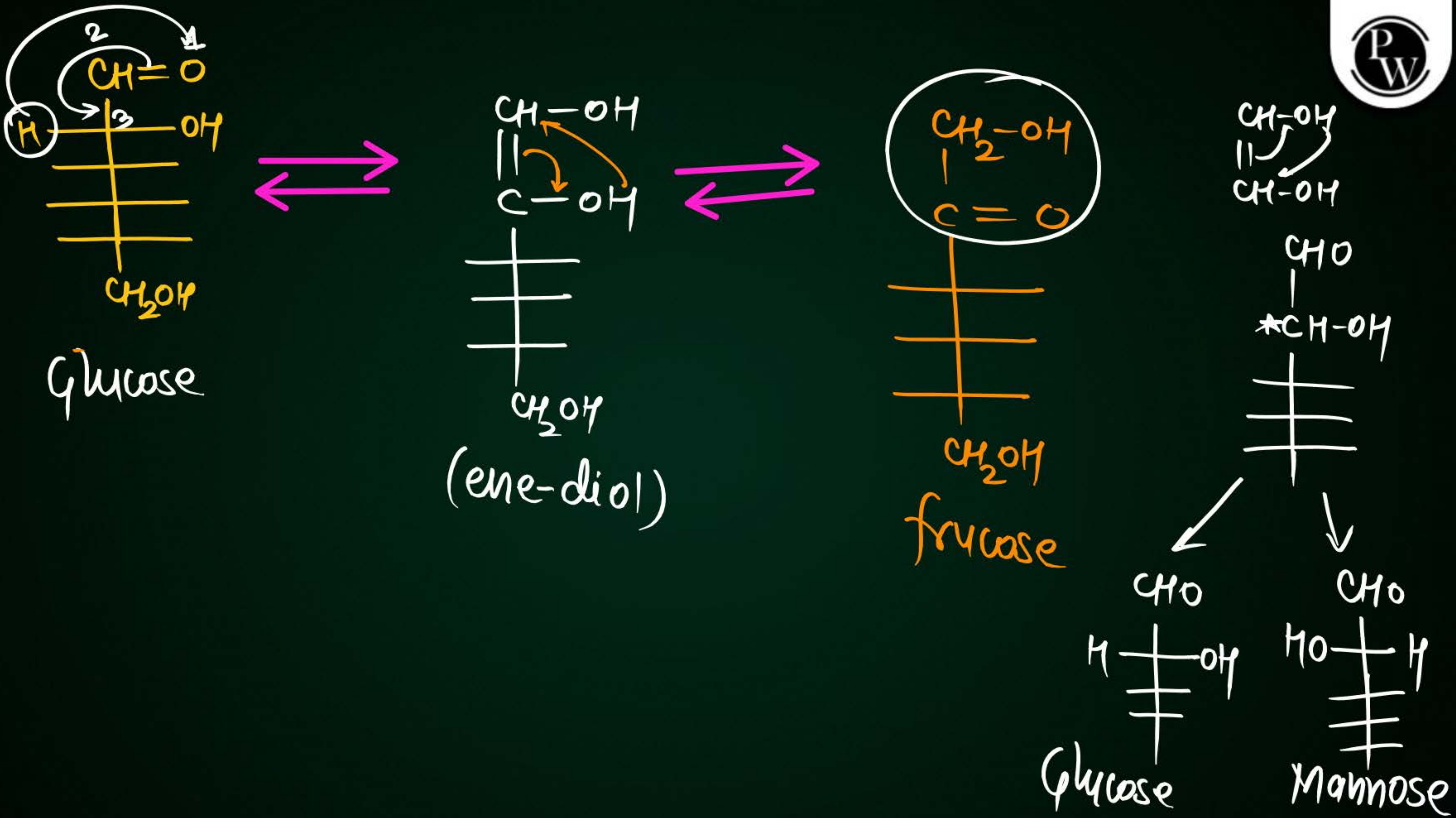
①

Gluconic acid

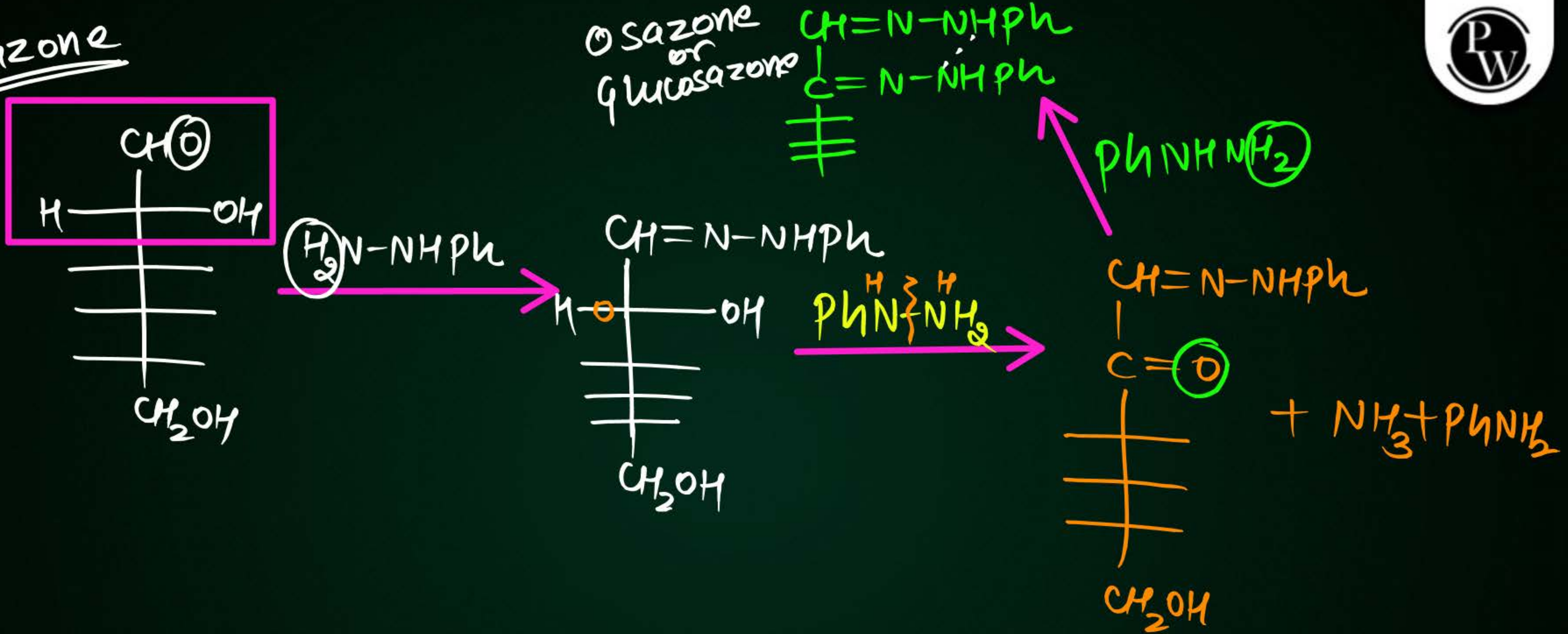

CHO
CH2OH
Br2+H2O
COOH
CH2OH

Glucose

Fructose $\xrightarrow{Br_2+H_2O}$ No Rxn


2
1
CH=O
3
H
OH
CH2OH
Glucose
CH—OH
C—OH
CH2OH
(ene-diol)
CH2—OH
C=O
CH2OH
frucose
CH-OH
CH-OH
CHO
*CH-OH
CHO
H
OH
Glucose
CHO
HO
H
Mannose

Osazone


CHO
H — OH
CH₂OH
H₂N-NHPh
CH=N-NHPh
H-O — OH
CH₂OH
PhNH-NH₂
CH=N-NHPh
C=O
CH₂OH
+ NH₃ + PhNH₂
PhNHNH₂
Osazone or Glucosazone
CH=N-NHPh
C=N-NHPh

QUESTION (NCERT Exemplar)

Glycogen is a branched chain polymer of α-D-glucose units in which chain is formed by C1—C4 glycosidic linkage whereas branching occurs by the formation of C1-C6 glycosidic linkage. Structure of glycogen is similar to ________.

(A) Amylose

[✓ (B) Amylopectin]

(C) Cellulose

(D) Glucose

QUESTION (NCERT Exemplar)

Which of the following polymer is stored in the liver of animals?

A Amylose

B Cellulose

C Amylopectin

D [✓ Glycogen]

QUESTION (NCERT Exemplar)

Sucrose (cane sugar) is a disaccharide. One molecule of sucrose on hydrolysis gives ________.

A 2 molecules of glucose

B 2 molecules of glucose + 1 molecule of fructose

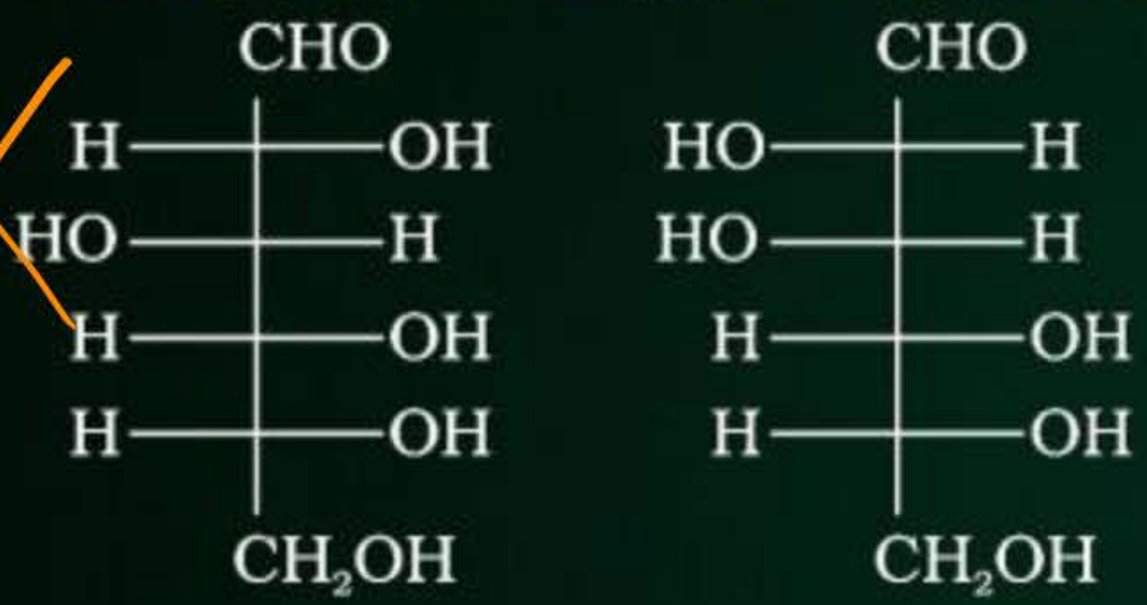
[✓ C] 1 molecule of glucose + 1 molecule of fructose

D 2 molecules of fructose

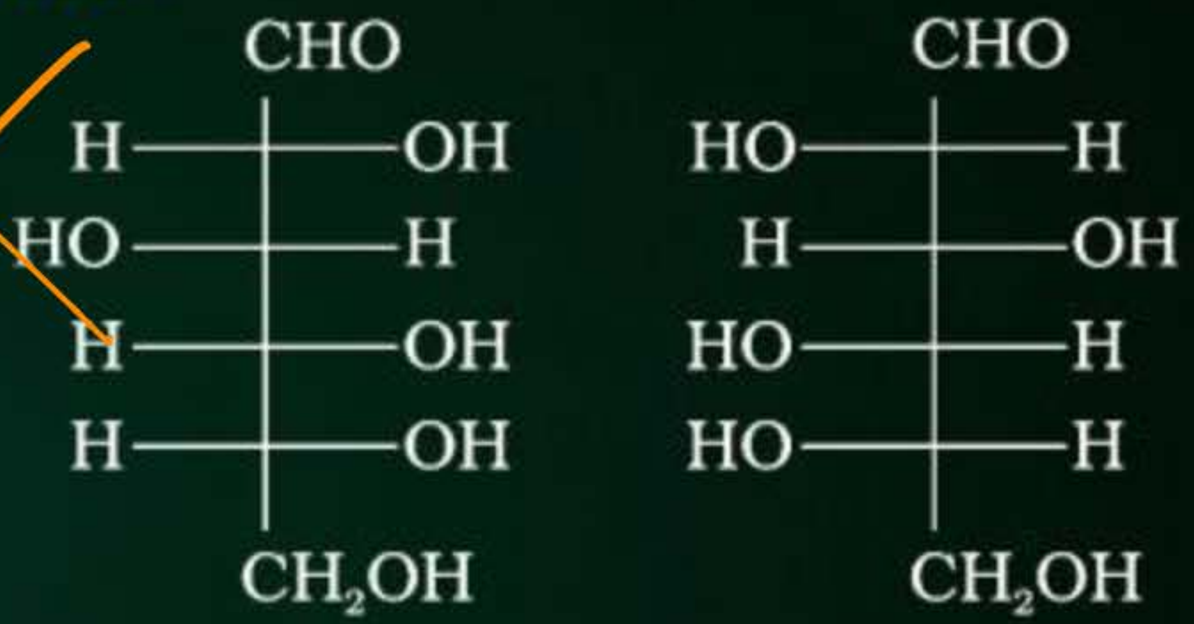
QUESTION (NCERT Exemplar)

Which of the following pairs represents anomers?

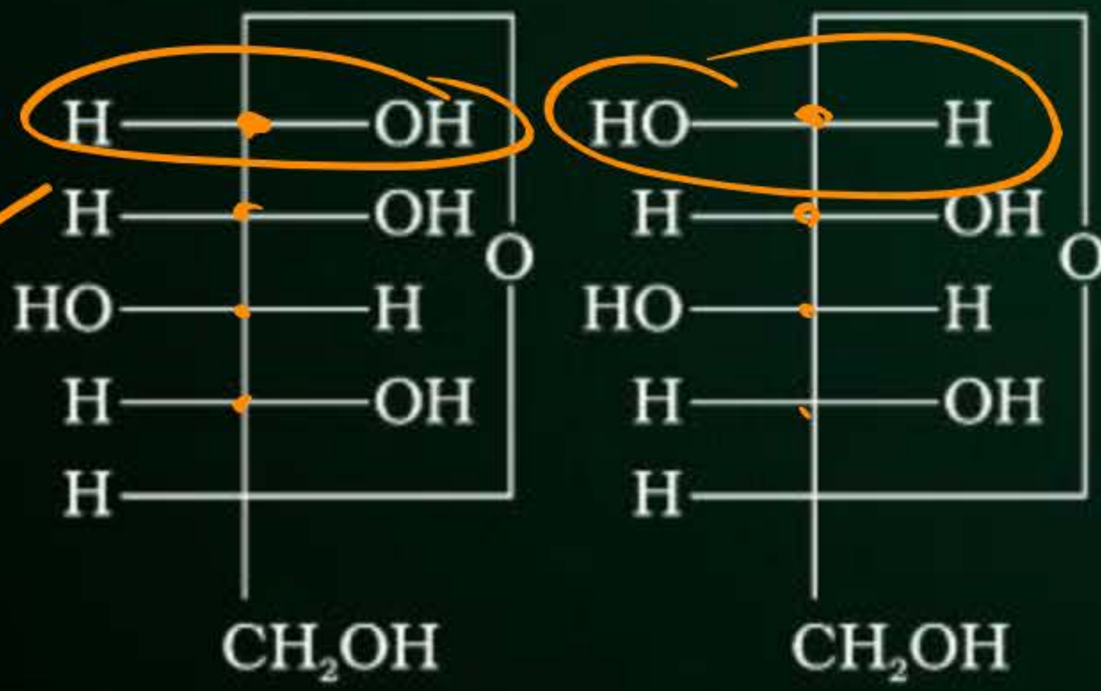
A


CHO
H OH
HO H
H OH
H OH
CH₂OH
CHO
HO H
HO H
H OH
H OH
CH₂OH

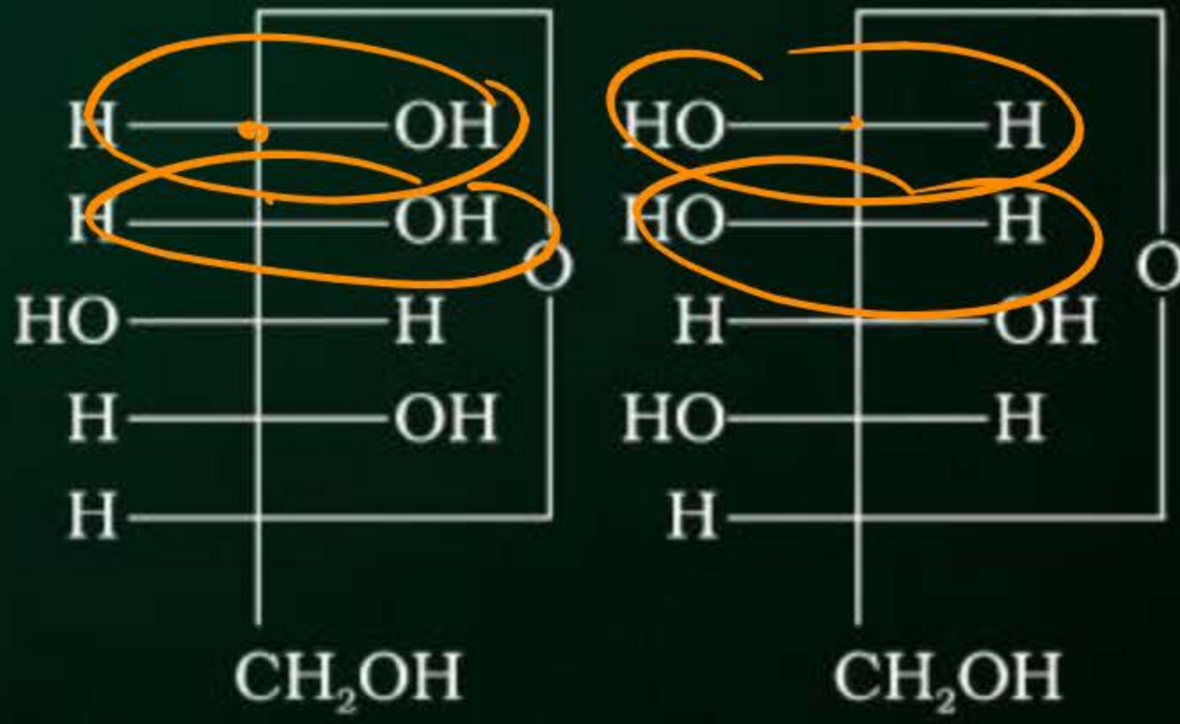
B


CHO
H OH
HO H
H OH
H OH
CH₂OH
CHO
HO H
H OH
HO H
HO H
CH₂OH

C

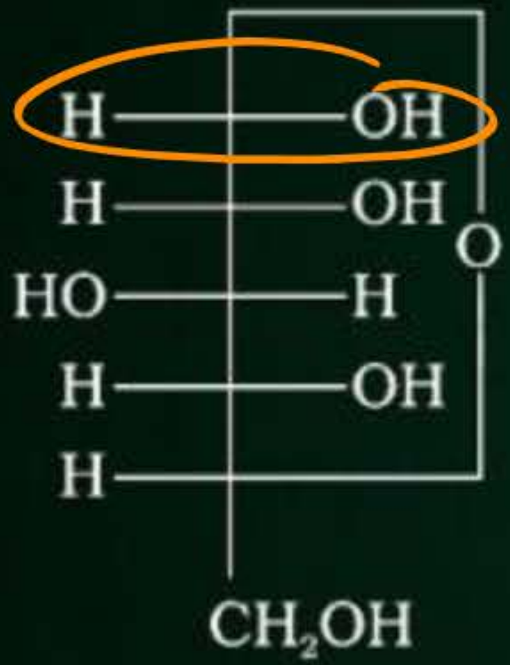

H OH
H OH
HO H
H OH
H
O
CH₂OH
HO H
H OH
HO H
H OH
H
O
CH₂OH

D

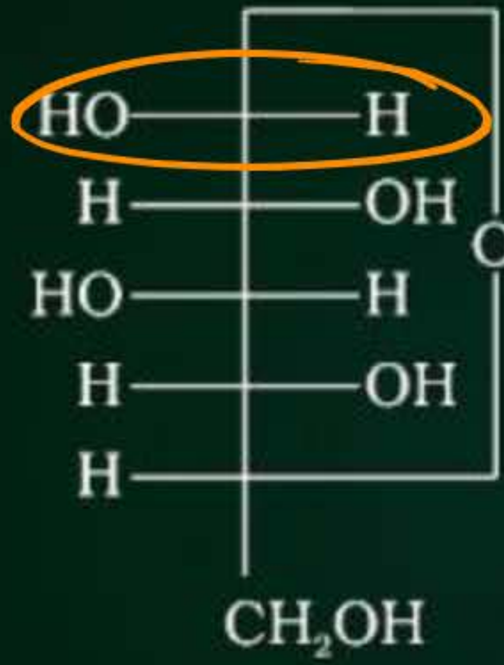

H OH
H OH
HO H
H OH
H
O
CH₂OH
HO H
HO H
H OH
HO H
H
O
CH₂OH

QUESTION (NCERT Exemplar)

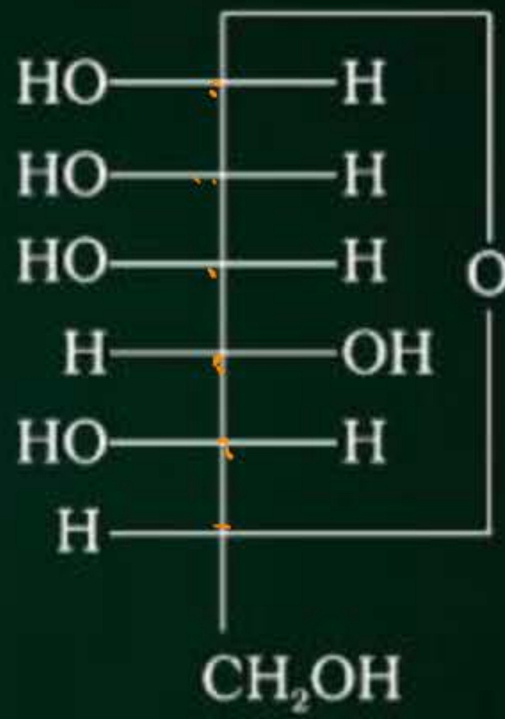
Three cyclic structures of monosaccharides are given below which of these are anomers.



(I)



(II)



(III)

[✓ **A**] I and II

B II and III

C I and III

D III is anomer of I and II

QUESTION (NCERT Exemplar)

Which of the following reactions of glucose can be explained only by its cyclic structure?

A Glucose forms pentaacetate.

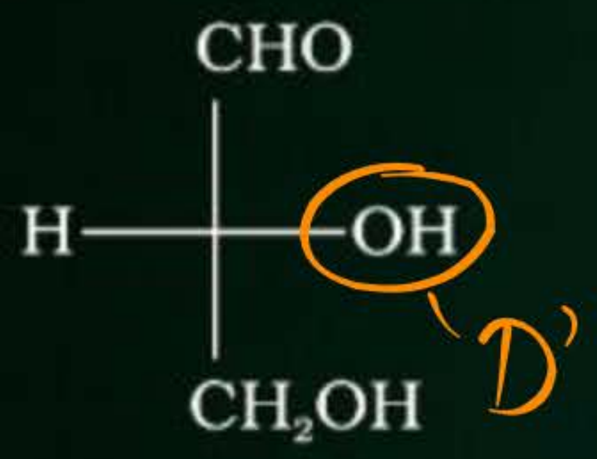
B Glucose reacts with hydroxylamine to form an oxime.

[✓ C] Pentaacetate of glucose does not react with hydroxylamine.

D Glucose is oxidised by nitric acid to gluconic acid.

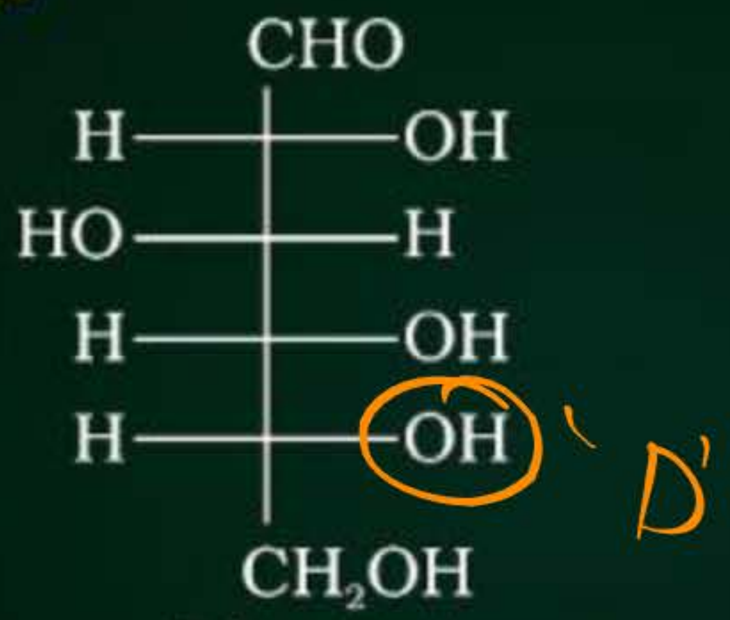
QUESTION (NCERT Exemplar)

Optical rotations of some compounds along with their structures are given below which of them have D configuration.


CHO
H
OH
CH₂OH
D

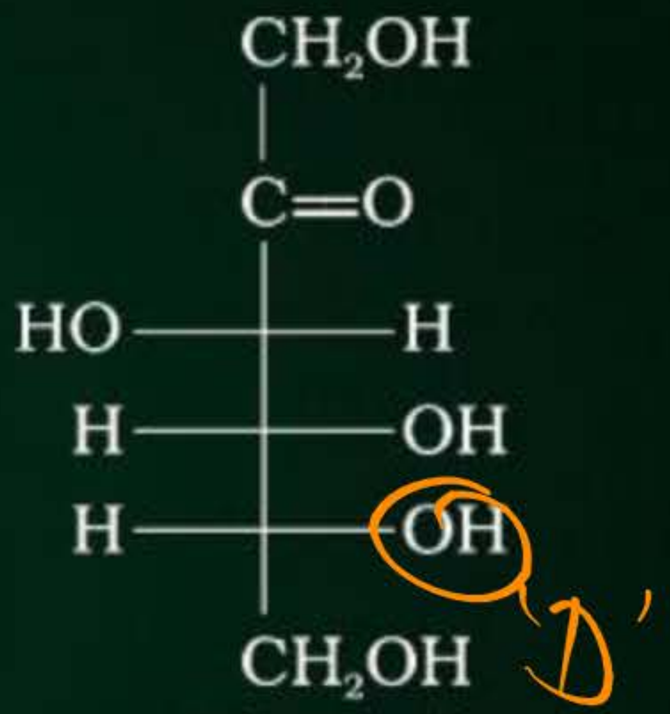
(+) rotation

(I)


CHO
H
OH
HO
H
H
OH
H
OH
CH₂OH
D

(+) rotation

(II)


CH₂OH
C=O
HO
H
H
OH
H
OH
CH₂OH
D

(–) rotation

(III)

[✓ A] I, II, III

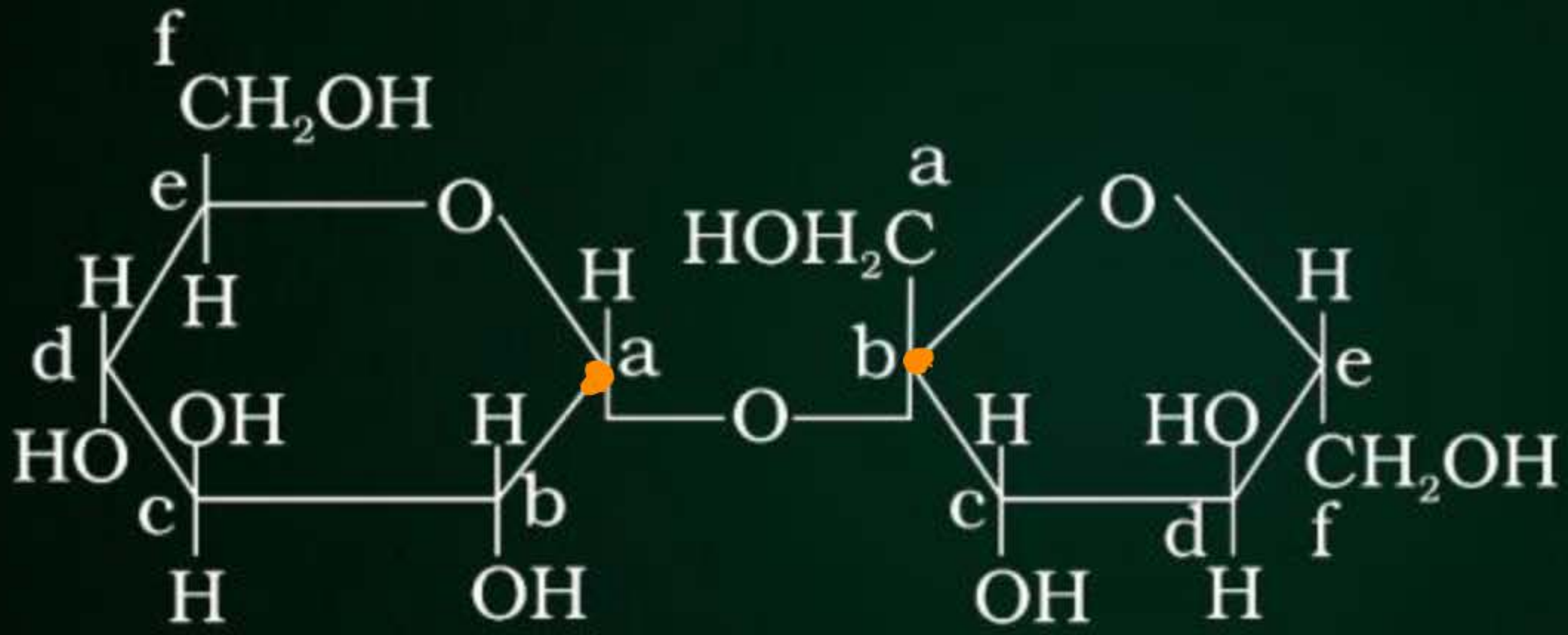
B II, III

C I, II

D III

QUESTION (NCERT Exemplar)

Structure of a disaccharide formed by glucose and fructose is given below. Identify anomeric carbon atoms in monosaccharide units.


f
CH₂OH
e
O
H
H
d
HO
OH
c
H
H
a
H
b
OH
O
a
HOH₂C
O
b
H
c
OH
HO
d
H
H
e
CH₂OH
f

A ‘a’ carbon of glucose and ‘a’ carbon of fructose.

B ‘a’ carbon of glucose and ‘e’ carbon of fructose.

[✓ C] ‘a’ carbon of glucose and ‘b’ carbon of fructose.

D ‘f’ carbon of glucose and ‘f ’ carbon of fructose.

QUESTION (NCERT Exemplar)

Carbohydrates are classified on the basis of their behaviour on hydrolysis and also as reducing or non-reducing sugar. Sucrose is a ________.

(A) monosaccharide

(B) disaccharide

(C) non-reducing sugar

[✓ (D)] Both (B) & (C)

QUESTION (NCERT Exemplar)

Which of the following carbohydrates are branched polymer of glucose?

- **A** Amylose
- **B** Amylopectin
- **C** Glycogen
- **D** [✓ Both (B) & (C)]

QUESTION (NCERT Exemplar)

Assertion: D (+) – Glucose is dextrorotatory in nature. ✓

Reason: ‘D’ represents its dextrorotatory nature. ✗

A Assertion and reason both are correct statements and reason explains the assertion.

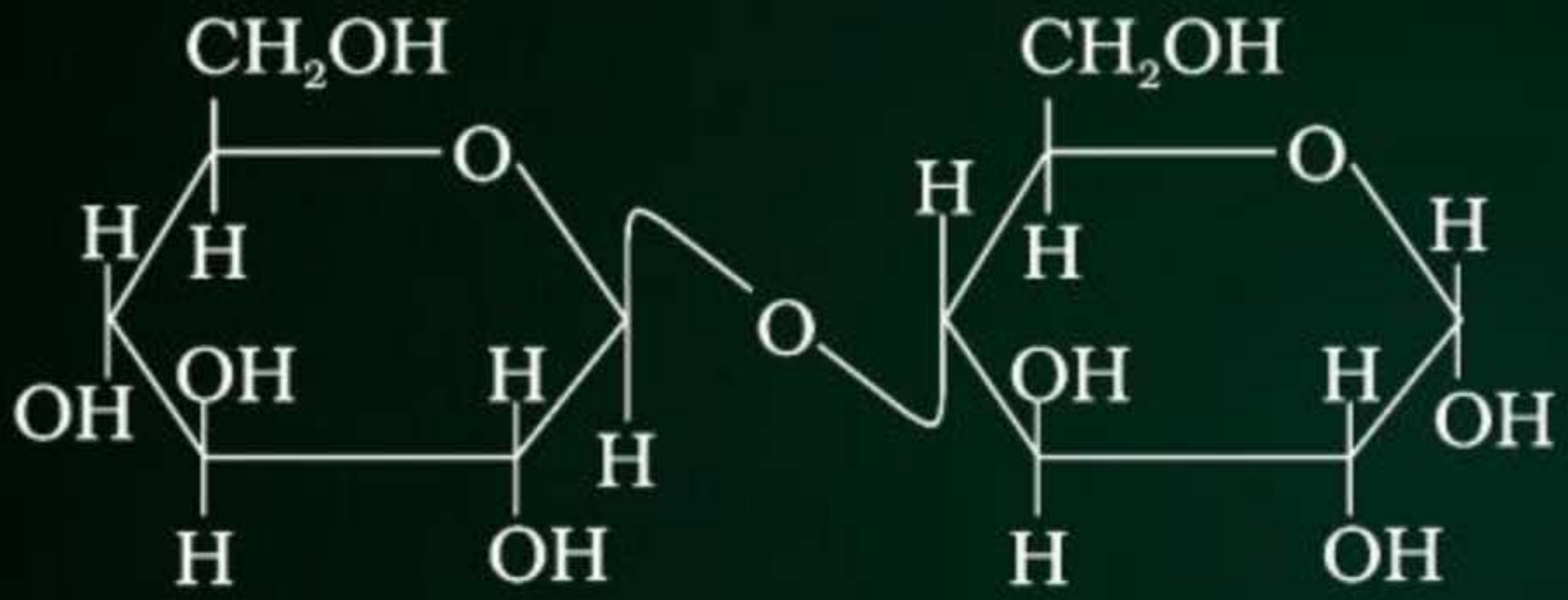
B Both assertion and reason are wrong statements.

[✓ C] Assertion is correct statement and reason is wrong statement.

D Assertion is wrong statement and reason is correct statement.

QUESTION (NCERT Exemplar)

Assertion: β-glycosidic linkage is present in maltose,



CH$_2$OH
O
H
H
OH
OH
H
H
OH
H
O
CH$_2$OH
O
H
H
H
OH
H
OH
H
OH

Reason: Maltose is composed of two glucose units in which C–1 of one glucose unit is linked to C–4 of another glucose unit.

A Assertion and reason both are correct statements and reason explains the assertion.

B Both assertion and reason are wrong statements.

C Assertion is correct statement and reason is wrong statement.

[✓ D] Assertion is wrong statement and reason is correct statement.

QUESTION (AIIMS 27 May, 2018 (M))

Assertion: Oxidation of glucose by Br_2 water gives saccharic acid. ✗

Reason: Br_2 water oxidizes –CHO and alcohol. ✗

A If both Assertion and Reason are correct and the Reason is the correct explanation of Assertion.

B If both Assertion and Reason are correct but Reason is not the correct explanation of Assertion.

C If Assertion is correct but Reason is incorrect.

[✓ **D**] If both the Assertion and Reason are incorrect.

QUESTION (AIIMS 26 May, 2018 (M))

Assertion: A solution of sucrose in water is dextrorotatory but on hydrolysis in presence of little hydrochloric acid, it becomes laevorotatory.

Reason: Sucrose on hydrolysis gives unequal amounts of glucose and fructose as a result of which change in sign of rotation is observed.

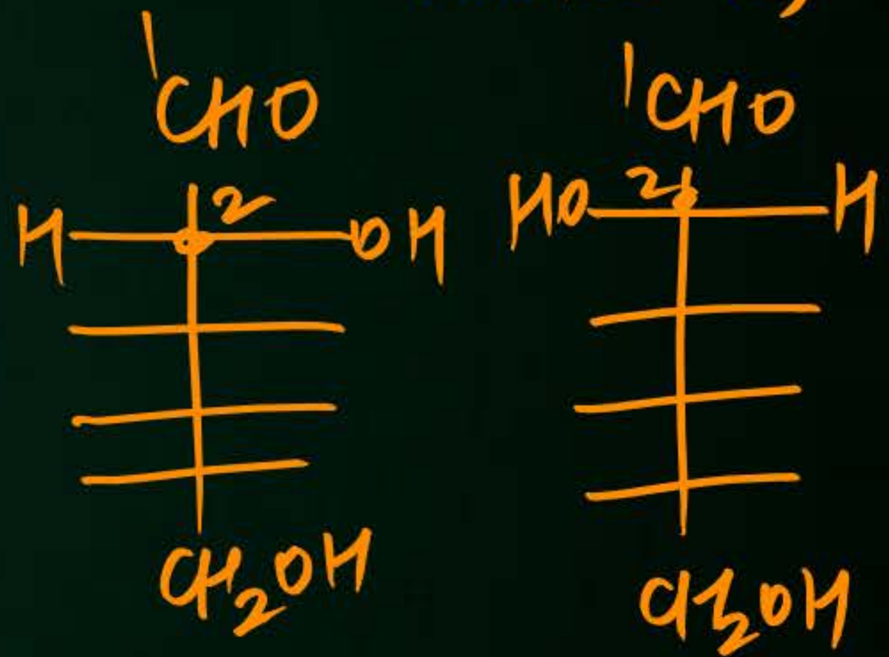
- **A** If both Assertion and Reason are correct and the Reason is the correct explanation of Assertion.
- **B** If both Assertion and Reason are correct but Reason is not the correct explanation of Assertion.
- [✓ **C**] If Assertion is correct but Reason is incorrect.
- **D** If both the Assertion and Reason are incorrect.

QUESTION (AIIMS 2017)

α-D-(+)-glucose and β-D-(+)-glucose are:

- **A** conformers
- **B** epimers
- **C** anomers ✓
- **D** enantiomers

Diastereo two diff molecules



1
CHO
H
2
OH
CH2OH
1
CHO
HO
2
H
CH2OH

G & M are C-2 epimer

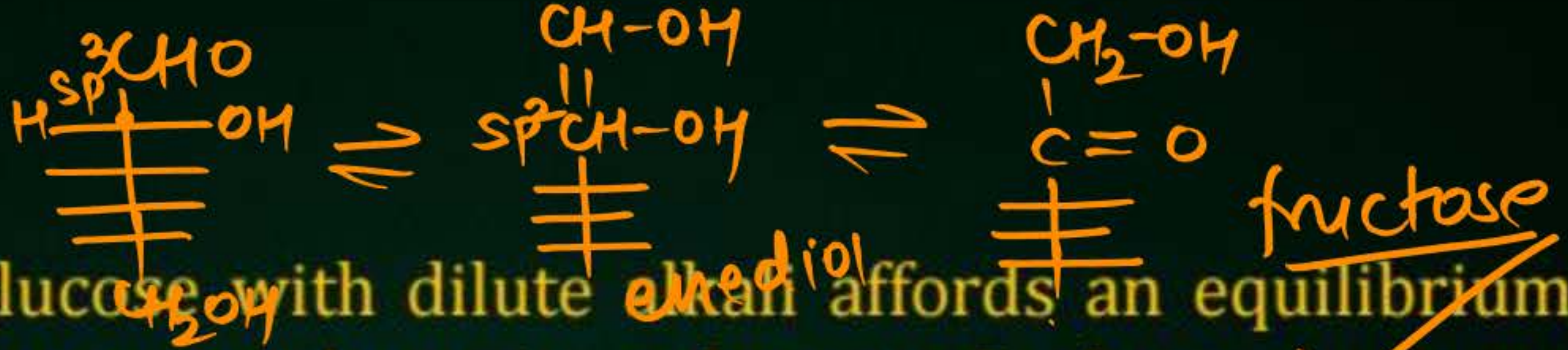
QUESTION (AIIMS 2014)

Assertion: Glucose and fructose give the same osazone. ✓

Reason: During osazone formation stereochemistry only at C_1 and C_2 is destroyed.

- (A) If both Assertion and Reason are correct and the Reason is the correct explanation of Assertion.
- (B) If both Assertion and Reason are correct but Reason is not the correct explanation of Assertion.
- [✓ (C)] If Assertion is correct but Reason is incorrect.
- (D) If both the Assertion and Reason are incorrect.

QUESTION (AIIMS 2013)



Assertion: Treatment of D-glucose with dilute alkali affords an equilibrium mixture consisting of D-mannose, D-fructose and starting substance D-glucose.

Reason: The reaction involves an intermediate in which hybridisation of C_2 changes from sp^3 to sp^2.

A If both Assertion and Reason are correct and the Reason is the correct explanation of Assertion.

[✓ B] If both Assertion and Reason are correct but Reason is not the correct explanation of Assertion.

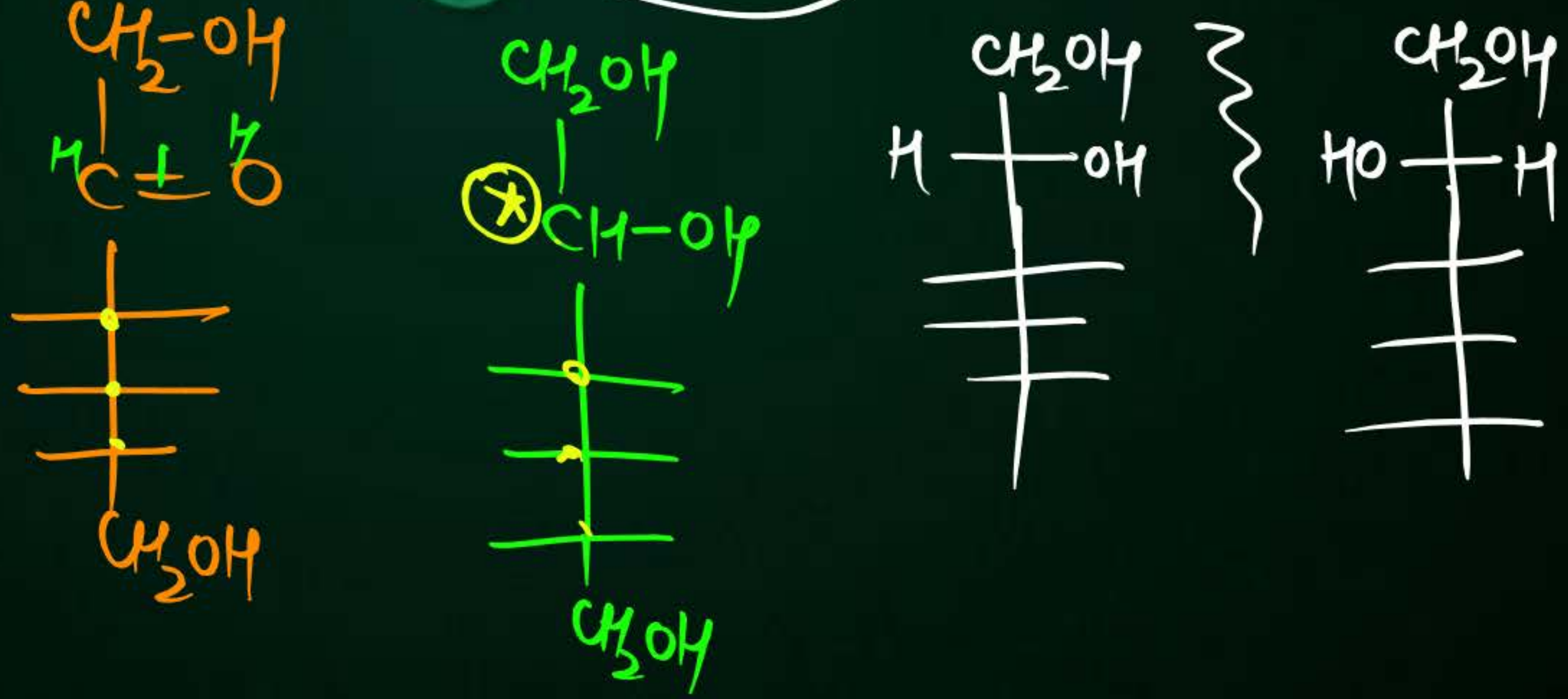
C If Assertion is correct but Reason is incorrect.

D If both the Assertion and Reason are incorrect.

QUESTION (AIIMS 2011)

Fructose on reduction gives a mixture of two alcohols which are related as

- [✓ (A) diastereomers]
- [✓ (B) epimers]
- [✓ (C) both (A) and (B)]
- (D) ~~anomers~~ ✗



CH2-OH
C = O
CH2OH
CH2OH
CH-OH
CH2OH
CH2OH
H
OH
CH2OH
HO
H

Home Work

QUESTION 01

Glucose is a/an:

Ⓐ oxidizing sugar

Ⓑ reducing sugar

Ⓒ reducing and oxidizing sugar

Ⓓ none of the above

QUESTION 02

Which of the following is a monosaccharide?

A Sucrose

B Galactose

C Maltose

D Lactose

QUESTION 03

Which of the following is a non-reducing sugar?

- (A) Glucose
- (B) Sucrose
- (C) Fructose
- (D) Lactose

QUESTION 04

Maltose is made up of

- A α-D-Glucose
- B α and β glucose
- C Glucose and Fructose
- D Fructose only

QUESTION 05

Glycoside linkage is an

- **A** Amide linkage
- **B** Ether
- **C** Ester linkage
- **D** None of these

QUESTION 06

$\text{D}-\text{Glucose} \xrightarrow{HO^-} A+B$; A and B are:

- **A** D-mannose & D-mannitol
- **B** D-mannose & D-Fructose
- **C** D-Allose & D-Altrose
- **D** D-Glucose & D-Idose

QUESTION 07

D-glucose & D-fructose can be differentiated by:

- A Fehling solution
- B Tollens reagent
- C Benedict test
- D Br_2/H_2O

QUESTION 08

Glucose and fructose does not give same type of reactions:

- A with phenyl hydrazine
- B on reduction with Na-Hg/H_2O
- C with Fehling's solutions
- D warming with dilute alkali

QUESTION 09

Which among the following will not produce D-glucose on hydrolysis?

- A Amylose
- B Cellulose
- C Sucrose
- D Galactose

QUESTION 10

D – Glucose $\xrightarrow[\Delta]{HNO_3}$ (A); Product(A) is:

(A) D-Gluconic acid

(B) D-Glucitol

(C) D-Fructose

(D) D-Glucaric acid

ANSWER KEY

1. B
2. B
3. B
4. A
5. B
6. B
7. D
8. B
9. D
10. D

Home Work From PW Module (Yakeen NEET)

Prarambh: Q 01, 02, 03, 04, 05, 06, 07, 08, 09, 10, 11, 12, 13, 14, 15

PhysicsWallah
अनुगच्छतु प्रवाहं

PANKAJ SIR

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@PSCAA

Thank you!!

(Carbohydrates)

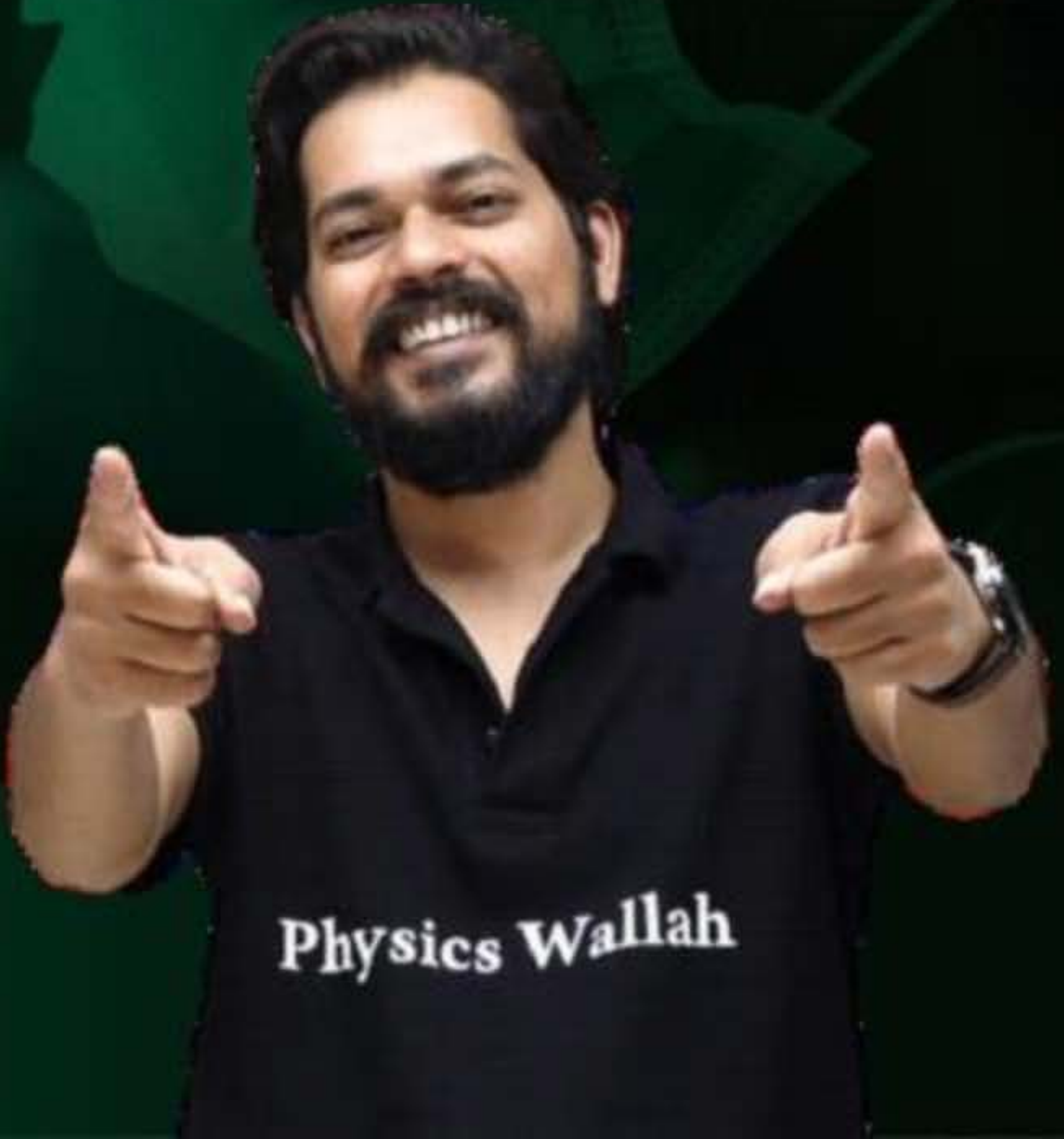
3 times

YAKEEN 2.0

FOR NEET 2025

Lecture- 02 | **Organic Chemistry**

Biomolecules


Physics Wallah

By- Pankaj Sir(POPU MAMA)

Topics *to be covered*

1. Carbohydrates Practice
2. Amino Acids
3. Practice

CARBOHYDRATES PRACTICE

QUESTION (AIIMS 2004)

Assertion: ✓ Sucrose is a non-reducing sugar.

Reason: ✗ It has peptide linkage.

(A) If both Assertion and Reason are correct and the Reason is a correct explanation of the Assertion.

(B) If both Assertion and Reason are correct but Reason is not a correct explanation of the Assertion.

[✓ (C)] If the Assertion is correct but Reason is incorrect.

(D) If both the Assertion and Reason are incorrect.

QUESTION (AIIMS 1997)

Assertion: Hydrolysis of sucrose is known as inversion of cane sugar.

Reason: Sucrose is a disaccharide.

- A If both Assertion and Reason are correct and the Reason is a correct explanation of the Assertion.
- [✓ B] If both Assertion and Reason are correct but Reason is not a correct explanation of the Assertion.
- C If the Assertion is correct but Reason is incorrect.
- D If both the Assertion and Reason are incorrect.

QUESTION

Carbohydrates have:

(A) –OH group

(B) –CHO group

(C) >C=O group

[✓ (D)] All

QUESTION

Which of the following pairs from the same osazone?

[✓ A] Glucose and fructose

B Glucose and galactose

C Glucose and arabinose

D Lactose and maltose

QUESTION

Which of the following does not show mutarotation? → Reducing sugar

A (–) Fructose

B (+) Lactose

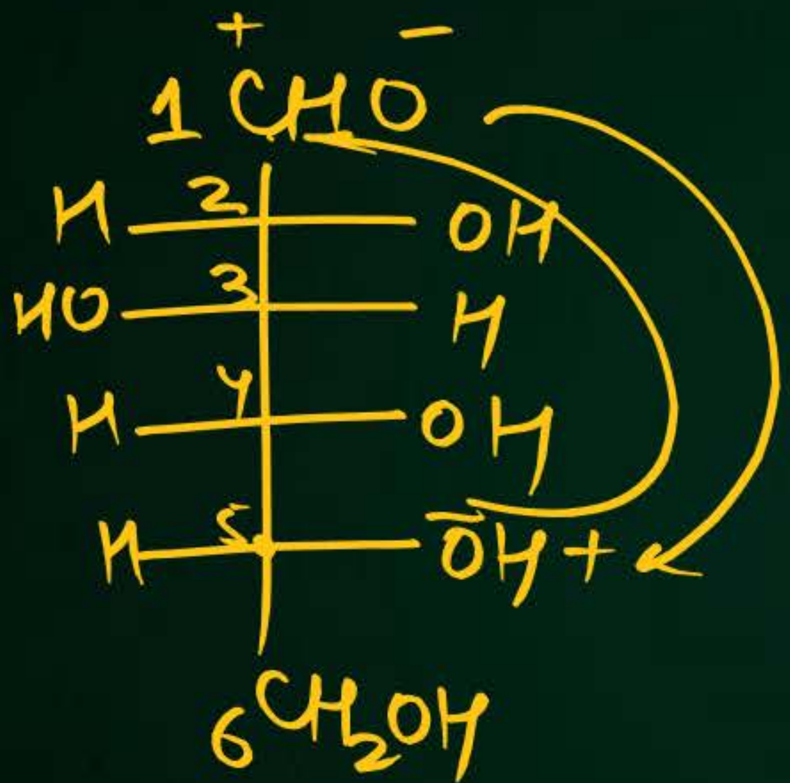
C (+) Maltose

[✓ D] (+) Sucrose

QUESTION

Ring structure of glucose is due to formation of hemiacetal and ring formation between.

- [✓ (A)] C_1 and C_5
- (B) C_1 and C_2
- (C) C_1 and C_3
- (D) C_1 and C_4



1 CHO
+ −
H 2 OH
HO 3 H
H 4 OH
H 5 OH +
6 CH2OH

QUESTION

Glucose $\xrightarrow{Br_2+H_2O}$ Product; Product is:

CHO → COOH

A Glucaric acid

[✓ **B** Gluconic acid]

C Hexanoic acid

D Bromo hexane

QUESTION

Glucose does not react with:

A $C_6H_5NHNH_2$

B $H_2N{-}OH$

C HCN

[✓ D] $\underbrace{NaHSO_3}$

QUESTION

A carbohydrate which cannot be hydrolyzed to simpler compounds is called

[✓ A] Monosaccharide

B Disaccharide

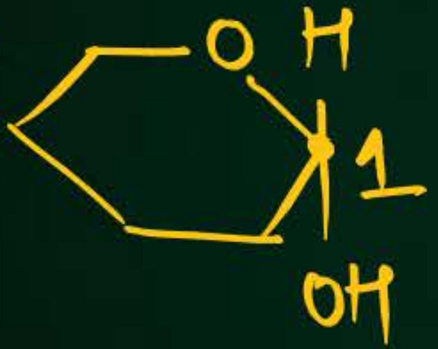
C Polysaccharide

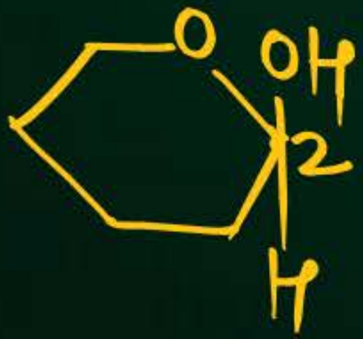
D Oligosaccharide

QUESTION

α-D-glucose and β-D-glucose differ from each other due to the difference in one of the carbon atoms, with respect to its

- (A) Number of –OH groups
- (B) Configuration
- (C) Conformation
- (D) Size of hemiacetal ring





QUESTION

For the reduction of glucose to n-hexane, the reagent used is:

- A HBr
- B HCl
- C HF
- [✓ D] HI

QUESTION

The letter 'D' in carbohydrates signifies

A dextro rotatory

B mode of synthesis

[✓ C] its configuration

D its diamagnetic nature

Aaj Sham 4 baje

Class 11th OC [revision]

(IUPAC + Isomerism)

IUPAC ↓ 5-6

Isomerism ↓ 10-12

Basic se padna

youtube

1) Compwallah

11th class O.C

2) Ummeed

11th + 12th

Mahabasic

[Yakeen 2.0 2025]

full course

QUESTION

Which one is not polysaccharides?

[✓ A Sucrose] disacc Glucose+fructose

B ~~Insulin~~ Glycogen

C Starch

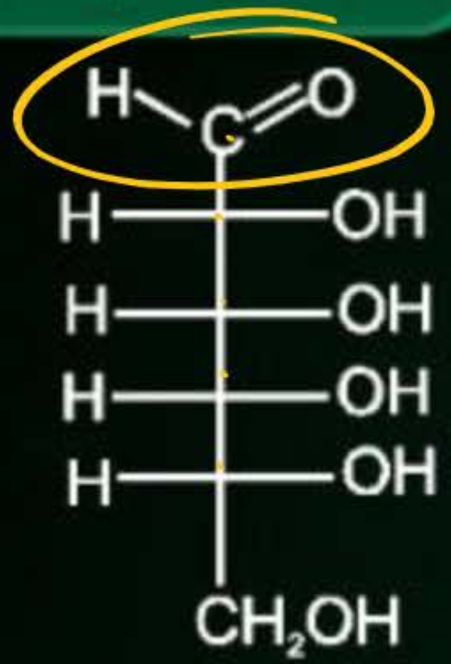
D Cellulose

QUESTION

A mixture of amylose and amylopectin is called:

- (A) lactose
- [✓ (B) starch]
- (C) cellulose
- (D) sucrose

QUESTION


H
C
O
H
OH
H
OH
H
OH
H
OH
CH_2OH

Allose, given monosaccharide is a/an

A Aldopentose

[✓ B Aldohexose]

C Ketopentose

D Aldoheptose

QUESTION

Sucrose is made up of:

A. α-glucose pyranose

B. α-glucose furanose

C. β-fructose furanose

[✓ D.] Both (A) & (C)

QUESTION

Which of the following is not a disaccharide?

A Cane sugar
[✓ B] Raffinose
C Lactose
D Maltose

QUESTION

Lactose on hydrolysis produces a mixture of

A Glucose only

B Glucose and Fructose

[✓ C] $\overset{\beta}{\text{Glucose}}$ and $\overset{\beta}{\text{Galactose}}$

D Fructose and Galactose

QUESTION

Hydrolysis of sucrose is called

- (A) Mutarotation
- (B) Saponification
- [✓ (C) Inversion]
- (D) De-esterification

QUESTION

To convert glucose to saccharic acid the regent used is:

CHO $\boxed{COOH}$

A Bromine water

B Fehling's solution

CH_2OH $\boxed{COOH}$

C [✓ Nitric acid]

D Alkaline solution of Iodine

QUESTION

When glucose is reacted with bromine water, the major product is:

Ⓐ [✓ Gluconic acid]

Ⓑ Saccharic acid

Ⓒ Sorbitol

Ⓓ Galactose

QUESTION

Invert sugar is an equimolar mixture of:

Ⓐ [✓ D-glucose and D-fructose]

Ⓑ D-glucose and L-fructose

Ⓒ D-glucose and L-glucose

Ⓓ D-fructose and L-fructose

QUESTION

Cellulose is a linear polymer of:

A α-D-glucose

[✓ B] β-D-glucose

C α-D-fructose

D β-L-glucose

QUESTION

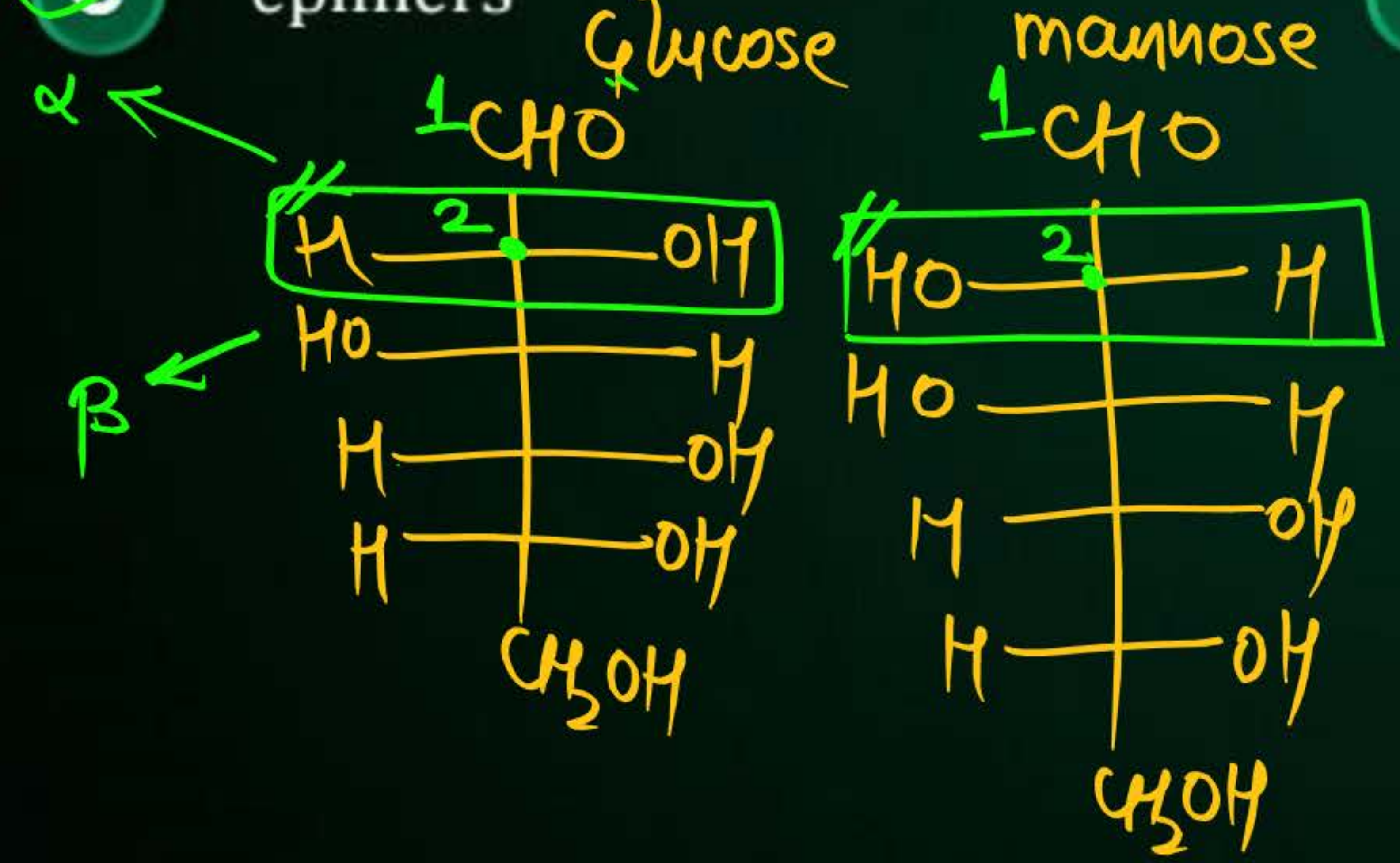
Which is correct about sucrose?

- A It is non reducing non sugar.
- B It is reducing non sugar.
- [✓ C] It is non reducing sugar.
- D It is reducing sugar.

QUESTION

Glucose and mannose are:

- (A) ketohexoses
- (B) anomers
- [✓ (C)] epimers
- (D) disaccharides


Glucose
1CHO
2
H
OH
HO
H
H
OH
H
OH
CH2OH
α
β
mannose
1CHO
2
HO
H
HO
H
H
OH
H
OH
CH2OH

C_2-epimer

QUESTION

Lactose is made of:

Ⓐ α-D-glucose only

[✓ Ⓑ β-D-galactose and β-D-glucose]

Ⓒ α-D-glucose and β-D-glucose

Ⓓ β-D-galactose and α-D-glucose

QUESTION

Which of the following is a disaccharide?

- **A** Glucose
- **B** Fructose
- **C** [✓ Sucrose]
- **D** Starch

QUESTION

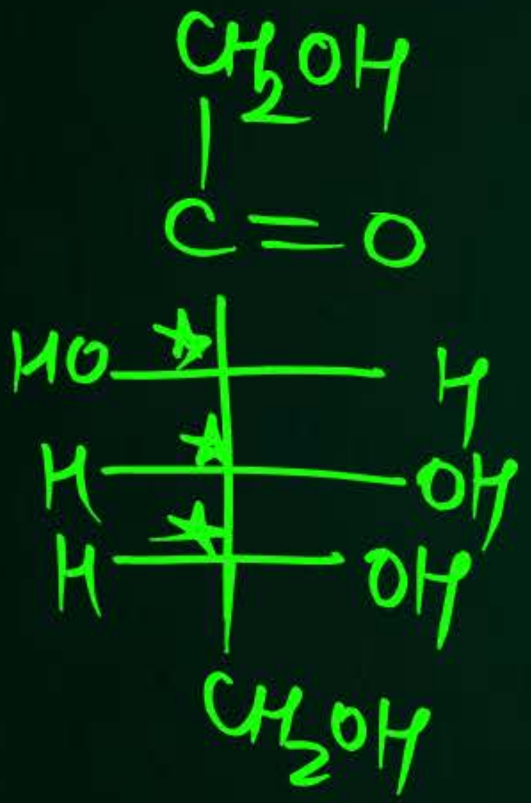
The number of asymmetric carbon atoms in fructose are:

(A) 2

[✓ (B) 3]

(C) 4

(D) 5



CH_2OH
C=O
HO
H
H
OH
H
OH
CH_2OH

QUESTION

Sucrose is made up of:

- Ⓐ D-glucose + L-fructose
- [✓ Ⓑ] D-glucose + D-fructose
  (+) (–)
- Ⓒ D-fructose + L-glucose
- Ⓓ L-fructose + L-glucose

QUESTION

Rapid interconversion of α-D-glucose and β-D-glucose in solution is known as:

A racemization

B asymmetric induction

C fluxional isomerization

[✓ D] mutarotation

QUESTION

Complete hydrolysis of starch gives

[✓ A] Glucose only

B Fructose only

C Both glucose and fructose in equimolar amount

D None of these

Starch

sucrose

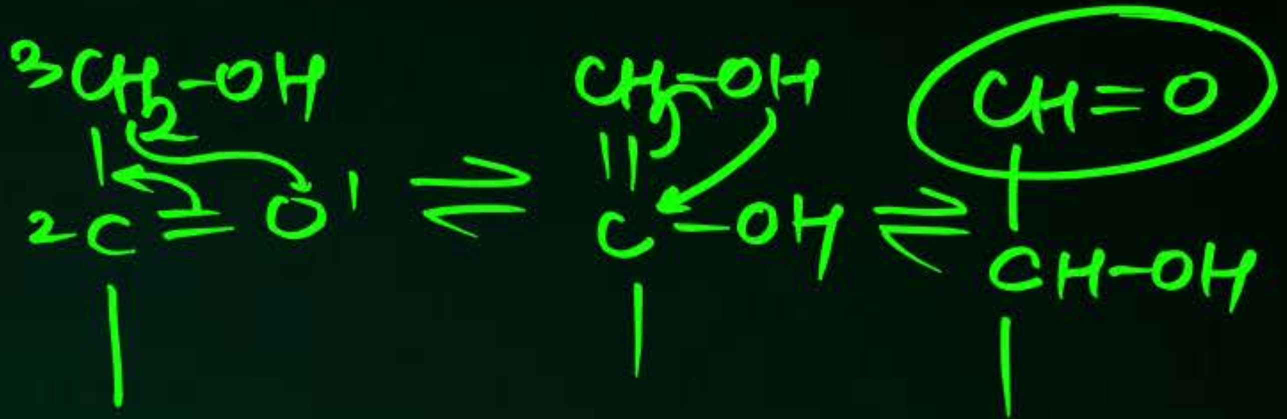
QUESTION

CHO $>C=O$

Glucose and fructose are

- A Optical isomers
- B Tautomers
- [✓ C Functional isomers]
- D Chain isomers

QUESTION



3 CH2-OH
2 C=O 1
⇌
CH-OH
C-OH
⇌
CH=O
CH-OH

Fructose reduces Tollen's reagent due to

[✓ A] Enolisation of fructose followed by conversion to aldehyde by base

B Primary alcoholic group

C Secondary alcoholic group

D Asymmetric carbons

QUESTION

Which reagent/s can be used to distinguish glucose and fructose?

(I) Bromine water (II) Tollen's reagent (III) Schiff's reagent

A (I), (II) and (III)

B (II) and (III)

[✓ **C** Only (I)]

D Only (III)

QUESTION

Which of the following pairs form the same osazone?

Ⓐ [✓ Glucose and fructose]

Ⓑ Glucose and galactose

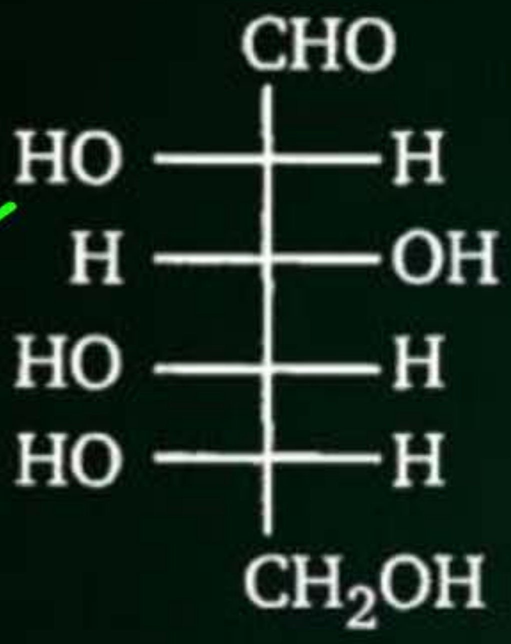
Ⓒ Glucose and arabinose

Ⓓ Lactose and maltose

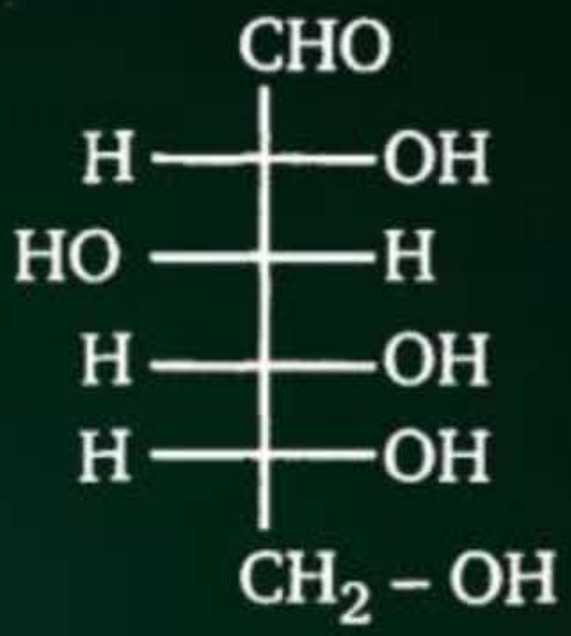
QUESTION

What is the structure of L-glucose?

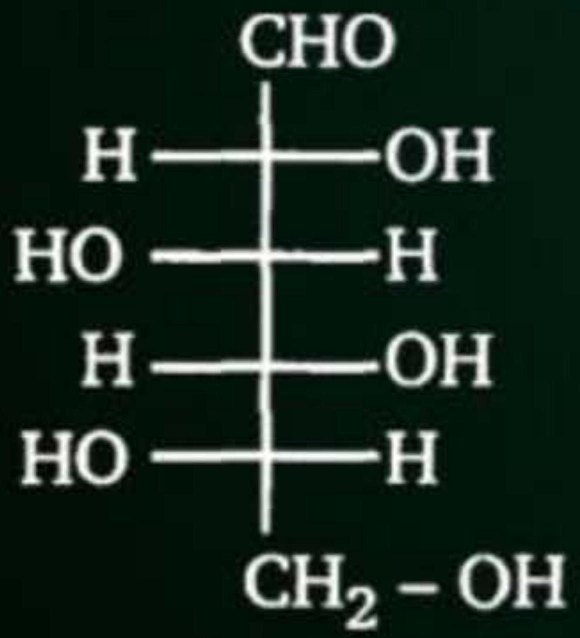
[✓ A]


CHO
HO
H
H
OH
HO
H
HO
H
CH2OH

B


CHO
H
OH
HO
H
H
OH
H
OH
CH2 – OH

C


CHO
H
OH
HO
H
H
OH
HO
H
CH2 – OH

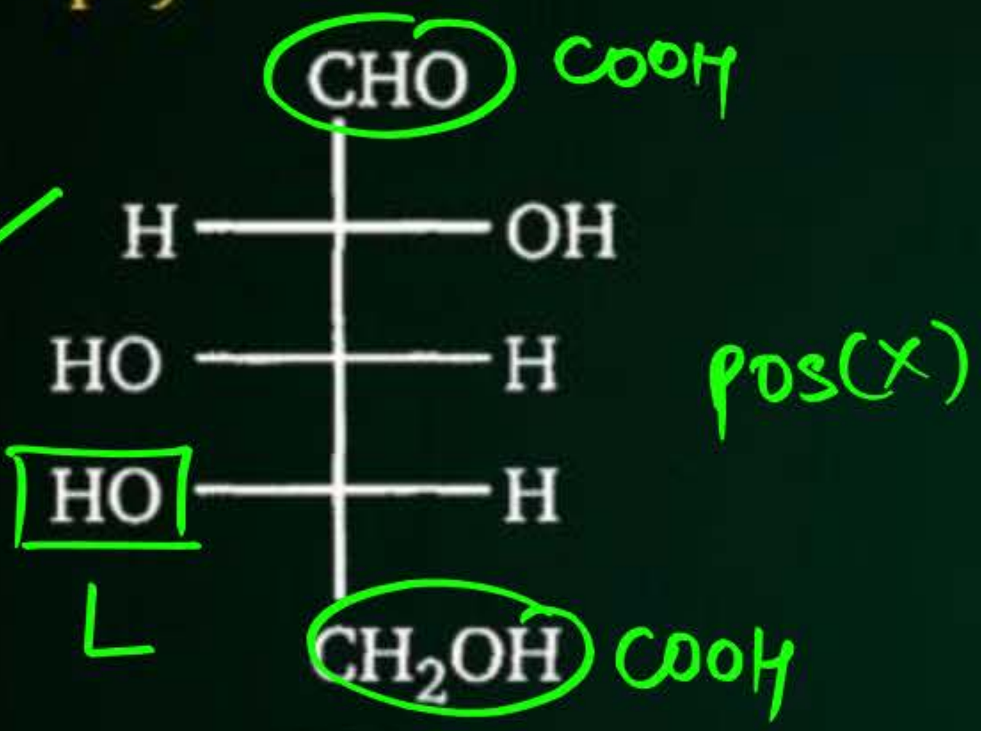
D None of these

QUESTION

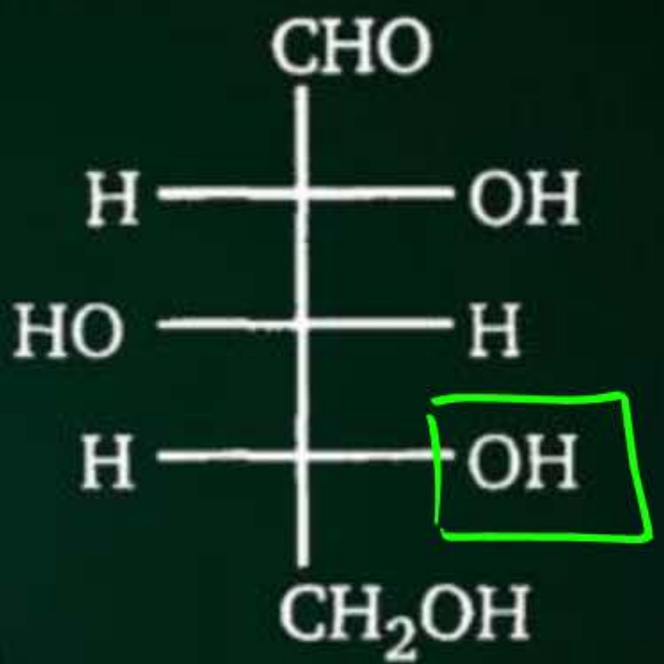
Which L-sugar on oxidation gives an optically active dibasic acid (2 COOH groups)?

HNO$_3$

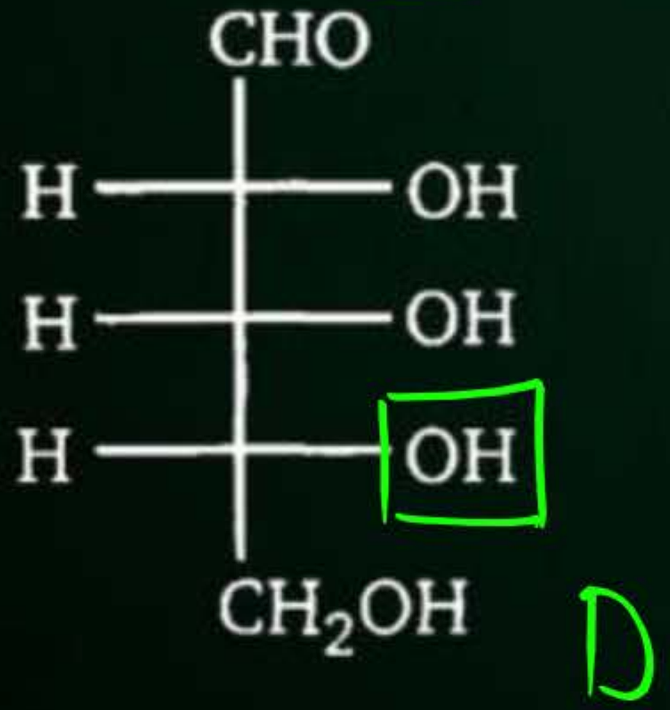
A


CHO
COOH
H
OH
HO
H
HO
H
L
CH$_2$OH
COOH
pos(x)

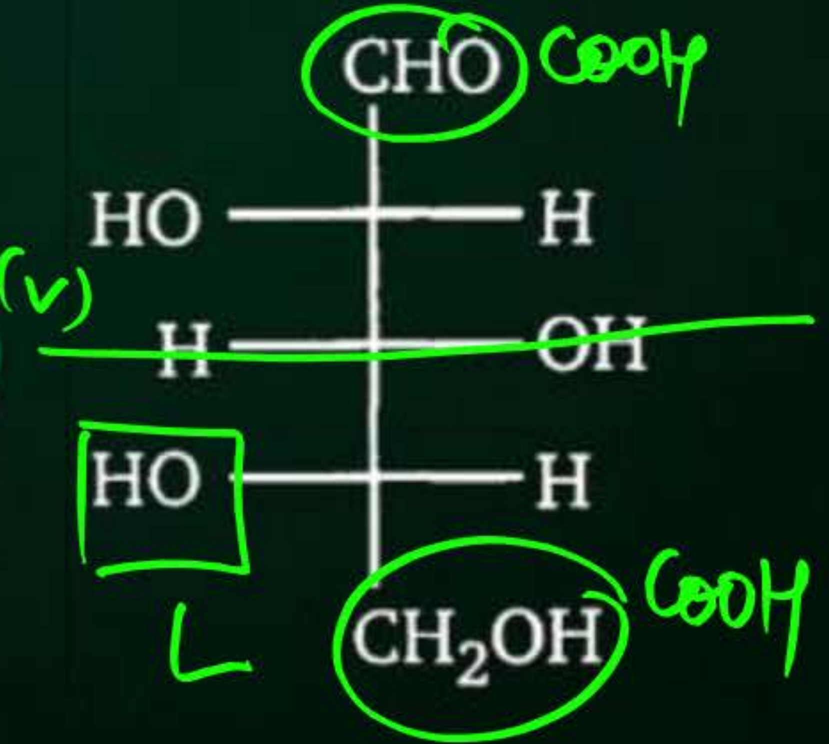
B


CHO
H
OH
HO
H
H
OH
CH$_2$OH

C


CHO
H
OH
H
OH
H
OH
CH$_2$OH
D

D


CHO
COOH
HO
H
H
OH
HO
H
L
CH$_2$OH
COOH
pos(v)

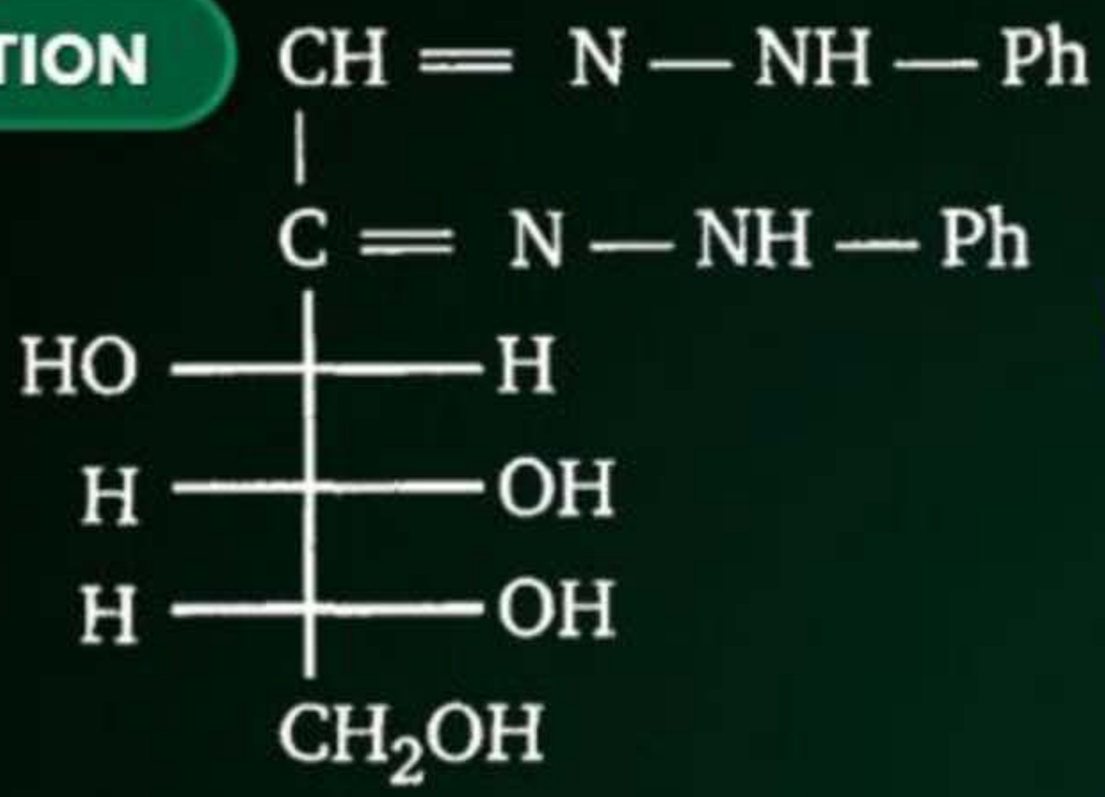
QUESTION

The terms anomers of glucose refers to:

- A isomers of glucose that differs in configuration at carbons one and four (C-1 and C-4)
- B a mixture of D-glucose and L-glucose.
- C enantiomers of glucose.
- [✓ D] isomers of glucose that differ in configuration at carbon one (C-1).

α & β

QUESTION


CH = N — NH — Ph
C = N — NH — Ph
HO — H
H — OH
H — OH
CH₂OH

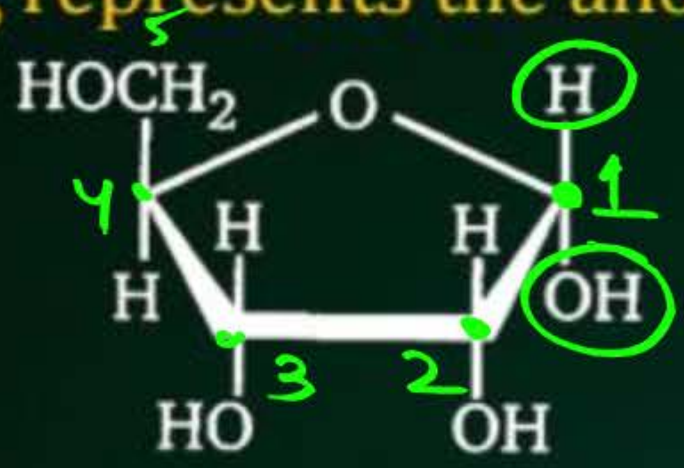
The given osazone can be obtained by:

- **A** D-glucose
- **B** D-mannose
- **C** D-Idose
- **D** [✓ Both (A) & (B)]

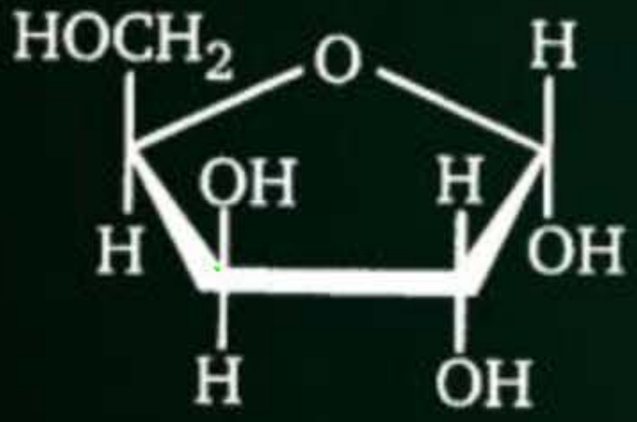
QUESTION

O se connected

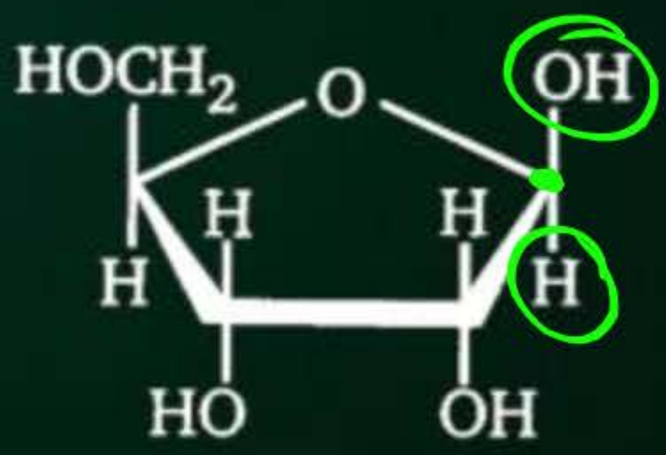
Which of the following represents the anomer of the compound shown?


5
HOCH₂
O
H
4
1
H
H
H
OH
3
2
HO
OH

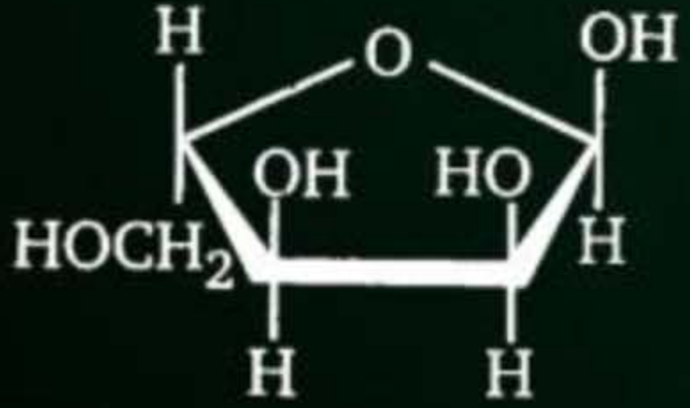
A


HOCH₂
O
H
OH
H
H
OH
H
OH

[✓ **B**]


HOCH₂
O
OH
H
H
H
H
HO
OH

C


H
O
OH
OH
HO
HOCH₂
H
H
H

D None of these

QUESTION

Find the pair which is correctly matched.

- **A** Sucrose: monosaccharide ✗
- **B** Fructose: aldose sugar ✗
- **C** Glucose: mutarotation ✓
- **D** Sucrose: reducing sugar ✗

QUESTION

Match the following

List -I (Name of the sugar)		List - II (Hydrolysis products)	
(A)	Sucrose ii	(i)	Glucose + fructose + Galactose
(B)	Lactose iii	(ii)	Glucose + fructose
(C)	Maltose iv	(iii)	Glucose + Galactose
(D)	Raffinose i	(iv)	Glucose + Glucose

The correct matching is:

- A A-iii, B-ii, C-i, D-iv
- B A-ii, B-iii, C-i, D-iv
- [✓ C] A-ii, B-iii, C-iv, D-i
- D A-ii, B-iv, C-iii, D-i

QUESTION

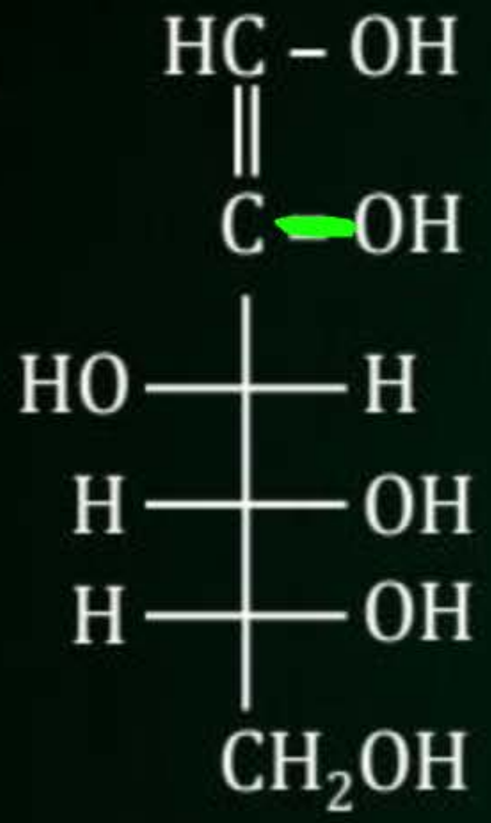
Match the following

List -I		List - II	
(A)	Sucrose ii	(i)	β-D-Galactose and β-D-Glucose
(B)	Cellulose	(ii)	α-D-Glucose and β-D-Fructose
(C)	Starch	(iii)	β-D-Glucose
(D)	Lactose	(iv)	α-D-Glucose

The correct matching is:

- **A** A-i, B-ii, C-iii, D-iv
- [✓ **B**] A-ii, B-iii, C-iv, D-i
- **C** A-i, B-ii, C-iv, D-iii
- **D** A-iv, B-iii, C-i, D-ii

QUESTION


HC – OH
C – OH
HO
H
H
OH
H
OH
CH_2OH

, the given is enol form of:

- A D-glucose
- B D-mannose
- C D-fructose
- [✓ D] All of these

QUESTION

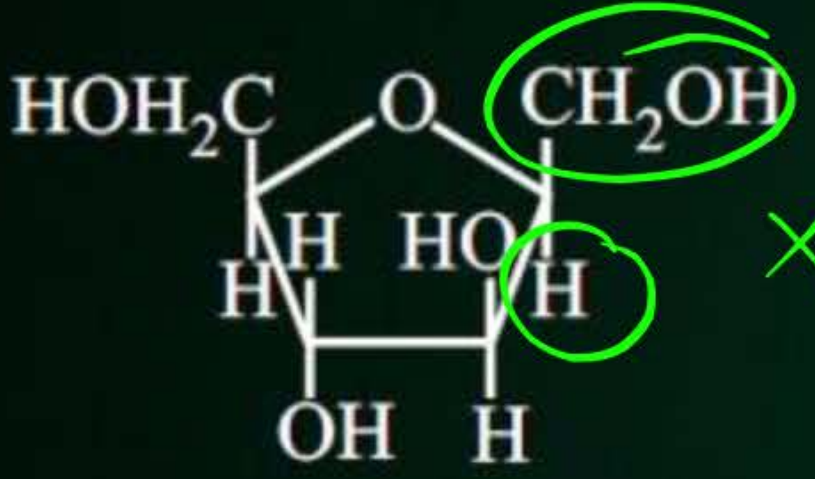
Fructose gives Fehling test because:

- (A) Ketonic group present in it can be oxidized by fehling's solution.
- [✓ (B)] Ketonic group converts into CHO group by enolization
- (C) Ketal form of fructose changes in to open chain structure which is sensitive towards base present in fehling's solution.
- (D) Fructose does not give fehling's test.

QUESTION

Correct Structure of β-D-fructose is:

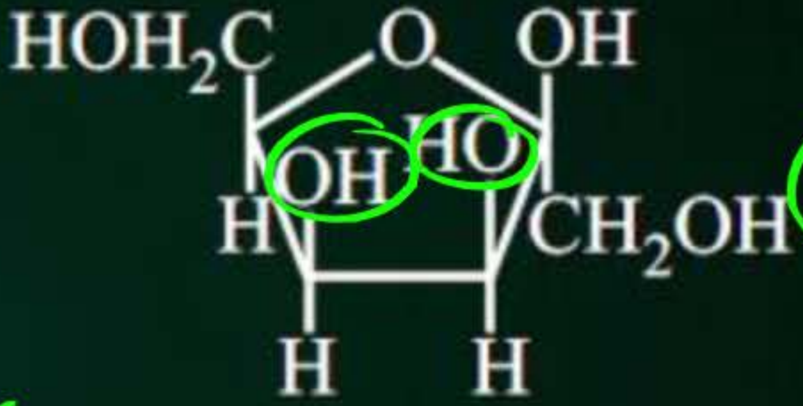
(A)


HOH₂C
O
CH₂OH
H
HO
H
H
OH
H

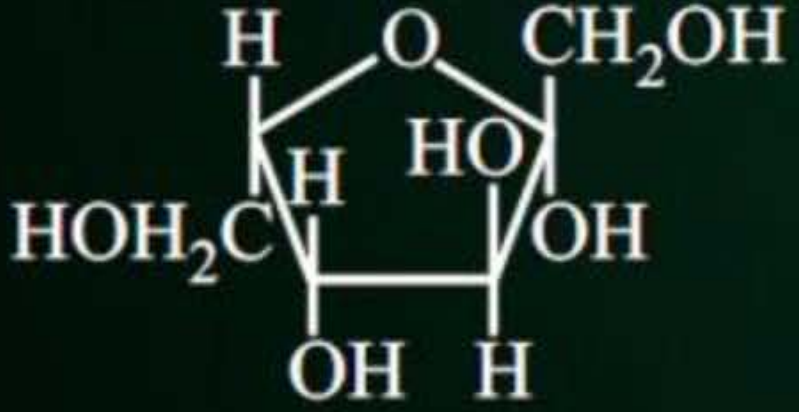
×

(B)

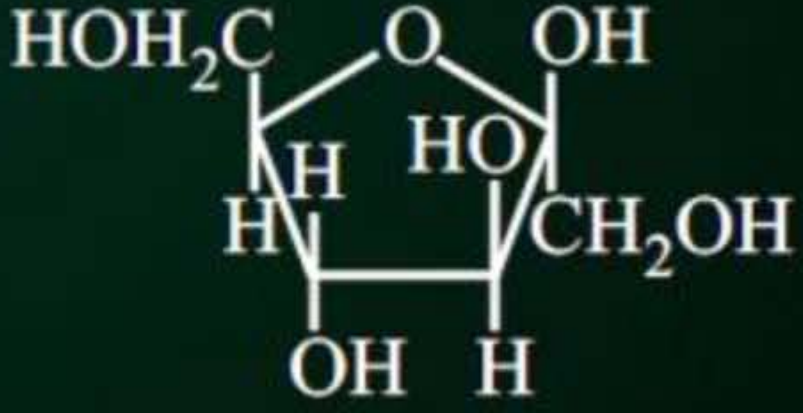
β

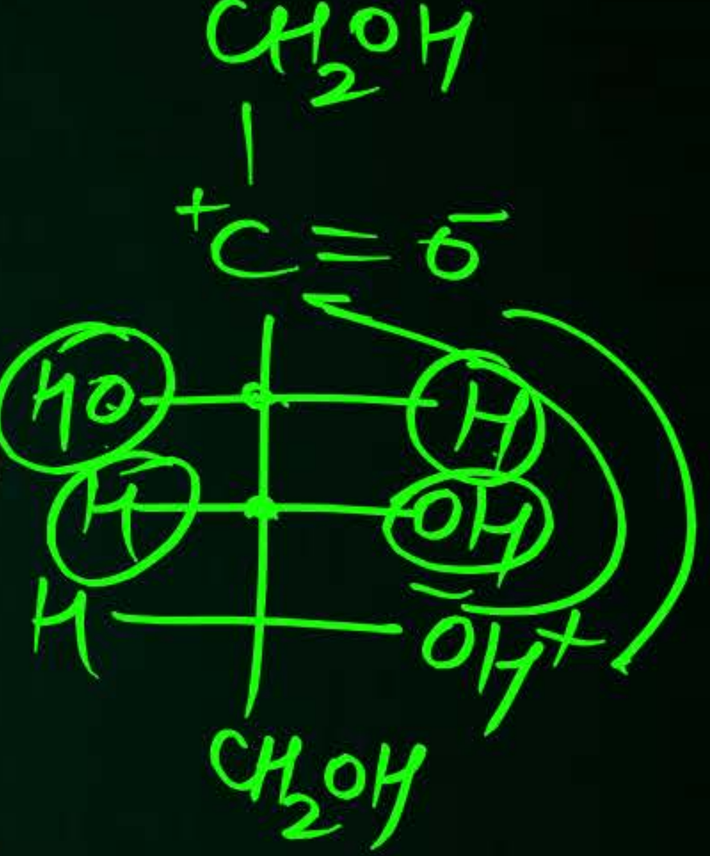

HOH₂C
O
OH
OH
HO
H
CH₂OH
H
H

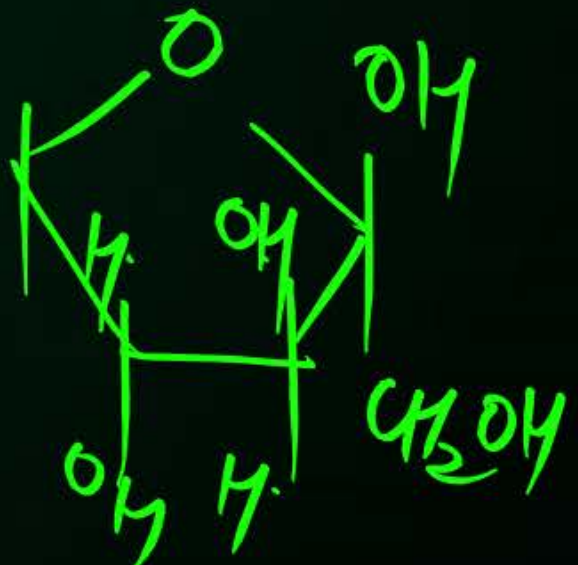
(C)


H
O
CH₂OH
H
HO
HOH₂C
OH
OH
H

(D)


HOH₂C
O
OH
H
HO
H
CH₂OH
OH
H


CH₂OH
C=O
HO
H
H
OH
H
OH
CH₂OH


O
OH
H
OH
CH₂OH
OH
H

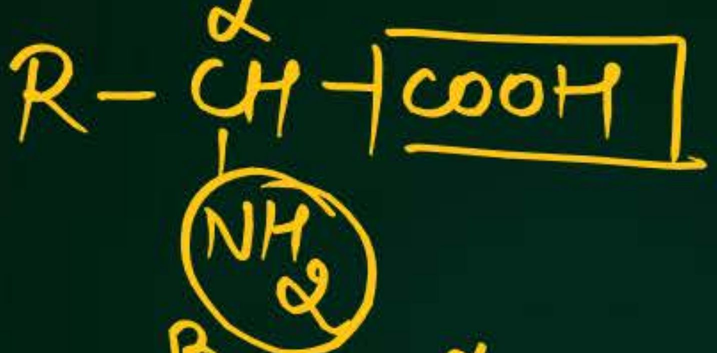
Amino Acids

NH_2 ↑ $COOH$ ↑

Amino Acids

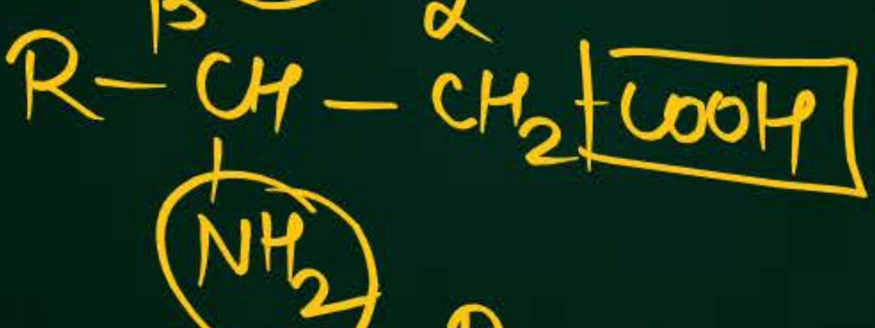
Classification Based on relative position of NH_2 & $COOH$

⊛ α-amino acid



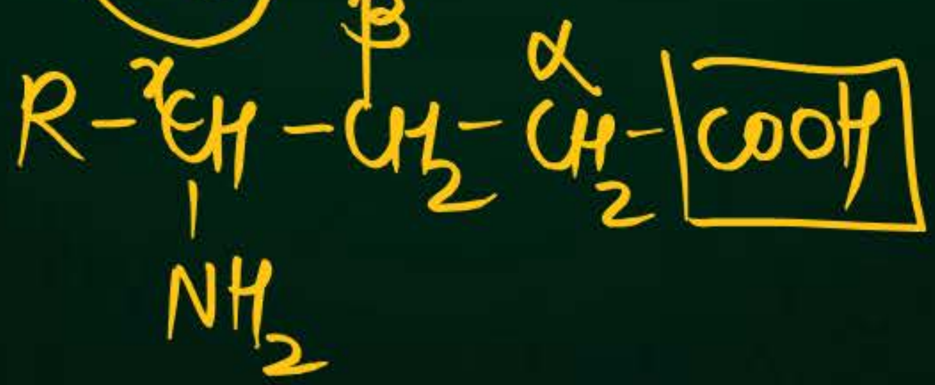
$R-\underset{NH_2}{\overset{\alpha}{CH}}-\boxed{COOH}$

β-amino acid



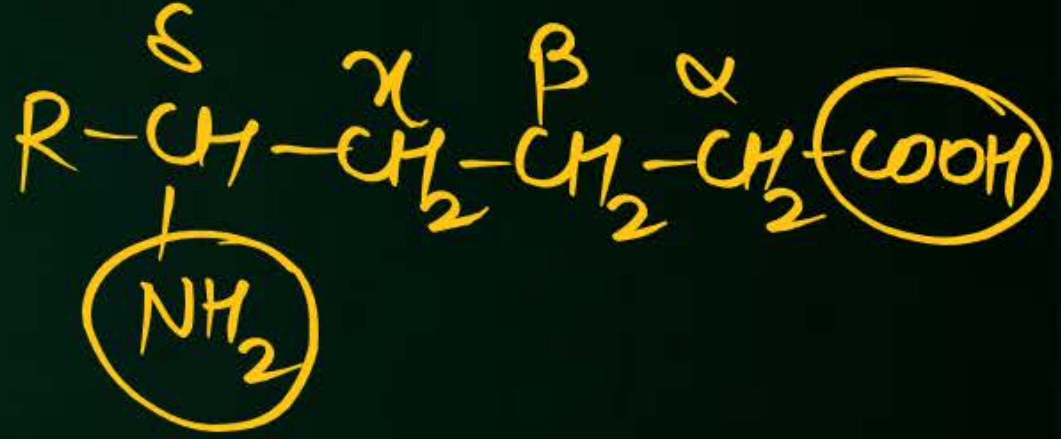
$R-\underset{NH_2}{\overset{\beta}{CH}}-\overset{\alpha}{CH_2}-\boxed{COOH}$

γ-amino acid



$R-\underset{NH_2}{\overset{\gamma}{CH}}-\overset{\beta}{CH_2}-\overset{\alpha}{CH_2}-\boxed{COOH}$

δ-amino acid



$R-\underset{NH_2}{\overset{\delta}{CH}}-\overset{\gamma}{CH_2}-\overset{\beta}{CH_2}-\overset{\alpha}{CH_2}-COOH$

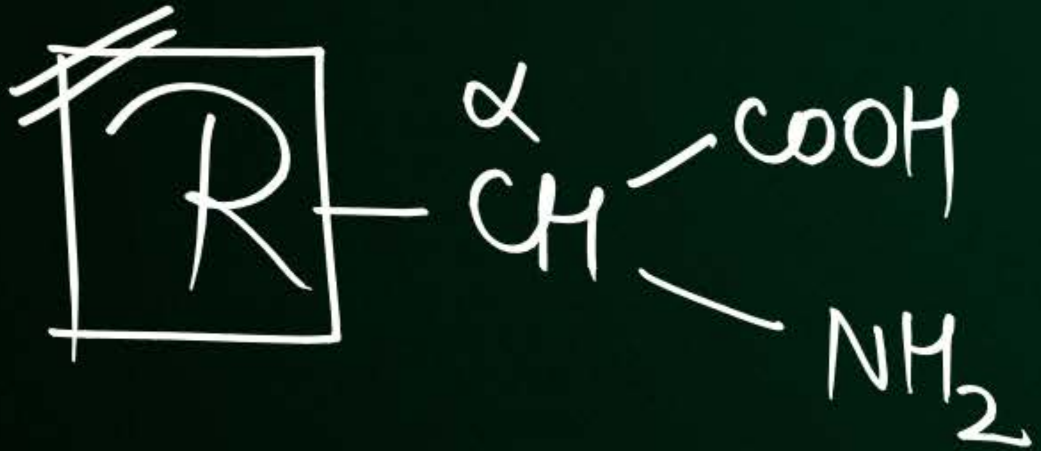
α-amino acid :- It is monomer of protein

Protein $\xrightarrow{H_3O^+}$ α-amino acid

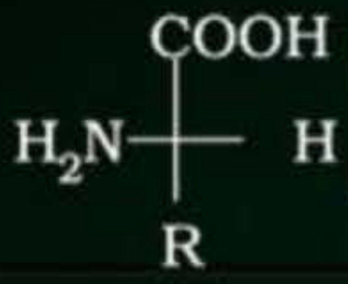
Classify :- ① Neutral amino acid R → Neither contain COOH nor NH_2

② Acidic " " R → Contain COOH

③ Basic " " R → " NH_2

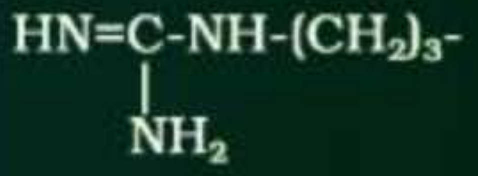
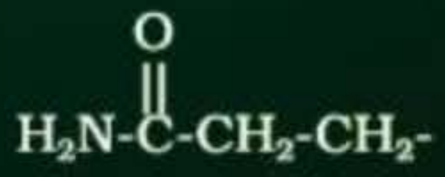


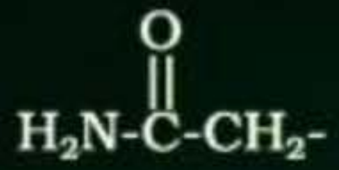
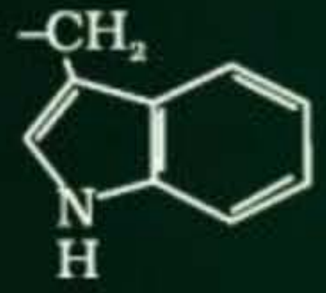
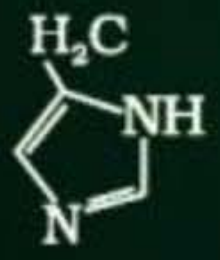
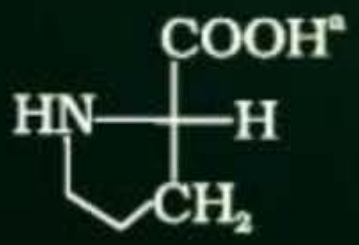
Natural Amino Acids



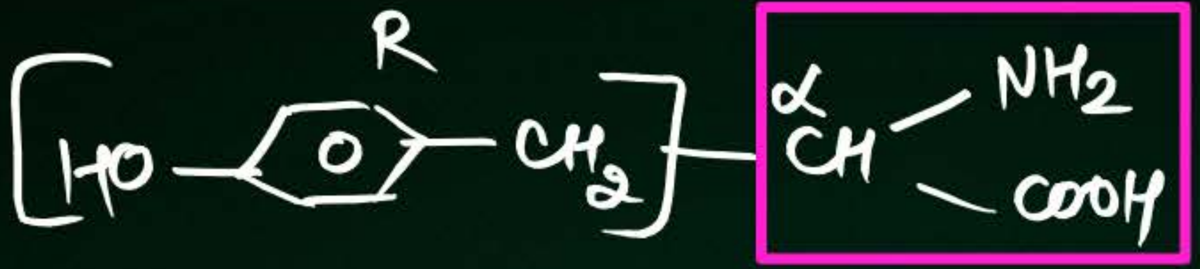
$$H_2N-\underset{R}{\overset{COOH}{C}}-H$$

$\underbrace{CH_3-CH_2-}_{\underbrace{Et-}}$

Name of the amino acids	Characteristic feature of side chain, R	Three letter symbol	One letter code
1. Glycine	H	Gly	G
2. Alanine	$-CH_3$	Ala	A
3. Valine*	$(H_3C)_2CH-$	Val	V
4. Leucine*	$(H_3C)_2CH-CH_2-$	Leu	L
5. Isoleucine*	$\underbrace{H_3C-CH_2}-\underset{CH_3}{\underset{\mid}{CH}}-$	Ile	I
6. Arginine*	 $HN=\underset{NH_2}{\underset{\mid}{C}}-NH-(CH_2)_3-$	Arg	R
7. Lysine*	$H_2N-(CH_2)_4-$	Lys	K
8. Glutamic acid	$HOOC-CH_2-CH_2-$	Glu	E
9. Aspartic acid	$HOOC-CH_2-$	Asp	D
10. Glutamine	 $H_2N-\overset{O}{\overset{\parallel}{C}}-CH_2-CH_2-$	Gln	Q

11. Asparagine	 $H_2N-\overset{\overset{O}{\|}}{C}-CH_2-$	Asn	N
12. Threonine*	$H_3C-CHOH-$	Thr	T
13. Serine	$HO-CH_2-$	Ser	S
14. Cysteine	$HS-CH_2-$	Cys	C
15. Methionine*	$H_3C-S-CH_2-CH_2-$	Met	M
16. Phenylalanine*	$C_6H_5-CH_2-$	Phe	F
17. Tyrosine	$(p)HO-C_6H_4-CH_2-$	Tyr	Y
18. Tryptophan*		Trp	W
19. Histidine*		His	H
20. Proline		Pro	P

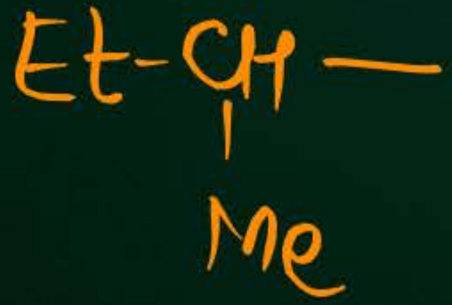
Tyrosine


R
HO
CH2
α
CH
NH2
COOH

serine $HO-CH_2-$

Glycine $H-$

Alanine $Me-$

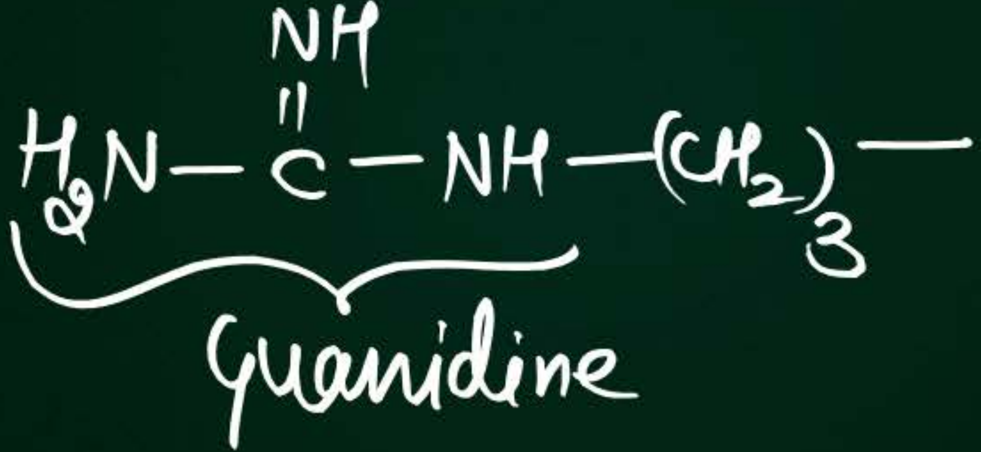
Phenyl alanine*	$Ph-CH_2-$
Valine*	Me_2CH-
Leucine*	Me_2CH-CH_2-
Isoleucine*	 $Et-\underset{\underset{Me}{\mid}}{CH}-$

Lysine* $H_2N-(CH_2)_4-$

Aspartic acid $HOOC-CH_2-$

Glutamic acid $HOOC-CH_2-CH_2-$

Arginine*



$$\underbrace{H_2N-\overset{NH}{\overset{\|}{C}}-NH}_{\text{Guanidine}}-(CH_2)_3-$$

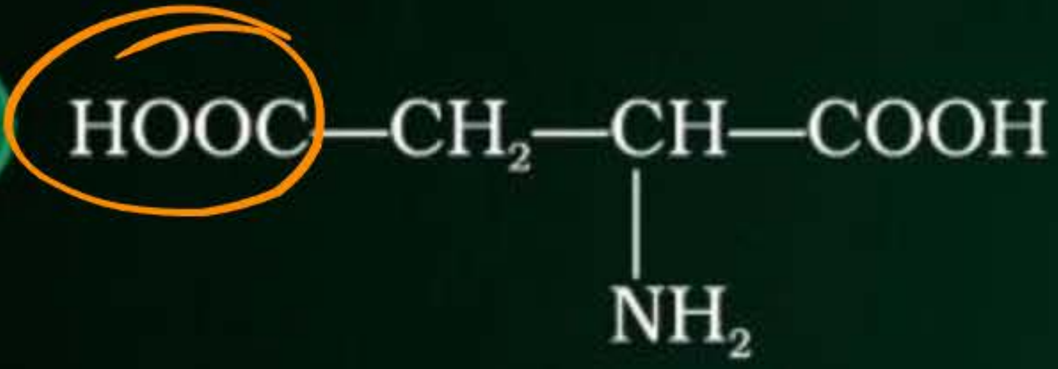
Tere
seher
main
gwala
pheri
wala
Lene
gaye
Lagaan

Bina star wale → Non-essential amino acid

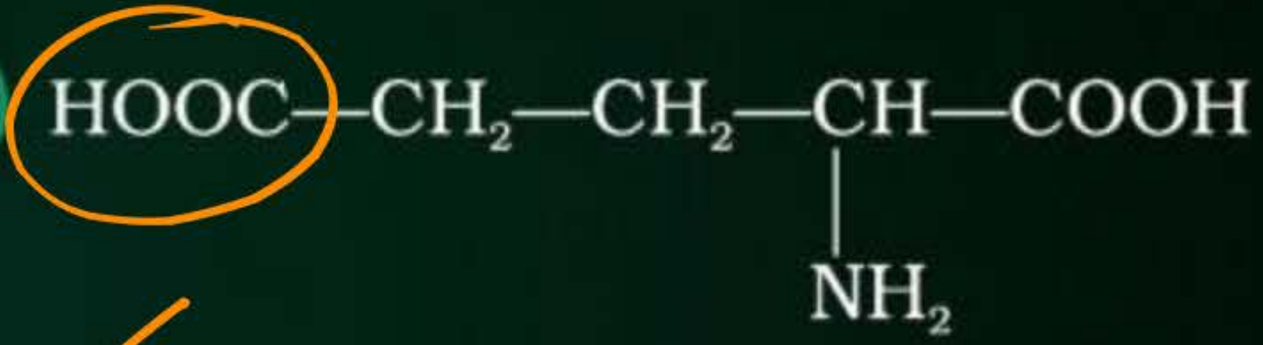
Star wale → Essential amino acid (Diet main include)

QUESTION (NCERT Exemplar)

Amino acids are classified as acidic, basic or neutral depending upon the relative number of amino and carboxyl groups in their molecule. Which of the following are acidic?

A


$HOOC-CH_2-\underset{\underset{NH_2}{|}}{CH}-COOH$

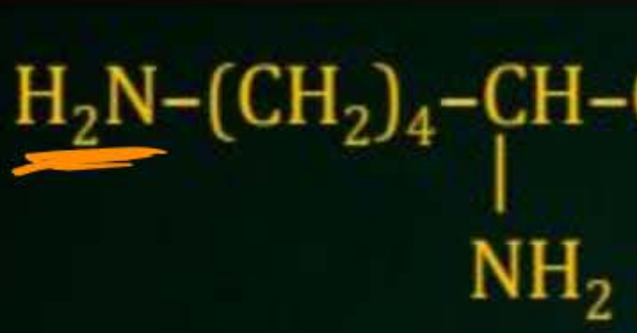
B


$HOOC-CH_2-CH_2-\underset{\underset{NH_2}{|}}{CH}-COOH$

C $H_2N-CH_2-CH_2-CH_2-COOH$

[✓ **D** Both (A) & (B)]

QUESTION (NCERT Exemplar)

Lysine, 

$\overset{\oplus}{H_2N}-(CH_2)_4-\underset{\displaystyle NH_2}{\underset{|}{CH}}-COOH$ is ______________.

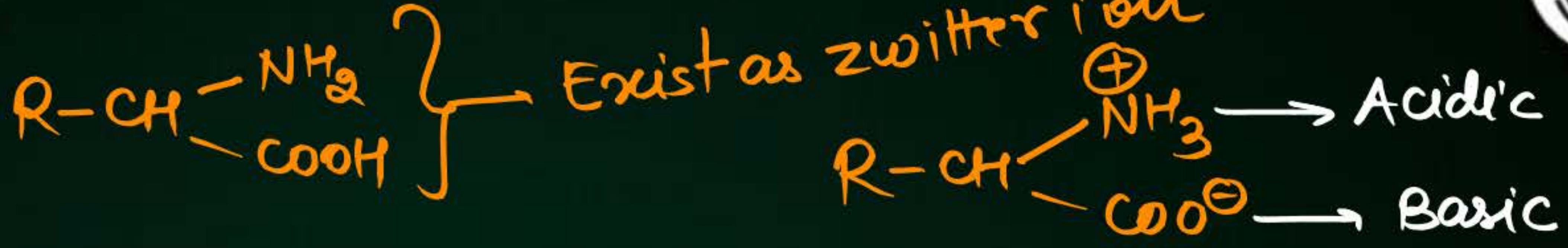
A α-Amino acid

B Basic amino acid

C Amino acid synthesized in body

[✓ D] Both (A) & (B)

QUESTION (AIIMS 2011)



$$\left.\text{R}-\text{CH}\begin{matrix}-\text{NH}_2\\ \diagdown\text{COOH}\end{matrix}\right\}\longrightarrow \text{Exist as zwitter ion}\quad \text{R}-\text{CH}\begin{matrix}\diagup\overset{\oplus}{\text{N}}\text{H}_3\longrightarrow \text{Acidic}\\ \diagdown\text{COO}^{\ominus}\longrightarrow \text{Basic}\end{matrix}$$

α-Amino acids are:

Ⓐ acidic due to –COOH group and basic due to $-NH_2$

[✓ Ⓑ] acidic due to $\underline{-NH_3^+}$ group and basic due to $\underline{-COO^-}$ group.

Ⓒ neither acidic nor basic.

Ⓓ None of these.

QUESTION

The amino acids which cannot be synthesized in the body but must be supplied through diet are:

[✓ A Essential amino acids]

B Non-essential amino acids

C Amino acids

D Acidic amino acids

QUESTION

The basic amino acids are

[✓ A] Lysine, arginine

B Alanine, glutamic acid

(2° amine)

C Proline, valine

D Alanine, cystein

QUESTION

The acidic amino acid is:

Ⓐ [✓ Aspartic acid]

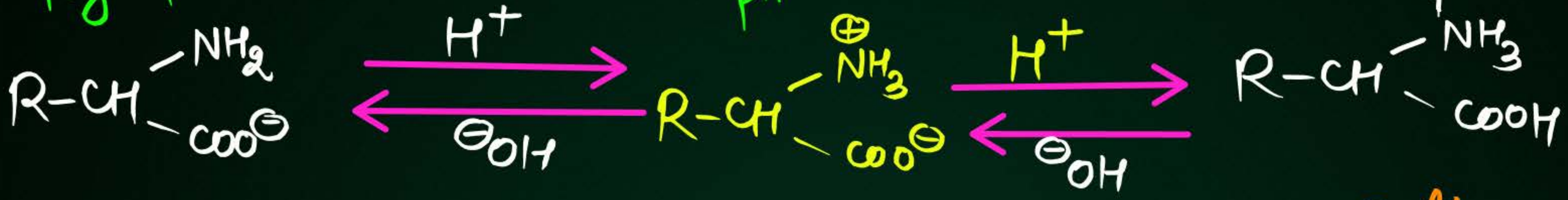
Ⓑ lysine

Ⓒ Serine

Ⓓ Tyrosine

Concept of zwitter ion. Depending upon pH of solⁿ 3 diff forms can exist

High pH Intermediate pH Low pH



$$R-CH\begin{matrix}NH_2\\COO^{\ominus}\end{matrix} \underset{^{\ominus}OH}{\overset{H^+}{\rightleftharpoons}} R-CH\begin{matrix}\overset{\oplus}{N}H_3\\COO^{\ominus}\end{matrix} \underset{^{\ominus}OH}{\overset{H^+}{\rightleftharpoons}} R-CH\begin{matrix}\overset{+}{N}H_3\\COOH\end{matrix}$$

Anion Zwitter ion Cation

$[H^+]\uparrow$, pH ↓

//

A	Z	Cat	
H	I	L	pH

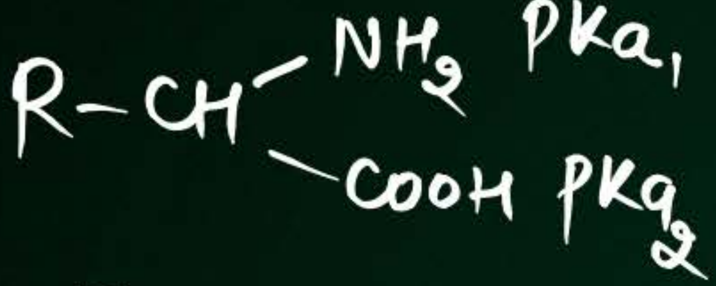
Isoelectric point : $p^{(I)}$ or pH at isoelectric point where zwitter ion exist

or

When there is no net migration of ion.

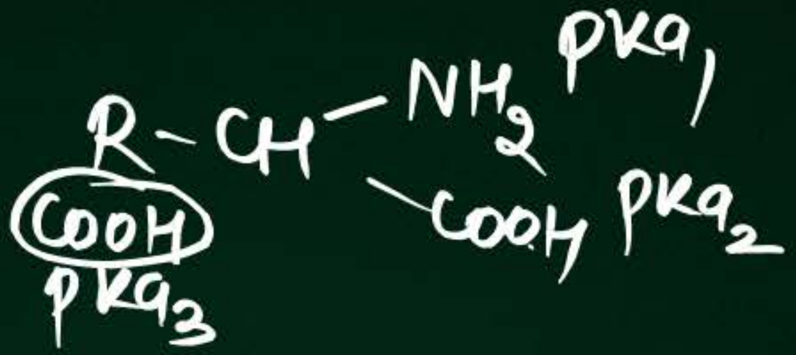
Calculation of p^I

Neutral


R–CH
NH2 pKa1
COOH pKa2

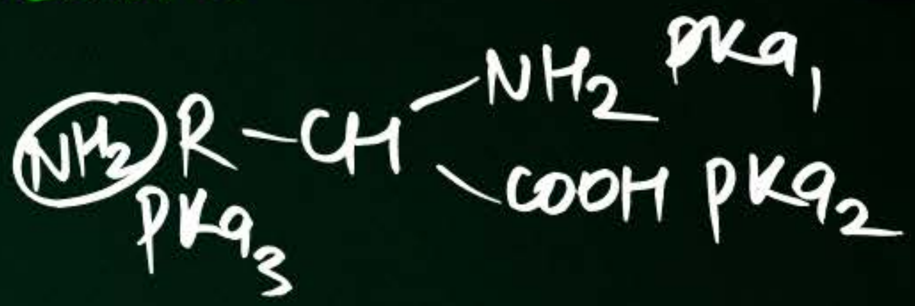
$$p^I = \frac{pKa_1 + pKa_2}{2}$$

Acidic


R–CH
NH2 pKa1
COOH pKa2
COOH
pKa3

$$p^I = \frac{pKa_2 + pKa_3}{2}$$

Basic


NH2
pKa3
R–CH
NH2 pKa1
COOH pKa2

$$p^I = \frac{pKa_1 + pKa_3}{2}$$

QUESTION

The three pK_a values of aspartic acid are 1.89, 3.65 and 9.60. The pI of the amino acid is:

Acid amino acid

$\underbrace{1.89, 3.65}_{\text{acid}}$ $\underbrace{9.60}_{\text{Basic}}$

[✓ A] 2.77

B 6.62

C 5.74

D 7.0

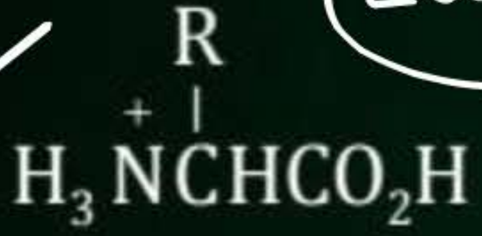
$$pI = \frac{1.89 + 3.65}{2}$$

QUESTION

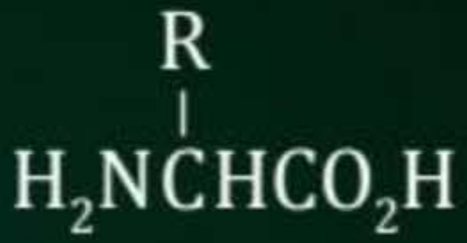
pI

Assume that a particular amino acid has an isoelectric point of 6.0. In a solution at pH 1.0, which of the following species will predominate ?

Low pH

✓ A 

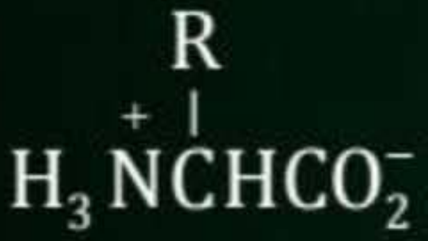
$H_3\overset{+}{N}\overset{R}{\overset{|}{C}}HCO_2H$

B 

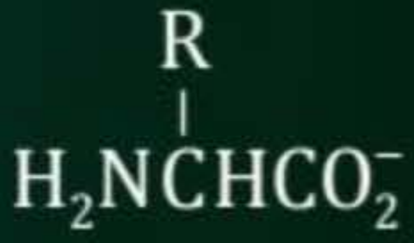
$H_2N\overset{R}{\overset{|}{C}}HCO_2H$

A = Cat

HI L pH

C 

$H_3\overset{+}{N}\overset{R}{\overset{|}{C}}HCO_2^-$

D 

$H_2N\overset{R}{\overset{|}{C}}HCO_2^-$

Home Work From PW Module (Yakeen NEET)

Prarambh: Q 16, 18, 19, 20, 22, 36, 37, 38, 39, 40, 43, 44, 45

Prabal: Q 01, 05, 07, 08, 09, 10, 11, 12, 13, 15, 17, 24, 27, 28

PANKAJ SIR
JOIN MY OFFICIAL TELEGRAM CHANNEL
PhysicsWallah
अनुगच्छतु प्रवाहं
@PSCAA

Thank you!!

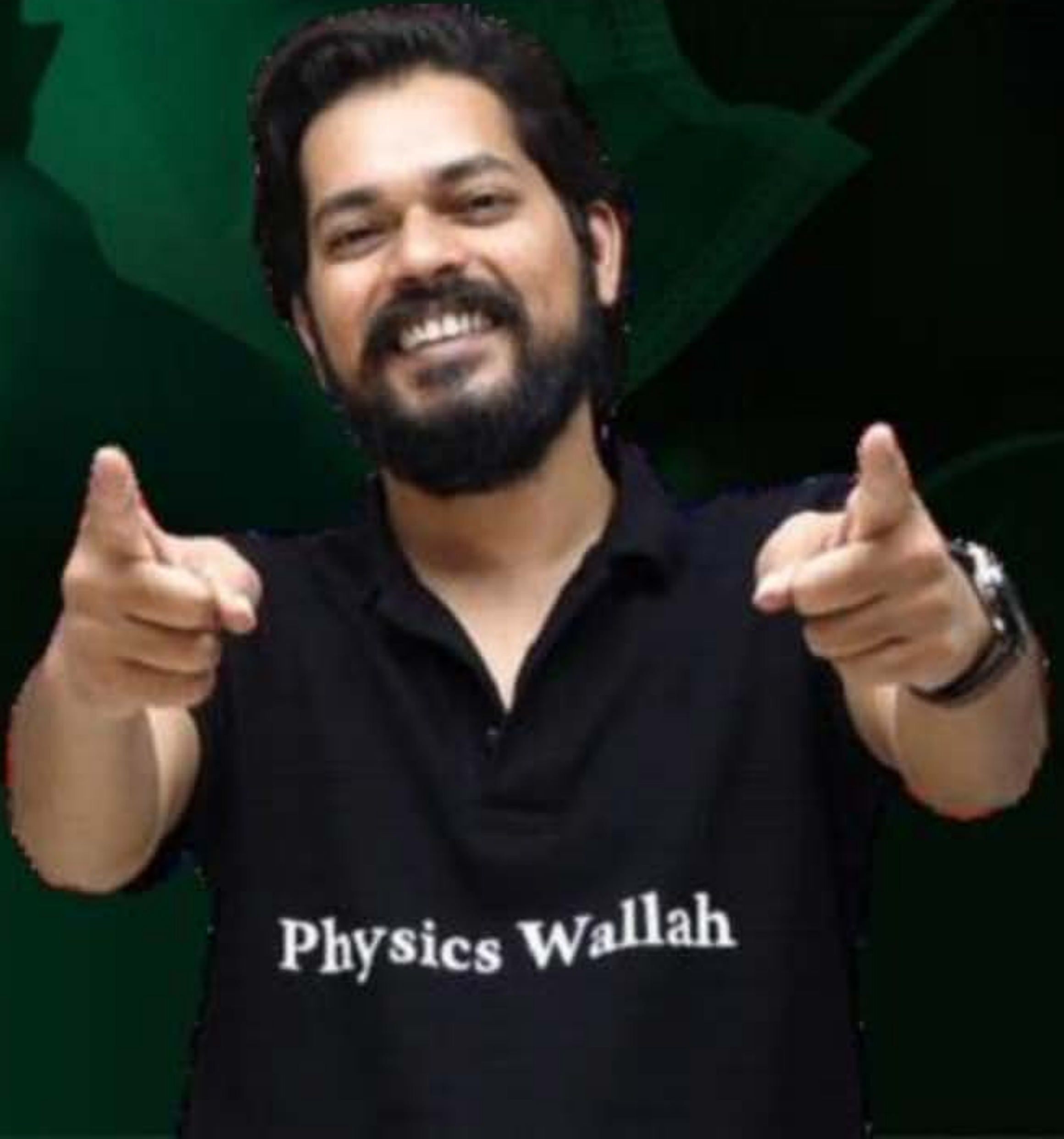
YAKEEN 2.0

FOR NEET 2025

Lecture- 03 Organic Chemistry

Biomolecules

By- Pankaj Sir(POPU MAMA)


Physics Wallah

Topics *to be covered*

1. Proteins & Nucleic Acids ✓
2. Vitamins, Enzymes & Hormones ✓
3. Practice

Peptides

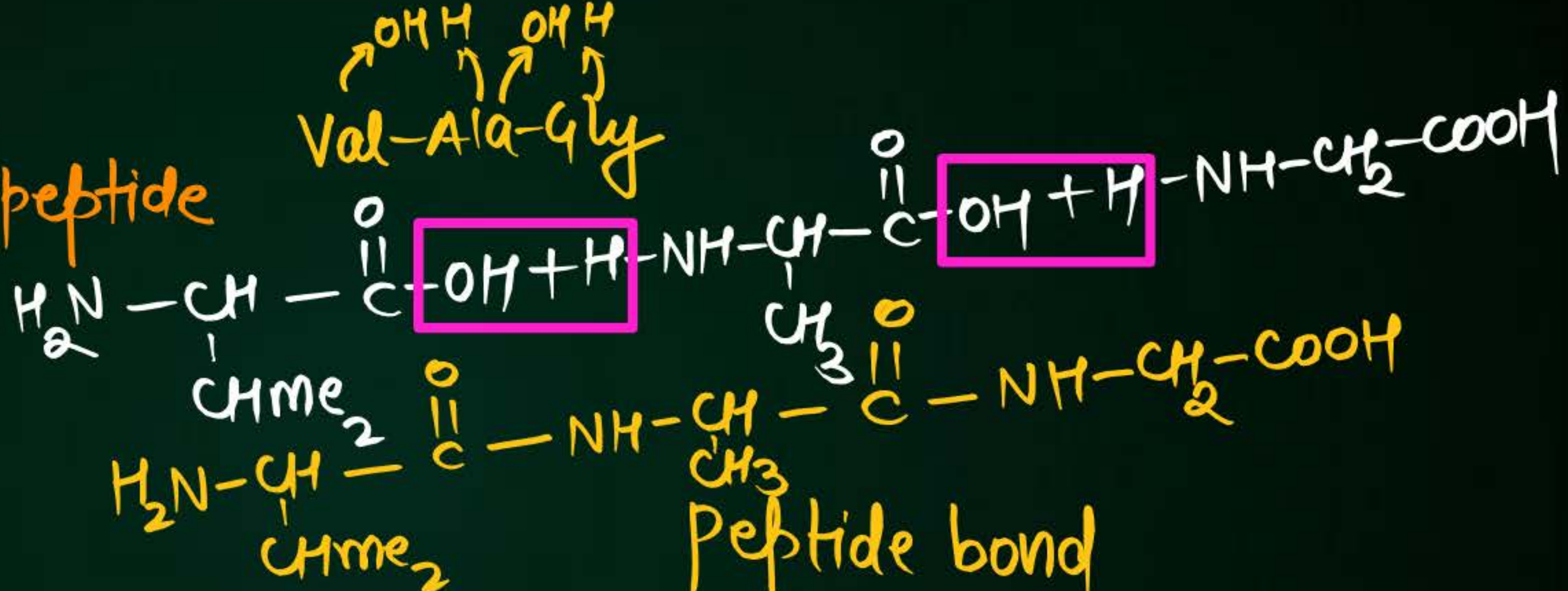
polypeptide (protein)

Dipeptide

formed by conden. of 2 amino acid

Gly-Ala

Tripeptide

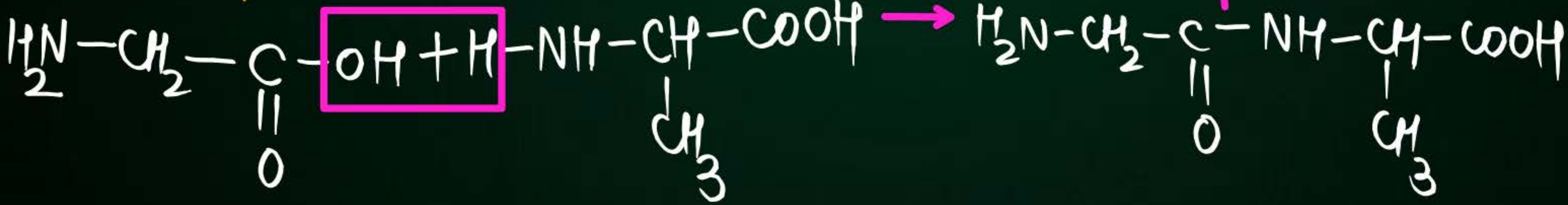


Val-Ala-Gly

$$H_2N-\underset{CHMe_2}{CH}-\overset{O}{\overset{\|}{C}}-\boxed{OH+H}-NH-\underset{CH_3}{CH}-\overset{O}{\overset{\|}{C}}-\boxed{OH+H}-NH-CH_2-COOH$$

$$H_2N-\underset{CHMe_2}{CH}-\overset{O}{\overset{\|}{C}}-NH-\underset{CH_3}{CH}-\overset{O}{\overset{\|}{C}}-NH-CH_2-COOH$$

Peptide bond



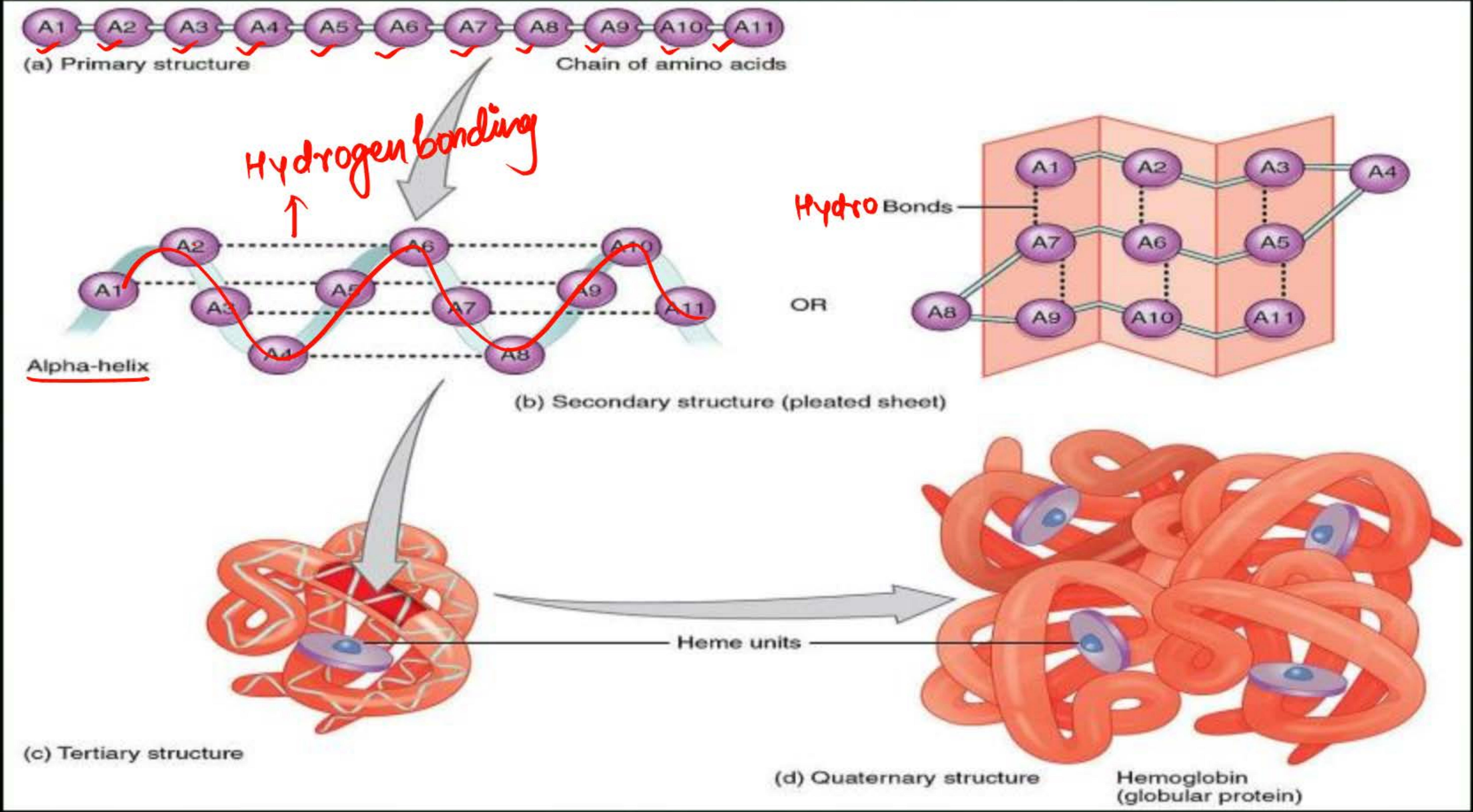
$$H_2N-CH_2-\underset{O}{\underset{\|}{C}}-\boxed{OH+H}-NH-\underset{CH_3}{CH}-COOH \rightarrow H_2N-CH_2-\underset{O}{\underset{\|}{C}}-NH-\underset{CH_3}{CH}-COOH$$

Globular & Fibrous Protein

Globular and Fibrous are 2 main types of proteins

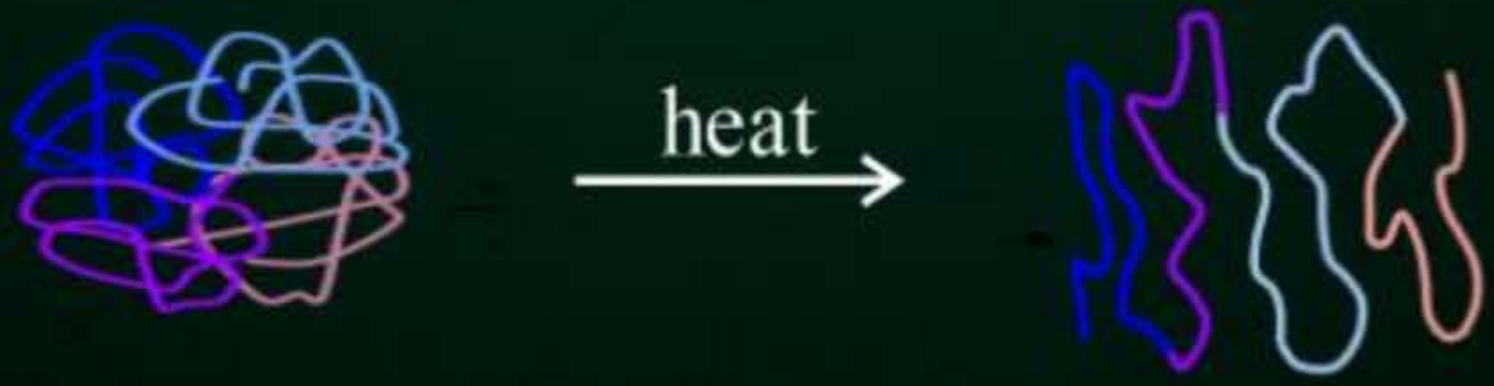
	Fibrous (collagen)	Globular (myoglobin)
Molecules	Long, thin Lie side by side to form fibres.	Fold into spherical 3-D shape.
Examples	Collagen (in skin and bone). keratin (present in hair, wool, silk) and myosin (present in muscles)	Haemoglobin Insulin (51 amino acid) Enzymes albumins
Solubility in water	Insoluble	Soluble
Roles	Structural : – Collagen in bone and cartilage – Keratin in fingernails and hair.	Metabolic – Enzymes in all organisms – Plasma proteins, antibodies in mammals.

Structure of Globular PROTEINS


A1 A2 A3 A4 A5 A6 A7 A8 A9 A10 A11
(a) Primary structure
Chain of amino acids
Hydrogen bonding
Alpha-helix
A1 A2 A3 A4 A5 A6 A7 A8 A9 A10 A11
OR
Hydro Bonds
A1 A2 A3 A4 A7 A6 A5 A8 A9 A10 A11
(b) Secondary structure (pleated sheet)
Heme units
(c) Tertiary structure
(d) Quaternary structure
Hemoglobin
(globular protein)

Denaturation of PROTEINS → Hydrogen bond breaking

1. When a protein in its native form, is subjected to physical change like change in temperature or chemical change like change in pH, the hydrogen bonds are disturbed. Due to this, globules unfold and helix get uncoiled and protein loses its biological activity. This is called denaturation of protein.
2. During denaturation secondary and tertiary structures are destroyed but primary structure remains intact.
3. Exp- coagulation of egg white on boiling , curdling of milk which is caused due to the formation of lactic acid by the bacteria present in milk.



Nucleic Acids

1. These are mainly of two types, the deoxyribonucleic acid (DNA) and ribonucleic acid (RNA).
2. Nucleic acids are long chain polymers of nucleotides, so they are also called polynucleotides.

Mono → polysacc

α-amino acid → polypeptide (protein)

Nucleotide → poly Nucleotide (Nucleic acid)

Nucleotide

Sugar

① Ribose

② Deoxy ribose

Base

Adenine, Guanine

Cytosine, Thymine

Uracil

Phosphate

(from phosphoric acid)

DNA [Nucleotide]

Sugar

Deoxy ribose

Base

Purine

[Adenine, Guanine]

[Cytosine, Thymine]

Pyrimidine

Phosphate

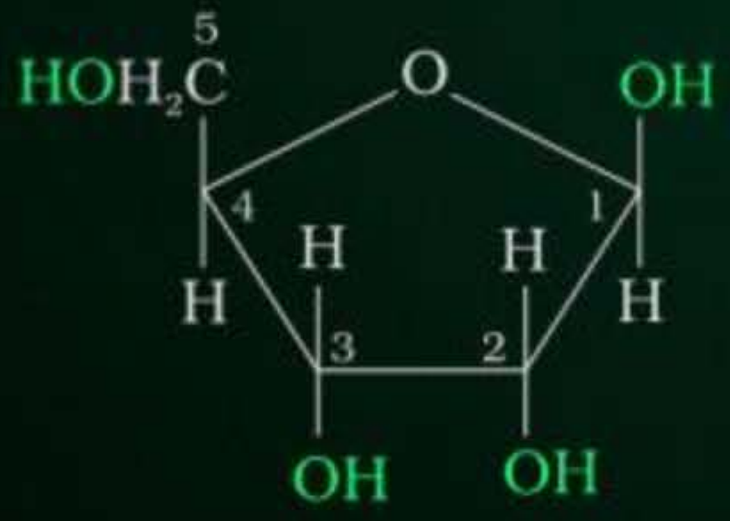
(from phosphoric acid)

(RNA) Nucleotide

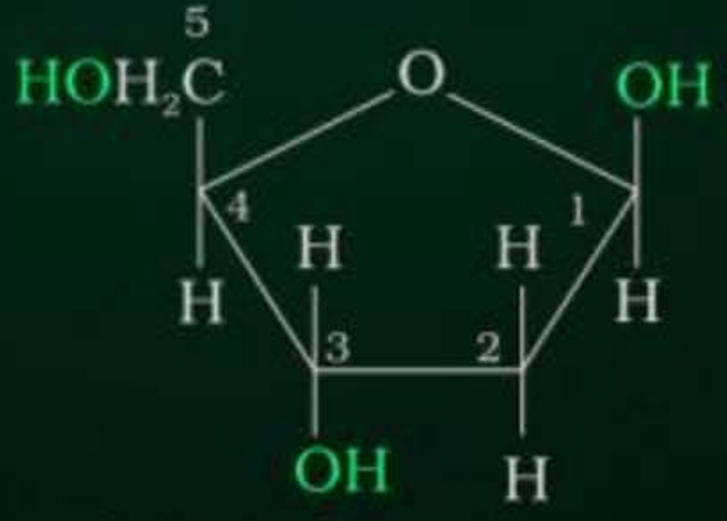
- Sugar
  - Ribose
- Base
  - [Adenine, Guanine] Purine
  - [Cytosine, Uracil] Pyrimidine
- Phosphate
  - (from phosphoric acid)

Chemical composition of Nucleic Acid

1. Complete hydrolysis of DNA (or RNA) yields a pentose sugar, phosphoric acid and nitrogen containing heterocyclic compounds (called bases).
2. The DNA molecules, the sugar moiety is β-D-2-deoxyribose whereas in RNA molecule, it is β-D-ribose.

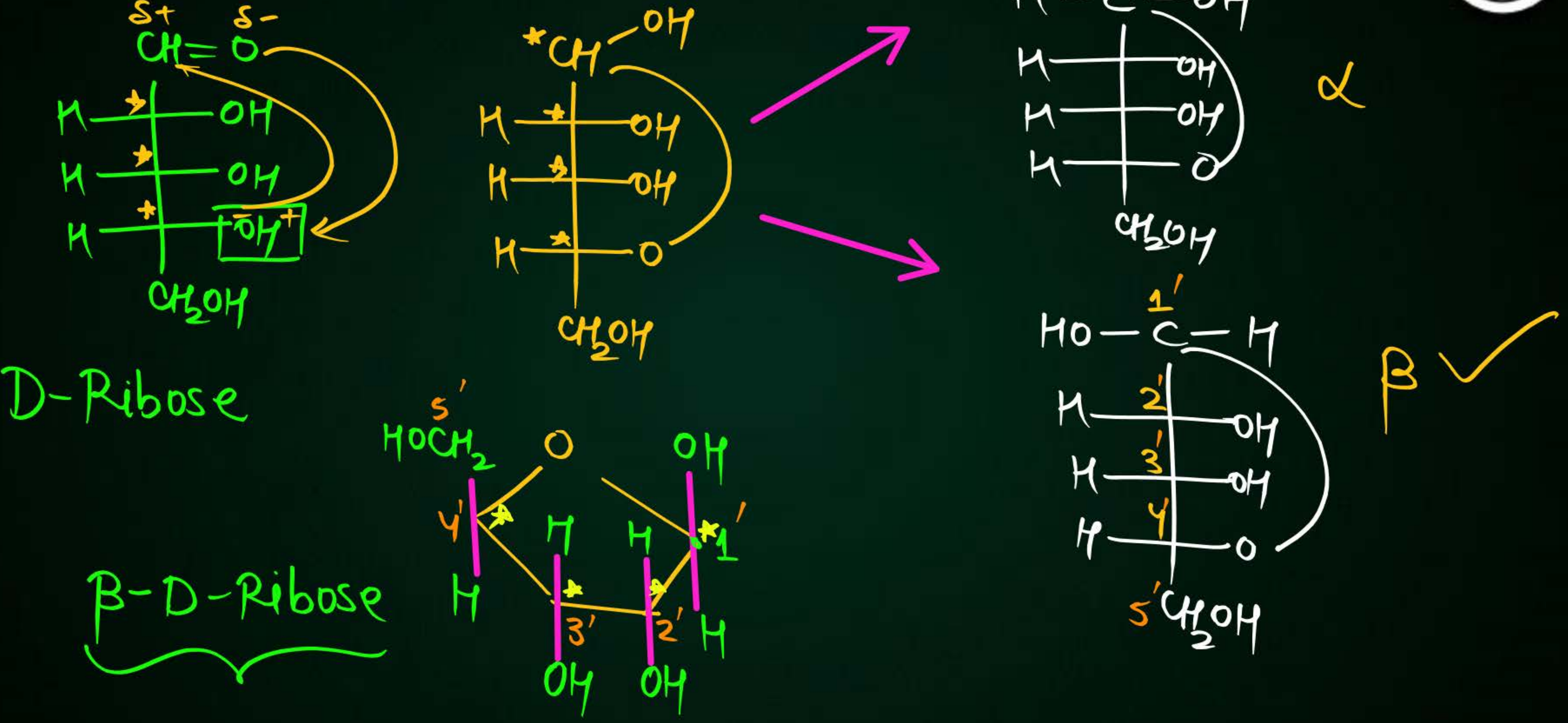

5
HOH$_2$C
O
OH
4
H
H
1
H
H
3
2
OH
OH

β–D–ribose

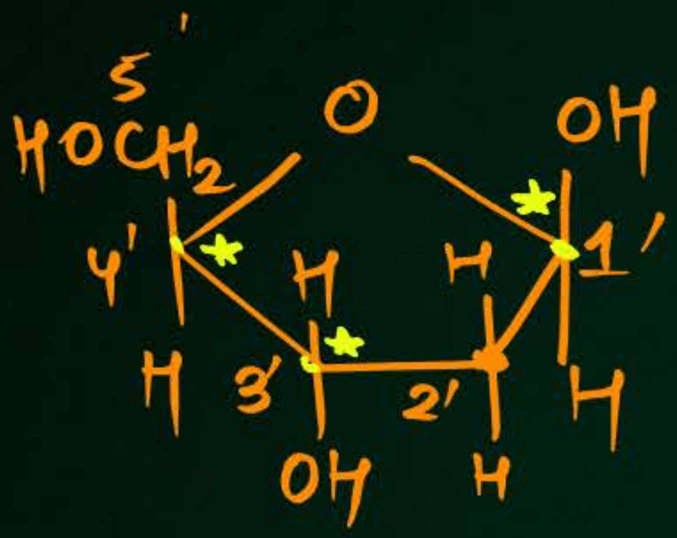

5
HOH$_2$C
O
OH
4
H
H
1
H
H
3
2
OH
H

β–D–2–deoxyribose

Formation of a Ribose sugar


δ+ δ-
CH=O
H — OH
H — OH
H — OH
CH₂OH
D-Ribose
*CH—OH
H — OH
H — OH
H — O
CH₂OH
H — C — OH
H — OH
H — OH
H — O
CH₂OH
α
1'
HO — C — H
2' H — OH
3' H — OH
4' H — O
5' CH₂OH
β ✓
5'
HOCH₂
O
OH
4'
H
H
H
1'
3'
2'
H
OH
OH
β-D-Ribose

Sugar of DNA

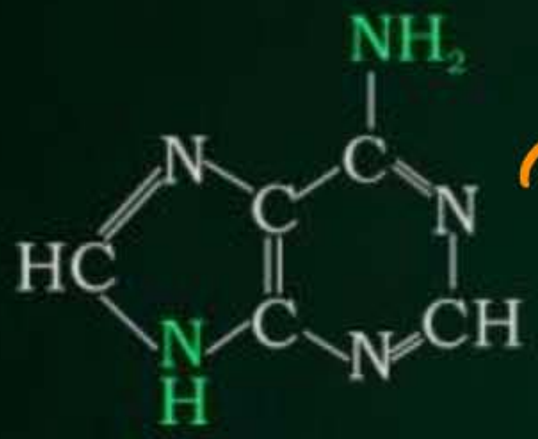

5'
HOCH2
O
OH
4'
H
H
1'
H
3'
2'
H
OH
H

β-D-2 deoxyribose

Bases in DNA & RNA

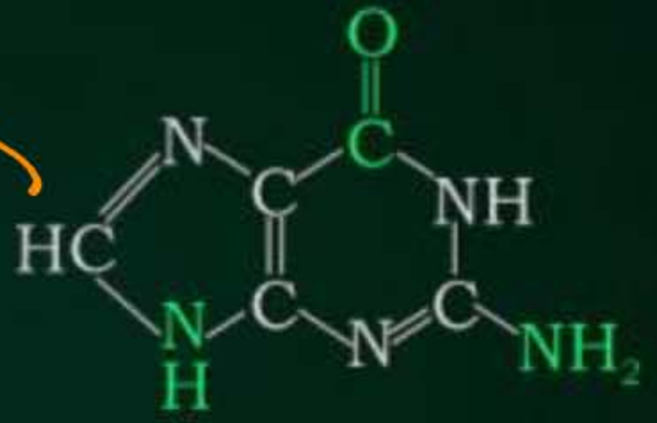
1. DNA adenine (A), guanine (G), cytosine (C) and thymine (T).
2. RNA adenine (A), guanine (G), cytosine (C) and uracil (U).

A G C T DNA
" " " U RNA



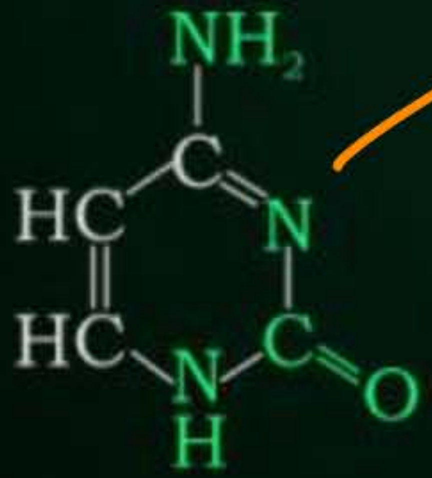
Adenine (A)

purine

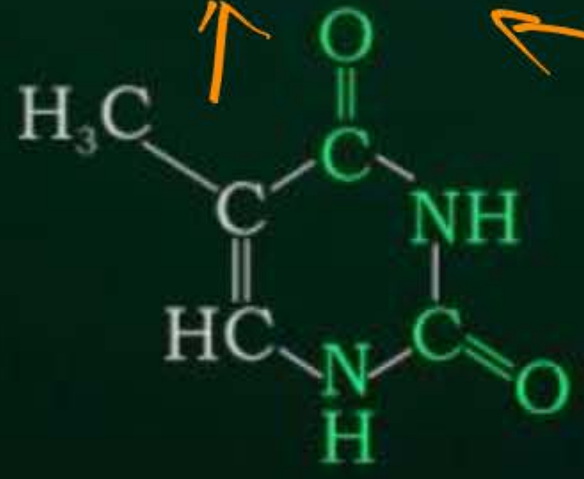


Guanine (G)

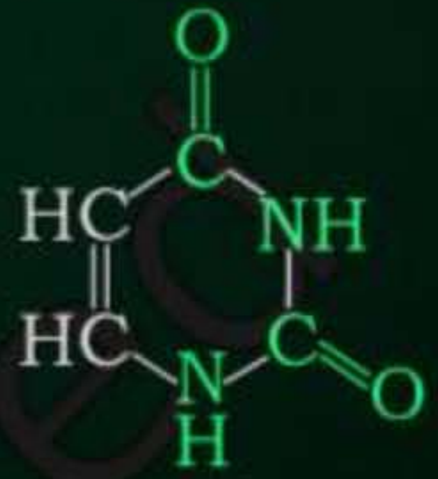
Pyrimidine



Cytosine (C)



Thymine (T)



Uracil (U)

Dinucleotide

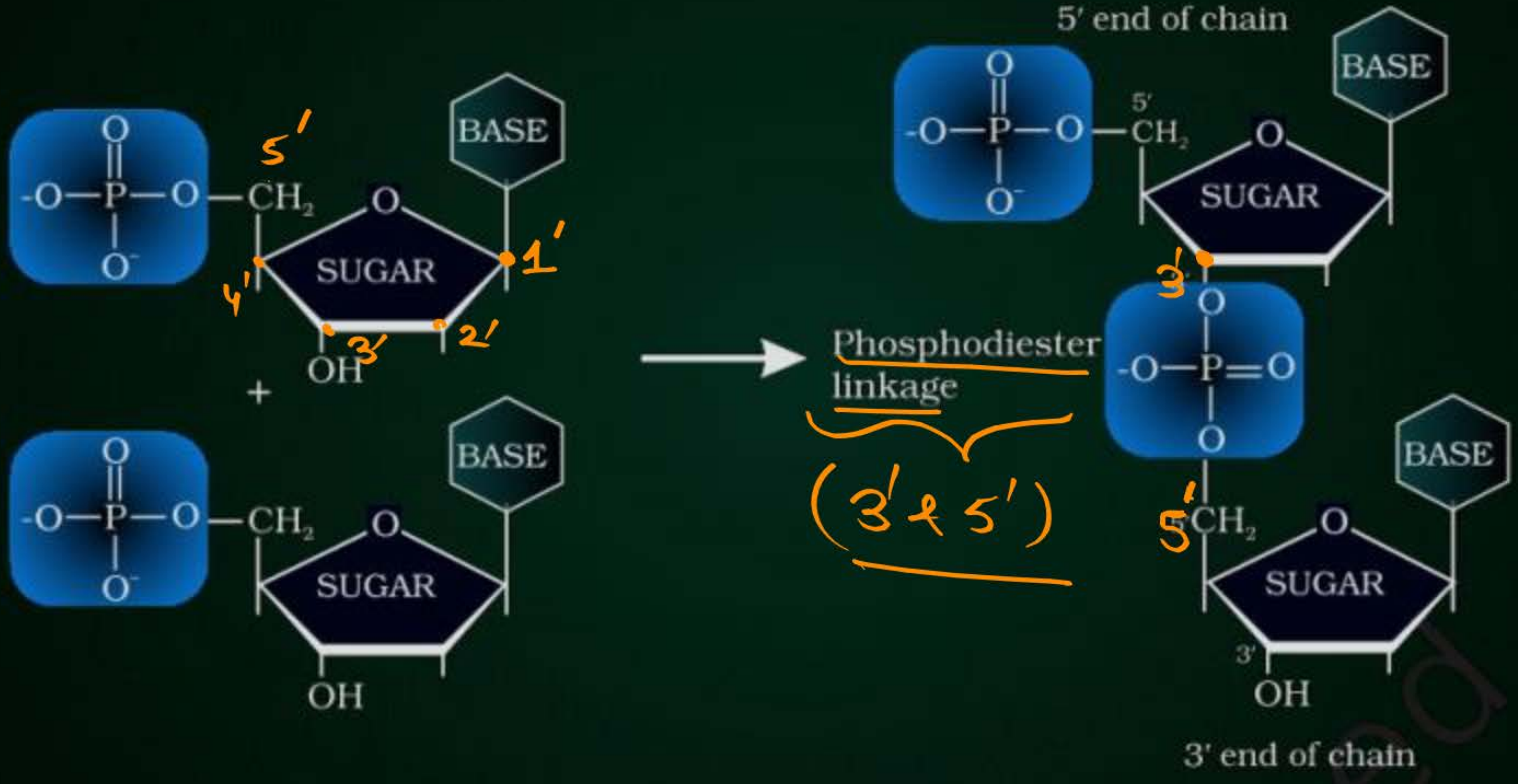

-O—P—O—CH2
O
O-
5'
BASE
O
SUGAR
1'
4'
3'
2'
OH
+
-O—P—O—CH2
O
O-
BASE
O
SUGAR
OH
5' end of chain
-O—P—O—CH2
5'
BASE
O
SUGAR
3'
Phosphodiester linkage
(3' & 5')
-O—P=O
O
O
5'
CH2
BASE
O
SUGAR
3'
OH
3' end of chain

Fig. 10.6: Formation of a dinucleotide

Nucleotide

[Sugar + base + phosphate]

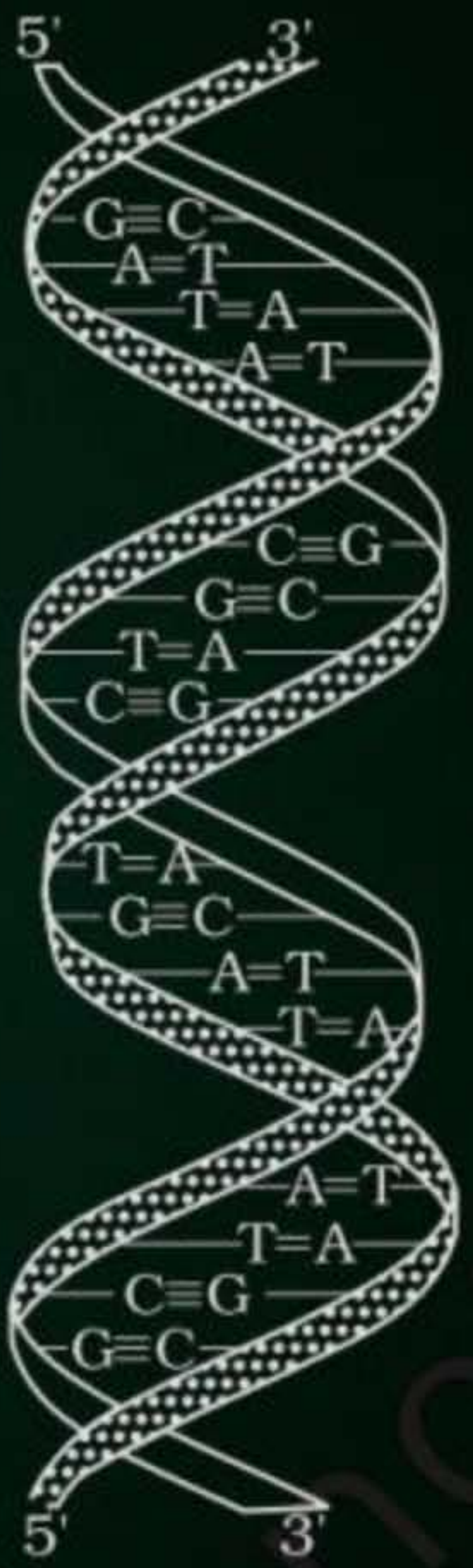
Nucleoside

[Sugar + base]

Double strand helix structure for DNA

AGCT

1. Nucleic acids have a secondary structure also.
2. Two nucleic acid chains are wound about each other and held together by hydrogen bonds between pairs of bases.
3. The two strands are complementary to each other because the hydrogen bonds are formed between specific pairs of bases.
4. Adenine forms 2 hydrogen bonds with thymine whereas cytosine forms 3 hydrogen bonds with guanine.



Secondary Structure for RNA

1. In secondary structure of RNA single stranded helics is present which sometimes folds back on itself.
2. RNA molecules are of three types and they perform different functions.
3. They are named as messenger RNA (m-RNA), ribosomal RNA (r-RNA) and transfer RNA (t-RNA).

DNA fingerprinting

1. It is known that every individual has unique fingerprints.
2. These occur at the tips of the fingers and have been used for identification for a long time but these can be altered by surgery.
3. A sequence of bases on DNA is also unique for a person and information regarding this is called DNA fingerprinting.
4. It is same for every cell and cannot be altered by any known treatment.
5. DNA fingerprinting is now used
   (i) in forensic laboratories for identification of criminals. ✓
   (ii) to determine paternity of an individual. ✓
   (iii) to identify the dead bodies in any accident by comparing the DNA's of parents or children.
   (iv) to identify racial groups to rewrite biological evolution.

QUESTION (NCERT Exemplar)

Proteins are found to have two different types of secondary structures viz. α-helix and β-pleated sheet structure. α-helix structure of protein is stabilized by:

Ⓐ Peptide bonds

Ⓑ van der Waals forces

Ⓒ [✓ Hydrogen bonds]

Ⓓ Dipole-dipole interactions

QUESTION (NCERT Exemplar)

Each polypeptide in a protein has aminoacids linked with each other in a specific sequence. This sequence of amino acids is said to be ________.

$- - - A_1 - A_2 - A_3 - A_4 - A_5 - - -$

[✓ Ⓐ] primary structure of proteins

Ⓑ secondary structure of proteins

Ⓒ tertiary structure of proteins

Ⓓ quaternary structure of proteins

QUESTION (NCERT Exemplar)

Proteins can be classified into two types on the basis of their molecular shape i.e., fibrous proteins and globular proteins. Examples of globular proteins are:

A Insulin

B Keratin

C Albumin

[✓ **D** Both (A) & (C)]

QUESTION (NCERT Exemplar)

Nucleic acids are the polymers of ____________.

Ⓐ Nucleosides

[✓ Ⓑ Nucleotides]

Ⓒ Bases

Ⓓ Sugars

QUESTION (NCERT Exemplar)

DNA and RNA contain four bases each. Which of the following bases is not present in RNA?

- A Adenine
- B Uracil
- [✓ C] Thymine
- D Cytosine

QUESTION (NCERT Exemplar)

Which of the following bases is not present in DNA?

Ⓐ Adenine

Ⓑ Thymine

Ⓒ Cytosine

[✓ Ⓓ Uracil]

QUESTION (NCERT Exemplar)

Which of the following are purine bases?

- (A) Guanine
- (B) Adenine
- [✓ (C) Both (A) & (B)]
- (D) Uracil

QUESTION (NCERT Exemplar)

Which of the statements about "Denaturation" given below are correct?

(A) Denaturation of proteins causes loss of secondary ✓ and tertiary structures of the protein.

(B) Denturation leads to the conversion of double ✓ strand of DNA into single strand.

(C) Denaturation affects primary structure ✗ which gets distorted.

Options:

A (B) and (C)

B (A) and (C)

[✓ C (A) and (B)]

D (A), (B) and (C)

QUESTION

Which among the following direct the synthesis of protein as well as responsible for transfer of genetic information?

- **A** Amino acids
- **B** [✓ Nucleic acids]
- **C** Pyruvic acid
- **D** Carbohydrates specially cellulose

QUESTION

On hydrolysis, proteins give:

Ⓐ nucleotides

Ⓑ nucleosides

Ⓒ amides

[✓ Ⓓ amino acids]

QUESTION

A nucleotide is made up of

A A base and sugar

B A base and phosphate unit

C A sugar and phosphate unit

[✓ D] A sugar, a base and phosphate unit

QUESTION

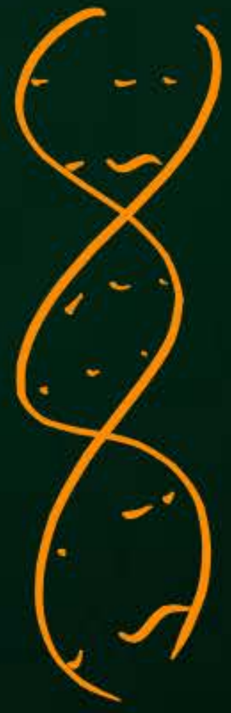
The reason for double helical structure of DNA is:

(A) van der Waal's forces.

(B) dipole-dipole interaction.

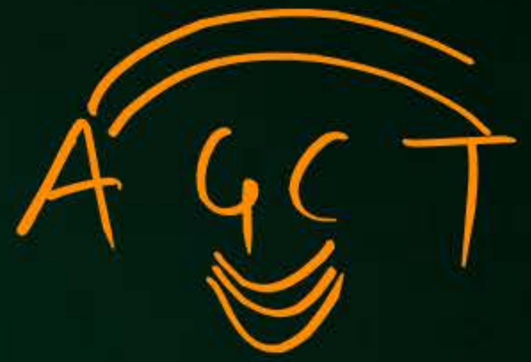
(C) [✓ hydrogen bonding.]

(D) electrostatic attractions.



QUESTION

The pair of bases in DNA are held together by



A [✓ Hydrogen bonds]

B Ionic bonds

C Phosphate groups

D Oxygen linkages

Vitamins

1. It has been observed that certain organic compounds are required in small amounts in our diet but their deficiency causes specific diseases. These compounds are called vitamins.
2. Vitamins are designated by alphabets A, B, C, D, etc. Some of them are further named as sub-groups e.g. B_1, B_2 , B_6 , B_{12} etc.
3. Excess of vitamins is also harmful and vitamin pills should not be taken without the advice of doctor.
4. The term "Vitamine" was coined from the word vital + amine since the earlier identified compounds had amino groups. Later work showed that most of them did not contain amino groups, so the letter 'e' was dropped and the term vitamin is used these days.

Fat Soluble Vitamins

- Vitamin K
- Vitamin E
- Vitamin D
- Vitamin A (Retinol)
- B_{12}

Water Soluble Vitamins

Vitamin	Name
B_1	Thiamine
B_2	Riboflavin
B_3	Niacin
B_5	Pantothenic Acid
B_6	Pyridoxine
B_7	Biotin
B_9	Folate
C	Ascorbic Acid

Sl. No.	Name of Vitamins	Sources	Deficiency diseases
1.	Vitamin A	Fish liver oil, carrots, butter and milk	Xerophthalmia (hardening of cornea of eye) Night blindness
2.	Vitamin B_1 (Thiamine)	Yeast, milk, green vegetables and cereals	Beri beri (loss of appetite, retarded growth)
3.	Vitamin B_2 (Riboflavin)	Milk, eggwhite, liver, kidney	Cheilosis (fissuring at corners of mouth and lips), digestive disorders and burning sensation of the skin.
4.	Vitamin B_6 (Pyridoxine)	Yeast, milk, egg yolk, cereals and grams	Convulsions
5.	Vitamin B_{12}	Meat, fish, egg and curd	Pernicious anaemia (RBC deficient in haemoglobin)
6.	Vitamin C (Ascorbic acid)	Citrus fruits, amla and green leafy vegetables	Scurvy (bleeding gums)
7.	Vitamin D	Exposure to sunlight, fish and egg yolk	Rickets (bone deformities in children) and osteomalacia (soft bones and joint pain in adults)
8.	Vitamin E	Vegetable oils like wheat germ oil, sunflower oil, etc.	Increased fragility of RBCs and muscular weakness
9.	Vitamin K	Green leafy vegetables	Increased blood clotting time

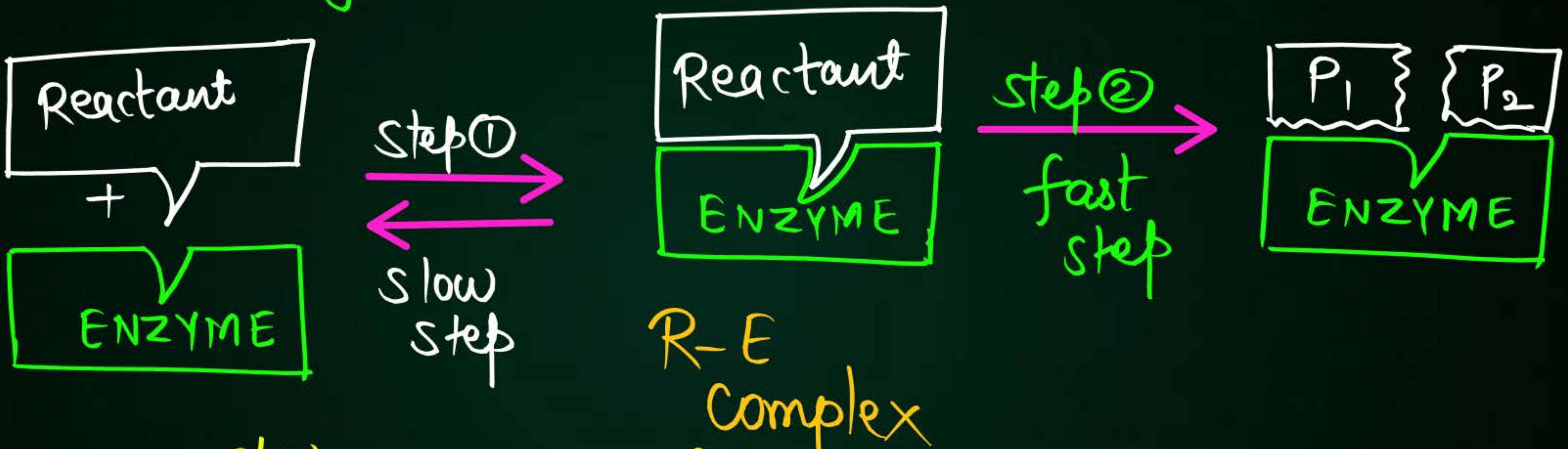
Enzymes

1. Enzymes are high molecular mass proteins.
2. One enzyme can catalyse million of the reactions
3. Also known as biochemical catalyst
4. Enzymes act efficiently at optimum temperature and p^H
5. Coenzymes increase the activities of enzymes.
6. Enzymes are specific in their action on substrates.

Enzymes

Mechanism of enzyme

Lock & Key model


Reactant
+
ENZYME
Step①
slow step
Reactant
ENZYME
step②
fast step
P1
P2
ENZYME
R-E Complex

$$R + E \overset{slow}{\rightleftharpoons} R\text{-}E\ complex \xrightarrow[step]{fast} P_1 + P_2 + \circled{E}$$

Enzymes

(i) urease	Decomposition of urea into NH_3 and CO_2
(ii) zymase	Conversion of glucose into ethyl alcohol
(iii) Maltase	Hydrolysis of maltose into glucose
(iv) invertase	Hydrolysis of cane sugar
(v) Pepsin	Hydrolysis of proteins into peptides

Hormones

1. Steroids Hormones - estrogens and androgens
2. poly peptides -insulin(to maintain glucose level) and endorphins
3. amino acid derivatives - epinephrine and norepinephrine.
4. Hormone glucagon tends to increase the glucose level in the blood.
5. Steroid hormones are produced by adrenal cortex and gonads (testes in males and ovaries in females).

6. Testosterone is the major sex hormone produced in males.
7. It is responsible for development of secondary male characteristics (deep voice, facial hair, general physical constitution).
8. Estradiol is the main female sex hormone.
9. It is responsible for development of secondary female characteristics and participates in the control of menstrual cycle.
10. Progesterone is responsible for preparing the uterus for implantation of fertilized egg.

QUESTION (NCERT Exemplar)

Which of the following acids is a vitamin?

(A) Aspartic acid

(B) Ascorbic acid ✓

(C) Adipic acid

(D) Saccharic acid

QUESTION (NCERT Exemplar)

Which of the following B group vitamins can be stored in our body?

- (A) Vitamin B_1
- (B) Vitamin B_2
- (C) Vitamin B_6
- (D) [✓ Vitamin B_{12}]

QUESTION (NCERT Exemplar)

Which of the following terms are correct about enzyme?

Ⓐ Proteins

Ⓑ Dinucleotides

Ⓒ Biocatalysts

[✓ Ⓓ Both (A) & (C)]

QUESTION (NCERT Exemplar)

Match the following enzymes given in Column I with the reactions they catalyse given in Column II.

Column I (Enzymes)	Column II (Reactions)
(i) Invertase ⓓ	(a) Decomposition of urea into NH_3 and CO_2
(ii) Maltase ⓒ	(b) Conversion of glucose into ethyl alcohol
(iii) Pepsin ⓔ	(c) Hydrolysis of maltose into glucose
(iv) Urease ⓐ	(d) Hydrolysis of cane sugar
(v) Zymase ⓑ	(e) Hydrolysis of proteins into peptides

QUESTION (NCERT Exemplar)

Fat soluble

KEDA B_{12}

Assertion: Vitamin D can be stored in our body.

Reason: Vitamin D is fat soluble vitamin.

- [✓ A] Assertion and reason both are correct statements and reason explains the assertion.
- B Both assertion and reason are wrong statements.
- C Assertion is correct statement and reason is wrong statement.
- D Assertion is wrong statement and reason is correct statement.

QUESTION (NCERT Exemplar)

Assertion: In presence of enzyme, substrate molecule can be attacked by the reagent effectively.

Reason: Active sites of enzymes hold the substrate molecule in a suitable position.

- [✓ A] Assertion and reason both are correct statements and reason explains the assertion.
- B Both assertion and reason are wrong statements.
- C Assertion is correct statement and reason is wrong statement.
- D Assertion is wrong statement and reason is correct statement.

QUESTION

Deficiency of vitamin A leads to a disease known as

Ⓐ Scurvy

Ⓑ [✓ Night blindness]

Ⓒ Beriberi

Ⓓ Rickets

QUESTION

Citrous fruits rich in vitamin

(A) A

[✓ (B) C]

(C) B

(D) K

QUESTION

Vitamin D is also known as

Ⓐ Growth vitamin

[✓ Ⓑ Sunshine vitamin]

Ⓒ Reproductive vitamin

Ⓓ Ascorbic acid

QUESTION

With which of the following disease is vitamin K associated?

A Rickets

[✓ **B** Coagulating property]

C Scurvy

D Sore throat

QUESTION

Which of the following statements is not correct?

A All enzymes found in cells are invariably proteins which catalyze biological reactions.

B Enzymes act efficiently at a moderate temperature and p^H

C Coenzymes increase the activities of enzymes.

[✓ **D** Enzymes are not specific in their action on substrates.]

QUESTION

Which of the following is a vitamin?

- A Glucose
- B Keratin
- C Maltose
- [✓ D] Riboflavin

Home Work

QUESTION 01

The sequence in which the α-amino acids are linked to one another in a protein molecule is called its

Ⓐ Primary structure

Ⓑ Secondary structure

Ⓒ Tertiary structure

Ⓓ quaternary structure

QUESTION 02

The helical structure of protein is stabilized by:

(A) dipeptide bonds

(B) hydrogen bonds

(C) ether bonds

(D) peptide bonds

QUESTION 03

The bond that determines the secondary structure of a proteins is:

A ionic bond

B covalent bond

C coordinate bond

D hydrogen bond

QUESTION 04

Disease scurvy is caused by the deficiency of vitamin

Ⓐ A

Ⓑ B_6

Ⓒ C

Ⓓ D

QUESTION 05

Pyrimidine bases present in RNA are:

- (A) Adenine and guanine
- (B) Thymine and uracil
- (C) Uracil and cytosine
- (D) Thymine and cytosine

QUESTION 06

RNA is a:

Ⓐ single helix strand

Ⓑ double helix strand

Ⓒ triple helix strand

Ⓓ none of these

QUESTION 07

Which of the following bases is present in DNA only?

- (A) Adenine
- (B) Guanine
- (C) Uracil
- (D) Thymine

QUESTION 08

Which of the following bases is present in RNA only?

Ⓐ Adenine

Ⓑ Guanine

Ⓒ Uracil

Ⓓ Thymine

QUESTION 09

Vitamin B_1 is known as

- (A) Ascorbic acid
- (B) Carotenoids
- (C) Thiamine
- (D) Pyridoxine

QUESTION 10

The best source of vitamin A is:

- **A** Oranges
- **B** Beans
- **C** Carrots
- **D** Wheat

ANSWER KEY

1. A
2. B
3. D
4. C
5. C
6. A
7. D
8. C
9. C
10. C

Home Work

Discussion of L-01

QUESTION 01

Glucose is a/an:

A oxidizing sugar

[✓ B reducing sugar]

C reducing and oxidizing sugar

D none of the above

QUESTION 02

Which of the following is a monosaccharide?

A Sucrose

B [✓ Galactose]

C Maltose

D Lactose

QUESTION 03

Which of the following is a non-reducing sugar?

- A Glucose
- B [✓ Sucrose]
- C Fructose
- D Lactose

QUESTION 04

Maltose is made up of

[✓ A α-D-Glucose]

B α and β glucose

C Glucose and Fructose

D Fructose only

QUESTION 05

Glycoside linkage is an

- A Amide linkage
- B [✓ Ether]
- C Ester linkage
- D None of these

QUESTION 06

Tauto

enediol

$\text{D-Glucose} \overset{HO^-}{\rightleftharpoons} A + B$; A and B are:

A D-mannose & D-mannitol

[✓ B] D-mannose & D-Fructose

C D-Allose & D-Altrose

D D-Glucose & D-Idose

QUESTION 07

D-glucose & D-fructose can be differentiated by:

A Fehling solution

B Tollens reagent

C Benedict test

[✓ D Br_2/H_2O]

QUESTION 08

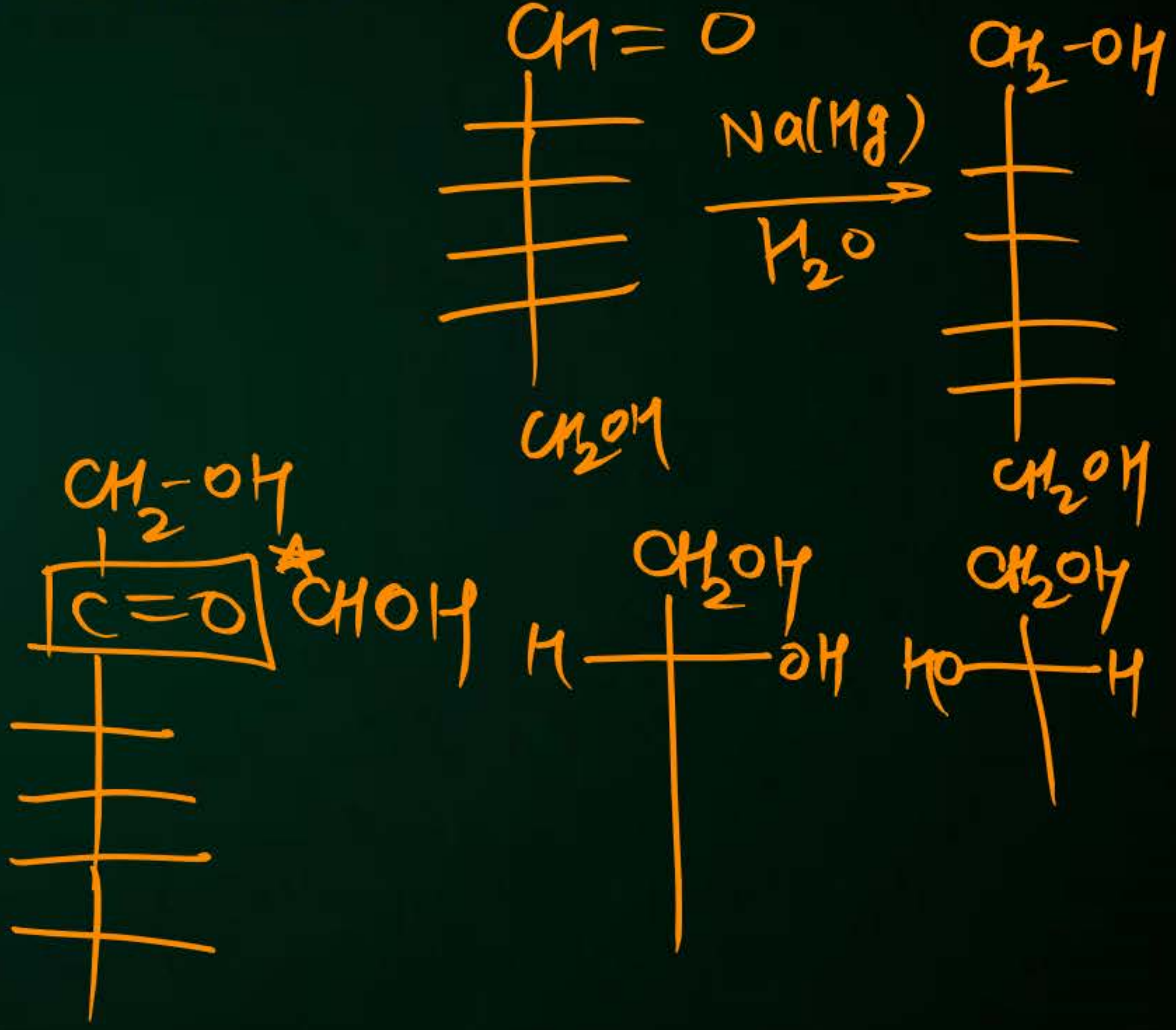
Glucose and fructose does not give same type of reactions:

(A) with phenyl hydrazine

[✓ (B)] on reduction with Na-Hg/H_2O

(C) with Fehling's solutions

(D) warming with dilute alkali


CH=O
Na(Hg)
H_2O
CH_2-OH
CH_2OH
CH_2OH
CH_2-OH
C=O
*CHOH
CH_2OH
H
OH
CH_2OH
HO
H

QUESTION 09

Which among the following will not produce D-glucose on hydrolysis?

A Amylose

B Cellulose

C Sucrose

[✓ D Galactose]

QUESTION 10

D−Glucose $\xrightarrow[\Delta]{HNO_3}$ (A); Product(A) is:

Ⓐ D-Gluconic acid

Ⓑ D-Glucitol

Ⓒ D-Fructose

Ⓓ [✓ D-Glucaric acid]

ANSWER KEY

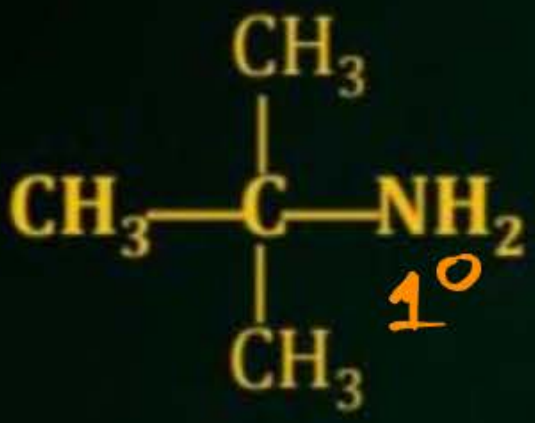
1. B
2. B
3. B
4. A
5. B
6. B
7. D
8. B
9. D
10. D

Home Work

Discussion of L-01

amines

QUESTION 01


$CH_3-\underset{CH_3}{\overset{CH_3}{C}}-NH_2$ is a:

1°

[✓ A primary amine]

B secondary amine

C tertiary amine

D quanternary salt

QUESTION 02

Which of the following would undergo Hofmann's reaction to give a primary amine?

[✓ A] $RCONH_2$ 1° amide

B $RCONHCH_3$

C $RCOCl$

D $RCOOR$

QUESTION 03

Gabriel phthalimide synthesis is used in the preparation of:

A) 1° amine Aliphatic

B) 2° amine

C) 3° amine

D) 4° amine

QUESTION 04

$R-CN \xrightarrow{\text{Partial Hydrolysis}} A$, Product A will be:

$RCONH_2$

A $RCOOH$

B RCH_2NH_2

[✓ C $RCONH_2$]

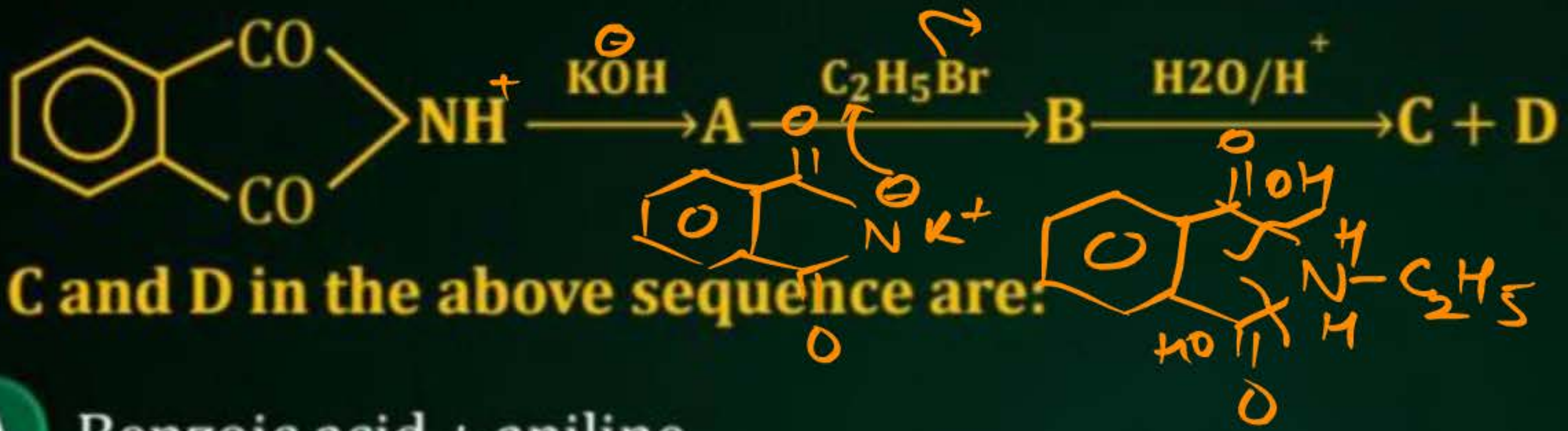
D $RCHO$

QUESTION 05

Which of the following reactions are suitable method for the preparation of primary amines?

- A Action of ammonia on alkyl halides ✗
- B Hoffmann bromide reaction
- C Gabriel's phthalimide synthesis of amines
- [✓ D Both (B) & (C)]

QUESTION 06

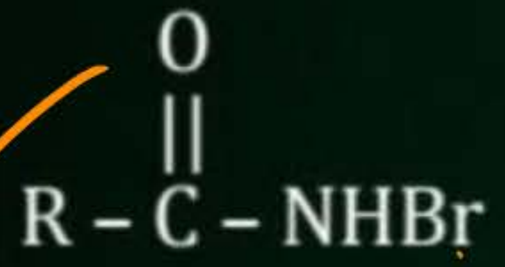

CO
CO
NH
+
KOH
A
C2H5Br
B
H2O/H+
C + D
N K+
OH
N
H
C2H5
H
HO
O

C and D in the above sequence are:

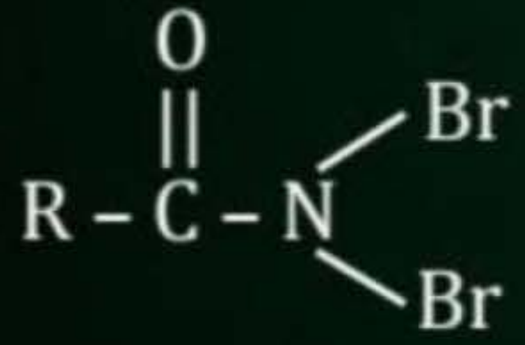
- (A) Benzoic acid + aniline
- [✓ (B) Phthalic acid + ethylamine]
- (C) Phthalic acid + aniline
- (D) Benzoic acid + ethylamine

QUESTION 07

Reaction of $RCONH_2$ with a mixture of Br_2 and KOH gives RNH_2 as the main product. The intermediate involved in the reaction is:

(A) ✓

$R-\overset{\overset{O}{\|}}{C}-NHBr$

(B) $R-NHBr$ ✗

(C)

$R-\overset{\overset{O}{\|}}{C}-N(Br)_2$ ✗

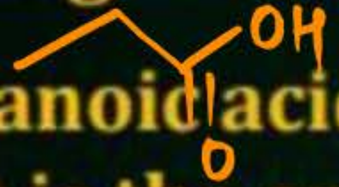
(D) $R-C\equiv N=O$ ✗

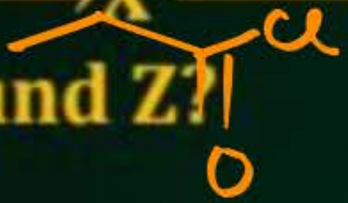
$\boxed{R-N=C=O}$ ✓

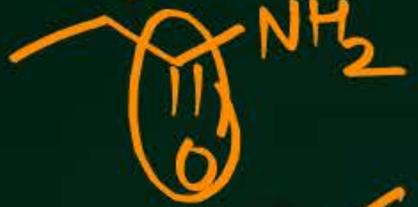
QUESTION 08

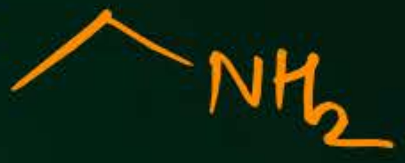
Starting from propanoic acid, the following reactions were carried out

Propanoic acid $\xrightarrow{SOCl_2}$ **X** $\xrightarrow{NH_3.\Delta}$ **Y** $\xrightarrow{Br_2+KOH}$ **Z**





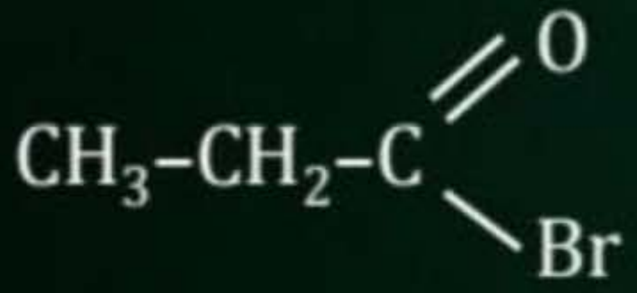




What is the compound Z?

(A) CH_3-CH_2-Br

(B) $CH_3-CH_2-NH_2$

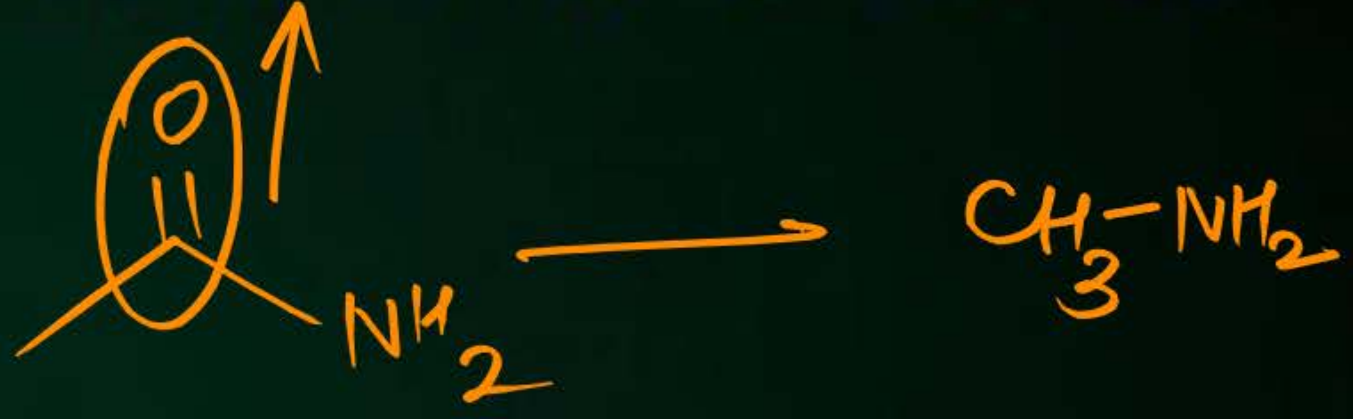
(C) 

$CH_3-CH_2-C(=O)Br$

(D) $CH_3-CH_2-CH_2-NH_2$

QUESTION 09

When acetamide is converted to methylamine, what is the name of the reaction?



- A Friedel-Craft's reaction
- B Hoffmann reaction
- [✓ C] Hoffmann bromamide degradation reaction
- D Hinsberg reaction

QUESTION 10

Which is not in the favour of Gabriel phthalimide reaction?

A It is the method for the preparation of pure primary amine.

B Aromatic amines can not be prepared by this method.

[✓ C] All aromatic amines (except aniline) can be prepared by this method.

D 2° & 3° amines cannot be prepared by this method.

ANSWER KEY

1.A
2.A
3.A
4.C
5.D
6.B
7.A
8.B
9.C
10.C

Home Work

discussion of L-03

QUESTION 01

Assertion: Amines are basic in nature.

Reason: Amines have lone pair of electrons on nitrogen atom.

[✓ A] If both Assertion and Reason are correct and the Reason is a correct explanation of the Assertion.

B If both Assertion and reason are correct but Reason is not a correct explanation of the Assertion.

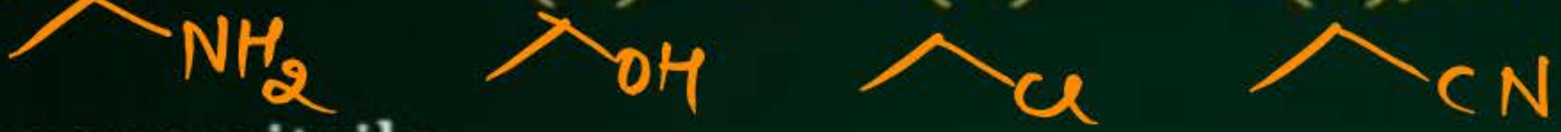
C If the Assertion is correct but Reason is incorrect.

D If both the Assertion and Reason are incorrect.

QUESTION 02

The end product of the reaction,

Ethylamine $\xrightarrow{HNO_2}$ (A) $\xrightarrow{PCl_5}$ (B) $\xrightarrow{KCN}$ (C), is:



[✓ A] propane nitrile

B triethylamine

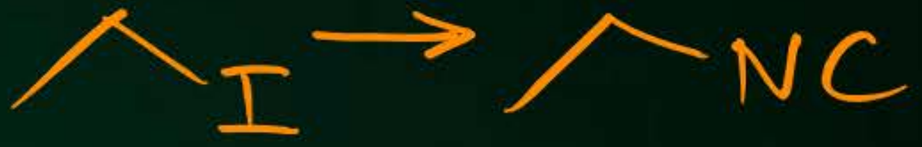
C diethylamine

D propylamine

QUESTION 03

isocyanide

Which of the following reagents can be used to prepare ethyl carbylamine from ethyl iodide?

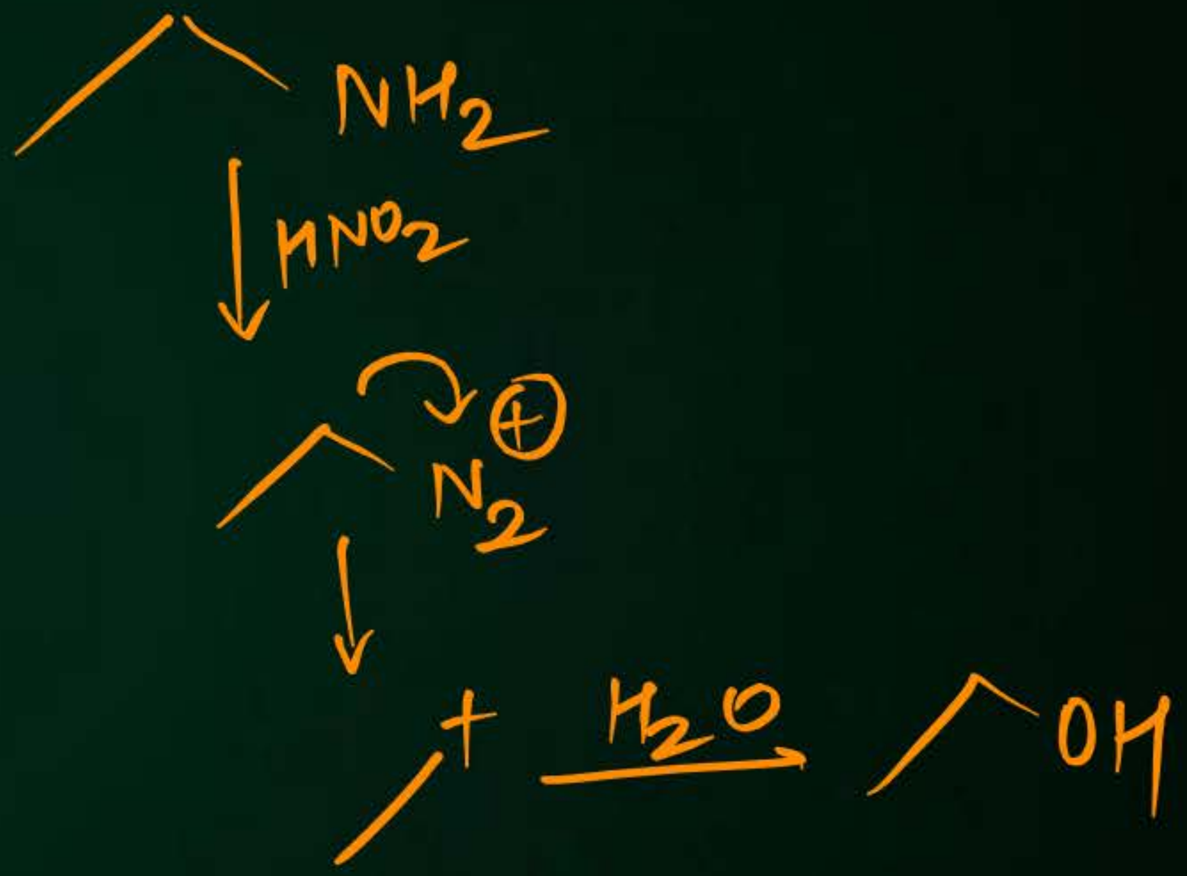


- A KCN
- [✓ B AgCN]
- C CuCN
- D HCN

QUESTION 04

Ethylamine reacts with nitrous acid to form:

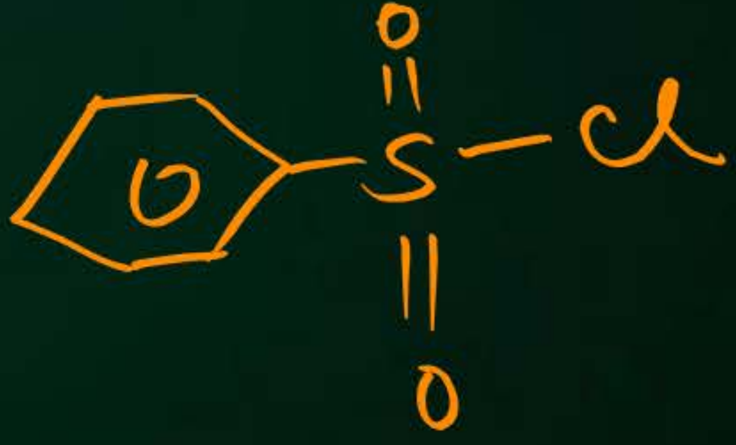
- **A** methyl alcohol
- [✓ **B** ethyl alcohol]
- **C** ethane
- **D** ethyl nitrite


NH₂
HNO₂
+
N₂
+
H₂O
OH

QUESTION 05

Hinsberg's reagent is:

- A benzene sulphonamide
- B benzene sulphonic acid
- C benzene sulphuryl chloride
- [✓ D benzene sulphonyl chloride]



QUESTION 06

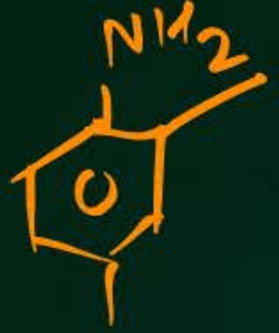
The positive carbylamine test is not given by

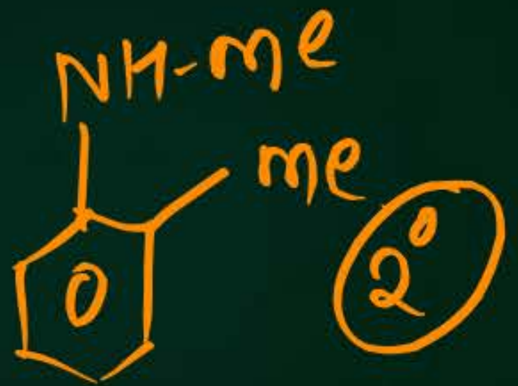
Ⓐ aniline

Ⓑ 2, 4-dimethyl aniline

[✓ Ⓒ] N–methyl-O-methylaniline

Ⓓ p-methyl benzylamine





QUESTION 07

Which of the following is incorrect for primary amines?

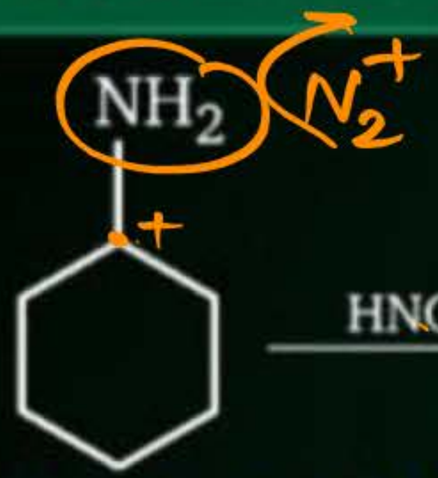
A On reaction with nitrous acid alkylamines produce alcohol.

[✓ B] On reaction with nitrous acid arylamines produce phenol.

C Alkylamines are more basic than ammonia.

D Alkylamines are more basic than arylamines.

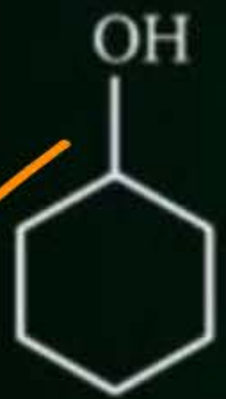
QUESTION 08



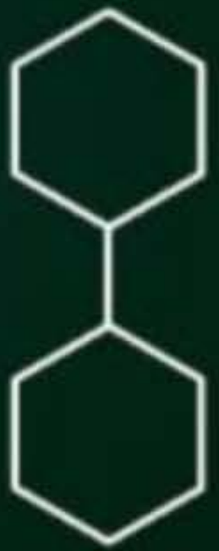
$\xrightarrow{HNO_2}$ *A* (Major) :

Product (A) is:

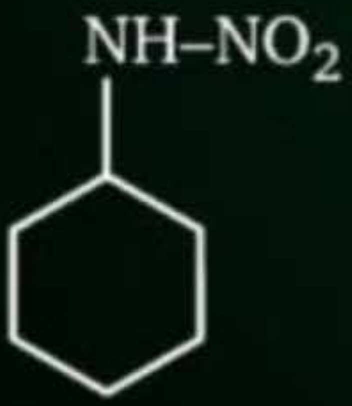
Ⓐ ✓



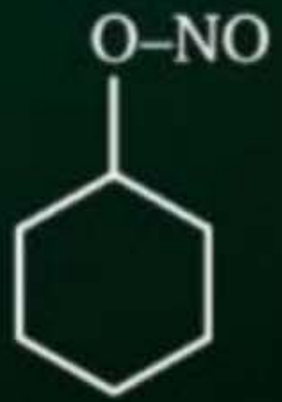
Ⓑ



Ⓒ

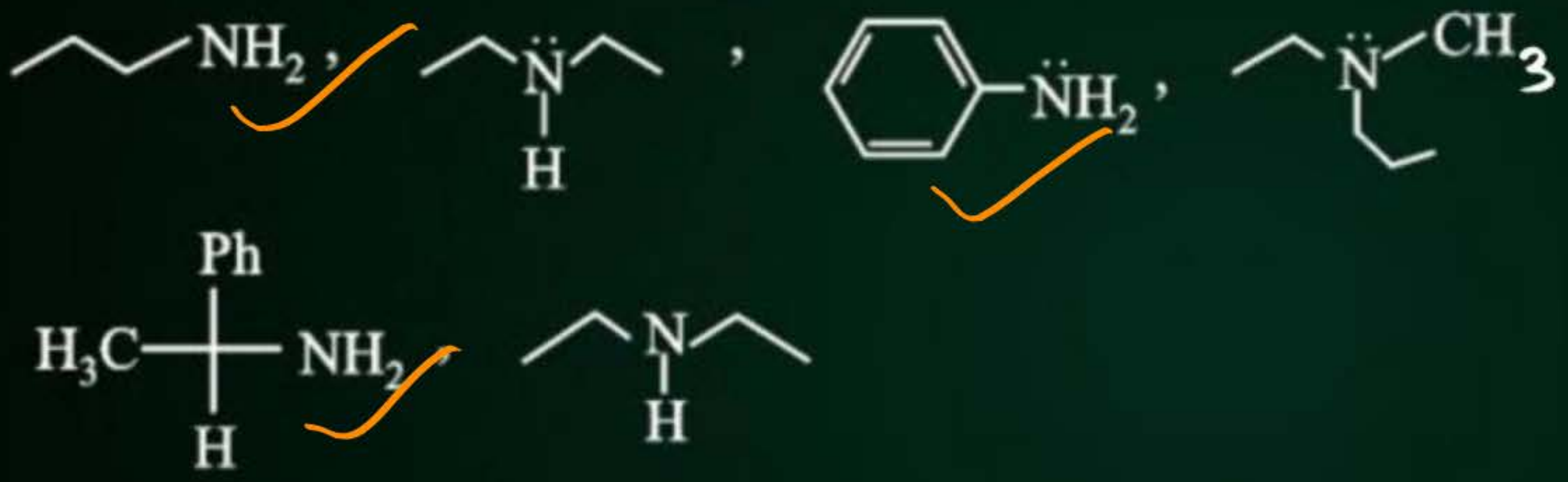


Ⓓ



QUESTION 09

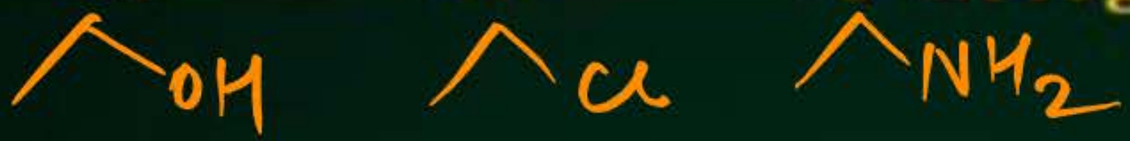
Out of the following amines how many amines can give carbylamine reaction?


NH$_2$
N
H
NH$_2$
N
CH$_3$
Ph
H$_3$C
NH$_2$
H
N
H

Ans: 3

QUESTION 10

$C_2H_5NH_2 \xrightarrow{HNO_2} A \xrightarrow{PCl_3} B \xrightarrow{NH_3} C$ Recognize the compound C from the following:



A propanenitrile

B methylamine

C [✓ ethylamine]

D acetamide

ANSWER KEY

1. A
2. A
3. B
4. B
5. D
6. C
7. B
8. A
9. 3
10. C

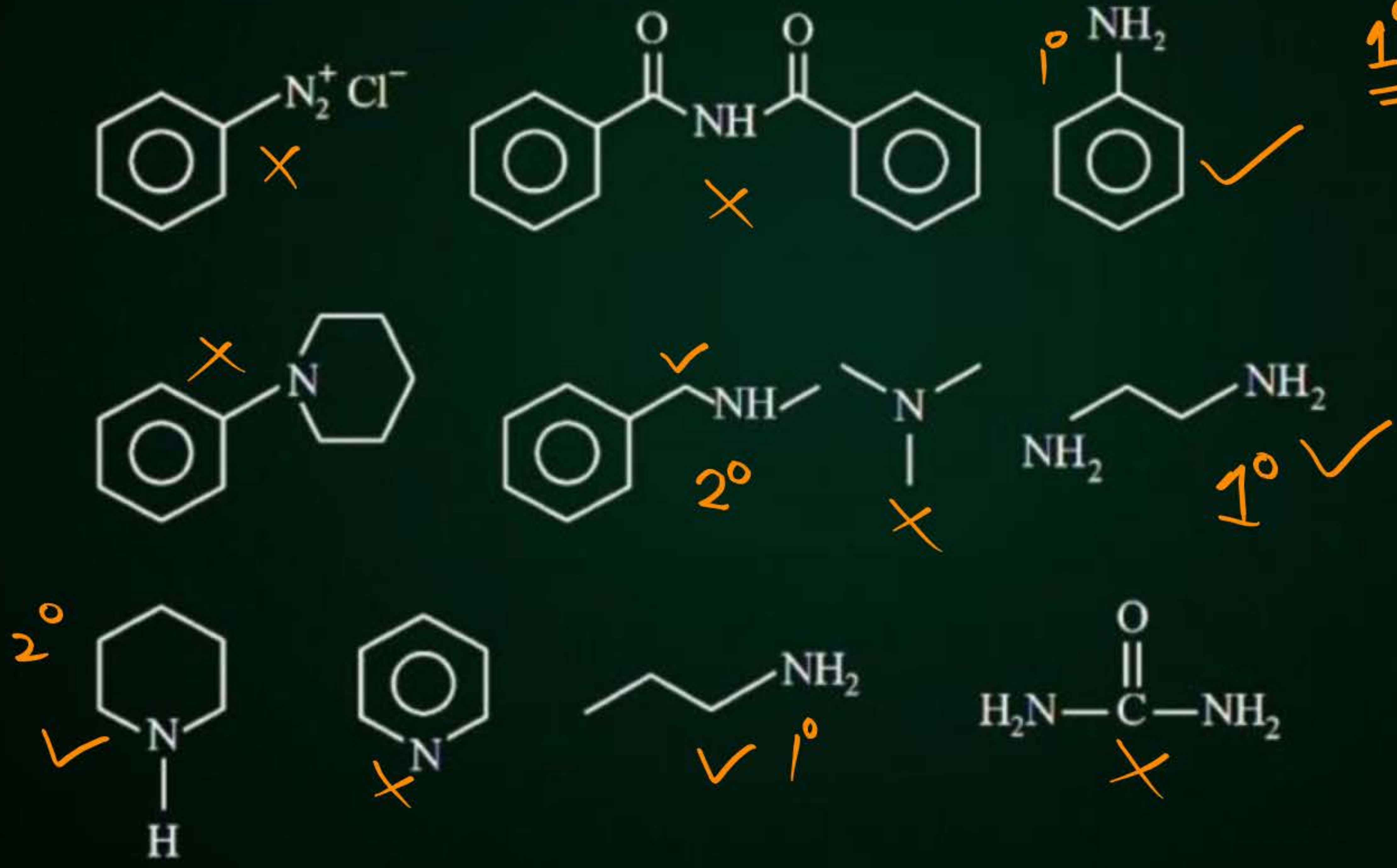
JEE Mains PYQs

Home work Discussion

QUESTION (JEE Mains 1st Feb 2024, Evening Shift)

Number of compound which give reaction with Hinsberg's reagent is 5 .

1° & 2°



$N_2^+Cl^-$
×
O
O
NH
×
1°
NH_2
✓
×
N
✓
NH
2°
N
×
NH_2
NH_2
1° ✓
2°
✓
N
H
N
×
NH_2
✓ 1°
O
$H_2N—C—NH_2$
×

QUESTION (JEE Mains 1st Feb 2024, Morning Shift)

Given below are two statements:

Statements (I): Aminobenzene and aniline are same organic compounds. ✓

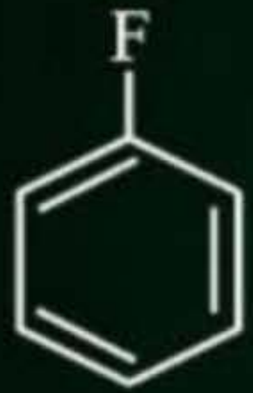
Statement (II): Aminobenzene and aniline are different organic compounds. ✗

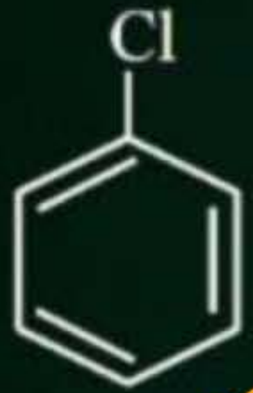
In the light of the above statements, choose the most appropriate answer from the options given below:

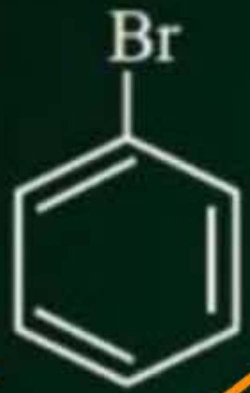
- A Both Statement I and Statement II are correct.
- [✓ B] Statement I is correct but Statement II is incorrect.
- C Statement I is incorrect but Statement II is correct.
- D Both Statement I and Statement II are incorrect.

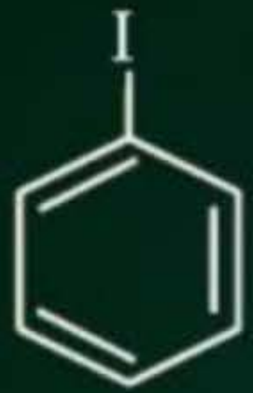
QUESTION (JEE Mains 5th April 2024, Morning Shift)

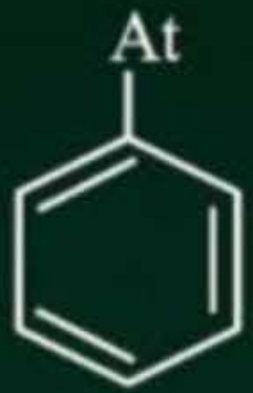
The number of halobenzenes from the following that can be prepared by Sandmeyer's reaction is 2


I


[✓ II]

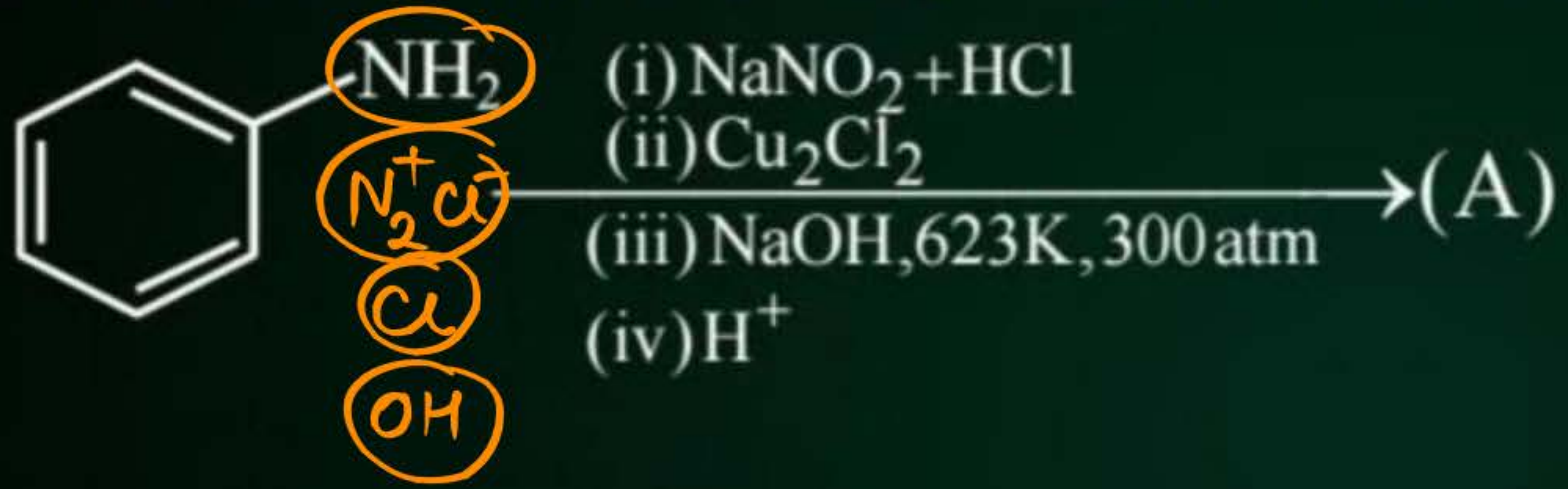

[✓ III]


IV

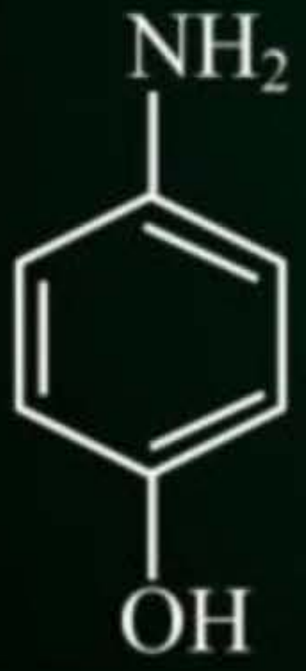

V

QUESTION (JEE Mains 6th April 2024, Evening Shift)

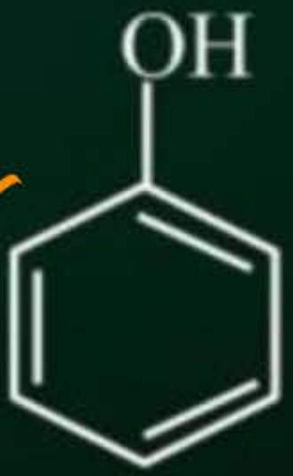
Identify the product (A) in the following reaction.


NH2
N2+Cl-
Cl
OH
(i) NaNO2+HCl
(ii) Cu2Cl2
(iii) NaOH, 623K, 300 atm
(iv) H+
(A)

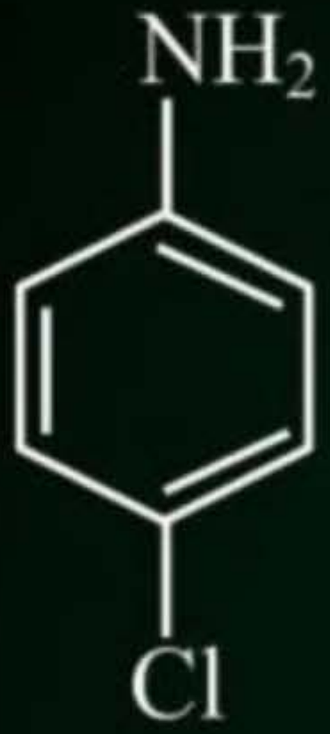
A



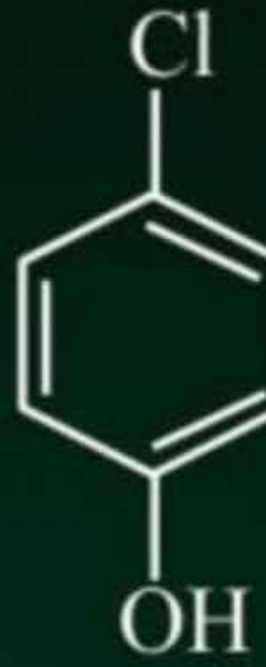
B



C



D



QUESTION (JEE Mains 9th April 2024, Evening Shift)

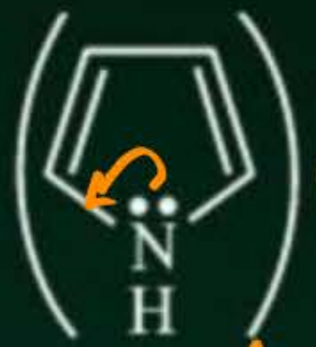
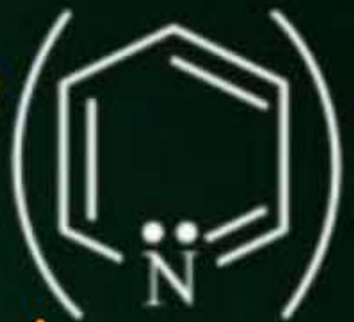
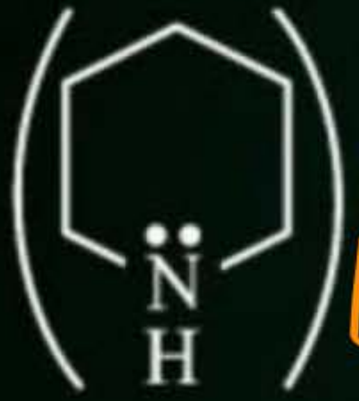
Number of compounds from the following which cannot undergo Friedel-Crafts reactions is: 4

toluene, [✓ nitrobenzene], xylene, cumene, [✓ aniline], chlorobenzene, [✓ m-nitroaniline], [✓ m-dinitrobenzene]

Aniline

Nitrobenzene

QUESTION (JEE Mains 9th April 2024, Morning Shift)

Correct order of basic strength of Pyrrole  , Pyridine  and Piperidine  is:

deloca

Loca
sp^2

Loca
Sp^3

A Piperidine > Pyridine > Pyrrole ✓

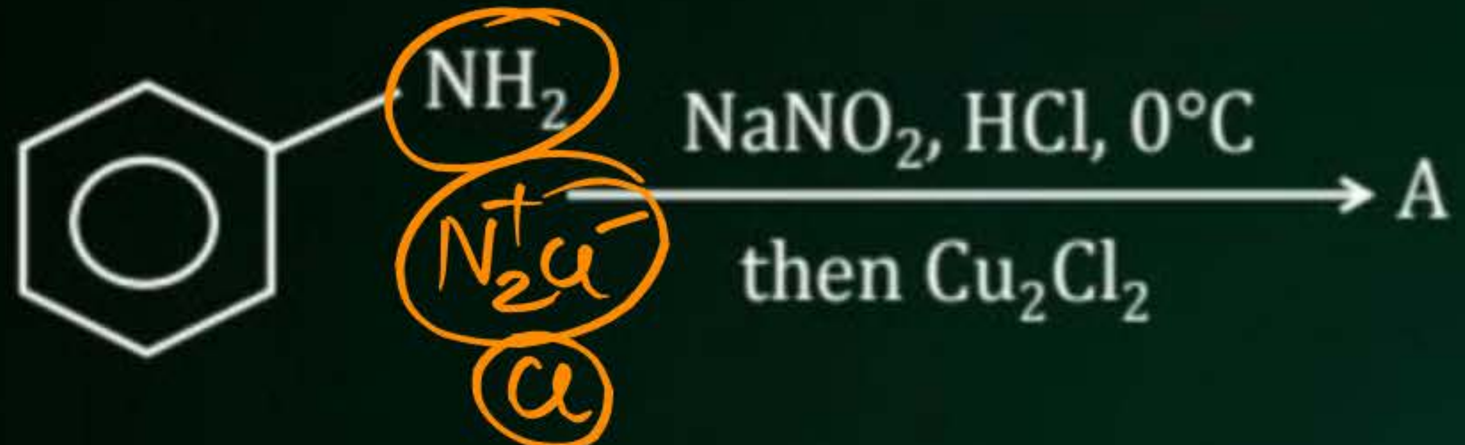
B Pyrrole > Pyridine > Piperidine

C Pyridine > Piperidine > Pyrrole

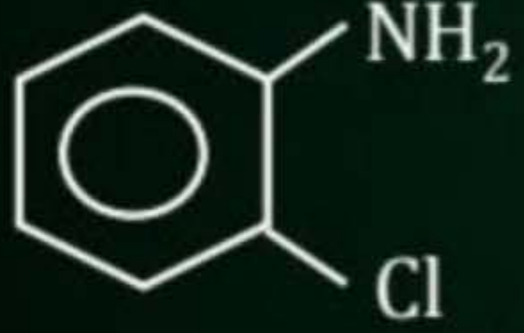
D Pyrrole > Piperidine > Pyridine

QUESTION (JEE Mains 29 January 2024, Evening Shift)

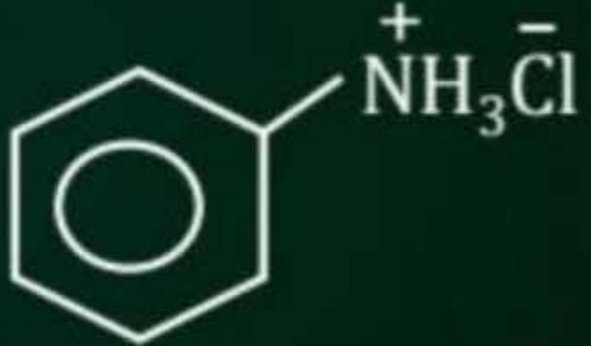
The product A formed in the following reaction is:


NH$_2$
N$_2^+$Cl$^-$
Cl
NaNO$_2$, HCl, 0°C
then Cu$_2$Cl$_2$
A

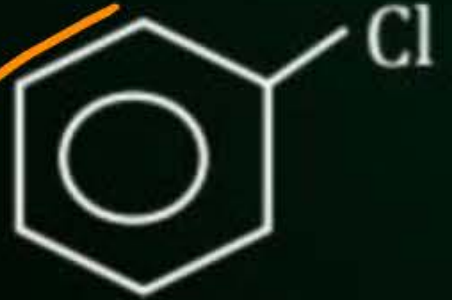
A



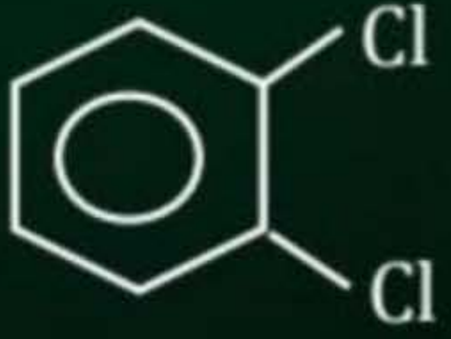
B


$\overset{+}{N}H_3\overset{-}{Cl}$

C



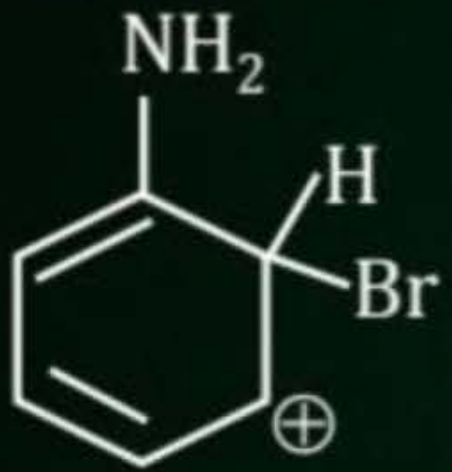
D



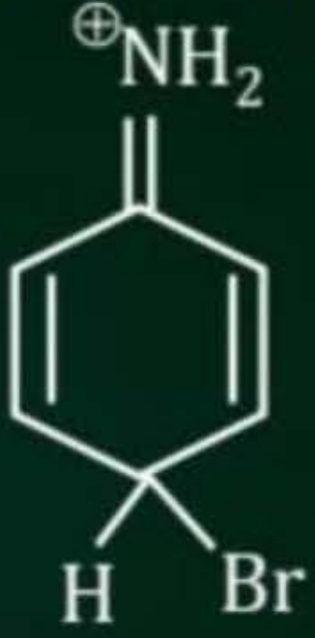
QUESTION (JEE Mains 29 January 2024, Morning Shift)

The arenium ion which is not involved in the bromination of Aniline is:

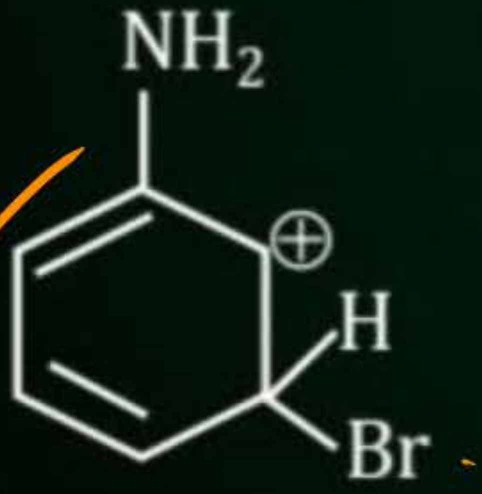
A



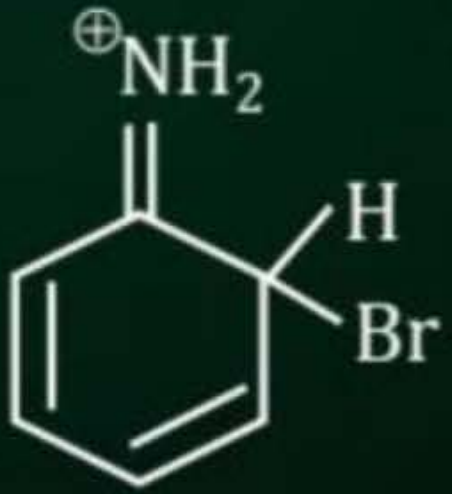
B



C

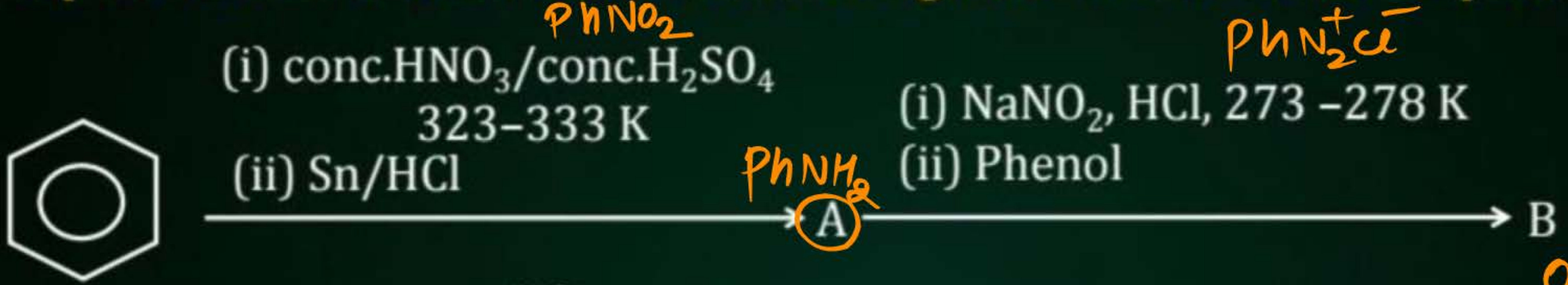


D



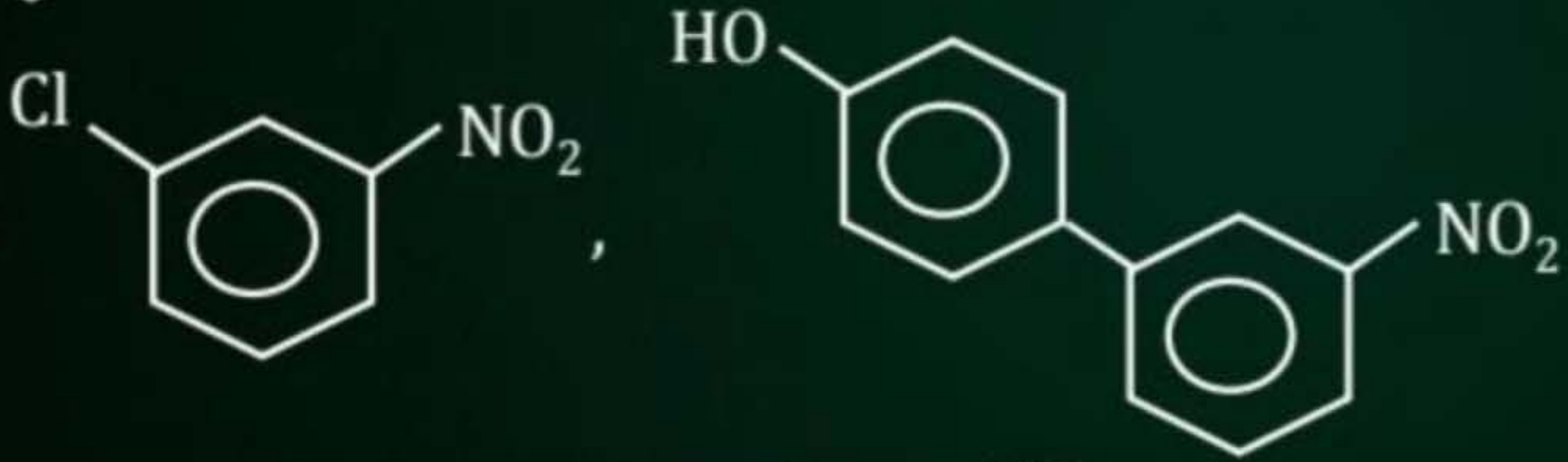
QUESTION (JEE Mains 30th January 2024, Evening Shift)

The products A and B formed in the following reaction scheme are respectively

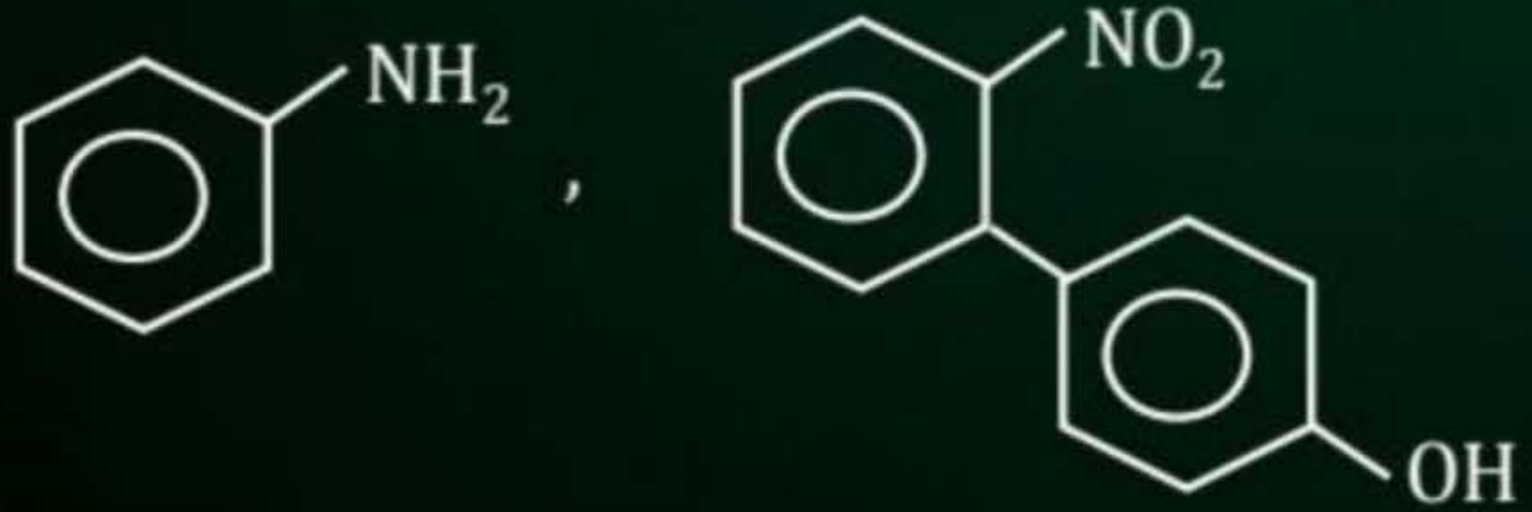

PhNO$_2$
(i) conc.HNO$_3$/conc.H$_2$SO$_4$
323–333 K
(ii) Sn/HCl
PhNH$_2$
A
PhN$_2^+$Cl$^-$
(i) NaNO$_2$, HCl, 273 –278 K
(ii) Phenol
B

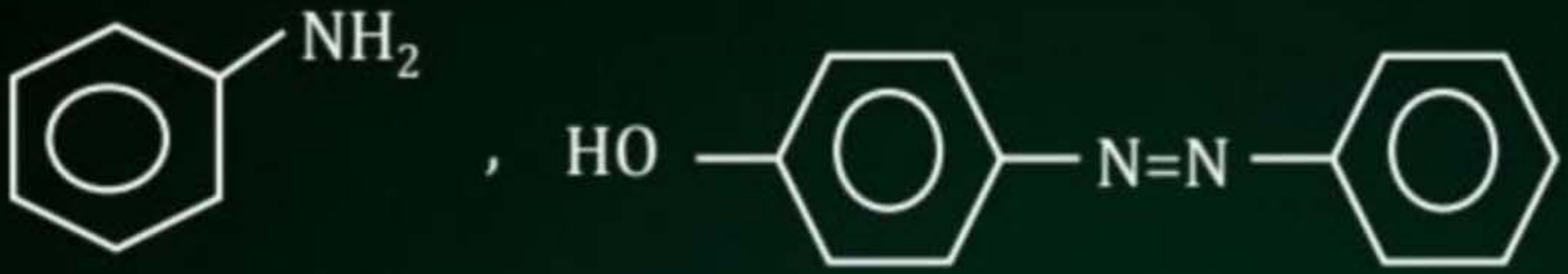
orange dye

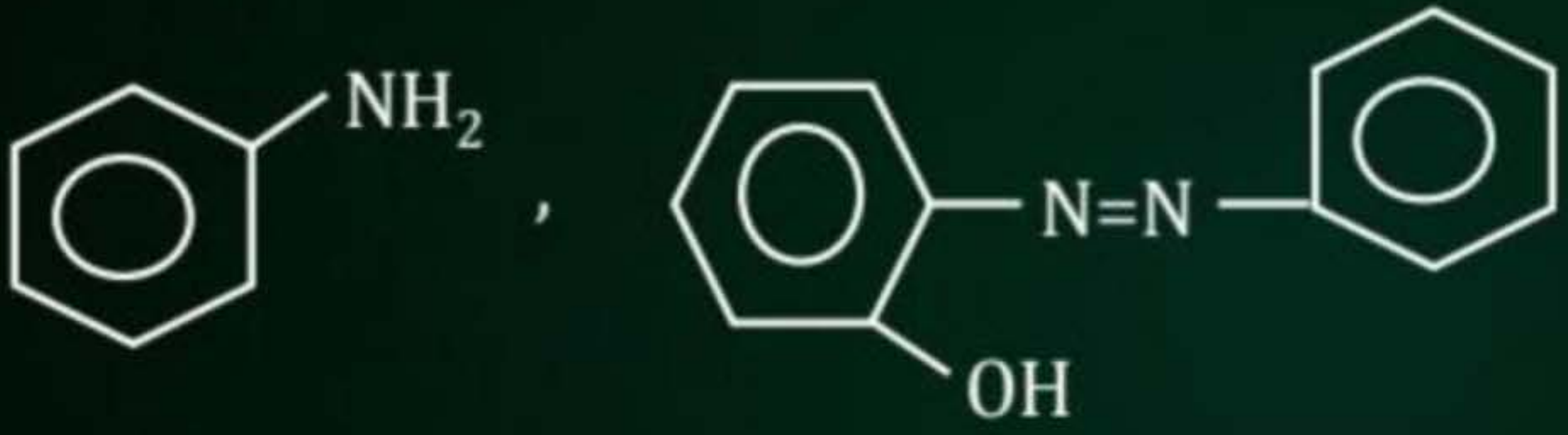
A


Cl
NO$_2$
HO
NO$_2$

B



Ⓒ 
NH2
,
HO
N=N
✓

Ⓓ 
NH2
,
N=N
OH

Thank you!!

Biomolecule PYQs

(Test of Biomolecules)

Physical prop

QL & QN & puri

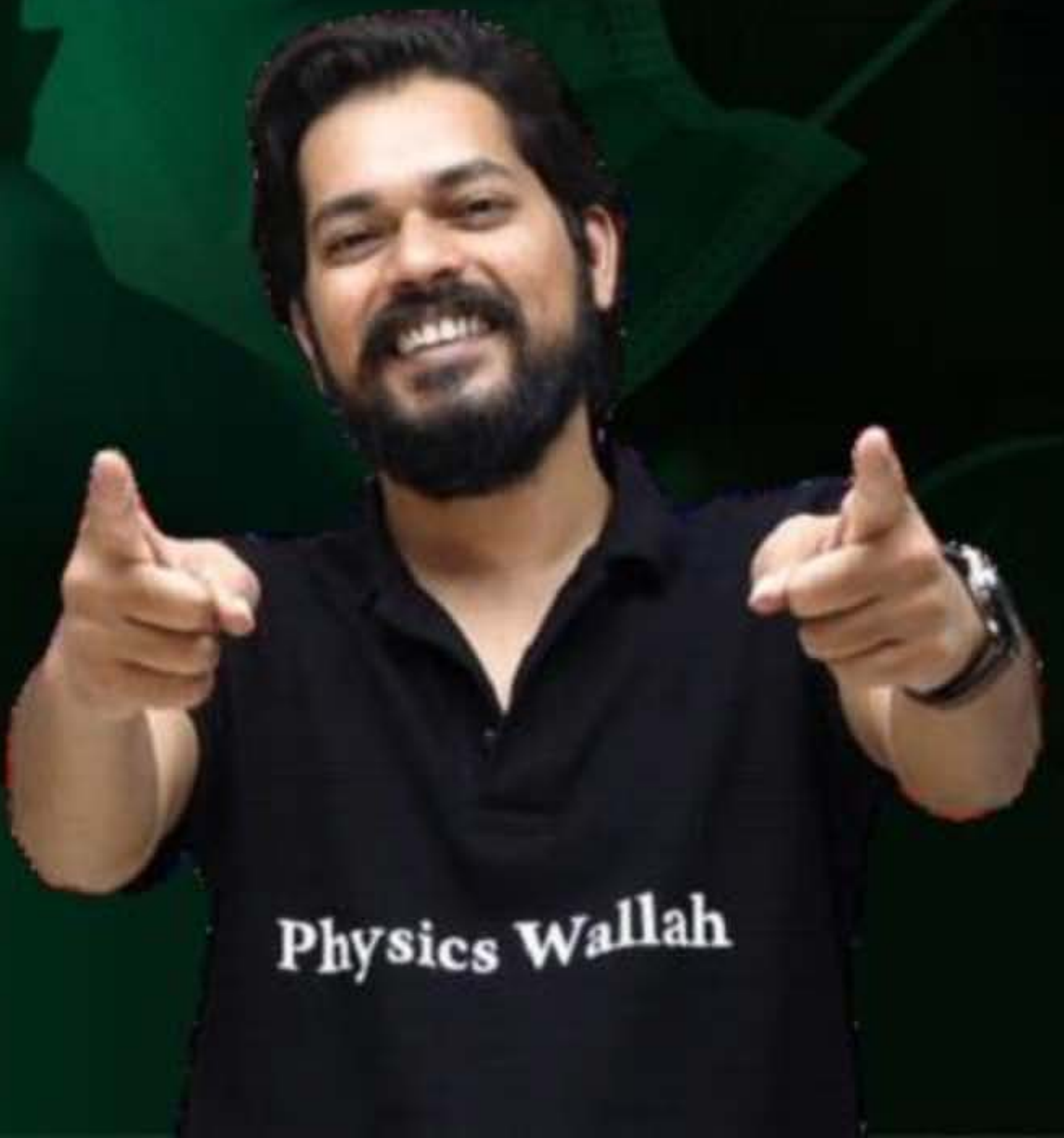
YAKEEN 2.0

FOR NEET 2025

Lecture- 04 Organic Chemistry

Biomolecules

By- Pankaj Sir(POPU MAMA)


Physics Wallah

Topics *to be covered*

1. Tests of Biomolecules ✓
2. Physical Properties of Organic Compounds ✓
3. NEET/AIPMT & JEE Mains PYQs ✓

④ Polyhalogens

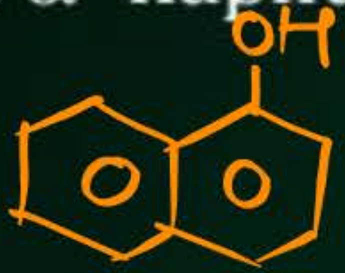
Tests of Biomolecules

Test of Carbohydrates

Test

1. Molisch Test (For Carbohydrates)

5% solution of α -naphthol +EtOH



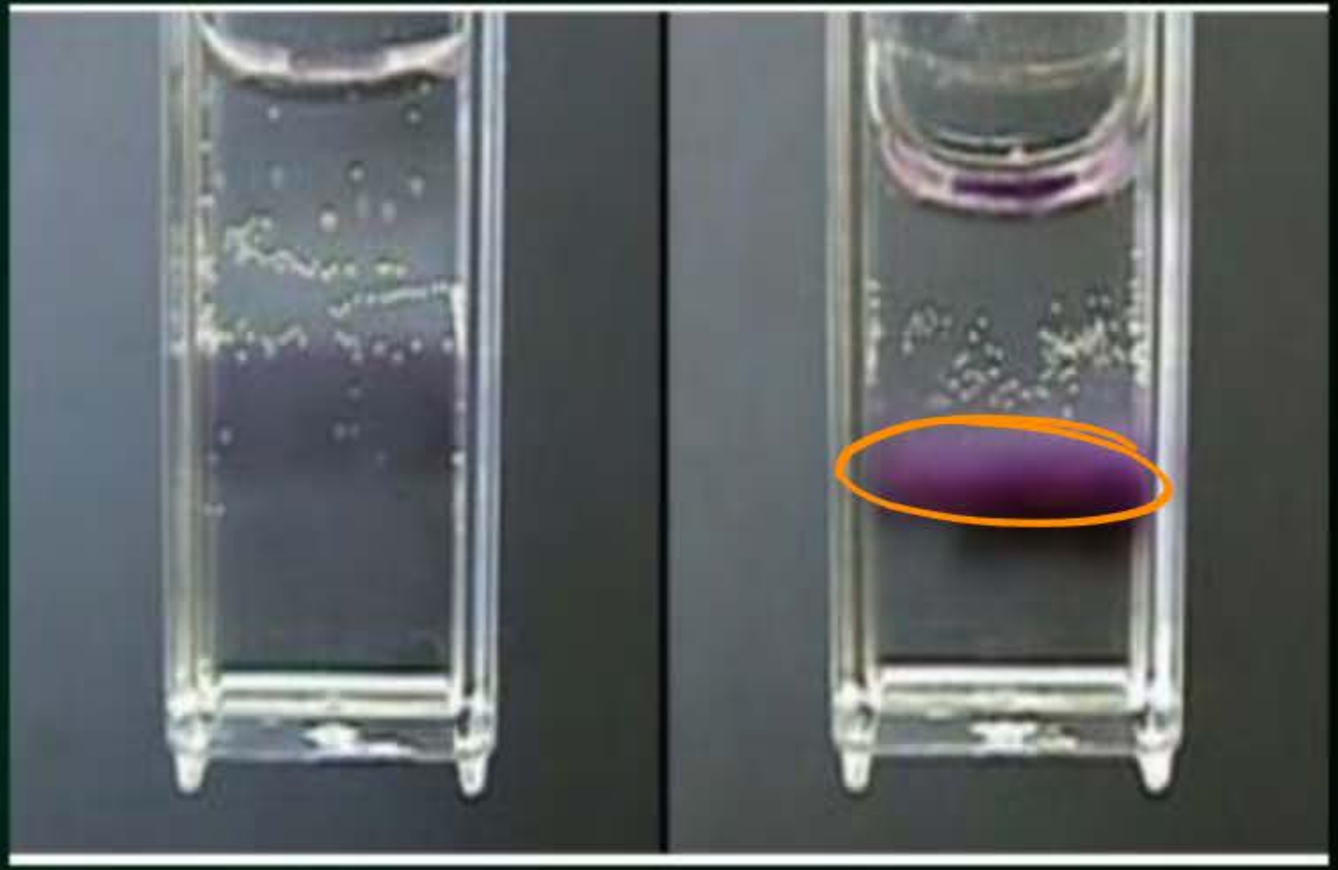
$\Big\downarrow$ Carbohydrate

✓

Purple ring at the junction of two liq.

MONO→ FAST ✓

DI or POLY→ SLOW ✓



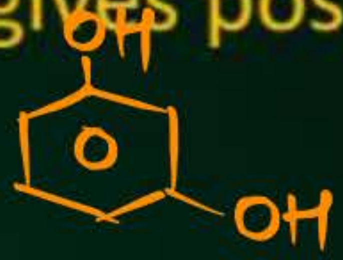
Test

fructose

2. Seliwanoff's Test (for ketose)

- This test is to be performed when sample gives positive test for Benedict's or Fehling's test.

→ Resorcinol



- Take Seliwanoff's reagent and add sample.
- Boil for two minutes. Appearance of red to orange colour indicates the presence of fructose.
- If no colour appears in 2 minutes, continue boiling for 5 minutes.
- If faint orange or no colour appears, then it indicates the presence of glucose.

Test

3. Barfoed Test (for mono and Disaccharides)

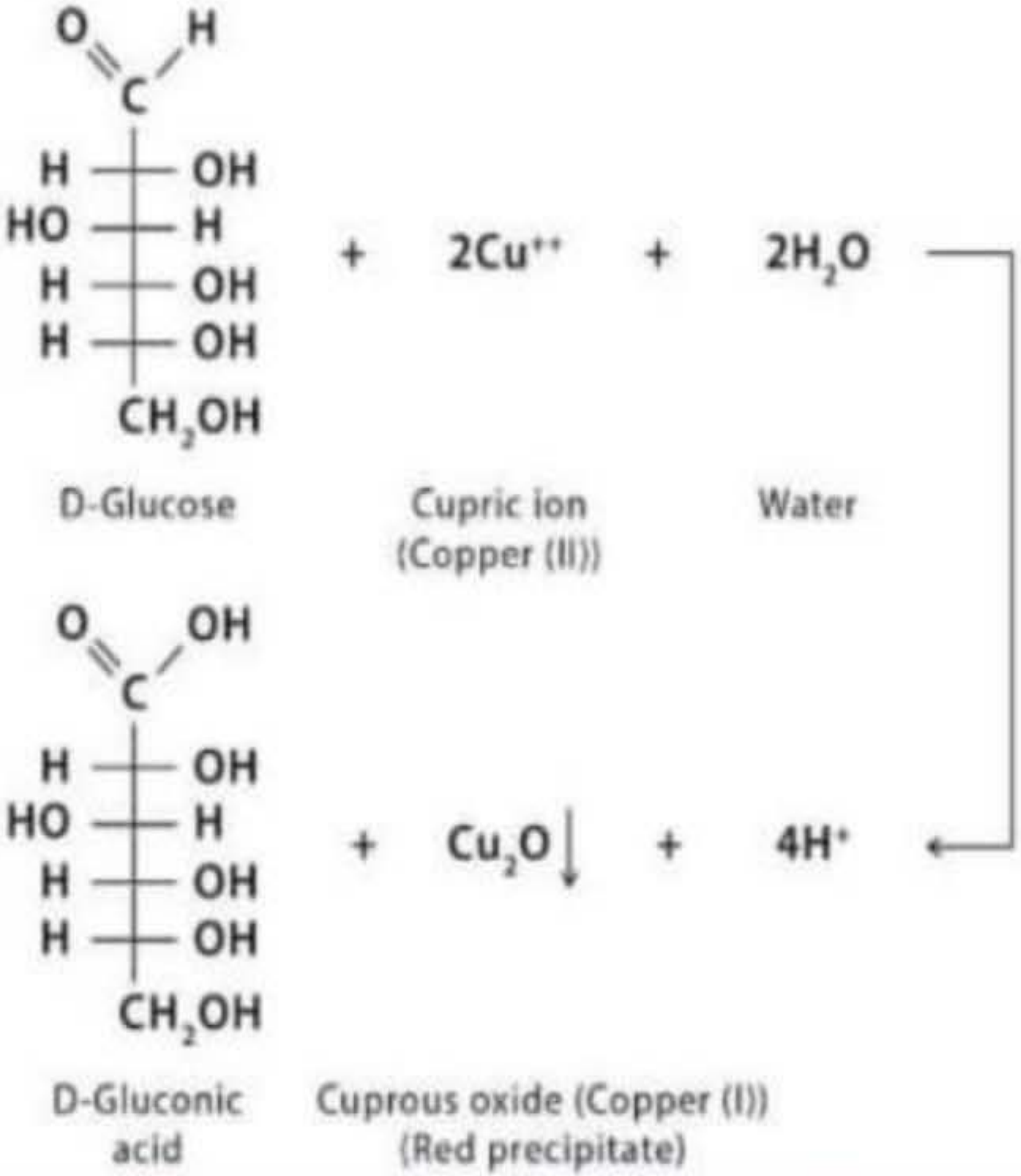
$\overset{2+}{\mathrm{Cu}}\mathrm{SO_4} + \mathrm{CH_3COOH}$

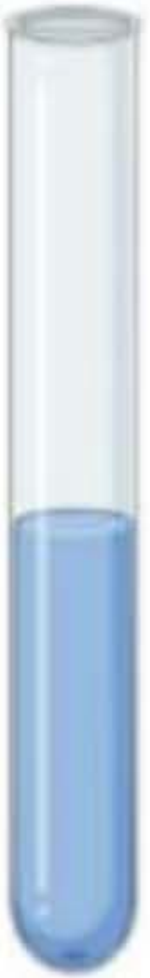
$$\Big\downarrow \; \underbrace{\text{Mono Sac}}$$

Red ppt

$$\left[\mathrm{Cu^{2+}} \rightarrow \underset{\text{Red}}{\overset{+1}{\mathrm{Cu_2O}}}\downarrow \right]$$

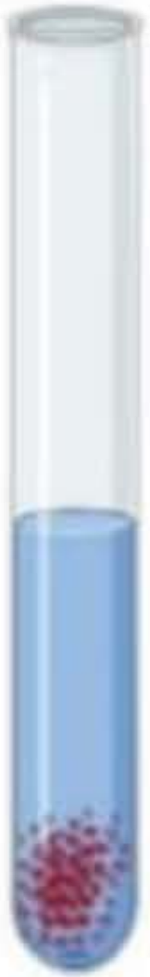
Barfoed's Test Reaction


O
H
C
H
OH
HO
H
H
OH
H
OH
CH2OH
D-Glucose
+ 2Cu⁺⁺ + 2H2O
Cupric ion (Copper (II))
Water
O
OH
C
H
OH
HO
H
H
OH
H
OH
CH2OH
D-Gluconic acid
+ Cu2O↓ + 4H⁺
Cuprous oxide (Copper (I)) (Red precipitate)



Blue Solution

Carbohydrates absent

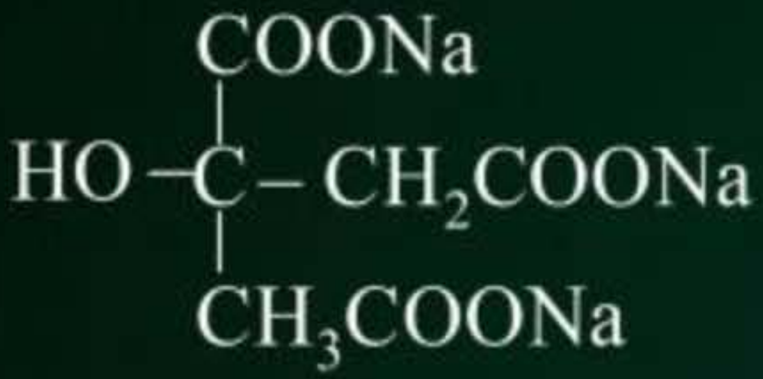


Red Precipitation

Within few minutes - monosaccharides
After 3 minutes- disaccharides

4. Benedict's test (for Reducing sugar)

$$\text{Aq }\overset{+2}{\text{CuSO}_4} + \text{sodium citrate} \xrightarrow{\text{Glucose}} \underset{\text{acid}}{\text{Gluconic}} + \underline{\underline{\overset{+1}{\text{Cu}_2\text{O}}}}$$



$$\begin{array}{l} \quad\;\;\text{COONa} \\ \quad\;\;| \\ \text{HO}-\text{C}-\text{CH}_2\text{COONa} \\ \quad\;\;| \\ \quad\;\;\text{CH}_3\text{COONa} \end{array}$$

Test

5. Tollen's Test (for reducing sugar)

T. R → $\underbrace{AgNO_3 + NH_4OH}_{}$

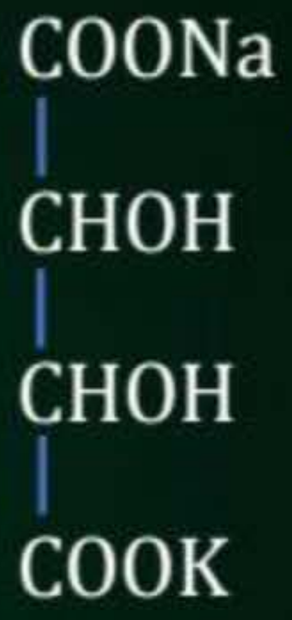
$-\underline{CHO} \rightarrow \underline{-COO}^-$

$Ag^+ \rightarrow Ag\downarrow$

$\underline{\text{ppt}}$

6. Fehling Test (for $\underline{\text{reducing}}$ sugar)

Aq $\overset{+2}{Cu}SO_4 + NaKT$



$$\begin{array}{c} COONa \\ | \\ CHOH \\ | \\ CHOH \\ | \\ COOK \end{array}$$

Rochellê's salt

$-CHO \rightarrow COO^-$

$Cu2+ \rightarrow \overset{+1}{Cu_2}O\downarrow$

$\underline{\text{Red ppt}}$

Sodium potassium tartarate

7. Iodine Test (for starch) $I_2 + I^- \longrightarrow I_3^{\ominus}$

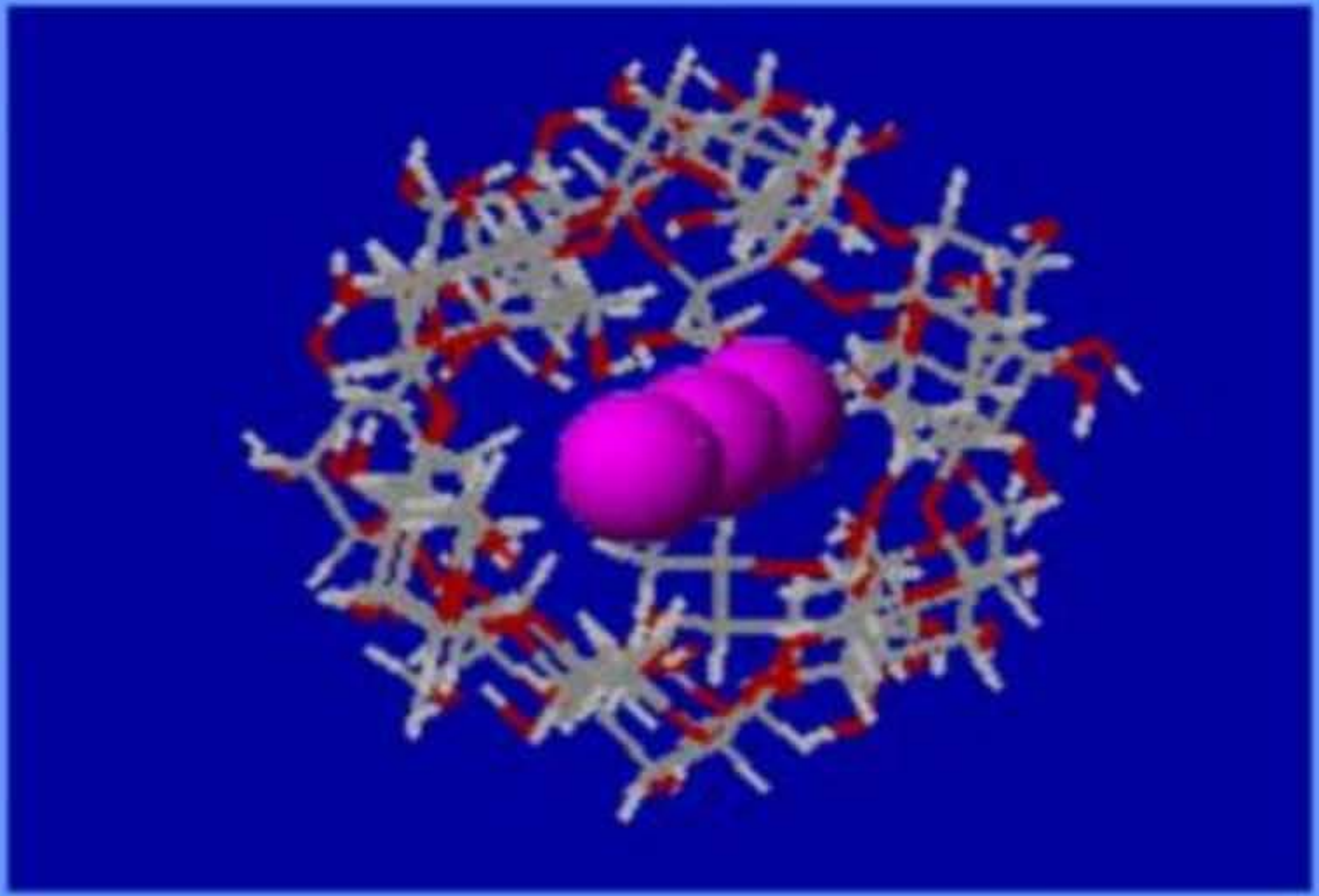
starch-iodine comple

Starch $\xrightarrow{I_2}$ Blue – Black Colouration

due to adsorption of iodine.

Starch - Iodine Complex

$$I_2 + I^- \longrightarrow I_3^-$$



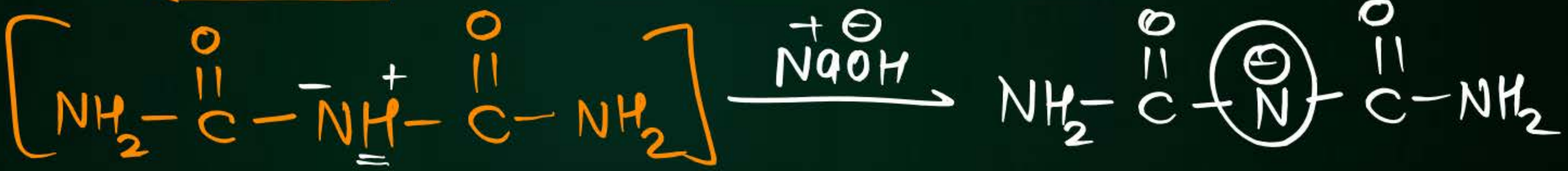
Iodine slides into starch coil
to give a blue-black color

Test of Amino acids

Tests of Proteins

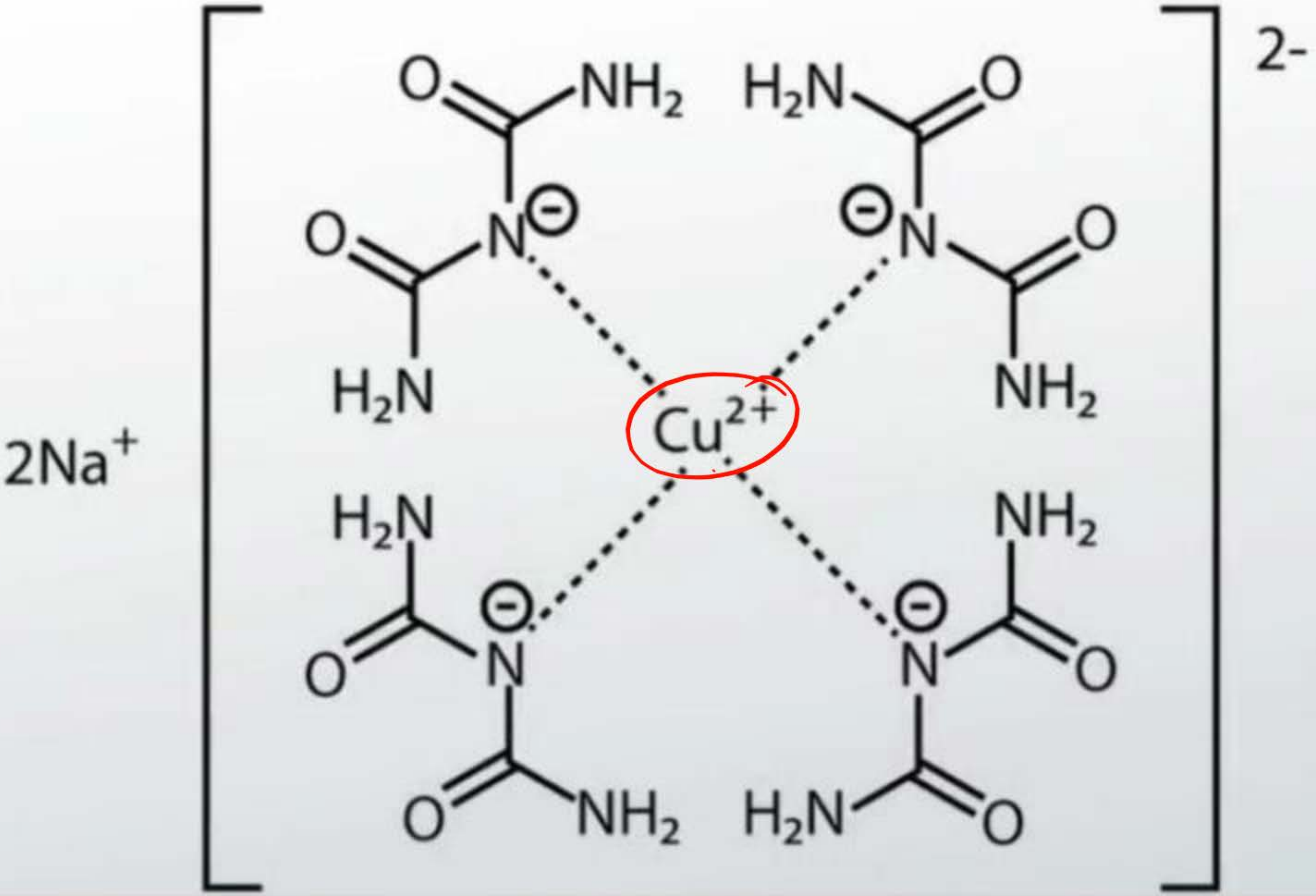
(a) Biuret test

- Take protein solution in a test tube.
- Add NaOH solution and 1 or 2 drops of $CuSO4$ solution.
- A violet colour indicates the presence of proteins.
- Biuret test is for peptide bond in the molecule of a protein



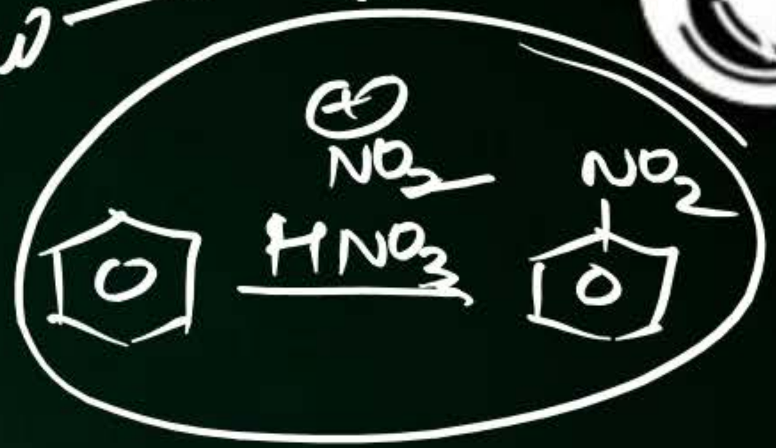
$$\left[NH_2-\overset{\overset{O}{\|}}{C}-\overset{-}{N}\overset{+}{H}-\overset{\overset{O}{\|}}{C}-NH_2\right]\xrightarrow{\overset{+\ \ominus}{NaOH}}NH_2-\overset{\overset{O}{\|}}{C}-\overset{\ominus}{N}-\overset{\overset{O}{\|}}{C}-NH_2$$

Care must be taken that excess of copper sulphate is not added otherwise there will be blue colour instead of violet colour.


2Na$^+$
O
NH$_2$
H$_2$N
O
O
N$^\ominus$
$^\ominus$N
O
H$_2$N
NH$_2$
Cu^{2+}
H$_2$N
NH$_2$
O
N
N
O
O
NH$_2$
H$_2$N
O
2-

Tests of Proteins

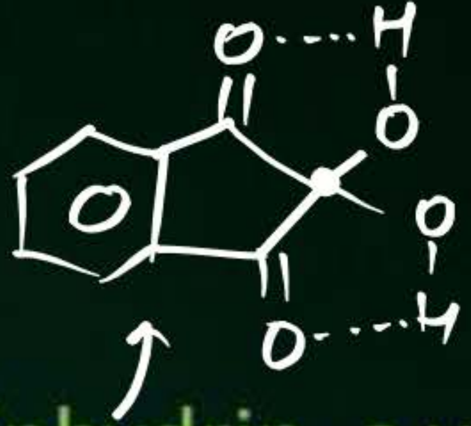
(white → yellow → orange)



(b) Xanthoproteic test : (Aro amino acid)

- Add concentrated HNO3 to protein solution
- A white precipitate is formed.
- Boil the solution and the colour changes to yellow.
- Cool the test tube and add NaOH (or ammonia solution) to make it alkaline.
- The colour changes to orange indicating the presence of proteins.
- Xanthoproteic test is specific for protein containing aromatic amino acids. The benzene ring in the amino acids is nitrated by heating with nitric acid and forms yellow nitro-compounds which turns to orange colour with alkali.

Tests of Proteins



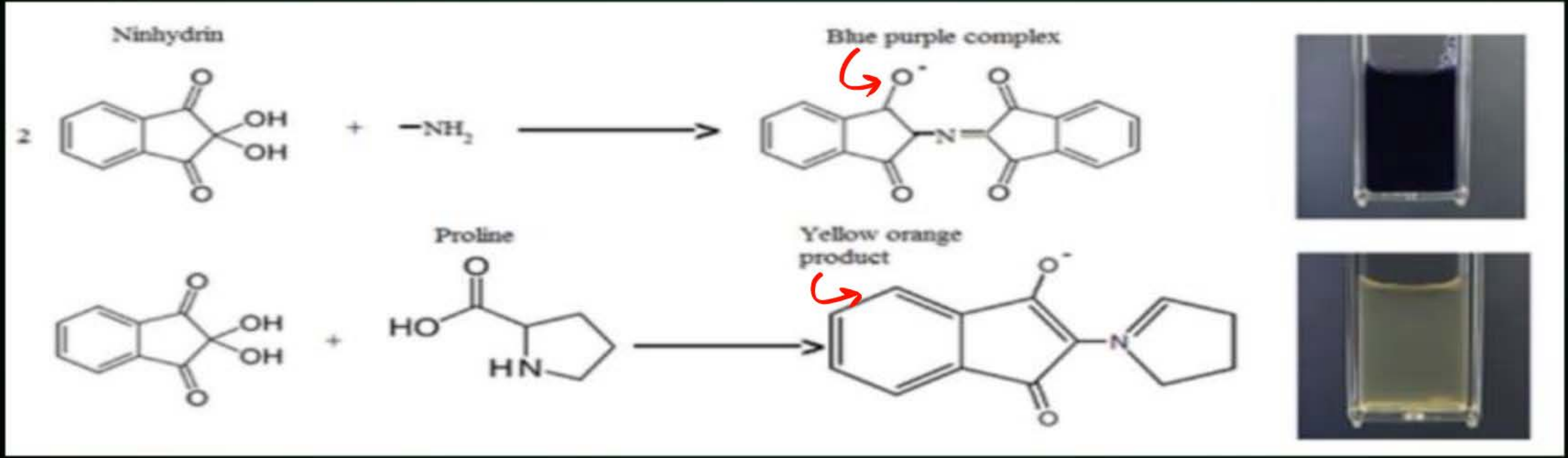
(C) Ninhydrin test

(i) This test is given by all proteins.

(ii) When protein is boiled with a dilute solution of ninhydrin, a violet colour is produced Called [Ruhemann's Purple] ✓

In case of Proline Yellow Orange Colour is produced

↳ 2° amine


Ninhydrin
2
OH
OH
+
−NH$_2$
Blue purple complex
O$^-$
N
Proline
HO
HN
Yellow orange
product
O$^-$
N

Tests of Proteins

(d) Millon's Test

Protein solution + Millon's reagent → pink colour

Millon's reagent is solution of mercuric nitrate and nitrite in nitric acid containing traces of nitrous acid.

$Hg(NO_3)_2$ $Hg_2(NO_3)_2$ HNO_3

HNO_2

Test of Carbo

Molisch →

seliwanoff →

Barfoed —

Benedict

'

'

'

'

'

'

.

Test of amino acid (protein)

Biuret →

Ninhy —

'

'

'

'

QUESTION (AIIMS 2019)

Which is the chemical test for Starch?

[✓ A] Iodine solution

B Ninhydrin test

C Tollen's test

D Benedict solution

QUESTION

Protein gives blue colour with
violet

- (A) Benedict reagent ✗
- (B) Iodine solution ✗
- (C) Ninhydrin violet
- (D) [✓ Biuret] violet

All protein

1° aminoacid violet

proline 2° yellow

QUESTION

Biuret test is used for

- A [✓ Proteins]
- B Fats
- C Sugar
- D None

QUESTION

Molisch's test reagent is:

- **A** 5 % solution of α-Naphthol in alcohol and few droplets of conc. H_2SO_4 ✓
- **B** 1% of ß-Napthol in alcohol ✗
- **C** Both (A) and (B)
- **D** None of these

QUESTION

Millon's test is given by

A [✓ Proteins]

B Sucrose

C Oil

D All of these

QUESTION

In iodine test of starch which colour of ppt had been observed

[✓ A blue]

B yellow

C red

D white

QUESTION

Amino acid/proteins gives positive test with

[✓ Ⓐ Xanthoproteic test]

Ⓑ Benedict test

Ⓒ Fehling's test

Ⓓ All of these

QUESTION

Observation of "Rhumann's purple" is a confirmatory test for the presence of:

Ⓐ Starch

Ⓑ Reducing sugar

Ⓒ Cupric ion

Ⓓ [✓ Protein]

QUESTION

Proteins when heated with conc. HNO_3 give a yellow colour. This is:

Ⓐ Oxidizing test

Ⓑ [✓ Xanthoproteic test]

Ⓒ molisch's test

Ⓓ acid-base test

QUESTION

Molisch test is used for the detection of:

Ⓐ fats

Ⓑ [✓ carbohydrates]

Ⓒ alkyl halide

Ⓓ alkaloid

QUESTION

Biuret test is not given by:

- **A** proteins
- **B** [✓ carbohydrates]
- **C** polypeptides
- **D** urea

QUESTION

Which of the following compounds can be detected by Molisch's test?

Ⓐ Nitro compounds

Ⓑ [✓ Sugars]

Ⓒ Amines

Ⓓ Primary alcohols

QUESTION

The reagent used for the detection of proteins is:

[✓ A] Conc. HNO_3

B Fehling's solution

C Tollens' reagent

D Baeyer's reagent

QUESTION

Which one of the following is the reagent used to identify glucose?

A Neutral $FeCl_3$

B $CHCl_3$ and alc. KOH

[✓ C Ammoniacal $AgNO_3$]

D C_2H_5ONa

QUESTION

Which of the following test is not used for testing of proteins?

A Millon's test

[✓ B] Molisch's test Carbo

C Biuret test

D Ninhydrin test

NEET/AIPMT

PYQs

QUESTION (NEET 2024)

The reagents with which glucose does NOT react to give the corresponding tests/ products are:

A. Tollen's reagent
[✓ B. Schiff's reagent]
C. HCN
D. NH_2OH
[✓ E. $NaHSO_3$]

Choose the correct options from the given below:

[✓ (A) B and E]
(B) E and D
(C) B and C
(D) A and D

QUESTION (NEET 2023)

O
Base
Sugar
Nucleoside

Given below are two statements:

Statement I: A unit formed by the attachment of a base to 1' position of sugar is known as nucleoside.

Statement II: When nucleoside is linked to phosphorous acid at 5'-position of sugar moiety, we get nucleotide.

1'C

- **A** Statement I is false but Statement II is true.
- **B** Both Statement I and Statement II are true.
- **C** Both Statement I and Statement II are false.
- [✓ **D**] Statement I is true but Statement II is false.

QUESTION (NEET 2022)

The incorrect statement regarding enzymes is:

A Enzymes are very specific for a particular reaction and substrate.

B Enzymes are biocatalysts.

C Like chemical catalysts enzymes reduce the activation energy of bio process.

[✓ D] Enzymes are polysaccharides.

QUESTION (NEET 2021)

The RBC deficiency is deficiency disease of:

Ⓐ Vitamin B_6

Ⓑ Vitamin B_1

Ⓒ Vitamin B_2

[✓ Ⓓ Vitamin B_{12}]

QUESTION (NEET 2020 Covid)

Which of the following statement is not true about glucose?

$C_6H_{12}O_6$

A It contains five hydroxyl groups.

B It is a reducing sugar.

[✓ C] It is an aldopentose.

D It is an aldohexose.

QUESTION (NEET 2020 Covid)

Deficiency of which vitamin causes osteomalacia?

Ⓐ [✓ Vitamin D]

Ⓑ Vitamin K

Ⓒ Vitamin E

Ⓓ Vitamin A

QUESTION (NEET 2020)

Sucrose on hydrolysis gives:

A α-D-Glucose + β-D-Glucose

[✓ B] α-D-Glucose + ß-D-Fructose

C α-D-Fructose + ß-D-Fructose

D α-D-Glucose + ß-D-Fructose

QUESTION (NEET 2020)

Which of the following is a basic amino acid?

(A) Alanine $\boxed{CH_3}$

(B) Tyrosine $HOPh-CH_2$

[✓ (C) Lysine] $H_2N-(CH_2)_4-$

(D) Serine $HO-CH_2$

QUESTION (NEET 2019)

The non-essential amino acid among the following is:

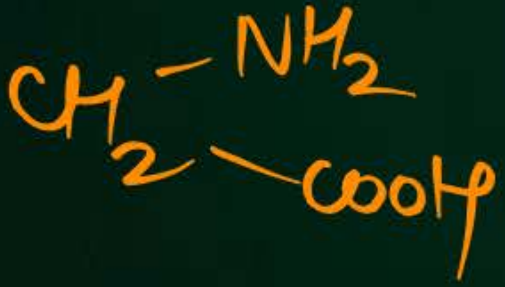
- A valine
- B leucine
- [✓ C alanine]
- D lysine

Te
Ser
Gly
Ala

QUESTION (NEET 2018)

Which of the following compounds can form a zwitter ion ?

- **A** Aniline $PhNH_2$
- **B** Acetanilide $Ph-NHCOCH_3$
- **C** [✓ Glycine]



$CH_2<^{-NH_2}_{-COOH}$

- **D** Benzoic acid $PhCOOH$

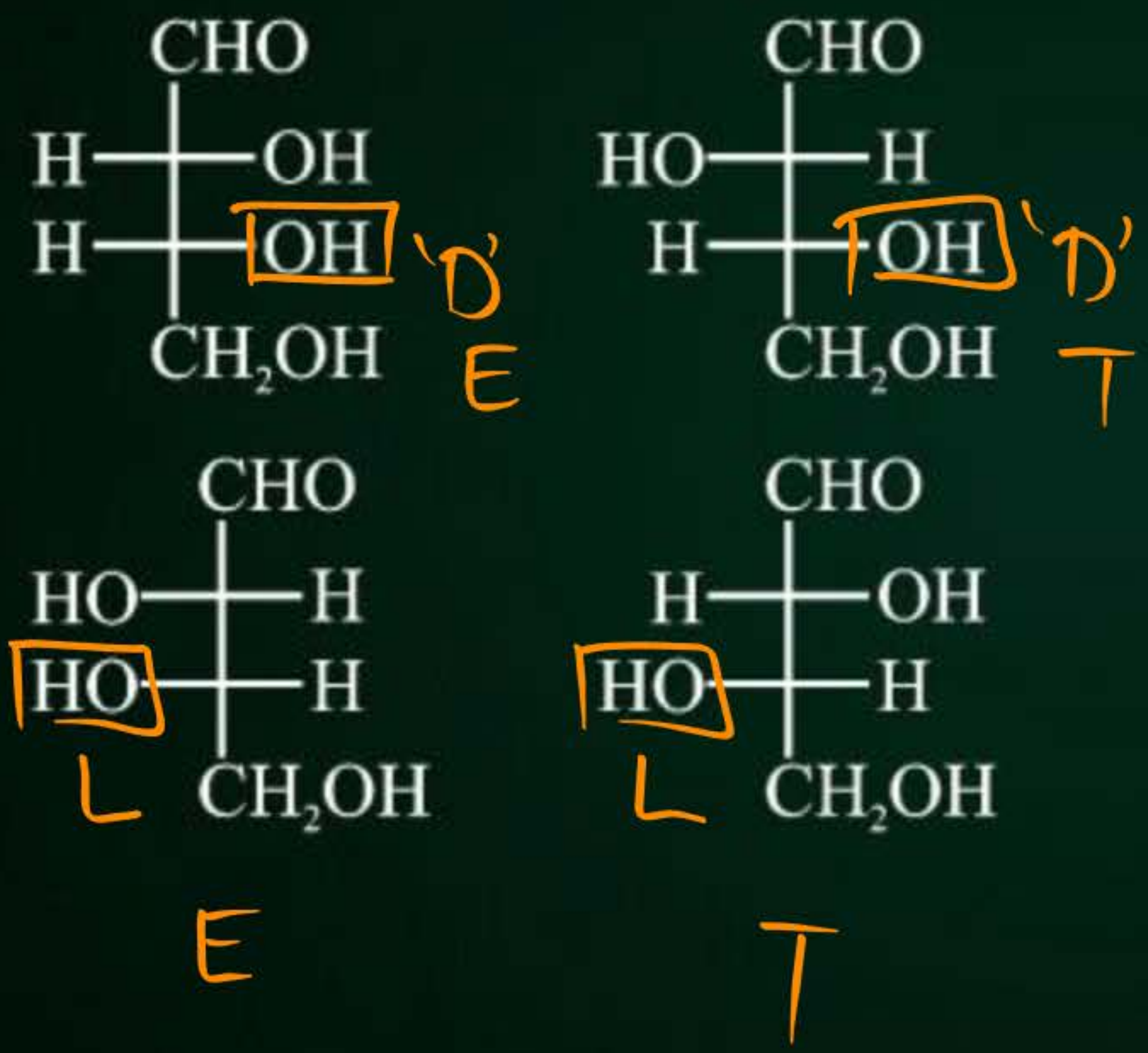
QUESTION (NEET 2018)

The difference between amylose and amylopectin is:

- A Amylopectin have $1 \rightarrow 4$ α-linkage and $1 \rightarrow 6$ α-linkage ✓
- B Amylose have $1 \rightarrow 4$ α-linkage and $1 \rightarrow 6$ β-linkage ✗
- C Amylose is made up of glucose and galactose ✗
- D Amylopectin have $1 \rightarrow 4$ α-linkage and $1 \rightarrow 6$ β-linkage ✗

QUESTION (NEET 2016-II)

The correct corresponding order of names of four aldoses with configuration given below:


CHO
H
OH
H
OH
CH₂OH
'D'
E
CHO
HO
H
H
OH
CH₂OH
'D'
T
CHO
HO
H
HO
H
L
CH₂OH
E
CHO
H
OH
HO
H
L
CH₂OH
T

A L-erythrose, L-threose, L-erythrose, D-threose

B D-threose, D-erythrose, L-threose, L-erythrose

C L-erythrose, L-threose, D-erythrose, D-threose

[✓ D D-erythrose, D-threose, L-erythrose, L-threose]

QUESTION (NEET 2016)

In a protein molecule various amino acids are linked together by

A α-glycosidic bond

B ß-glycosidic bond

[✓ **C** peptide bond]

D dative bond

$A_1 - A_2 - A_3 - A_4 - \; - \; - \; - \; .$

QUESTION (NEET 2016)

Which one given below is a non-reducing sugar?

Ⓐ Maltose

Ⓑ Lactose

Ⓒ Glucose

[✓ Ⓓ Sucrose]

QUESTION (NEET 2016)

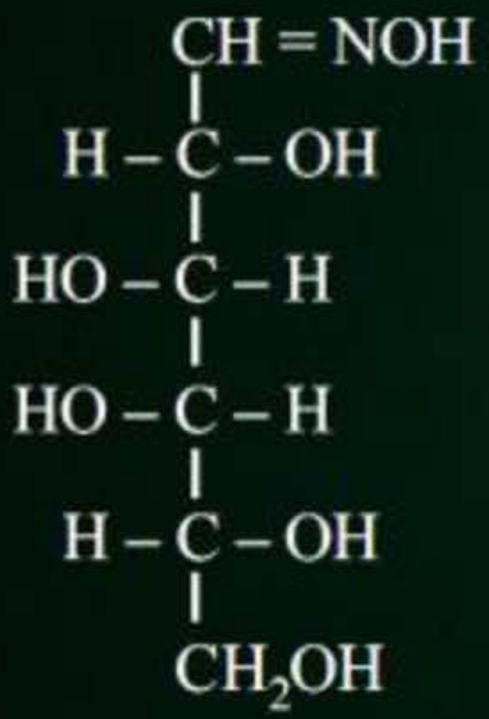
The correct statement regarding RNA and DNA, respectively is:

- A The sugar component in RNA is arabinose and the sugar component in DNA is 2'-deoxyribose.
- [✓ B] The sugar component in RNA is ribose and the sugar component in DNA is 2'-deoxyribose.
- C The sugar component in RNA is arabinose.
- D The sugar component in RNA is 2'-deoxyribose and the sugar component in DNA is arabinose.

QUESTION (NEET 2014)

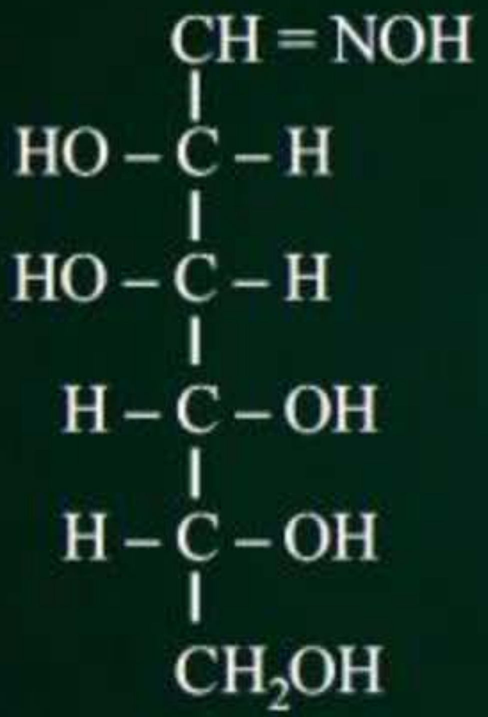
D (+) glucose reacts with hydroxylamine and yields an oxime. The structure of the oxime would be:

A



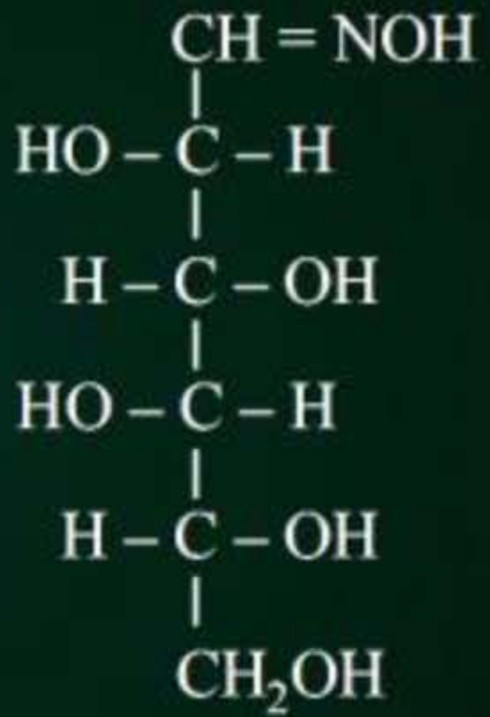
$$\begin{array}{rcl} & \mathrm{CH{=}NOH} & \\ \mathrm{H}- & \mathrm{C} & -\mathrm{OH} \\ \mathrm{HO}- & \mathrm{C} & -\mathrm{H} \\ \mathrm{HO}- & \mathrm{C} & -\mathrm{H} \\ \mathrm{H}- & \mathrm{C} & -\mathrm{OH} \\ & \mathrm{CH_2OH} & \end{array}$$

B



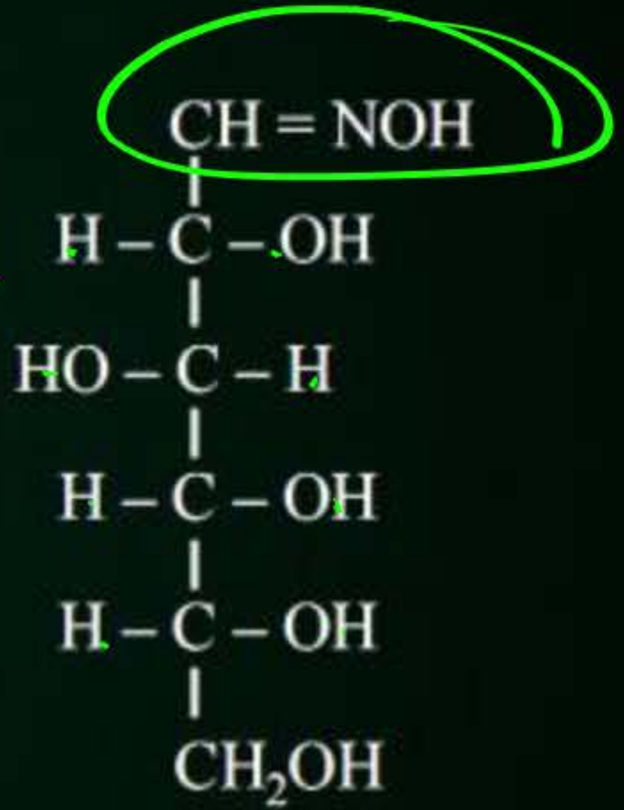
$$\begin{array}{rcl} & \mathrm{CH{=}NOH} & \\ \mathrm{HO}- & \mathrm{C} & -\mathrm{H} \\ \mathrm{HO}- & \mathrm{C} & -\mathrm{H} \\ \mathrm{H}- & \mathrm{C} & -\mathrm{OH} \\ \mathrm{H}- & \mathrm{C} & -\mathrm{OH} \\ & \mathrm{CH_2OH} & \end{array}$$

C



$$\begin{array}{rcl} & \mathrm{CH{=}NOH} & \\ \mathrm{HO}- & \mathrm{C} & -\mathrm{H} \\ \mathrm{H}- & \mathrm{C} & -\mathrm{OH} \\ \mathrm{HO}- & \mathrm{C} & -\mathrm{H} \\ \mathrm{H}- & \mathrm{C} & -\mathrm{OH} \\ & \mathrm{CH_2OH} & \end{array}$$

[✓ **D**]



$$\begin{array}{rcl} & \mathrm{CH{=}NOH} & \\ \mathrm{H}- & \mathrm{C} & -\mathrm{OH} \\ \mathrm{HO}- & \mathrm{C} & -\mathrm{H} \\ \mathrm{H}- & \mathrm{C} & -\mathrm{OH} \\ \mathrm{H}- & \mathrm{C} & -\mathrm{OH} \\ & \mathrm{CH_2OH} & \end{array}$$

JEE Mains PYQs

QUESTION (JEE Mains 1st Feb 2024, Morning Shift)

AGCT

If one strand of a DNA has the sequence ATGCTTCA, sequence of the basis in complementary strand is:

TACGAAGT

A CATTAGCT

[✓ B] TACGAAGT

C GTACTTAC

D ATGCGACT

QUESTION (JEE Mains 4th April 2024, Evening Shift)

Match List I with List II.

	LIST I		LIST II
A.	(C_4 epimer) (IV) α-Glucose and α-Galactose	I.	Functional isomers
B.	α-Glucose and β-Glucose	II.	Homologous
C.	α-Glucose and α-Fructose	III.	Anomers
D.	α-Glucose and α-Ribose	IV.	Epimers

Choose the correct answer from the options given below:

A) A – III, B – IV, C – II, D – I

B) A – III, B – IV, C – I, D – II

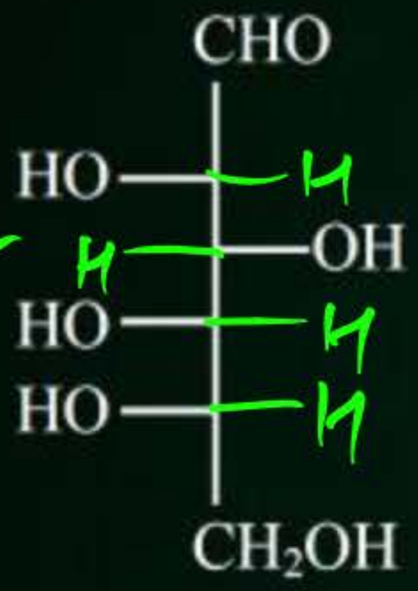
[✓ C) A – IV, B – III, C – I, D – II]

D) A – IV, B – III, C – II, D – I

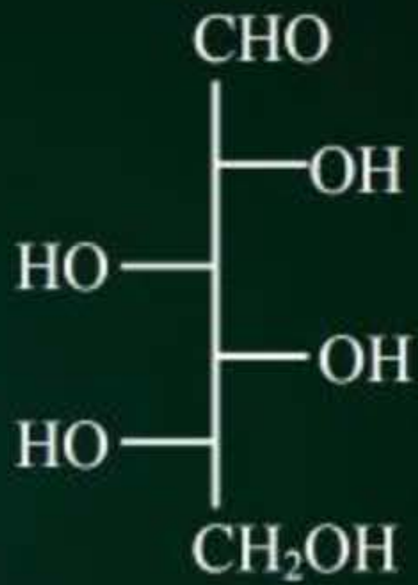
QUESTION (JEE Mains 4th April 2024, Morning Shift)

Which of the following is the correct structure of L-Glucose?

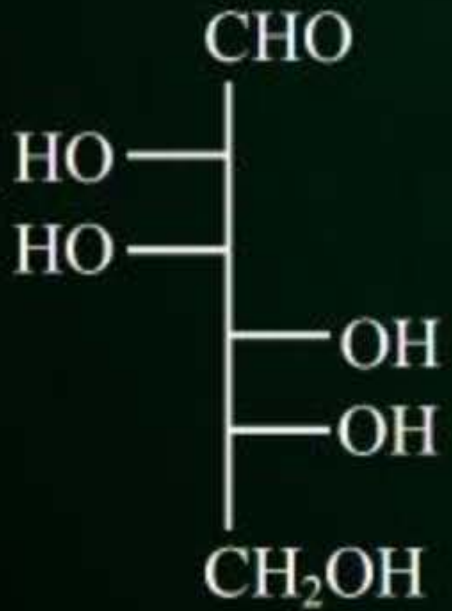
(A)


CHO
HO
H
H
OH
HO
H
HO
H
CH2OH

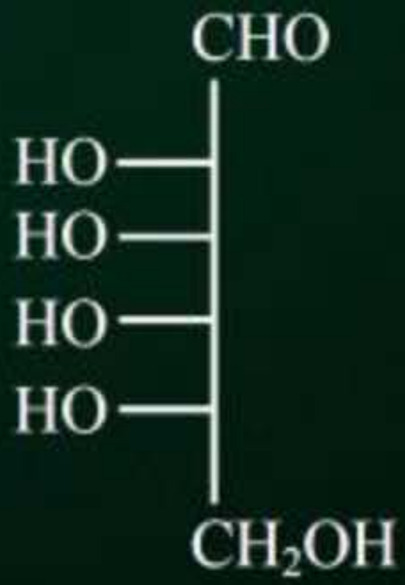
(B)

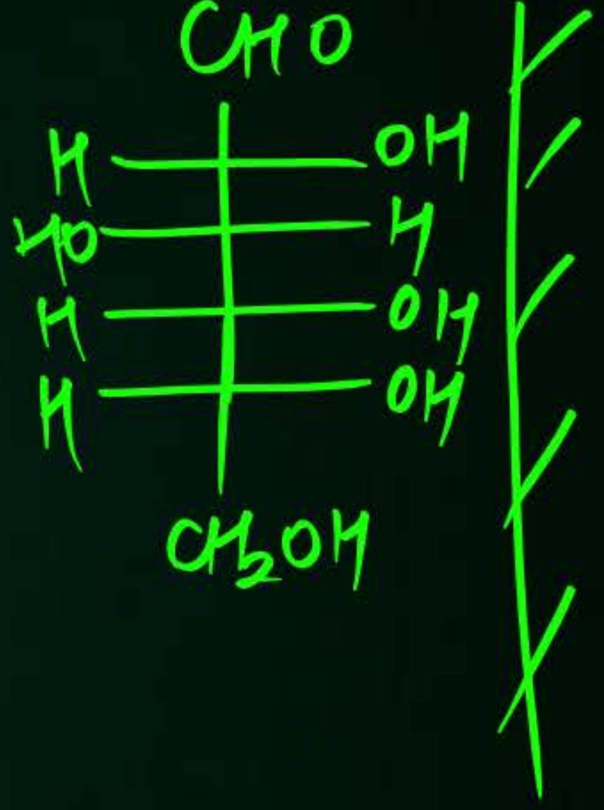

CHO
OH
HO
OH
HO
CH2OH

(C)


CHO
HO
HO
OH
OH
CH2OH

(D)


CHO
HO
HO
HO
HO
CH2OH


CHO
H
OH
HO
H
H
OH
H
OH
CH2OH

QUESTION (JEE Mains 5th April 2024, Morning Shift)

Which of the following gives a positive test with ninhydrin ? Protein

A Cellulose β glucose polymer

B Starch α glucose polymer

C Polyvinyl chloride

$$\left[CH_2-\underset{Cl}{\underset{|}{CH}}\right]_n$$

[✓ D] Egg albumin

QUESTION (JEE Mains 6th April 2024, Evening Shift)

The incorrect statements regarding enzymes are:

(A) Enzymes are biocatalysts.

(B) Enzymes are non-specific and can catalyse different kinds of reactions. ✓

(C) Most Enzymes are globular proteins.

maltase

(D) Enzyme - oxidase catalyses the hydrolysis of maltose into glucose.

Choose the correct answer from the option given below:

- A (B) and (C) ✗
- B (B), (C) and (D) ✗
- [✓ C (B) and (D)]
- D (A), (B) and (C) ✗

QUESTION (JEE Mains 9th April 2024, Evening Shift)

The incorrect statement about Glucose is:

[✓ Ⓐ] Glucose is soluble in water because of having aldehyde functional group.

Ⓑ Glucose remains in multiple isomeric form in its aqueous solution.

Ⓒ Glucose is an aldohexose.

Ⓓ Glucose is one of the monomer unit in sucrose.

QUESTION (JEE Mains 27 January 2024, Morning Shift)

Two nucleotides are joined together by a linkage known as:

- **A** [✓ Phosphodiester linkage]
- **B** Glycosidic linkage
- **C** Disulphide linkage
- **D** Peptide linkage

$3' \& 5'$

Phosphodiester

QUESTION (JEE Mains 29 January 2024, Evening Shift)

Match List I with List II.

List-I (Bio Polymer)		List-II (Monomer)	
A.	Starch (II)	I.	nucleotide
B.	Cellulose (III)	II.	α-glucose
C.	Nucleic acid (I)	III.	β-glucose
D.	Protein (IV)	IV.	α-amino acid

Choose the correct answer from the options given below:

A A-II, B-I, C-III, D-IV

B A-IV, B-II, C-I, D-III

C A-I, B-III, C-IV, D-II

D [✓ A-II, B-III, C-I, D-IV]

QUESTION (JEE Mains 30 January 2024, Morning Shift)

Sugar which does not give reddish brown precipitate with Fehling's reagent is:

Ⓐ [✓ Sucrose]

Ⓑ Lactose

Ⓒ Glucose

Ⓓ Maltose

QUESTION (JEE Mains 31 January 2024, Evening Shift)

From the vitamins A, B_1, B_6, B_{12}, C, D, E and K, the number vitamins that can be stored in our body is ___5___.

K E D A B_{12}

QUESTION (JEE Mains 31 January 2024, Morning Shift)

Match List I with List II.

LIST-I		LIST-II	
A.	Glucose/$NaHCO_3$/Δ II	I.	Gluconic acid
B.	Glucose/HNO_3 IV	II.	No reaction
C.	Glucose/HI/ Δ III	III.	n-hexane
D.	Glucose/Bromine water I	IV.	Saccharic acid

Choose the correct answer from the options given below:

A A-IV, B-I, C-III, D-II

[✓ B] A-II, B-IV, C-III, D-I

C A-III, B-II, C-I, D-IV

D A-I, B-IV, C-III, D-II

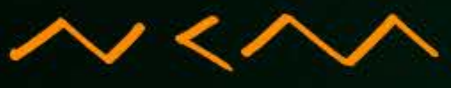
Physical Properties of Organic Compounds

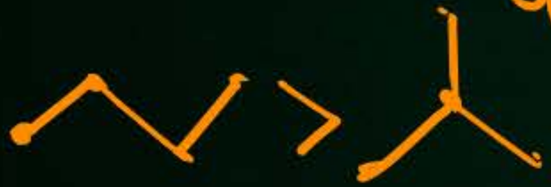
BP

✓1) $BP \propto MW$

✓2) $BP \propto \frac{1}{Branch}$

Branch ↑ spherical shape acquire





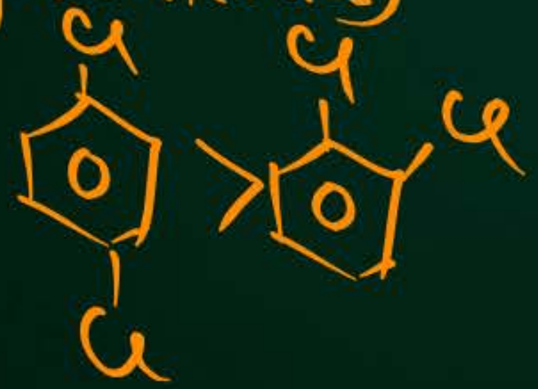
MP

Crystal lattice energy

stability ↑ MP ↑

packing ↑ MP ↑

(Sym molecules)

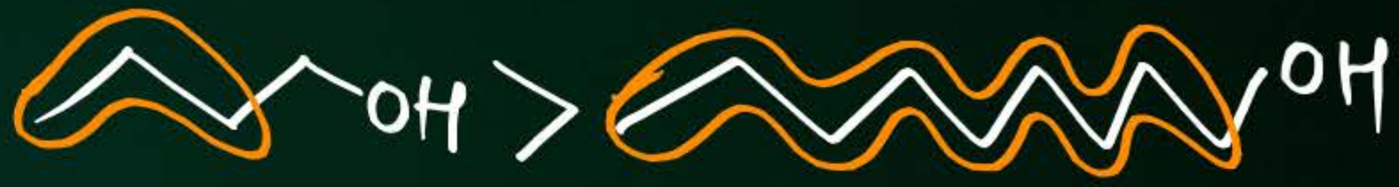


Solubility

Hydrophobic part

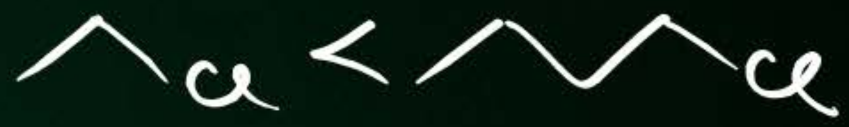
'C' chain ↑

Solubility ↓

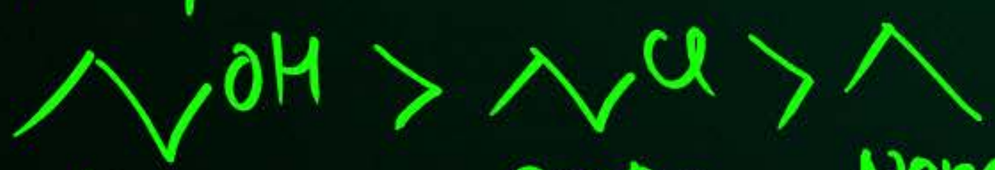


density

MW ↑ density ↑



In Hydrogenbond BP ↑



Hydrogen bond

DPDP

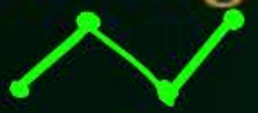
Nonpolar
IDP-IDP

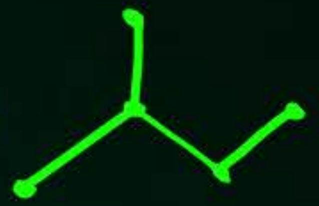
Concept of Boiling point

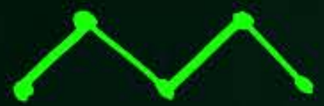
1. Boiling point increases with increase in molecular mass.
2. This is due to the fact that the intermolecular van der Waals forces increase with increase of the molecular size or the surface area of the molecule.
3. With increase in number of branched chains, the molecule attains the shape of a sphere.
4. This results in smaller area of contact and therefore weak intermolecular forces between spherical molecules, which are overcome at relatively lower temperatures.

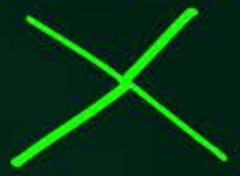
QUESTION (NCERT Exemplar)

Arrange the following in decreasing order of their boiling points.

(A) *n*–butane 

(B) 2–methyl butane 

(C) *n*-pentane 

(D) 2, 2–dimethyl propane 

A ✗ A > B > C > D

B B > C > D > A

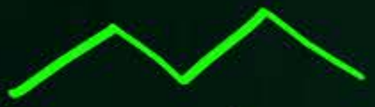
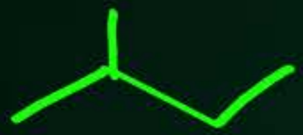
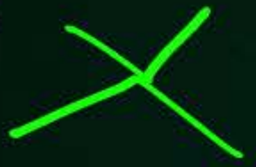
C D > C > B > A

[✓ **D**] C > B > D > A

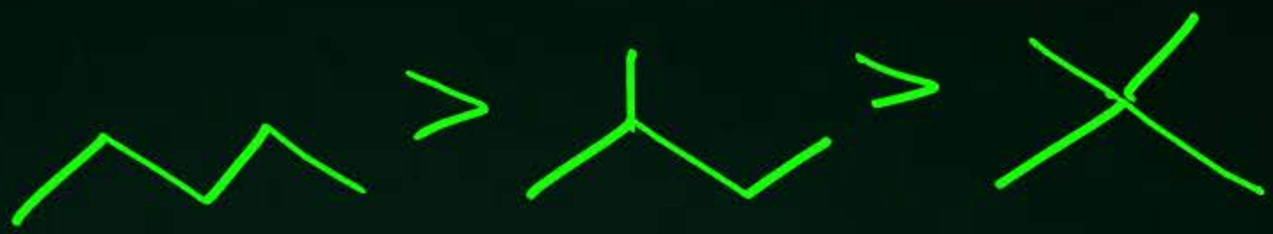
$BP \propto \frac{1}{\text{Branch}}$

QUESTION (NCERT Exemplar)

Match the hydrocarbons in Column I with the boiling points given in Column II.

Column I			Column II
(i) n–Pentane		ⓑ	(a) 282.5 K
(ii) iso-Pentane		ⓒ	(b) 309 K
(iii) neo-Pentane			(c) 301 K
		ⓐ	

QUESTION (NCERT Exemplar)

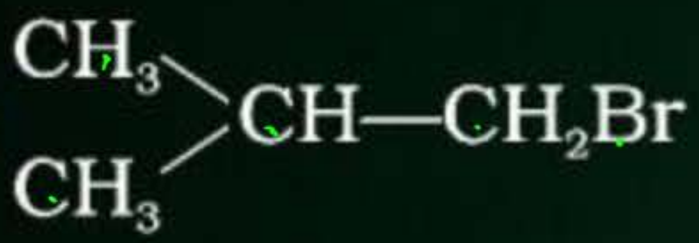


Assertion (A): Among isomeric pentanes, 2, 2-dimethylpentane has ~~highest~~ boiling point.
Reason (R): Branching does not affect the boiling point. ✗

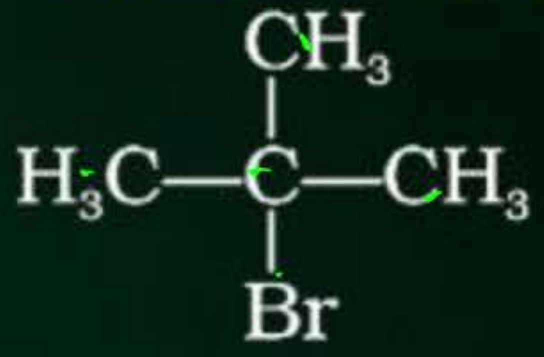
- **A** Both A and R are correct and R is the correct explanation of A.
- **B** Both A and R are correct but R is not the correct explanation of A.
- [✓ **C** Both A and R are not correct.]
- **D** A is not correct but R is correct.

QUESTION (NCERT Exemplar)

Arrange the following compounds in increasing order of their boiling points.

(a) 

(b) $CH_3CH_2CH_2CH_2Br$

(c) 

$$H_3C-\underset{\displaystyle Br}{\overset{\displaystyle CH_3}{C}}-CH_3$$

A (b) < (a) < (c)

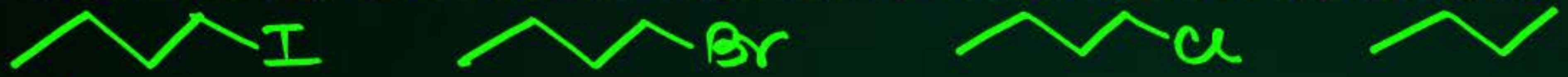
B (a) < (b) < (c)

[✓ C] (c) < (a) < (b)

D (c) < (b) < (a)

QUESTION (NCERT Exemplar)

Which is the correct increasing order of boiling points of the following compounds?
1-Iodobutane, 1-Bromobutane, 1-Chlorobutane, Butane



[✓ A] Butane < 1-Chlorobutane < 1-Bromobutane < 1-Iodobutane

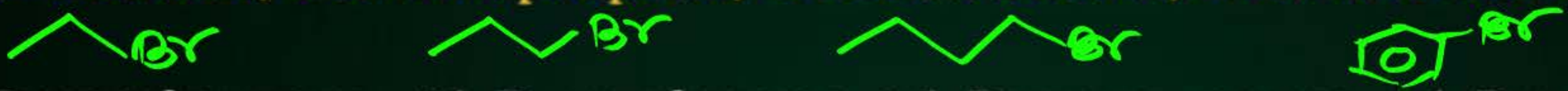
B 1-Iodobutane < 1-Bromobutane < 1-Chlorobutane < Butane

C Butane < 1-Iodobutane < 1-Bromobutane < 1-Chlorobutane

D Butane < 1-Chlorobutane < 1-Iodobutane < 1-Bromobutane

QUESTION (NCERT Exemplar)

Which is the correct increasing order of boiling points of the following compounds?
1-Bromoethane, < 1-Bromopropane, < 1-Bromobutane, < Bromobenzene



- A ✗ Bromobenzene < 1-Bromobutane < 1-Bromopropane < 1-Bromoethane
- B ✗ Bromobenzene < 1-Bromoethane < 1-Bromopropane < 1-Bromobutane
- C 1-Bromopropane < 1-Bromobutane < 1-Bromoethane < Bromobenzene
- [✓ D] 1-Bromoethane < 1-Bromopropane < 1-Bromobutane < Bromobenzene

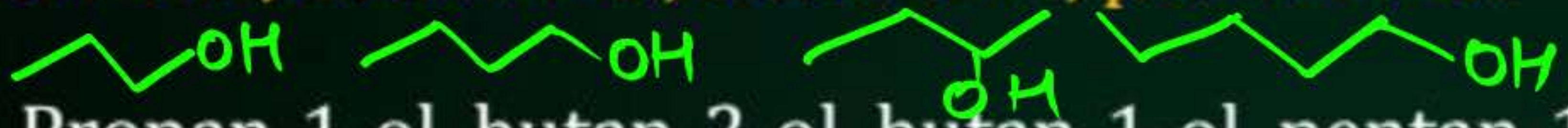
QUESTION (NCERT Exemplar)

Assertion: The boiling points of alkyl halides decrease in the order: RI > RBr > RCl > RF.
Reason: The boiling points of alkyl chlorides, bromides and iodides are considerably higher than that of the hydrocarbon of comparable molecular mass.

- **A** Assertion and reason both are correct and reason is correct explanation of assertion.
- [✓ **B**] Assertion and reason both are correct statements but reason is not correct explanation of assertion.
- **C** Assertion is correct but reason is wrong statement.
- **D** Assertion is wrong but reason is correct statement.

QUESTION (NCERT Exemplar)

Arrange the following compounds in increasing order of boiling point.
Propan-1-ol, butan-1-ol, butan-2-ol, pentan-1-ol



- (A) Propan-1-ol, butan-2-ol, butan-1-ol, pentan-1-ol
- (B) Propan-1-ol, butan-1-ol, butan-2-ol, pentan-1-ol
- (C) Pentan-1-ol, butan-2-ol, butan-1-ol, propan-1-ol
- (D) Pentan-1-ol, butan-1-ol, butan-2-ol, propan-1-ol

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PANKAJ SIR

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Thank you!!